PROJECT MANUAL

for

CONSTRUCT OCWS FIELD OFFICES

at

OKALOOSA COUNTY
FORT WALTON BEACH, FLORIDA

PREPARED FOR:

OKALOOSA COUNTY WATER & SEWER
1804 Lewis Turner Boulevard, Suite 200
Fort Walton Beach, FL 32547
Phone: (850) 651-7171
Contact: Mark Wise

PREPARED BY:

AVCON, INC.
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October 2020
AVCON Project Number: 2018.0125.02

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INVITATION TO BID (ITB) & RESPONDENT'S ACKNOWLEDGEMENT

ITB TITLE: CONSTRUCT OKALOOSA COUNTY WATER AND SEWER FIELD OFFICES

ITB NUMBER: ITB WS 02-21

ISSUE DATE:	**12 October, 2020**	**8:00 A.M. C.S.T.**
MANDATORY PRE-BID MEETING:	**22 October, 2020**	**10:00 A.M. C.S.T.**
LAST DAY FOR QUESTIONS:	**3 November, 2020**	**3:30 P.M. C.S.T.**
ITB OPENING DATE & TIME:	**18 November, 2020**	**3:00 P.M. C.S.T.**

NOTE: BIDS RECEIVED AFTER THE BID OPENING DATE & TIME WILL NOT BE CONSIDERED.

Okaloosa County, Florida solicits your company to submit a bid on the above referenced goods or services. All terms, specifications and conditions set forth in this ITB are incorporated into your response. A bid will not be accepted unless all conditions have been met. All bids must have an authorized signature in the space provided below. All bids must be sealed and received by the Okaloosa County Purchasing Department by the "ITB Opening Date & Time" referenced above. The official clock for the purpose of receiving bids is located in the Okaloosa County Purchasing Department, located at 5479A Old Bethel Rd., Crestview, FL 32536. All envelopes containing sealed bids must reference the "ITB Title", "ITB Number" and the "ITB Opening Date & Time". Okaloosa County is not responsible for lost or late delivery of bids by the U.S. Postal Service or other delivery services used by the respondent. Neither faxed nor electronically submitted bids will be accepted. Bids may not be withdrawn for a period of ninety (90) days after the bid opening unless otherwise specified.

RESPONDENT ACKNOWLEDGEMENT FORM BELOW MUST BE COMPLETED, SIGNED, AND RETURNED AS PART OF YOUR BID. BIDS WILL NOT BE ACCEPTED WITHOUT THIS FORM, SIGNED BY AN AUTHORIZED AGENT OF THE RESPONDENT.

COMPANY NAME _____

MAILING ADDRESS _____

CITY, STATE, ZIP _____

FEDERAL EMPLOYER'S IDENTIFICATION NUMBER (FEIN): _____ TELEPHONE NUMBER: _____ EXT: _____ E- MAIL ADDRESS: _____

I CERTIFY THAT THIS BID IS MADE WITHOUT PRIOR UNDERSTANDING, AGREEMENT, OR CONNECTION WITH ANY OTHER RESPONDENT SUBMITTING A BID FOR THE SAME MATERIALS, SUPPLIES, EQUIPMENT OR SERVICES, AND IS IN ALL RESPECTS FAIR AND WITHOUT COLLUSION OR FRAUD. I AGREE TO ABIDE BY ALL TERMS AND CONDITIONS OF THIS BID AND CERTIFY THAT I AM AUTHORIZED TO SIGN THIS BID FOR THE RESPONDENT. **AUTHORIZED SIGNATURE:** _____ **TYPED OR PRINTED NAME:** _____

TITLE: _____ **DATE:** _____

NOTICE TO BIDDERS

ITB WS 02-21

CONSTRUCT OKALOOSA COUNTY WATER AND SEWER (OCWS) FIELD OFFICES
for
OKALOOSA COUNTY, FLORIDA

Notice is hereby given that the Board of County Commissioners of Okaloosa County will receive sealed bids until **18 November, 2020 at 3:00 P.M.** (Central Daylight Savings Time) for the OCWS Field Office Development and Construction project. Interested respondents desiring consideration shall provide an original and two (2) copies (total three (3)) of their Invitation to Bid (ITB) response with the respondent's area of expertise identified. Submissions shall be portrait oriented, unbound, and 8 ½"x 11" where practical. **All originals must have original signatures in blue ink.**

The Okaloosa County Water & Sewer Field Offices Development project generally includes a new approx. 6,500 sf office building, a new 2,450 sf maintenance building, demolition of existing infrastructure, grading and drainage, stormwater improvements, parking lot, gravel parking area, water and sewer improvements, and landscaping.

Beginning on **Monday 12 October, 2020** digital copies of the above documents may be downloaded by accessing the following sites:
http://www.myokaloosa.com/purchasing/home then accessing the link "View Current Solicitations"
https://www.bidnetdirect.com/florida
https://www.demandstar.com/supplier/bids/agency_inc/bid_list.asp?f=search&mi=2442519

A mandatory Pre-Bid Conference will be conducted at the Water and Sewer Administrative Building, 3rd Floor located at 1804 Lewis Turner, Fort Walton Beach, Florida 32547on **22 October, 2020 at 10:00 A.M. (Central Daylight Savings Time).** Okaloosa County will transmit to all plan holders of record an Addenda in response to written questions received no later than seven (7) days prior to Bid Opening date. Oral statements may not be relied upon and will not be binding or legally effective.

In order to help protect yourself and others a face covering or mask will be required to attend the meeting. Staff will be following the latest guidance from the CDC, State, and Local authorities.

Funding for this project is being provided by Okaloosa County and will be subject to all applicable County requirements.

On **18 November, 2020 at 3:00 P.M.** (Central Daylight Savings Time), all bids will be opened and read aloud. All bids must be in sealed envelopes reflecting on the outside thereof the Respondent's name and "ITB WS 21-21 OCWS FIELD OFFICES DEVELOPMENT AND CONSTRUCTION".
The Board of County Commissioners will consider all bids properly submitted at its scheduled bid opening in the Okaloosa County Purchasing Department located at opening located at 5479A Old Bethel Rd., Crestview, FL 32536. Bids may be submitted at the Purchasing department prior to bid

opening or delivered to the Okaloosa County Purchasing Department, 5479A Old Bethel Rd., Crestview, FL 32536.

NOTE: Crestview, FL is not a next day guaranteed delivery location by most delivery services. Respondents using mail or delivery services assume all risks of late or non-delivery.

All originals must have original signatures in blue pen ink.

All bids should be addressed as follows:

BID ENCLOSED – CONSTRUCT OKALOOSA COUNTY WATER AND SEWER FIELD OFFICES

ITB WS 02-21
Okaloosa County Purchasing Department
5479A Old Bethel Rd.
Crestview, FL 32536

_____ _____

Jeff Hyde
Purchasing Manager

Date

BOARD OF COUNTY COMMISSIONERS OKALOOSA COUNTY, FL

Robert A. "Trey" Goodwin III, Chairman

INSTRUCTIONS TO CONTRACTORS

PROJECT IDENTIFICATION:

a) Project Title:

CONSTRUCT OKALOOSA COUNTY WATER AND SEWER (OCWS) FIELD OFFICES

b) Owner:

OKALOOSA COUNTY BOARD OF COUNTY COMMISSIONERS

c) Engineer:

AVCON, INC.

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1. Defined Terms.

Terms used in the Instructions to Contractors that are defined in the Standard General Conditions of the Project Manual have the meanings assigned to them in the General Conditions.

Certain additional terms used in the Instruction to Contractors have the meanings indicated below which are applicable to both the singular and plural thereof.

1.1 Contractor – one who submits a Bid directly to Owner as distinct from sub-contractor, who submits a bid to a Contractor.

1.2 Issuing Office – the office from which the Project Documents are to be issued and where the bid procedures are to be administered.

1.3 Successful Contractor – the lowest, responsible and responsive Contractor to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes and award.

2. Copies of Project Documents.

2.1 Complete sets of the Project Documents in the number and for the sum, if any, stated in the Advertisement or Notice to Contractors may be obtained from the Issuing Office.

2.2 Complete sets of Project Documents must be used in preparing Bids; neither Owner nor Engineer assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Project Documents.

2.3 Owner and Engineer in making copies of Project Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

3. Qualifications of Contractors.

To demonstrate qualifications to perform the Work, each Contractor must submit within two (2) business days after Bid opening upon Owner's request detailed written evidence such as financial data, previous experience, present commitments and other such data as may be called for below. Each Bid must contain evidence of Contractors qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the contract.

4. Examination of Documents and Site.

4.1 It is the responsibility of each contractor before submitting a Bid:

4.1.1 To examine thoroughly these documents and other related data identified (including "technical data" referred to below);

4.1.2 To visit the site to become familiar with and satisfy Contractor as to the general, local and site conditions that may affect cost, progress, performance, or furnishing of the Work;

4.1.3 To consider federal, state, and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work;

4.1.4 To study and carefully correlate Contractors knowledge and observations with these Project Documents and such other related data; and

4.1.5 To promptly notify Engineer of all conflicts, errors, ambiguities or discrepancies which Contractor has discovered in or between these Project Documents and such other related documents.

4.2 Reference is made to the General Conditions for identification of:

4.2.1 Those reports of explorations and tests of subsurface conditions at or contiguous to the site which have been utilized by Engineer in preparation of these Project Documents. Contractor may rely upon the general accuracy of the "technical data" contained in such reports but not upon other data, interpretations, opinions or information contained in such reports or otherwise relating to the subsurface conditions at the site, nor upon the completeness thereof for the purposes of the bid or construction.

4.2.2 Those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities) which are at or contiguous to the site that have been utilized by Engineer in preparation of these Project Documents. Contractor may rely upon the general accuracy of the "technical data" contained in such drawings but not upon other data, interpretations, opinions, or information shown or indicated in such drawings or otherwise relating to such structures, nor upon the completeness thereof for the purposes of the bid or construction.

Copies of such reports and drawings will be made available by Owner to any Contractor on request. Those reports and drawings are not part of the Project Documents, but the "technical data" contained therein upon which Contractor is entitled to rely as provided in Paragraph 4.2 of the General Conditions. Contractor is responsible for any interpretation or conclusion drawn from any "technical data" or any such data, interpretations, opinions, or information.

4.3 Information and data shown or indicated in these Project Documents with respect to existing Underground Facilities at or contiguous to the site is based upon information and data furnished to Owner and Engineer by Owners of such Underground Facilities or others, and the Owner and Engineer do not assume responsibility for the accuracy or completeness thereof.

4.4 Provisions concerning responsibilities for the adequacy of data furnished to prospective Contractors with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in these Project Documents due to differing or unanticipated conditions appear in Paragraphs 4.2 and 4.3 of the General Conditions.

4.5 Before submitting a Bid each Contractor will be responsible to obtain such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the site or otherwise, which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences or procedures of construction to be

employed by the Contractor and safety precautions and programs incident thereto or performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contact Documents.

4.6 On request, Owner will provide each Contractor access to the site to conduct such examinations, investigations, explorations, tests, and studies as each Contractor deems necessary for submission of a Bid. Contractor must fill all holes and clean up and restore the site to its former conditions upon completion of such explorations, investigations, tests, and studies.

4.7 Reference is made to the General Conditions for the identification of the general nature of work that is to be performed at the site by Owner or others (such as utilities and other prime contractors) that relates to the work for which a Bid is to be submitted. On request, Owner will provide to each Contractor for examination access to or copies of appropriate documents (other than portions thereof related to price) for such work.

4.8 The submission of a Bid will constitute an incontrovertible representation by Contractor that Contractor has complied with every requirement of this Article 4, that without exception of the Bid is premised upon performing and furnishing the Work required by these Project Documents and applying the specific means, methods, techniques, sequences, or procedures for construction (if any) that may be shown or indicated or expressly required by these Project Documents, the Contractor has given Engineer written notice of all conflicts, errors, ambiguities and discrepancies that Contractor has discovered in these Project Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

4.9 The provisions of 1-4.1 through 4.8, inclusive, do not apply to Asbestos, Polychlorinated biphenyls (PCBs), Petroleum, Hazardous Waste, or Radioactive Material covered by Paragraph 4.5 of the General Conditions.

5. Availability of Lands for Work, Etc.

The lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by the successful Contractor in performing the Work are identified in these Project Documents. All additional land and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by the Successful Contractor. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in these Project Documents.

6. Interpretations and Addenda.

6.1 All questions about the meaning or intent of these Project Documents are to be directed to Engineer. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed, faxed or delivered to all parties recorded by Engineer as having received the Project Documents. Questions received less than ten (10) days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

6.2 Addenda may also be issued to modify these Project Documents as deemed advisable by Owner or Engineer.

7. Bid Security.

7.1 Each Bid must be accompanied by Bid security made payable to Owner in an amount of five percent (5%) of Contractors maximum Bid Price in the form of a certified or bank check or a Bid Bond on form attached, issued by a surety meeting the requirements of Paragraph 5.1 of the General Conditions.

7.2 The Bid security of Successful Contractor will be retained until such Contractor has executed the Agreement, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Contractor fails to execute and deliver the Agreement and furnishes the required contract security within fifteen days after the Notice of Award, Owner may annul the Notice of Award and the Bid security of that Contractor will be forfeited. The Contractor security of other Contractors whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of:

the seventh (7^{th}) day after the Effective Date of the Agreement

or

the ninth (90^{th}) day after the Bid opening,

whereupon Bid security furnished by such Contractors will be returned. Bid security with Bids which are not competitive will be returned within seven (7) days after the Bid opening.

8. Contract Times.

The number of days within which, or the dates by which, the Work is to be substantially completed and also completed and ready for final payment (the term "Contract Times" is defined in paragraph 1.12 of the General Conditions) are set forth in the Agreement (or incorporated therein by reference to the attached Bid Form).

9. Substitute and "Or-Equal" Items.

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications. Whenever it is indicated in the Drawings or specified in the specifications that a substitute or “or-equal” item of material or equipment may be furnished or used by Contractor if acceptable to the County, acceptance of the substitution “or equal” to material or equipment, will typically be considered by the County after the contract is awarded. However, any proposed substitution that represents a deviation from the design intent, must be approved prior to submission of the bid responses. A determination as to whether a design deviation or particular item that changes the design intent of the plans or specification is acceptable as a substitute or “equal” will be made by the County and Engineer. Design deviations approved prior to bid submittals will be made known to other bidders through an addendum. Specific product substitute materials or equipment and requested “or equal” items to be used will be reviewed during the submittal process and follow the procedures outlined in Paragraphs 6.7.1, 6.7.2. and 6.7.3. of the General Conditions.

10. Subcontractors, Suppliers, and Others

10.1 If the General Conditions require the identity of certain Subcontractors, Suppliers and other persons and organizations (including those who are to furnished the principal items of material and equipment) to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, apparent Successful Contractor, and any other Contractor so requested, shall within 24 hours after Bid opening submit to Owner a list of all such Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor Supplier, person, or organization if requested by Owner. An Owner or Engineer who after due investigation has reasonable objection to any proposed Subcontractor, Supplier, other person, or organization, may before the Notice of Award is given request apparent Successful Contractor to submit an acceptable substitute without an increase in Bid Price.

If apparent Successful Contractor declines to make any such substitution, Owner may award the contract to the next lowest Contractor that proposes to use acceptable Subcontractors, Suppliers, and other persons and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any Contractor. Any subcontractor, Supplier, other person or organization listed and to whom Owner or Engineer does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.8.2 of the General Conditions.

11. Bid Form.

11.1 All blanks on the Bid Form must be completed by printing in ink or by typewriter.

11.2 Bids by corporations must be executed in the corporate name by the president or a vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation must be shown below the signature.

11.3 Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature.

11.4 All names must be typed or printed in ink below the signature.

11.5 The bid shall contain an acknowledgment of receipt of all Addenda (the numbers of which must be filled in on the Bid Form).

11.6 The address and telephone number for communications regarding the bid must be shown.

11.7 Evidence of authority to conduct business as an out-of-state corporation in the state where the Work is to be performed shall be provided. State contractor license number, if any, must also be shown.

12. Submission of Bids.

12.1 Contractor shall submit the original plus two (2) copies of their bid to the place indicated in the Advertisement of Notice to Bidder.

12.2 Bids shall be submitted at the time and place indicated in the Advertisement of Notice to Bidder and shall be enclosed in an opaque sealed envelope, marked with the Project title and name and address of Contractor and accompanied by the Bid security and other required documents. If the Bid is sent through the mail or other delivery system the sealed envelope shall be enclosed in a separate envelope with the notation **"BID ENCLOSED – CONSTRUCT OCWS FIELD OFFICES"** on the face of it.

13. Modification and Withdrawal of Bids.

13.1 Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are submitted at any time prior to the opening of Bids.

13.2 If, within twenty-four hours after Bids are opened, any Contractor files a duly signed, written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Contractor may withdraw its Bid and bid security will be returned. Thereafter, that Contractor will be disqualified from further bids on the Work to be provided under the Project Documents.

14. Opening of Bids.

Bids will be opened and (unless obviously non-responsive) read aloud publicly at the place where Bids are to be submitted. An abstract of the amounts of the base Bids and major alternates (if any) will be made available to Contractors after the opening of Bids.

15. Bids to Remain Subject to Acceptance.

All Bids will remain subject to acceptance for ninety (90) days after the day of the Bid opening, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to that date.

16. Disqualification of Contractors

Any of the following reasons may be considered as sufficient for the disqualification of a contractor and the rejection of his proposal or proposals:

A. More than one proposal for the same work from an individual, firm or corporation under the same or different name.

B. Evidence that the contractor has a financial interest in the firm of another contractor for the same work.

C. Evidence of collusion among contractors. Participants in such conclusion will receive no recognition as contractors for any future work of the County until such participant shall have been reinstated as a qualified contractor.

D. Uncompleted work that in the judgment of the County might hinder or prevent the prompt completion of additional work if awarded.

E. Failure to pay or satisfactorily settle all bills due for labor and material on former contracts in force at the time of advertisement for bids.

F. Default under previous contract.

17. Award of Contract.

17.1 Owner reserves the right to reject any or all Bids, including without limitation the rights to reject any or all nonconforming, non-responsive, unbalanced, or conditional Bids and to reject the Bid of any Contractor if Owner believes that it would not be in the best interest of the Project to make an award to that Contractor, whether because the Bid is not responsible or the Contractor is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by Owner. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

17.2 Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications, and financial ability of Contractors, proposed Subcontractors, Suppliers, and other persons and organizations to perform and furnish the Work in accordance with the Project Documents to Owner's satisfaction within the prescribed time.

17.3 The Owner in its absolute discretion may reject any bid of a Contractor that has failed, in the opinion of the Owner, to complete or perform an Owner-contracted project in a timely fashion, and emphasizes this condition to potential Contractors.

17.4 If a contract is to be awarded, it shall be awarded to the responsible and responsive bidder who submits the lowest responsive bid. Owner may request from the proposers additional information to be provided to the County prior to Notice of Award.

18. Pre-Bid Conference.

A **mandatory** Pre-Bid Meeting will be conducted at the Water and Sewer Administrative Building, 3rd floor located at 1804 Lewis Turner, Fort Walton Beach, Florida 32547 on **October 22th, 2020 at 10:00 am (local time/CST**). Engineer, in conjunction with the County's Purchasing Department, will transmit to all plan holders of record such Addenda as Engineer considers necessary in response to written questions received no later than seven (7) days prior to the Bid Opening date. Oral statements may not be relied upon and will not be binding or legally effective.

19. Sales and Use Taxes.

Work under this Bid is subject to the provisions of Chapter 212, Florida Statutes, Tax on state, Use and Other Transactions. Other state, local, or federal taxes may be applicable. The contractor is responsible to remit to the appropriate governmental entity all applicable taxes. Any applicable tax shall be included in the total Bid price by the contractor.

OKALOOSA COUNTY STANDARD CLAUSES

INDEMNIFICATION AND HOLD HARMLESS

CONTRACTOR shall indemnify and hold harmless **COUNTY**, its officers and employees from liabilities, damages, losses, and costs including but not limited to reasonable attorney fees, to the extent caused by the negligence, recklessness, or intentional wrongful conduct of the **CONTRACTOR** and other persons employed or utilized by the **CONTRACTOR** in the performance of this Agreement.

NOTE: For Contractor's convenience, this certification form is enclosed and is made a part of the bid package.

CONFLICT OF INTEREST

The award hereunder is subject to the provisions of Chapter 112, Florida Statues. All respondents must disclose with the proposal the name of any officer, director, or agent who is also a public officer or an employee of the Okaloosa Board of County Commissioners, or any of its agencies.

Furthermore, all respondents must disclose the name of any County officer or employee who owns, directly or indirectly, an interest of five percent (5%) or more in the firm or any of its branches.

Furthermore, the official, prior to or at the time of submission of the proposal, must file a statement with the Clerk of Circuit Court of Okaloosa County if he is an officer or employee of the County, disclosing his or spouse's or child's interest and the nature of the intended business.

NOTE: For Contractor's convenience, a certification form is enclosed and is made a part of the bid package

IDENTICAL TIE PROPOSALS

In cases of identical procurement responses, the award shall be determined either by lot or on the basis of factors deemed to serve the best interest of the County. In the case of the latter, there must be adequate documentation to support such a decision.

TRENCH SAFETY ACT

Each contractor must submit with his bid an executed sworn certification that he will comply with the Trench Safety Act, Chapter 90-96, Florida Statues, on trench safety.

NOTE: For Contractor's convenience, a certification form is enclosed and is made a part of the bid package.

PUBLIC ENTITY CRIME INFORMATION

A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Section 287.107, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list.

BONDING REQUIREMENTS

A Bid Bond is required with the Contractor's submittal for 5% of the Bid price, in the form of a cashier's check, certified check or bond. A performance and payment bond will be required in the amount of 100% of the estimated contract value. The performance bond and payment bond can be a total of 100% combined.

INSURANCE REQUIREMENTS

CONTRACTORS INSURANCE

1. The Contractor shall not commence any work in connection with this Agreement until he has obtained all required insurance and such insurance has been approved by the Okaloosa County Risk Manager or designee.

2. All insurance policies shall be with insurers authorized to do business in the State of Florida.

3. All insurance shall include the interest of all entities named and their respective officials, employees & volunteers of each and all other interests as may be reasonably required by Okaloosa County. The coverage afforded the Additional Insured under this policy shall be primary insurance. If the Additional Insured have other insurance that is applicable to the loss, such other insurance shall be on an excess or contingent basis. The amount of the company's liability under this policy shall not be reduced by the existence of such other insurance.

4. Where applicable, the County shall be shown as an Additional Insured with a Waiver of Subrogation on the Certificate of Insurance.

5. The County shall retain the right to reject all insurance policies that do not meet the requirement of this Agreement. Further, the County reserves the right to change these insurance requirements with 60-day notice to the Contractor.

6. The County reserves the right at any time to require the Contractor to provide copies of any insurance policies to document the insurance coverage specified in this Agreement.

7. The designation of Contractor shall include any associated or subsidiary company which is involved and is a part of the contract and such, if any associated or subsidiary company involved in the project must be named in the Workers' Compensation coverage.

8. Any exclusions or provisions in the insurance maintained by the Contractor that excludes coverage for work contemplated in this agreement shall be deemed unacceptable and shall be considered breach of contract.

WORKERS' COMPENSATION INSURANCE

1. The Contractor shall secure and maintain during the life of this Agreement Workers' Compensation insurance for all of his employees employed for the project or any site connected with the work, including supervision, administration or management, of this project and in case any work is sublet, with the approval of the County, the Contractor shall require the Subcontractor similarly to provide Workers' Compensation insurance for all employees employed at the site of the project, and such evidence of insurance shall be furnished to the County not less than ten (10) days prior to the commencement of any and all sub-contractual Agreements which have been approved by the County.

2. Contractor must be in compliance with all applicable State and Federal workers' compensation laws, including the U.S. Longshore Harbor Workers' Act or Jones Act, if applicable.

3. No class of employee, including the Contractor himself, shall be excluded from the Workers' Compensation insurance coverage. The Workers' Compensation insurance shall also include Employer's Liability coverage.

BUSINESS AUTOMOBILE LIABILITY

Coverage must be afforded for all Owned, Hired, Scheduled, and Non-Owned vehicles for Bodily Injury and Property Damage in an amount not less than $1,000,000 combined single limit each accident. If the contractor does not own vehicles, the contractor shall maintain coverage for Hired & Non-Owned Auto Liability, which may be satisfied by way of endorsement to the Commercial General Liability policy or separate Business Auto Policy. Contractor must maintain this insurance coverage throughout the life of this Agreement.

COMMERCIAL GENERAL LIABILITY INSURANCE

1. The Contractor shall carry other Commercial General Liability insurance against all other Bodily Injury, Property Damage and Personal and Advertising Injury exposures.

2. All liability insurance (other than Professional Liability) shall be written on an occurrence basis and shall not be written on a claims-made basis. If the insurance is issued with an aggregate limit of liability, the aggregate limit of liability shall apply only to the locations included in this Agreement. If, as the result of any claims or other reasons, the available limits of insurance reduce to less than those stated in the Limits of Liability, the Contractor shall notify the County representative in writing. The Contractor shall purchase additional liability insurance to maintain the requirements established in this Agreement. Umbrella or Excess Liability insurance can be purchased to meet the Limits of Liability specified in this Agreement.

3. Commercial General Liability coverage shall include the following:

    1.) Premises & Operations Liability
    2.) Bodily Injury and Property Damage Liability
    3.) Independent Contractors Liability
    4.) Contractual Liability
    5.) Products and Completed Operations Liability

4. Contractor shall agree to keep in continuous force Commercial General Liability coverage for the length of the contract.

LIMITS OF LIABILITY

The insurance required shall be written for not less than the following, or greater if required by law and shall include Employer's liability with limits as prescribed in this contract:

	LIMIT
1. Worker's Compensation	
1.) State	Statutory
2.) Employer's Liability	$500,000 each accident
2. Business Automobile	$1M each accident (A combined single limit)
3. Commercial General Liability	$1M each occurrence for Bodily Injury & Property Damage $1M each occurrence Products and completed operations
4. Personal and Advertising Injury	$1M each occurrence

NOTICE OF CLAIMS OR LITIGATION

The Contractor agrees to report any incident or claim that results from performance of this Agreement. The County representative shall receive written notice in the form of a detailed written report describing the incident or claim within ten (10) days of the Contractor's knowledge. In the event such incident or claim involves injury and/or property damage to a third party, verbal notification shall be given the same day the Contractor becomes aware of the incident or claim followed by a written detailed report within ten (10) days of verbal notification.

INDEMNIFICATION & HOLD HARMLESS

Contractor shall indemnify and hold harmless the County, its officers and employees from liabilities, damages, losses, and costs including but not limited to reasonable attorney fees, to the extent caused by the negligence, recklessness, or wrongful conduct of the Contractor and other persons employed or utilized by the Contractor in the performance of this contract.

Note: For Contractor's convenience, this certification form is enclosed and is made a part of the bid package.

CERTIFICATE OF INSURANCE

1. Certificates of insurance indicating the job site and evidencing all required coverage must be submitted not less than 10 days prior to the commencement of any of the work. The certificate holder(s) shall be as follows: Okaloosa County, 5479A Old Bethel Road, Crestview, Florida, 32536.

2. The contractor shall provide a Certificate of Insurance to the County with a thirty (30) day notice of cancellation; ten (10 days' notice if cancellation is for nonpayment of premium).

3. In the event that the insurer is unable to accommodate the cancellation notice requirement, it shall be the responsibility of the contractor to provide the proper notice. Such notification shall be in writing by registered mail, return receipt requested, and addressed to the Okaloosa County Purchasing Department at 5479-A Old Bethel Road, Crestview, FL 32536.

GENERAL TERMS

Any type of insurance or increase of limits of liability not described above which, the Respondent required for its own protection or on account of statute shall be its own responsibility and at its own expense.

The carrying of the insurance described shall in no way be interpreted as relieving the Respondent of any responsibility under this contract.

Should the Respondent engage a subcontractor or sub-subcontractor, the same conditions will apply under this Agreement to each subcontractor and sub-subcontractor.

The Respondent hereby waives all rights of subrogation against Okaloosa County and its consultants and other indemnities of the Respondent under all the foregoing policies of insurance.

UMBRELLA INSURANCE

The Respondent shall have the right to meet the liability insurance requirements with the purchase of an umbrella insurance policy. In all instances, the combination of primary and umbrella liability coverage must equal or exceed the minimum liability insurance limits stated in this Agreement.

DELIVERY OF BIDS

Bid Opening shall be public, on the date and time specified on the NOTICE TO CONTRACTORS. It is the contractor's responsibility to assure that his bid is delivered at the proper time and place. Offers by telegram, facsimile, or telephone are NOT acceptable. NOTE: Crestview, Florida is "not a next-day-guaranteed delivery location" by delivery services.

Liquidated Damages:

a. In case of failure on the part of the Contractor to complete the work within the time(s) specified in the contract, or within such additional time(s) as may be granted by Okaloosa County, the County will suffer damage, the amount of which is difficult, if not impossible, to ascertain. Therefore, the Contractor shall pay to the County, as liquidated damages, the amount established in the schedule below for each calendar day of delay that actual completion extends beyond the time limit specified until such reasonable time as may be required for final completion of the work. In no way shall costs for liquidated damages be construed as penalty on the contractor.

Daily Charge

Original Contract Amount	**Per Calendar Day**
$50,000 and under	**$ 311**
Over $50,000 but less than $250,000	**972**
$250,000 but less than $500,000	**1584**
$500,000 but less than $2,500,000	**1924**
$2,500,000 but less than $5,000,000	**2694**
$5,000,000 but less than $10,000,000	**3902**
$10,000,000 but less than $15,000,000	**6102**
$15,000,000 but less than $20,000,000	**7022**
$20,000,000 and over	**7022 plus 0.2% for any amount over $20 million**

b. **Determination of Number of Days of Default:** For all contracts, regardless of whether the contract time is stipulated in calendar days or working days, the default days shall be counted in calendar days.

c. **Conditions under which Liquidated Damages are Imposed:** Should the Contractor or, in case of his default, the Surety, fail to complete the work within the time stipulated in the contract, or within such extra time as may have been granted by the County, the Contractor or, in case of his default, the Surety, shall pay to the County, not as a penalty, but as liquidated damages, the amount as provided above.

d. **Right of Collection:** The County shall have the right to apply as payment on such liquidated damages any money which is due to the Contractor by the County.

e. **Permitting Contractor to Finish Work:** Permitting the Contractor to continue and to finish the work, or any part of it, after the expiration of the contract time allowed, including extensions of time granted to the Contractor, shall in no way act as a waiver on the part of the County the liquidated damages due under the contract.

f. **Completion of Work by County:** In case of default of the contract and the completion of the work by the County, the Contractor and his Surety shall be liable for the liquidated damages under the contract, but no liquidated damages shall be chargeable for any delay in the final completion of the work by the County due to any unreasonable action or delay on the part of the County.

BID DOCUMENTS

BID FORM

PROJECT IDENTIFICATION:

CONSTRUCT OCWS FIELD OFFICES

THIS BID IS SUBMITTED TO:

OKALOOSA COUNTY PURCHASING DEPARTMENT

1. The undersigned Contractor proposes and agrees, if this Bid is accepted, to enter into an agreement with Owner in the form included in these documents to perform and furnish all Work as specified or indicated in these documents for the Bid Price and within the Bid Times indicated in this Bid and in accordance with the other terms and conditions of these documents.

2. Contractor accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Contractors, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for one hundred and twenty (120) days after the day of Bid opening. Contractor will sign and deliver the required number of counterparts of the Agreement with the Bonds and other documents required by the Project Requirements within fifteen (15) days after the date of Owner's Notice of Award.

3. In submitting this Bid, Contractor represents as more fully set forth in the Agreement, that:

   (a) Contractor has examined and carefully studied the Project Documents and the following Addenda receipt of all which is hereby acknowledged: (List Addenda by Addendum Number and Date)

   Addendum No. _____ Date _____

   Addendum No. _____ Date _____

   Addendum No. _____ Date _____

   Addendum No. _____ Date _____

   (b) Contractor has visited the site and become familiar with and is satisfied as to the general, local, and site conditions that may affect cost, progress, performance, and furnishing of the Work.

   (c) Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, performance, and furnishing of the Work.

   (d) Contractor has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except underground facilities) which have been identified in the General Conditions as provided in paragraph 4.2.1 of the General Conditions. Contractor accepts the determination set forth in Article 4 of the General Conditions of the extent of the "technical data" contained in such reports and drawings upon which Contractor is entitled to rely as provided in paragraph 4.2 of the General Conditions.

Contractor acknowledges that such reports and drawings are not Contract Documents and may not be complete for Contractor's purposes. Contractor acknowledges that Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicted in the Project Documents with respect to underground facilities at or contiguous to the site. Contractor has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the site or otherwise which may affect cost progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto. Contractor does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the times, price, and other terms and conditions of these Documents.

(e) Contractor is aware of the general nature of Work to be performed by Owner and others at the site that relates to Work for which this Bid is submitted as indicated in these documents.

(f) Contractor has correlated the information known to Contractor, information and observation obtained from visits to the site, reports and drawings identified in these documents and all additional examinations, investigations, explorations, tests, studies, and data with these documents.

(g) Contractor has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Contractor has discovered in these documents and the written resolution thereof by Engineer is acceptable to Contractor, and these documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this Bid is submitted.

(h) This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm, or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; Contractor has not directly or indirectly induced or solicited any other Contractor to submit a false or sham Bid; Contractor has not solicited or induced any person, firm or corporation to refrain from Project; and Contractor has not sought by collusion to obtain for itself any advantage over any other Contractor or over Owner.

4. Contractor will complete the Work in accordance with these documents for the price found in the Bid Schedule:

   Unit Prices have been computed in accordance with paragraph 11.9.2 of the General Conditions.

   Contractor acknowledges that quantities are not guaranteed and final payment will be based on actual quantities determined as provided in these documents.

5. Contractor agrees that Work will be substantially complete 365 calendar days after the date when the Contract Time commences to run as provided in paragraph 2.3 of the General Conditions, and will be completed and ready for final payment in accordance with paragraph 14.13 of the general conditions within 395 calendar days after the date when the Contract Time commences to run.

6. Contractor accepts the provisions of the Agreement as to liquidated damages in the event of failure to achieve substantial complete of the Work within the Substantial Completion time and achieve final completion of the work within the Final Completion time as specified in the Agreement.

7. The following documents are attached to and made a condition of this Bid:

   a) Bid Security as required by the Instructions to Contractors in the form of a certified or bank check made payable to The Board of County Commissioners of Okaloosa County or a Bid Bond on form attached, issued by a surety meeting the requirements of Paragraph 5.1 of the General Conditions. (BF-1 to BF-6)

   b) Bid Schedule (BS-1 to BS-12)

   c) Bid Affidavit (BA-1)

   d) Bid Bond (BB-1 to BB-2)

   e) Required Contractor's Qualification Statement with supporting data. (CQQ-1 to CQQ-3)

   f) Form of Non-collusion Affidavit (NCA-1)

   g) Public Entity Crimes (SSPEC-1 to SSPEC-3)

   h) Certificate as to Corporate Principal (CCP-1)

   i) Certified Copy of Resolution of Board of Directors (RBD-1)

   j) Conflict of Interest Disclosure Form (OC-1)

   k) Drug-Free Workplace Certification (OC-2)

   l) Certification of Contractor Regarding Trench Safety (OC-3)

   m) Indemnification and Hold Harmless (OC-4)

   n) Insurance Compliance (OC-5)

   o) Affidavit – Worker’s Compensation (OC-6)

   p) Recycled Content Form (OC-7)

   q) Performance of Work by Subcontractors (PWSC-1)

   r) E-Verify Compliance Certification (EVCC-1)

   s) Cone of Silence (CS-1)

t) Buy American Certificate (BAC-1)

u) Lobbying – 31 USC 1352 (LF-1)

v) Equal Employment Opportunity Report Statement (EEOR-1)

w) Company Data (CD-1)

x) System of Award Management (SAM-1)

y) Addendum Acknowledgement Page (AA-1)

z) Certification of Non-Segregated Facilities (NSF-1)

aa) Vendor's on Scrutinized List (VSL-1)

8. Communications concerning this Bid shall be addressed to the address of Contractor indicated below.

_____

_____

_____

_____

_____

9. Terms used in this Bid which are defined in the General Conditions or Instructions to Contractors will have the meanings indicated in the General Conditions or Instructions.

10. Contractor acknowledges that the Basis of Award shall be the Total Bid Amount, price and other factors considered. The bid bond amount shall be in the amount of the Total Bid Amount.

SUBMITTED on_____, 20___

State Contractor License No. _____

BID FORM - continued

If Contractor is: An

Individual

By _____ (SEAL)
(Individual's Name)
doing business as _____
Business address: _____
_____
Phone No.: _____

A Partnership

By _____ (SEAL)
(Firm Name)
_____
(General Partner)
Business address: _____
_____
Phone No.: _____

A Corporation

By _____ (SEAL)
(Corporation Name)
_____
(State of Incorporation)
By _____ (SEAL)
(Name of person authorized to sign)
_____
(Title)

(Corporate Seal)

Attest _____
(Secretary)
Business address: _____
_____
Phone No.: _____

Date of Incorporation is _____

A Joint Venture

By_____(SEAL)
(Name)

_____
(Address)

By_____(SEAL)
(Name)

_____
(Address)

Phone Number and Address for receipt of official communications

_____

_____

(Each joint venturer must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above).

BID SCHEDULE

BIDDER: _____ DATE: _____

PROJECT DESCRIPTION: CONSTRUCT OKALOOSA COUNTY WATER AND SEWER FIELD OFFICES

BID SCHEDULE

BASE BID – OCWS Field Office

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
1	101-1	Mobilization	LS	1		
2	102-1	Maintenance of Traffic	LS	1		
3	104-1	Prevention, Control, and Abatement of Erosion and Water Pollution	LS	1		
4	110-1	Complete Asphalt and Base Removal Within Existing Parking Lot	SY	160		
5	110-2	Miscellaneous Curbing/Sidewalk Demolition (selective)	LS	1		
6	110-3	Utility/Storm/Structure Demolition - Field Office	LS	1		

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
7	120-1	Unclassified Excavation and Embankment- Field Office	LS	1		
8	160-1	12" Stabilized Subgrade- Field Office	SY	2,464		
9	285-1	6" Base Course	SY	2,259		
10	334-1	1" Bituminous Surface Course	TN	30		
11	334-2	2" Bituminous Surface Course	TN	230		
12	425-1	FDOT Type "5" Top; FDOT Type "J" Alt B Bottom	EA	1		
13	425-2	FDOT Type "C" DBI	EA	3		
14	425-3	FDOT Type "F" DBI	EA	2		

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
15	425-4	FDOT Type “V” DBI	EA	2		
16	430-1	18” ADS, N-12	LF	383		
17	430-2	24”ADS, N-12	LF	33		
18	430-3	18” MES	EA	1		
19	520-1	Concrete Type “F” Curb- Field Office	LF	982		
20	520-2	Concrete Type “V” Curb – Field Office	EA	240		
21	520-3	Concrete Wheel Stop- Field Office	EA	8		
22	522-1	Concrete Sidewalk- Field Office	SY	88		
23	522-2	Concrete Bollards- Field Office	EA	17		

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
24	522-3	8" PCC Drive Approach- Field Office	SY	240		
25	527-1	Detectable Warning Surfaces - Field Office	EA	1		
26	700-1	Vehicular Signage - Field Office	LS	1		
27	710-1	Vehicular Pavement Markings, (White)- Field Office	SF	305		
28	710-2	Vehicular Pavement Markings, (Blue)- Field Office	SF	40		
29	710-3	Vehicular Pavement Markings, (Yellow)- Field Office	SF	375		
30	711-1	Thermoplastic, Standard, White, Solid, 24"- Field Office	LF	35		
31	711-2	Thermoplastic, Standard, Yellow, Solid, 6"- Field Office	LF	116		

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
32	711-3	Thermoplastic, Preformed, White, Arrow- Field Office	EA	6		
33	711-4	Handicap Parking Symbol – Field Office	EA	2		
34	981-1	Centipede Sod – Field Office	SY	2,840		
35	981-2	Landscaping – Field Office	LS	1		
36	AL-1-1	Special Provision No. 2- Utility Relocation/Replacement- Field Office	AL	1		
37	FB-1	Field Office Building, Complete	LS	1		
38	02730-1	Sanitary Sewer Infrastructure – Field Office	LS	1		

For all work required to perform the work in accordance with the construction drawings, specifications, and other contract documents, including all costs related to the work, and any required permits, taxes, bonds and insurance, the undersigned submits a total BASE BID – OCWS Field Office Bid Amount of:

TOTAL BASE BID – OCWS FIELD OFFICE AMOUNT (in words):_____

_____Dollars and_____cents

($_____)
(amount in numbers)

Note: Total Base Bid – OCWS Field Office Bid Amount shall equal the total amount for Bid Item No. 1 through 38 for BASE BID – OCWS Field Office.

BASE BID - OCWS Maintenance Building

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
1	110-4	Utility/Storm/Structure Demolition – Maint. Bldg.	LS	1		
2	120-2	Unclassified Excavation and Embankment- Maint. Bldg.	LS	1		
3	160-2	12” Stabilized Subgrade- Maint. Bldg.	SY	4,735		
4	160-3	8” Graded Aggregate - Maint. Bldg.	SY	2,452		
5	520-4	Concrete Type “F” Curb- Maint. Bldg.	LF	170		

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
6	520-5	Concrete Wheel Stop (Furnish Only)- Maint. Bldg.	EA	14		
7	522-4	Concrete Parking with Sidewalk- Maint. Bldg.	SY	198		
8	522-5	Concrete Bollards- Maint. Bldg.	EA	1		
9	522-6	8" PCC Drive Approach – Maint. Bldg.	SY	115		
10	527-2	Detectable Warning Surfaces- Maint. Bldg.	EA	1		
11	700-2	Vehicular Signage- Maint. Bldg.	LS	1		
12	710-4	Vehicular Pavement Markings, (White)- Maint. Bldg.	SF	20		

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
13	710-5	Vehicular Pavement Markings, (Blue)- Maint. Bldg.	SF	50		
14	711-5	Thermoplastic, Standard, White, Solid, 24"- Maint. Bldg.	LF	17		
15	711-6	Thermoplastic, Standard, Yellow, Solid, 6"- Maint. Bldg.	LF	50		
16	711-7	Handicap Parking Symbol- Maint. Bldg.	EA	1		
17	981-3	Centipede Sod – Maint. Bldg.	SY	2,005		
18	981-4	Landscaping – Maint. Bldg.	LS	1		
19	AL-1-2	Special Provision No. 2- Utility Relocation- Maint. Bldg.	AL	1		

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
20	MB-1	Maintenance Building, Complete	LS	1		
21	02730-3	Sanitary Sewer Infrastructure – Maint. Bldg.	LS	1		

For all work required to perform the work in accordance with the construction drawings, specifications, and other contract documents, including all costs related to the work, and any required permits, taxes, bonds and insurance, the undersigned submits a Total BASE BID – OCWS MAINTENANCE BUILDING Bid Amount of:

TOTAL BASE BID – OCWS MAINTENANCE BUILDING AMOUNT (in words):_____

_____Dollars and_____cents

($_____)
(amount in numbers)

Note: Total Base Bid – OCWS Maintenance Building Bid Amount shall equal the total amount for Bid Item No. 1 through 21 for BASE BID – OCWS Maintenance Building.

ADDITIVE ALTERNATE NO. 1 - OCWS FIELD OFFICE

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
1	550-1	Fencing – Field Office	LF	735		

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
2	550-2	Vehicular Double Gate – Field Office	EA	3		

For all work required to perform the work in accordance with the construction drawings, specifications, and other contract documents, including all costs related to the work, and any required permits, taxes, bonds and insurance, the undersigned submits a Total ADDITIVE ALTERNATE NO. 1 – OCWS FIELD OFFICE Bid Amount of:

TOTAL ADDITIVE ALTERNATE NO. 1 – OCWS FIELD OFFICE AMOUNT (in words):_____

_____Dollars and_____cents

($_____)
(amount in numbers)

Note: Total Additive Alternate No. 1 - OCWS Field Office Bid Amount shall equal the total amount for Bid Item No. 1 through 2 for ADDITIVE ALTERNATE NO. 1 – OCWS FIELD OFFICE.

ADDITIVE ALTERNATE NO. 2 - OCWS MAINTENANCE BUILDING

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
1	110-5	Fence Demolition – Maintenance Building	LF	660		
2	522-7	8” PCC Apron – Maintenance Building	SY	1,540		

Bid Item No.	Item No.	Item Description & Unit Price Bid In Words	Unit	Estimated Quantity	Unit Price	Total Amount/ Item
3	550-3	Fencing – Maintenance Building	LF	670		
4	550-4	Vehicular Double Gate – Maintenance Building	EA	2		

For all work required to perform the work in accordance with the construction drawings, specifications, and other contract documents, including all costs related to the work, and any required permits, taxes, bonds and insurance, the undersigned submits a Total ADDITIVE ALTERNATE NO. 2 – OCWS MAINTENANCE BUILDING Bid Amount of:

TOTAL ADDITIVE ALTERNATE NO. 2 – OCWS MAINTENANCE BUILDING AMOUNT (in words):_____

_____Dollars and_____cents

($_____)
(amount in numbers)

Note: Total Additive Alternate No. 2 - OCWS Maintenance Building Bid Amount shall equal the total amount for Bid Item No. 1 through 4 for ADDITIVE ALTERNATE NO. 2 – OCWS MAINTENANCE BUILDING.

BID SUMMARY (amount in numbers)

(A) TOTAL BASE BID – OCWS FIELD OFFICE AMOUNT: $_____

(B) TOTAL BASE BID – OCWS MAINTENANCE BUILDING AMOUNT: $_____

(C) TOTAL ADDITIVE ALTERNATE NO. 1 – OCWS FIELD OFFICE AMOUNT: $_____

(D) TOTAL ADDITIVE ALTERNATE NO. 2 – OCWS MAINTENANCE BUILDING AMOUNT: $_____

(E) TOTAL BID AMOUNT (A + B + C + D): $_____

Contractor acknowledges that the Basis of Award shall be the Total Bid Amount, or any combination of the

Base Bid and Additive Alternates ultimately awarded by the County, price and other factors considered. The bid bond amount shall be in the amount of the Total Bid Amount.

The Bidder represents that it has examined the site of the Work and informed itself fully in regard to all conditions pertaining to the place where the work is to be done; that it has examined the plans and specifications for the work and other Contract Documents relative thereto and has read all of the Addenda furnished prior to the opening of the Bids, as acknowledged below; and that it has otherwise fully informed itself regarding the nature, extent, scope and details of the Work to be performed.

If provided with a Notice of Intent to Award the Contract by the Owner, the Bidder shall execute and deliver to the Owner all of the documents required by the Contract Documents, including but not limited to, the Addendum to the Agreement and the Performance and Payment Bonds in the form contained in the Contract Documents, furnish the required evidence of the specified insurance coverages, furnish all necessary permits, license, materials, equipment, machinery, maintenance, tools, apparatus, means of transportation and labor necessary to complete the Work.

Dated and signed at_____,_____, this_____day of_____, 20___.

_____
(Name of Bidder)

_____
(Authorized Signature)

_____
(Title)

_____
(Mailing Address)

_____
(City, State, Zip)

_____
(Federal ID No. or SS No.)

BID AFFIDAVIT

The following affidavit must be executed in order that your quotation may be considered.

STATE OF _____

COUNTY OF _____

_____of lawful age, being first duly sworn, upon his oath deposes and says: That he executed the accompanying Quotation of behalf of the Contractor therein named, and that he had lawful authority so to do, and said Contractor has not directly or indirectly, entered into any agreement, expressed or implied, with any Contractor or Contractors, having to its object the controlling of the price or amount of such quotation or any quotations, the limiting of the Quotation or Contractors, the parceling or farming out to any Contractor or Contractors, to other persons of any part of the contract or any of the subject matter or the Quotations, or of the profits thereof, and that he has not and will not divulge the sealed Quotation to any person whomsoever, except those having a partnership or other financial interest with him in said Quotation or Quotations, until after the sealed Quotation or Quotations are opened.

_____
[signature]

_____
[date]

STATE OF_____COUNTY OF _____

PERSONALLY APPEARED BEFORE ME, the undersigned authority,

[name of individual signing]

who, after first being sworn by me, affixed his/her signature in the space provided above on this_____day of _____, 20___.

Subscribed and sworn to before me this_____day of_____, 20 .

My Commission Expires:

_____ _____
Notary Public

BID BOND

CONTRACTOR *(Name and Address):*

_____
_____
_____

SURETY *(Name and Address of Principal Place of Business)*:

_____
_____
_____

OWNER *(Name and Address)*:

Okaloosa County Water & Sewer
1804 Lewis Turner Blvd Ste 300
Fort Walton Beach, FL 32547

BID:

BID DUE DATE: _____
PROJECT *(Brief Description Including Location):* _____
CONSTRUCT OKALOOSA COUNTY WATER AND SEWER FIELD OFFICES
Okaloosa County, Florida

BOND:

BOND NUMBER: _____
DATE: *(Not later than Bid Due Date):* _____
PENAL SUM: _____

IN WITNESS WHEREOF, Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each because this Bid bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR	SURETY
_____(Seal)	_____(Seal)
Contractor's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest: _____	Attest: _____
Signature and Title	Signature and Title

Note: (1) Above addresses are to be used for giving required notice.
(2) Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

EJCDC NO. 1910-28-C (1990 Edition)

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to OWNER upon default of Contractor the penal sum set forth on the face of this Bond.

2. Default of Contractor shall occur upon the failure of Contractor to deliver within the time required by the Project Documents the executed Agreement required by the Project Documents and any performance and payment bonds required by the Project Documents and Contract Documents.

3. This obligation shall be null and void if:

3.1. OWNER accepts Contractor's Bid and Contractor delivers within the time required by the Project Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Project Documents and any performance and payment bonds required by the Project Documents and Contract Documents, or

3.2 All Bids are rejected by OWNER, or

3.3 OWNER fails to issue a notice of award to Contractor within the time specified in the Project Documents (or any extension thereof agreed to in writing by Contractor and, if applicable, consented to by Surety when required by paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Contractor and within 30 calendar days after receipt by Contractor and Surety of written notice of default from OWNER, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of and any and all defenses based on or arising out of any time extension to issue notice of award agreed to in writing by OWNER and Contractor, provided that the time for issuing notice of award including extensions shall not in the aggregate exceed 120 days from Bid Due Date without Surety's written consent.

6. No suit or action shall commence under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Contractor and Surety, and in no case later than one year after Bid Due Date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notice required hereunder shall be in writing and sent to Contractor and Surety at their respective addresses shown on the face of this Bond. such notices may be sent by personal deliver, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted form this Bond shall be deemed to be included herein as if set forth at length. If any provision of any Bond conflicts with any applicable provision of any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

CONTRACTOR'S QUALIFICATION QUESTIONNAIRE

The undersigned guarantees the accuracy of all statements and answers herein contained. (Please print in ink).

1. How many years has your firm been in business as a Contractor?

2. List up to three (3) projects of this nature that you have completed in the last three (3) years, and give the name, address and telephone number of a reference from each. Also give the completion date, the original contract bid price and the completed cost of each project listed.

3. List projects presently under construction by your firm the dollar volume of the contract and the percentage completion of the contract.

4. Have you ever failed to complete work awarded to you; if so, state where and why.

5. Do you plan to sublet any part of this work? If so, give details.

6. What equipment do you own that is available for this work?

7. What equipment do you plan to rent or purchase for this work?

8. Have you ever performed work under the direction of a Professional Engineer or Registered Architect? If so, list up to three (3) such firms giving the name of the firm, its address, telephone number and the name of the project. (List most recent projects).

9. Give the name, address and telephone number of an individual who represents each of the following and whom the Owner may contact to investigate your financial responsibility: a surety, a bank, and a major material supplier.

10. Provide a financial statement for your company. This should include a balance and income statement for your most recent fiscal year. A certified audit is preferred but not required. Use an insert sheet, if needed. Only three (3) lowest bidders shall submit this information (if requested by Owner) to the Owner within two (2) business days of the opening of the Bids.

11. State the true, exact, correct and complete name of the partnership, corporation or trade name under which you do business, and the address of the place of business. (If a corporation, state the name of all partners. If a trade name, state the names of the individuals who do business under the trade name.) It is absolutely necessary that information be furnished.

Correct Name of Contractor _____

(a) The business is a _____

(b) The address of principal place of business is:

_____

_____

(c) The names of the corporate officers, or partners, or individuals doing business under a trade name, are as follows:

_____

_____

_____

_____

FORM OF NON-COLLUSION AFFIDAVIT

(This Affidavit is Part of Bid)

STATE OF _____

COUNTY OF _____

_____Being

first duly sworn, deposes and says that he is

_____(Sole owner, a partner, president, secretary, etc.) of

_____the party making the foregoing Proposal or BID that such BID is genuine and not collusive or sham; that said CONTRACTOR has not colluded, conspired, connived, or agreed, directly or indirectly, with any CONTRACTOR or person, to put in a sham BID, or that such other person shall refrain from the project, and has not in any manner, directly or indirectly sought by agreement or collusion, or communication or conference, with any person, to fix the Bid Price of affiant or any other CONTRACTOR, or to fix any overhead, profit or cost element of said Bid Price, or of that of any other CONTRACTOR, or to secure any advantage against OWNER any person interested in the proposed Contract; and that all statements in said Proposal or Bid are true; and further, that such CONTRACTOR has not, directly or indirectly submitted this BID, or the contents thereof, or divulged information or date relative thereto to any association or to any member or agent thereof.

_____(Contractor)

Sworn to and subscribed before me this_____day of

_____, 20___.

Notary Public in and for

_____County,

_____.

My Commission Expires:

_____, 20 _.

**SWORN STATEMENT UNDER SECTION 287.133 (3) (a),
FLORIDA STATUTES, ON PUBLIC ENTITY CRIMES**

THIS FORM MUST BE SIGNED AND SWORN IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted to _____
[print name of public entity]

by_____
[print individuals name and title]

for_____
[print name of entity submitting sworn statement]

whose business is_____and (if applicable) its Federal Employer Identification Number (FEIN) is_____(If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement:_____.)

2. I understand that a "public entity crime" as defined in Section 287.133 (1) (g), Florida Statutes, means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or of the United States, including, but not limited to, any bid or contract for goods or services to be provided to any public entity or an agency or political subdivision of any other state or of the United States and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.

3. I understand that "convicted" or "conviction" as defined in Section 287.133 (1) (b), Florida Statutes, means a finding of guilt or a conviction of a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilty or nolo contendere.

4. I understand that an "affiliate" as defined in Section 287.133 (1) (a), Florida Statutes, means:

   A. A predecessor or successor of a person convicted of a public entity crime; or

   B. An entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term "affiliate" includes those officers, directors, executives, partners, shareholders, employees, members and agents who are active in the management of an affiliate. The ownership by one person of shares constituting a controlling interest in another person, or a pooling of equipment or income among persons when not for fair market value under an arm's length agreement, shall be a prima facie case that one person controls another person. A person who knowingly enters into a joint venture with a person who has been convicted of a public entity crime in Florida during the preceding 36 months shall be considered an affiliate.

5. I understand that a "person" as defined in Section 287.133 (1) (e) Florida Statutes, means any natural person or entity organized under the laws of any state or of the United States with the legal

power to enter into a binding contract and which bids or applies to bid on contracts for the provision of goods or services let by a public entity, or which otherwise transacts or applies to transact business with a public entity. The term "person" includes those officers, directors, executives, partners, shareholders, and employees, members, and agents who are active in management of an entity.

6. Based on information and belief, the statement which I have marked below is true and in relation to the entity submitting this sworn statement. **[Indicate which statement applies.]**

___Neither the entity submitting this sworn statement, nor any of its officers, directors, executives, partners, shareholders, employees, members, or agents who are active in the management of the entity, nor any affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989.

___The entity submitting this sworn statement, or one or more of its officers, directors, executives, partners, shareholders, employees, members, or agents who are active in the management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989.

___The entity submitting this sworn statement, or one or more of its officers, directors, executives, partners, shareholders, employees, members, or agents who are active in the management of the entity, or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989. However, there has been a subsequent proceeding before a Hearing Officer of the State of Florida, Division of Administrative Hearings and the Final Order entered by the Hearing Officer determined that it was not in the public interest to place the submitting this sworn statement on the convicted vendor list. **[attach a copy of the final order]**

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR THE PUBLIC ENTITY IDENTIFIED IN PARAGRAPH 1 (ONE) ABOVE IS FOR THAT PUBLIC ENTITY ONLY AND, THAT THIS FORM IS VALID THOROUGH DECEMBER 31 OF THE CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT I AM REQUIRED TO INFORM THE PUBLIC ENTITY PRIOR TO ENTERING INTO A CONTRACT IN EXCESS OF THE THRESHOLD AMOUNT PROVIDED IN SECTION 287.107, FLORIDA STATUTES FOR CATEGORY TWO ON ANY CHANGE IN THE INFORMATION CONTAINED IN THIS FORM.

_____
[signature]

_____
[date]

STATE OF_____COUNTY OF _____

PERSONALLY APPEARED BEFORE ME, the undersigned authority,

[name of individual signing]

who, after first being sworn by me, affixed his/her signature in the space provided above on this_____day of _____, 20___.

Subscribed and sworn to before me this_____day of_____, 20 .

My Commission Expires:

_____ _____
Notary Public

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____ who signed the bond on behalf of the Principal, was then _____ of said Corporation; that I know his/her signature, and his/her signature hereto is genuine; and that said bond was duly signed, sealed, and attested for and in behalf of said Corporation by authority of its governing body.

_____
Secretary (Corporate Seal)

STATE OF FLORIDA
COUNTY OF

Before me, a Notary Public, duly commissioned, qualified and acting, personally appeared _____ to me well known, who being my first duly sworn upon oath, says that he/she is the Attorney-in-Fact, for the _____ and that he has been authorized by _____ to execute the foregoing bond on behalf of the Contractor named therein in favor of Okaloosa County.

Subscribed and sworn to before me this _____ day of _____, 20__, A.D.

[Attach Power of Attorney to Original Bid Bond and Financial Statement from Surety Company]

_____

Notary Public
State of Florida-at-Large

My commission Expires:

_____

CERTIFIED COPY OF RESOLUTION OF
BOARD OF DIRECTORS OF

_____
(NAME OF CORPORATION)

"RESOLVED that, _____
(Person Authorized to Sign) (Title)

(Title)

of _____
(Name of Corporation)

is authorized to sign and submit the Bid of this corporation for the following Project:

OCWS FIELD OFFICES DEVELOPMENT

and to include in such bid the certificate as to non-collusion, and for any inaccuracies or misstatements in such certificate this corporate Contractor shall be liable under the penalties of perjury.

The foregoing is a true and correct copy of the resolution adopted by

_____
(NAME OF CORPORATION)

at a meeting of its Board of Directors held on the_____day of_____, 20__.

By _____

Title _____

(SEAL)

The above form must be completed if the Contractor is a Corporation.

CONFLICT OF INTEREST DISCLOSURE FORM

For purposes of determining any possible conflict of interest, all contractors/proposers, must disclose if any Okaloosa Board of County Commissioner, employee(s), elected officials(s), or if any of its agencies is also an owner, corporate officer, agency, employee, etc., of their business.

Indicate either "yes" (a county employee, elected official, or agency is also associated with your business), or "no." If yes, give person(s) name(s) and position(s) with your business.

YES_____ NO _____

NAME(S) POSITION(S)

_____

_____

_____

_____

FIRM NAME: _____

BY (PRINTED): _____

BY (SIGNATURE): _____

TITLE: _____

ADDRESS: _____

_____

PHONE NO.: _____

DRUG-FREE WORKPLACE CERTIFICATION

THE BELOW SIGNED CONTRACTOR CERTIFIES that it has implemented a drug-free workplace program. In order to have a drug-free workplace program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection 1.

4. In the statement specified in subsection 1, notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, to any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace no later than five (5) days after such conviction.

5. Impose a sanction on, or require the satisfactory participation in drug abuse assistance or rehabilitation program if such is available in the employee's community, by any employee who is convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

DATE: _____

COMPANY: _____ SIGNATURE:_ _____

ADDRESS: _____ NAME: _____
(Typed or Printed)

_____

_____ TITLE: _____

PHONE #: _____

CERTIFICATION OF CONTRACTOR REGARDING TRENCH SAFETY

This certification is required pursuant to the Trench Safety Act, Chapter 90-98, Florida Statutes regarding Trench Safety. The Act specifically incorporates the Occupational Safety and Health Administration's excavation safety standards, 29 CFR S. 1928.650 Subpart P as the state standard. Any revision to OSHA's safety standards that are consistent with the Florida Statutes shall also be complied with upon its effective date. The act requires that any bidder or prospective contractor, or any of their proposed subcontractors, shall provide written assurance that the contractor will comply with the applicable trench safety standards

NAME AND ADDRESS OF CONTRACTOR (Include Zip Code)

1. Contractor agrees that he is aware of the Trench Safety Act and the requirements of the Act.

   Yes _____ No _____

2. Contractors agrees to comply with all applicable trench safety standards as set forth in the Act and as referenced in the Act.

   Yes _____ No _____

NAME AND TITLE OF SIGNER (Please Print or Type)

SIGNATURE _____ DATE _____

INDEMNIFICATION AND HOLD HARMLESS

CONTRACTOR shall indemnify and hold harmless COUNTY, its officers and employees from liabilities, damages, losses, and costs including but not limited to reasonable attorney fees, to the extent caused by the negligence, recklessness, or intentional wrongful conduct of the CONTRACTOR and other persons employed or utilized by the CONTRACTOR in the performance of this Agreement.

Contractor's Company Name	Authorized Signature - Manual
Physical Address	Authorized Signature - Typed
Mailing Address	Title
Phone Number	FAX Number
Cellular Number	After-Hours Number(s)
Date	

INSURANCE COMPLIANCE

This form is to be completed and signed the Contractor and by your insurance agent/carrier certifying that your policy either meets the insurance requirements (as specified in page BOC-2 to BOC-6) or that the insurance company has reviewed the bid requirements and certifies that you were bid any price increase due to required coverage.

CONTRACTOR

I certify that the insurance requirements have been reviewed.

Company Name _____

Address _____

Representative

Name _____

Title _____

Phone Number _____

INSURANCE COMPANY

I certify that the insurance requirements have been reviewed with the above contractor.

Company Name _____

Address _____

Representative

Name _____

Title _____

Phone Number _____

AFFIDAVIT - WORKER'S COMPENSATION

State of _____

County of _____

SS:_____

of _____

being duly sworn, deposes and says that he now carries or that he has applied for a Worker's Compensation Policy to cover the operations, as set forth in the preceding contract, and to comply with the provisions thereof.

Signed: _____

Subscribed and sworn to before me this_____day of_____, 20 ___

Notary Public

RECYCLED CONTENT FORM

RECYCLED CONTENT INFORMATION:

1. Is the material in the above: VIRGIN _____ or RECYCLED _____
(Check the applicable blank)
If RECYCLED, what percentage _____%.

Product Description: _____

_____

_____

2. Is your product packaged and/or shipped in material containing recycled content?

Yes_____ No _____

Specify: _____

_____

_____

3. Is your product recyclable after it has reached its intended end use?

Yes_____ No _____

Specify: _____

_____

_____

The above is not applicable if there is only a personal service involved with no product involvement.

Name of Contractor:

_____

PERFORMANCE OF WORK BY SUBCONTRACTORS

The CONTRACTOR hereby states that he proposes, if awarded the Contract, to use the following subcontractors on this project: List below all proposed subcontractors and trade specialties. (List only one subcontractor for each item.)

	Items of Work (Describe)	Subcontractors
1	.....	
2	.....	
3	.....	
4	.....	
5	.....	
6	.....	
7	.....	
8	.....	
9	.....	
10	.....	
11	.....	
12	.....	
13	.....	
14	.....	
15	.....	

Estimated Total Cost of Items that CONTRACTOR states will be performed by Subcontractor:

($_____)

E-VERIFY COMPLIANCE CERTIFICATION

In accordance with Okaloosa County Policy and Executive Order Number 11-116 from the office of the Governor of the State of Florida, Bidder hereby certifies that the U.S. Department of Homeland Security's E-Verify system will be used to verify the employment eligibility of all new employees hired by the contractor during the contract term, and shall expressly require any subcontractors performing work or providing services pursuant to the contract to likewise utilize the U.S. Department of Homeland Security's E-Verify system to verify the employment eligibility of all new employees hired by the subcontractor during the contract term; and shall provide documentation of such verification to the OWNER upon request.

As the person authorized to sign this statement, I certify that this company complies/will comply fully with the above requirements.

DATE: _____ SIGNATURE: _____

COMPANY: _____ NAME: _____
(Typed or Printed)

ADDRESS: _____ TITLE: _____

_____

E-MAIL: _____

PHONE NO.: _____

CONE OF SILENCE

The Board of County Commissioners have established a solicitation silence policy **(Cone of Silence)** that prohibits oral and written communication regarding all formal solicitations for goods and services (ITB, RFP, ITQ, ITN, and RFQ) or other competitive solicitation between the bidder (or its agents or representatives) or other entity with the potential for a financial interest in the award (or their respective agents or representatives) regarding such competitive solicitation, and any County Commissioner or County employee, selection committee member or other persons authorized to act on behalf of the Board including the County's Architect, Engineer or their subconsultants, or anyone designated to provide a recommendation to award a particular contract, other than the Purchasing Department Staff..

The period commences from the time of advertisement until contract award.

Any information thought to affect the committee or staff recommendation submitted after bids are due, should be directed to the Purchasing Manager or an appointed representative. It shall be the Purchasing Manager's decision whether to consider this information in the decision process.

Any violation of this policy shall be grounds to disqualify the respondent from consideration during the selection process.

All respondents must agree to comply with this policy by signing the following statement and including it with their submittal.

I _____ (Signature) representing _____(Company Name)

on this _____ day of _____, 20 hereby agree to abide by the County's "Cone of Silence Clause"

and understand violation of this policy shall result in disqualification of my proposal/submittal.

BUY AMERICAN CERTIFICATE

Except for those items listed by the Bidder below or on a separate and clearly identified attachment to this Bid, the Bidder hereby certifies that steel and each manufactured product, is produced in the United States and that components of unknown origin are considered to have been produced or manufactured outside the United States.

PRODUCT	COUNTRY OF ORIGIN

_____
(Name of Bidder)

By: _____

Title: _____

Dated: _____

LOBBYING- 31 U.S.C. 1352, 49 CFR PART 19, 49 CFR PART 20

APPENDIX A, 49 CFR PART 20—CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

The undersigned (Contractor) certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for making the lobbying contacts to an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form—LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions [as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96). Note: Language in paragraph (2) herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (P.L. 104-65, to be codified at 2 U.S.C. 1601, et seq.)]

3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

[Note: Pursuant to 31 U.S.C. 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure or failure.]

The Contractor, _____ , certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. A 3801, *et seq, apply* to this certification and disclosure, if any.

_____ Signature of Contractor's Authorized Official

_____ Name and Title of Contractor's Authorized Official

_____ Date

EQUAL EMPLOYMENT OPPORTUNITY REPORT STATEMENT

Section 60-1.7(b) of the Regulations of the Secretary of Labor requires each bidder or prospective prime Contractor and proposed Subcontractor, where appropriate, to state in the bid or at the outset of negotiations for the Contract whether it has participated in any previous Contract or Subcontract subject to the equal opportunity clause; and if so, whether it has filed with the Joint Reporting Committee, the Director, an agency, or the former President's Committee on Equal Employment Opportunity all reports due under the applicable filing requirements. In any case in which a bidder or prospective prime Contractor or proposed Subcontractor which participated in a previous Contract subject to Executive Order 10925, 11114 or 111246 has not filed a report due under the applicable filing documents, no Contract or Subcontract shall be awarded unless such Contractor submits a report covering the delinquent period or such other period specified by the FAA or the Director, OFCCP.

The Bidder (Proposer) shall complete the following statement by checking the appropriate boxes. Failure to complete these blanks may be grounds for rejection of bid.

1. The Bidder (Proposer) has (_) has not (___) developed and has on file at each establishment Affirmative Action Programs pursuant to 41 CFR 60-1.4 and 41 CFR 60-2.

2. The Bidder (Proposer) has (_) has not (___) participated in any previous Contract or Subcontract subject to the Equal Opportunity Clause prescribed by Executive Order 10925, or Executive Order 111114, or Executive Order 11246.

3. The Bidder (Proposer) has (_) has not (_) filed with the Joint Reporting Committee the annual compliance report on Standard Form 100 (EEO-1 Report).

4. The Bidder (Proposer) has (_) has not (___) submitted all compliance reports in connection with any such Contract due under the application filing requirements; and that representations indicating submission of required compliance reports signed by proposed Subcontractors will be obtained prior to award of Subcontractors.

5. The Bidder (Proposer) does (_) does not (_) employ fifty (50) or more employees.

If the Bidder (Proposer) has participated in a previous Contract subject to the equal opportunity clause and has not submitted compliance reports due under applicable filing requirements, the Bidder (Proposer) shall submit a compliance report on Standard Form 100. "Employee Information EEO-1" prior to the award of Contract.

Standard Form 100 is normally furnished to Contractors annually, based on a mailing list currently maintained by the Joint Reporting Committee. In the event a Contractor has not received the form, he may obtain it by writing to the following address: Joint Reporting Committee, 1800 G Street, Washington, D.C. 20506.

_____
(Name of Bidder)

By:_____
Signature

Title: _____
Title

Date:_____
*Must be the same signature on Bid Proposal

COMPANY DATA

Contractor's Company Name: _____

Physical Address & Phone #: _____

_____

_____

_____

_____

Contact Person (Typed-Printed): _____

Phone #: _____

Cell #: _____

Email: _____

Federal ID or SS #: _____

Contractor's License #: _____

Contractor's DUNS #: _____

Fax #: _____

Emergency #'s After Hours,
Weekends & Holidays: _____

SYSTEM FOR AWARD MANAGEMENT (OCT 2016)

(a) Definitions. As used in this provision.

"Electronic Funds Transfer (EFT) indicator" means a four-character suffix to the unique entity identifier. The suffix is assigned at the discretion of the commercial, nonprofit, or Government entity to establish additional System for Award Management records for identifying alternative EFT accounts (see subpart 32.11) for the same entity.

"Registered in the System for Award Management (SAM) database" means that.

(1) The Offeror has entered all mandatory information, including the unique entity identifier and the EFT indicator, if applicable, the Commercial and Government Entity (CAGE) code, as well as data required by the Federal Funding Accountability and Transparency Act of 2006 (see subpart 4.14) into the SAM database;

(2) The offeror has completed the Core, Assertions, and Representations and Certifications, and Points of Contact sections of the registration in the SAM database;

(3) The Government has validated all mandatory data fields, to include validation of the Taxpayer Identification Number (TIN) with the Internal Revenue Service (IRS). The offeror will be required to provide consent for TIN validation to the Government as a part of the SAM registration process; and

(4) The Government has marked the record "Active". "Unique entity identifier" means a number or other identifier used to identify a specific commercial, nonprofit, or Government entity. See www.sam.gov for the designated entity for establishing unique entity identifiers.

(b)

(1) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee shall be registered in the SAM database prior to award, during performance, and through final payment of any contract, basic agreement, basic ordering agreement, or blanket purchasing agreement resulting from this solicitation.

(2) The Offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation "Unique Entity Identifier" followed by the unique entity identifier that identifies the Offeror's name and address exactly as stated in the offer. The Offeror also shall enter its EFT indicator, if applicable. The unique entity identifier will be used by the Contracting Officer to verify that the Offeror is registered in the SAM database.

(c) If the Offeror does not have a unique entity identifier, it should contact the entity designated at www.sam.gov for establishment of the unique entity identifier directly to obtain one. The

Offeror should be prepared to provide the following information:

(1) Company legal business name.

(2) Tradestyle, doing business, or other name by which your entity is commonly recognized.

(3) Company Physical Street Address, City, State, and Zip Code.

(4) Company Mailing Address, City, State and Zip Code (if separate from physical).

(5) Company telephone number.

(6) Date the company was started.

(7) Number of employees at your location.

(8) Chief executive officer/key manager.

(9) Line of business (industry).

(10) Company Headquarters name and address (reporting relationship within your entity).

(d) If the Offeror does not become registered in the SAM database in the time prescribed by the Contracting Officer, the Contracting Officer will proceed to award to the next otherwise successful registered Offeror.

(e) Processing time, which normally takes 48 hours, should be taken into consideration when registering. Offerors who are not registered should consider applying for registration immediately upon receipt of this solicitation.

(f) Offerors may obtain information on registration at https://www.acquisition.gov .

Offerors SAM information:

Entity Name: _____

Entity Address: _____

Duns Number: _____

CAGE Code: _____

ADDENDUM ACKNOWLEDGEMENT

ITB WS 02-21

Acknowledgment is hereby made of the following addenda (identified by number) received since issuance of solicitation:

ADDENDUM NO. DATE

NOTE: Prior to submitting the response to this solicitation, it is the responsibility of the Respondent to confirm if any addenda have been issued. If such addenda have been issued, acknowledge receipt by noting number(s) and date(s) above.

CERTIFICATION OF NON-SEGREGATED FACILITIES

(Must be completed and submitted with the Bid)

The Contractor certifies that it does not maintain or provide for its employee any segregated facilities at any segregated facilities at any of its establishments, and that it does not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor certifies further that it will not maintain or provide for its employees segregated facilities at any of its establishments, and that it will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this certification is a violation of the equal opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting room, work areas, restrooms and washrooms, restaurants and other eating areas, parking lots, drinking fountains, recreation or entertainment areas, transportation and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on basis of race, color, religion, or national origin, because of habit, local custom, or any other reason. The Contractor agrees that (except where it has obtained identical certification from proposed subcontractors for the specific time period) it will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the equal opportunity clause, and that it will retain such certification in its files.

(Name of Contractor)

_____

By: _____

Title: _____

Dated: _____

VENDORS ON SCRUTINIZED COMPANIES LISTS

By executing this Certificate_____, the bid proposer, certifies that it is not: (1) listed on the Scrutinized Companies that Boycott Israel List, created pursuant to section 215.4725, Florida Statutes, (2) engaged in a boycott of Israel, (3) listed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, created pursuant to section 215.473, Florida Statutes, or (4) engaged in business operations in Cuba or Syria. Pursuant to section 287.135(5), Florida Statutes, the County may disqualify the bid proper immediately or immediately terminate any agreement entered into for cause if the bid proposer is found to have submitted a false certification as to the above or if the Contractor is placed on the Scrutinized Companies that Boycott Israel List, is engaged in a boycott of Israel, has been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or has been engaged in business operations in Cuba or Syria, during the term of the Agreement. If the County determines that the bid proposer has submitted a false certification, the County will provide written notice to the bid proposer. Unless the bid proposer demonstrates in writing, within 90 calendar days of receipt of the notice, that the County's determination of false certification was made in error, the County shall bring a civil action against the bid proposer. If the County's determination is upheld, a civil penalty shall apply, and the bid proposer will be ineligible to bid on any Agreement with a Florida agency or local governmental entity for three years after the date of County's determination of false certification by bid proposer.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

DATE: _____

SIGNATURE: _____

COMPANY: _____

NAME: _____
(Typed or Printed)

ADDRESS: _____

TITLE: _____

_____

E-MAIL: _____

_____

PHONE NO.: _____

CONTRACT FORMS

PERFORMANCE BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*: Okaloosa Board of County Commissioners
1250 N. Eglin Parkway
Shalimar, FL 32579

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*: Construct Okaloosa County Water and Sewer Field Offices

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

(seal)

Contractor's Name and Corporate Seal

By:
Signature

Print Name

Title

Attest:
Signature

Title

SURETY

(seal)

Surety's Name and Corporate Seal

By:
Signature *(attach power of attorney)*

Print Name

Title

Attest:
Signature

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after:

3.1 The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

3.2 The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

3.3 The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

7.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

7.2 additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

7.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this

Bond shall be construed as a statutory bond and not as a common law bond.

14. Definitions

14.1 Balance of the Contract Price: The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made
including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

14.2 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

14.3 Contractor Default: Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

14.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

END OF PERFORMANCE BOND

PAYMENT BOND

CONTRACTOR *(name and address)*:

SURETY *(name and address of principal place of business)*:

OWNER *(name and address)*: Okaloosa Board of County Commissioners
1250 N. Eglin Parkway
Shalimar, FL 32579

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location)*: Construct Okaloosa County Water and Sewer Field Offices

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract)*:

Amount:

Modifications to this Bond Form: ☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

(seal)

Contractor's Name and Corporate Seal

By:
Signature

Print Name

Title

Attest:
Signature

Title

SURETY

(seal)

Surety's Name and Corporate Seal

By:
Signature *(attach power of attorney)*

Print Name

Title

Attest:
Signature

Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond shall arise after the following:

5.1 Claimants who do not have a direct contract with the Contractor,

5.1.1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

5.1.2 have sent a Claim to the Surety (at the address described in Paragraph 13).

5.2 Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

7.2 Pay or arrange for payment of any undisputed amounts.

7.3 The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

16.1 Claim: A written statement by the Claimant including at a minimum:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;
4. A brief description of the labor, materials, or equipment furnished;
5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2 Claimant: An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3 Construction Contract: The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4 Owner Default: Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5 Contract Documents: All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

18. Modifications to this Bond.

END OF PAYMENT BOND

Please note: this contract is a draft for respondent to view and understand the County's standard terms and conditions, it is subject to revisions. By submitting a bid/proposal bidder/respondent understands and acknowledges that the draft contract is not an offer. Bidders/respondents are not to sign this draft contract

Sample Contract – Do Not Sign
This Sample Contract is subject to revision and not binding until fully approved by the BoCC and executed by all parties.

STANDARD FORM CONSTRUCTION BID AGREEMENT

THIS AGREEMENT is dated as of the____day of_____in the year 20 by and between Okaloosa County, a political subdivision of the state of Florida (hereinafter called Owner) and _____(hereinafter-called Contractor).

Owner and Contractor, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1. WORK.

Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

CONSTRUCT OKALOOSA COUNTY WATER AND SEWER FIELD OFFICES ARTICLE 2.

ENGINEER.

The Project has been designed by

AVCON, INC.

Who is hereinafter called Engineer and who is to act as Owner's representative, assume all duties and responsibilities and have the rights and authority assigned to Engineer in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 3. CONTRACT TIMES.

3.1 The Work will be substantially completed within 365 calendar days after the date when the Contract Times commence to run, and completed and ready for final payment within 395 calendar days after the date when the Contract Times commence to run.

3.2 Liquidated Damages. Owner and Contractor recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed by the Owner. They also recognize the delays, expense and difficulties involved in proving the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring of such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner the amount specified in Paragraph 3.3. for each day that expires after the time specified in paragraph 3.1 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the time specified in paragraph 3.1 for completion and readiness for final payment or any proper extension thereof granted by Owner, Contractor shall pay Owner the amount specified in Paragraph 3.3. for each day that expires after the time specified in paragraph 3.1 for completion and readiness for final payment. The Contractor hereby

expressly waives and relinquishes any right which it may have to seek to characterize the liquidated damages as a penalty, which the parties agree represents a fair and reasonable estimate of the Owner's actual damages at the time of contracting if the Contractor fails to substantially complete the Work in a timely manner.

3.3 Liquidated Damages are based upon the original contract amount, as established by Okaloosa County. Liquidated damages, based upon the original contract amount of $_____, will be_____dollars _____) per calendar day.

LIQUIDATED DAMAGES SCHEDULE

Phase	Begin Date	Consecutive Calendar Days to Complete	Liquidated Damages
1	Notice to Proceed		**Daily Rate as Referenced on ITB AP _____**
Entire Project	Notice to Proceed		**Daily Rate as Referenced on ITB _____**

ARTICLE 4. CONTRACT PRICE.

Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in the Bid Schedule submitted in the Bid Form. The cost of this project is $ as per the attached Contractor bid.

Estimated quantities are not guaranteed, and determinations of actual quantities and classification are to be made by Engineer.

ARTICLE 5. PAYMENT PROCEDURES

Contractor shall submit Application for Payment in accordance with Contract. Applications for Payment will be processed by Engineer as provided in the contract.

5.1 *Progress Payments; Retainage*. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment as recommended by Engineer, on or about the fifteenth (15th) day of each month during construction as provided in paragraphs 5.1.1 and 5.1.2 below. All such payments will be measured based on the number of units completed. Payments to the Contractor shall in no way imply approval or acceptance of Contractor's work

5.1.1 Prior to Substantial completion, payments will be made in an amount equal to the percentage indicated below, but, in each case, less the aggregate of payments previously made and less such amounts as Engineer shall determine, or Owner may withhold.

90 % of Work completed (with the balance being retainage). Once the Contractor completes at least 50% of the Work based on approved pay applications, the retainage will be reduced from 10% to 5% for the remainder of the project. Therefore, following completion of at least 50% of the Work, the Contractor may be paid 95 % of Work

completed (with the balance being retainage).

of materials and equipment not incorporated in the Work (but delivered, suitably stored and accompanied by documentation satisfactory to Owner).

5.1.2 Upon Substantial Completion, in an amount sufficient to increase total payments to Contractor to 95 % of the Contract Price (with the balance being retainage), less such amounts as Engineer shall determine, or Owner may withhold..

5.1.3 Retainage requirements may be changed to reflect a proposed change to state regulatory statutes.

5.2 *Final Payment.* Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price as recommended by Engineer.

5.2.1 Contractor's acceptance of final payment shall constitute a full waiver of any and all claims by Contractor against the County arising out of this Agreement or otherwise relating to the Project, except those previously made in writing and identified by Contractor as unsettled at the time of the final Application for Payment. Neither the acceptance of the Work nor payment by the County shall be deemed to be a waiver of the County's right to enforce any obligations of the Contractor hereunder or to the recovery of damages for defective Work not discovered by the Engineer or the County at the time of final inspection.

5.3 Payments Withheld

5.3.1 The Engineer or the County may decline to approve any Applications for Payment, or portions thereof, because of subsequently discovered evidence or subsequent inspections. The Engineer or the County may nullify the whole or any part of any inspections. The Engineer or the County may nullify the whole or any part of any approval for payment previously issued and the County may withhold any payments otherwise due Contractor under this Agreement or any other agreement between the County and the Contractor, to such extent as may be necessary in the County's opinion to protect it from loss because of:

5.3.1.1 Defective Work not remedied;

5.3.1.2 Third party claims filed or reasonable evidence indicating probable filing of such claims;

5.3.1.3 Failure of Contractor to make payment properly to subcontractors or for labor, materials or equipment;

5.3.1.4 Reasonable doubt that the Work can be completed for the unpaid balance of the Contract Amount;

5.3.1.5 Reasonable indication that the Work will not be completed within the Contract Time;

5.3.1.6 Unsatisfactory prosecution of the Work by the Contractor;

5.3.1.7 Failure to provide accurate and current "As-Builts"; or

5.3.1.8 Any other material breach of the Contract Documents.

5.3.2 If these conditions in Subsection 5.3.1 are not remedied or removed, the County may after three (3) days written notice, rectify the same at Contractor's expense. The County also may offset against any sums due Contractor the amount of any liquidated or unliquidated obligations of Contractor to the County, whether relating to or arising out of his Agreement or any other agreement between Contractor and the County.

ARTICLE 6. CONTRACTOR'S REPRESENTATIONS.

In order to induce Owner to enter into this Agreement Contractor makes the following representations:

6.1 Contractor has examined and carefully studied the Contract Documents (including the Addenda listed in Article 7) and the other related data identified in the Project Documents including "technical data."

6.2 Contractor has visited the site and become familiar with and is satisfied as to the general, local, and site conditions that may affect cost, progress, performance or furnishing of the Work.

6.3 Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, performance and furnishing of the Work.

6.4 Contractor has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) which have been identified in the Bid documents. Contractor acknowledges that such reports and drawings are not Contract Documents and may not be complete for Contractor's purposes. Contractor acknowledges that Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown, indicated in the Contract Documents with respect to Underground Facilities at, or contiguous to the site. Contractor has obtained and carefully studied (or assumes responsibility for having done so) all such additional supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor and safety precautions, and programs incident thereto. Contractor does not consider that any additional examinations, investigations, explorations, tests, studies, or data are necessary for the performance and furnishing of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.

6.5 Contractor is aware of the general nature of work to be performed by Owner and others at the site that relates to the Work as indicated in the Contract Documents.

6.6. Contractor has correlated the information known to Contractor, information and observation obtained from visits to the site, reports, and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

6.7. Contractor has given Engineer written notice of all conflicts, errors, ambiguities or discrepancies that Contractor has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Contractor, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 7. CONTRACT DOCUMENTS

The Contract Documents that comprise the entire agreement between Owner and Contractor concerning the Work consist of the following:

7.1 This Agreement

7.2 Attachment A- Contractor's Bid, to include Addendums

7.3 Attachment B- Standard Contract Clauses

7.4 Attachment C- Title VI List of Pertinent Nondiscrimination Acts and Authorities

7.5 Attachment D- Insurance Requirements

7.6 Any other documents necessary to clarify and memorialize the agreement between Contractor and Owner.

ARTICLE 8. PUBLIC RECORDS

Any record created by either party in accordance with this Contract shall be retained and maintained in accordance with the public records law, Florida Statutes, Chapter 119.

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT OKALOOSA COUNTY RISK MANAGEMENT DEPARTMENT 5479 OLD BETHEL ROAD CRESTVIEW, FL 32536 PHONE: (850) 689-5977 riskinfo@myokaloosa.com.

Contractor must comply with the public records laws, Florida Statute chapter 119, specifically Contractor must:

8.1 Keep and maintain public records required by the County to perform the service.

8.2 Upon request from the County's custodian of public records, provide the County with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in chapter 119 Florida Statutes or as otherwise provided by law.

8.3 Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the consultant does not transfer the records to the County.

8.4 Upon completion of the contract, transfer, at no cost, to the County all public records in possession of the contractor or keep and maintain public records required by the County to perform the service. If the contractor transfers all public records to the public agency upon completion of the contract, the consultant shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the consultant keeps and maintains public records upon completion of the contract, the contractor shall meet all applicable requirements for retaining the public records. All records stored electronically must be provided to the public agency, upon the request from the public agency's custodian of public records, in a format that is compatible with the information technology systems of the public agency.

ARTICLE 9. AUDIT

The County and/or its designee shall have the right from time to time at its sole expense to audit the compliance by the Contractor with the terms, conditions, obligations, limitations, restrictions, and requirements of this Contract and such right shall extend for a period of three (3) years after termination of this Contract.

ARTICLE 10. TERMINATION FOR CONVENIENCE

Owner may at any time and for any reason terminate Contractor's services and work at Owner's convenience. Upon receipt of such notice, Contractor shall, unless the notice directs otherwise, immediately discontinue the work and placing of orders for materials, facilities and supplies in connection with the performance of this Agreement.

Upon such termination, Contractor shall be entitled to payment only as follows: (1) the actual cost of the work completed in conformity with this Agreement; plus, (2) such other costs actually incurred by Contractor as are permitted by the prime contract and approved by Owner; (3) plus ten percent (10%) of the cost of the work referred to in subparagraph (1) above for overhead and profit. There shall be deducted from such sums as provided in this subparagraph the amount of any payments made to Contractor prior to the date of the termination of this Agreement. Contractor shall not be entitled to any claim or claim of lien against Owner for any additional compensation or damages in the event of such termination and payment. Further, Owner may terminate this contract immediately for failure of contractor to comply with Chapter 119, Florida Statutes.

ARTICLE 11. VIOLATIONS OF CHAPTER 119 FLORIDA STATUTES

The County reserves the right to terminate this agreement immediately for failure of Contractor to adhere to the requirements of Florida Statutes Chapter 119.

ARTICLE 12. MISCELLANEOUS.

12.1 Terms used in this Agreement which are defined in the Bid documents.

12.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

12.3 Owner and Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

12.4 Any provisions or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision

12.5 All documents prepared by the Contractor pursuant to this Agreement and related Services to this Agreement are intended and represented for the ownership of the County only. Any other use by Contractor or other parties shall be approved in writing by the County. If requested, Contractor shall deliver the documents to the County within fifteen (15) calendar days.

ARTICLE 13. GOVERNING LAW, VENUE AND WAIVER OF JURY TRIAL.

This Agreement shall be interpreted and construed in accordance with and governed by the laws of the State of Florida. All parties agree and accept that jurisdiction of any dispute or controversy arising out of this Agreement, and any action involving the enforcement or interpretation of any rights hereunder shall be brought exclusively in the First Judicial Circuit in and for Okaloosa County, Florida, and venue for litigation arising out of this Agreement shall be exclusively in such state courts, forsaking any other jurisdiction which either party may claim by virtue of its residency or other jurisdictional device. In the event it becomes necessary for the County to file a lawsuit to enforce any term or provision under this Agreement, then the County shall be entitled to its costs and attorney's fees at the pretrial, trial and appellate levels. BY ENTERING INTO THIS AGREEMENT, CONTRACTOR AND COUNTY HEREBY EXPRESSLY WAIVE ANY RIGHTS EITHER PARTY MAY HAVE TO A TRIAL BY JURY OF ANY CIVIL
LITIGATION RELATED TO THIS AGREEMENT. Nothing in this Agreement is intended to serve as a waiver of sovereign immunity, or of any other immunity, defense, or privilege enjoyed by the County pursuant to Section 768.28, Florida Statutes.

ARTICLE 14. CIVIL RIGHTS.

The Contractor agrees to comply with pertinent statutes, Executive Orders and such rules as are promulgated to ensure that no person shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance. This provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract. This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

ARTICLE 15. COMPLIANCE WITH NONDISCRIMINATION REQUIREMENTS.

During the performance of this Agreement, the Contractor, for itself, its assignees, and successors in interest, agrees as follows:

a. Compliance with Regulations: The Contractor will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated and attached hereto as Attachment "C".

b. Nondiscrimination: The Contractor, with regard to the work performed by it during the Agreement, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

c. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor's obligations

under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.

d. Information and Reports: The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the County or other governmental entity to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the County or the other governmental entity, as appropriate, and will set forth what efforts it has made to obtain the information.

e. Sanctions for Noncompliance: In the event of a Contractor's noncompliance with the non-discrimination provisions of this contract, the County will impose such contract sanctions as it or another applicable state or federal governmental entity may determine to be appropriate, including, but not limited to:

a. Withholding payments to the Contractor under the Agreement until the Contractor complies; and/or

b. Cancelling, terminating, or suspending the Agreement, in whole or in part.

f. Incorporation of Provisions: The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the County may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the County to enter into any litigation to protect the interests of the County. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

ARTICLE 16. COMPLIANCE WITH LAWS.

Contractor shall secure any and all permits, licenses and approvals that may be required in order to perform the Services, shall exercise full and complete authority over Contractor's personnel, shall comply with all workers' compensation, employer's liability and all other federal, state, county, and municipal laws, ordinances, rules and regulations required of an employer performing services such as the Services, and shall make all reports and remit all withholdings or other deductions from the compensation paid to Contractor's personnel as may be required by any federal, state, county, or municipal law, ordinance, rule, or regulation.

ARTICLE 17. CONFLICT OF INTEREST.

The Contractor covenants that it presently has no interest and shall not acquire any interest, directly or indirectly which could conflict in any manner or degree with the performance of the Services. The Contractor further covenants that in the performance of this Agreement, no person having any such interest shall knowingly be employed by the Contractor. The Contractor guarantees that he/she has not offered or given to any member of, delegate to the Congress of the United States, any or part of this contract or to any benefit arising therefrom.

ARTICLE 18. INDEPENDENT CONTRACTOR.

Contractor enters into this Agreement as, and shall continue to be, an independent contractor. All services shall be performed only by Contractor and Contractor's employees. Under no circumstances shall Contractor or any of Contractor's employees look to the County as his/her employer, or as partner, agent or principal. Neither Contractor, nor any of Contractor's employees, shall be entitled to any benefits accorded to the County's employees, including without limitation worker's compensation, disability insurance, vacation or sick pay. Contractor shall be responsible for providing, at Contractor's expense, and in Contractor's name, unemployment, disability, worker's compensation and other insurance as well as licenses and permits usual and necessary for conducting the services to be provided under this Agreement.

ARTICLE 19. THIRD PARTY BENEFICIARIES.

It is specifically agreed between the parties executing this Agreement that it is not intended by any of the provisions of any part of the Agreement to create in the public or any member thereof, a third party beneficiary under this Agreement, or to authorize anyone not a party to this Agreement to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Agreement.

ARTICLE 20. INDEMNIFICATION AND WAIVER OF LIABILITY.

The Contractor agrees, to the fullest extent permitted by law, to defend, indemnify and hold harmless the County, its agents, representatives, officers, directors, officials and employees from and against claims, damages, losses and expenses (including but not limited to attorney's fees, court costs and costs of appellate proceedings) relating to, arising out of or resulting from the Contractor's negligent acts, errors, mistakes or omissions relating to professional Services performed under this Agreement. The Contractor's duty to defend, hold harmless and indemnify the County its agents, representatives, officers, directors, officials and employees shall arise in connection with any claim, damage, loss or expense that is attributable to bodily injury; sickness; disease; death; or injury to impairment, or destruction of tangible property including loss of use resulting therefrom, caused by any negligent acts, errors, mistakes or omissions related to Services in the performance of this Agreement including any person for whose acts, errors, mistakes or omissions the Contractor may be legally liable. The parties agree that TEN DOLLARS ($10.00) represents specific consideration to the Contractor for the indemnification set forth herein.

The waiver by a party of any breach or default in performance shall not be deemed to constitute a waiver of any other or succeeding breach or default. The failure of the County to enforce any of the provisions hereof shall not be construed to be a waiver of the right of the County thereafter to enforce such provisions.

ARTICLE 21. TAXES AND ASSESSMENTS.

Contractor agrees to pay all sales, use, or other taxes, assessments and other similar charges when due now or in the future, required by any local, state or federal law, including but not limited to such taxes and assessments as may from time to time be imposed by the County in accordance with this Agreement. Contractor further agrees that it shall protect, reimburse and indemnify County from and assume all liability for its tax and assessment obligations under the terms of the Agreement.

The County is exempt from payment of Florida state sales and use taxes. The Contractor shall not be exempted from paying sales tax to its suppliers for materials used to fulfill contractual obligations with the County, nor is the Contractor authorized to use the County's tax exemption number in securing such materials.

The Contractor shall be responsible for payment of its own and its share of its employees' payroll, payroll taxes, and benefits with respect to this Agreement.

ARTICLE 22. PROHIBITION AGAINST CONTRACTING WITH SCRUTINIZED COMPANIES.

Pursuant to Florida Statutes Section 215.4725, contracting with any entity that is listed on the Scrutinized Companies that Boycott Israel List or that is engaged in the boycott of Israel is prohibited. Contractors must certify that the company is not participating in a boycott of Israel. Any contract for goods or services of One Million Dollars ($1,000,000) or more shall be terminated at the County's option if it is discovered that the entity submitted false documents of certification, is listed on the Scrutinized Companies with Activities in Sudan List, the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or has been engaged in business operations in Cuba or Syria after July 1, 2018.

Any contract entered into or renewed after July 1, 2018 shall be terminated at the County's option if the company is listed on the Scrutinized Companies that Boycott Israel List or engaged in the boycott of Israel. Contractors must submit the certification that is attached to this agreement as Attachment "D". Submitting a false certification shall be deemed a material breach of contract. The County shall provide notice, in writing, to the Contractor of the County's determination concerning the false certification. The Contractor shall have ninety (90) days following receipt of the notice to respond in writing and demonstrate that the determination was in error. If the Contractor does not demonstrate that the County's determination of false certification was made in error, then the County shall have the right to terminate the contract and seek civil remedies pursuant to Florida Statute Section 215.4725.

ARTICLE 23. INCONSISTENCIES AND ENTIRE AGREEMENT.

If there is a conflict or inconsistency between any term, statement, requirement, or provision of any attachment attached hereto, any document or events referred to herein, or any document incorporated into this Agreement, the term, statement, requirement, or provision contained in this Agreement shall prevail and be given superior effect and priority over any conflicting or inconsistent term, statement, requirement or provision contained in any other document or attachment, including but not limited to Attachments listed in Section 1.

ARTICLE 24. SEVERABILITY.

If any term or condition of this Contract shall be deemed, by a court having appropriate jurisdiction, invalid or unenforceable, the remainder of the terms and conditions of this Contract shall remain in full force and effect. This Contract shall not be more strictly construed against either party hereto by reason of the fact that one party may have drafted or prepared any or all the terms and provisions hereof.

ARTICLE 25. ENTIRE AGREEMENT.

This Agreement and Exhibits_____contains the entire agreement of the parties, and may be amended, waived, changed, modified, extended or rescinded only by in writing signed by the party against whom any such amendment, waiver, change, modification, extension and/or rescission is sought.

ARTICLE 26. REPRESENTATION OF AUTHORITY TO CONTRACTOR/SIGNATORY.

The individual signing this Agreement on behalf of Contractor represents and warrants that he or she is duly authorized and has legal capacity to execute and deliver this Agreement. The signatory represents and warrants to the County that the execution and delivery of this Agreement and the performance of the

Services and obligations hereunder have been duly authorized and that the Agreement is a valid and legal agreement binding on the Contractor and enforceable in accordance with its terms.

IN WITNESS WHEREOF, Owner, and Contractor have signed this Agreement in triplicate. One counterpart each has been delivered to Owner, Contractor, and Engineer. All portions of the Contract Documents have been signed, initialed or identified by Owner, and Contractor, or identified by Engineer on their behalf.

This Agreement will be effective on_____, 20___(which is the Effective Date of the Agreement).

WITNESS:

_____ BY: _____

Signatur
e

_____

Print Name

ATTEST: **OKALOOSA COUNTY, FLORIDA**

_____ BY: _____

J.D. Peacock II, Clerk of Courts Chairman

Sample Contract – Do Not Sign
This Sample Contract is subject to revision and not binding until fully approved by the BoCC and executed by all parties.

CONTRACTOR'S RELEASE OF LIENS

STATE OF: _____

COUNTY OF: _____

Before me, the undersigned Notary Public in and for the said County and State personally appeared _____, representing the Contractor _____, who being duly sworn according to law deposes and says that all labor, materials, and outstanding claims and indebtedness of whatever nature arising out of the performance of the Contract with _____ _____, the Owner, for _____, Contract No. , have been paid in full and that for the final payment in the amount of $ _____, the Contractor releases and discharges the Owner and his authorized representatives from any liens or claims or any nature because of or arising from this Contract and/or its performance, which it has had, has or may have in the future.

By: _____

Sworn to and subscribed before me this

_____day of _____

_____
(Notary Public)

My Commission Expires: _____

ADVERTISEMENT OF COMPLETION

_____(Contractor)

_____(Address)

gives notice of completion of_____(Project)

and sets_____as the date of final settlement.

All persons and firms should file all claims for payment to the below address prior to the settlement date:

Okaloosa County
5479A Old Bethel Road
Crestview, FL 32536

By:_____(Name)

_____(Title)

Leg:_____(Publication Dates)

Standard Additional Contract Clauses

Title VI Clauses for Compliance with Nondiscrimination Requirements

Compliance with Nondiscrimination Requirements

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts And Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.

3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Nondiscrimination Acts And Authorities on the grounds of race, color, or national origin.

4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts And Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the sponsor or the Federal Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

a. Withholding payments to the contractor under the contract until the contractor complies; and/or

b. Canceling, terminating, or suspending a contract, in whole or in part.

6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the sponsor to enter into any litigation to protect the interests of the sponsor. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

Title VI List of Pertinent Nondiscrimination Acts and Authorities

Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq*., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination In Federally-Assisted Programs of The Department of Transportation—Effectuation of Title VI of The Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 *et seq*.), as amended, (prohibits discrimination on the basis of disability); and 49 CFR part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 *et seq*.), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-

aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

- Titles II and III of the Americans with Disabilities Act of 1990, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures non-discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part time workers.

The *contractor* has full responsibility to monitor compliance to the referenced statute or regulation. The *contractor* must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division

OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. Contractor must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The Contractor retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 CFR Part 1910). Contractor must address

any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

E-VERIFY

Enrollment and verification requirements.

(1) If the Contractor is not enrolled as a Federal Contractor in E-Verify at time of contract award, the Contractor shall-

a. Enroll. Enroll as a Federal Contractor in the E-Verify Program within thirty (30) calendar days of contract award;

b. Verify all new employees. Within ninety (90) calendar days of enrollment in the E-Verify program, begin to use E-Verify to initiate verification of employment eligibility of all new hires of the Contractor, who are working in the United States, whether or not assigned to the contract, within three (3) business days after the date of hire (but see paragraph (b)(3) of this section); and,

c. Verify employees assigned to the contract. For each employee assigned to the contract, initiate verification within ninety (90) calendar days after date of enrollment or within thirty (30) calendar days of the employee's assignment to the contract, whichever date is later (but see paragraph (b)(4) of this section.)

(2) If the Contractor is enrolled as a Federal Contractor in E-Verify at time of contract award, the Contractor shall use E-Verify to initiate verification of employment eligibility of

a. All new employees.

a. Enrolled ninety (90) calendar days or more. The Contractor shall initiate verification of all new hires of the Contractor, who are working in the United States, whether or not assigned to the contract, within three (3) business days after the date of hire (but see paragraph (b)(3) of this section); or

b. Enrolled less than ninety (90) calendar days. Within ninety (90) calendar days after enrollment as a Federal Contractor in E-Verify, the Contractor shall initiate verification of all new hires of the contractor, who are working in the United States, whether or not assigned to the contract, within three (3) business days after the date of hire (but see paragraph (b)(3) of this section; or

c. Employees assigned to the contract. For each employee assigned to the contract, the Contractor shall initiate verification within ninety (90) calendar

days after date of contract award or within thirty (30) days after assignment to the contract, whichever date is later (but see paragraph (b)(4) of this section.)

(3) If the Contractor is an institution of higher education (as defined at 20 U.S.C. 1001(a)); a State of local government or the government of a Federally recognized Indian tribe, or a surety performing under a takeover agreement entered into with a Federal agency pursuant to a performance bond, the Contractor may choose to verify only employees assigned to the contract, whether existing employees or new hires. The Contractor shall follow the applicable verification requirements of (b)(1) or (b)(2), respectively, except that any requirement for verification of new employees applies only to new employees assigned to the contract.

(4) Option to verify employment eligibility of all employees. The Contractor may elect to verify all existing employees hired after November 6, 1986 (after November 27, 2009, in the Commonwealth of the Northern Mariana Islands), rather than just those employees assigned to the contract. The Contractor shall initiate verification for each existing employee working in the United States who was hired after November 6, 1986 (after November 27, 2009, in the Commonwealth of the Northern Mariana Islands), within one hundred eighty (180) calendar days of-

a. Enrollment in the E-Verify program; or

b. Notification to E-Verify Operations of the Contractor's decision to exercise this option, using the contract information provided in the E-Verify program Memorandum of Understanding (MOU)

(5) The Contractor shall comply, for the period of performance of this contract, with the requirements of the E-Verify program MOU.

a. The Department of Homeland Security (DHS) or the Social Security Administration (SSA) may terminate the Contractor's MOU and deny access to the E-Verify system in accordance with the terms of the MOU. In such case, the Contractor, will be referred to a suspension or debarment official.

b. During the period between termination of the MOU and a decision by the suspension or debarment official whether to suspend or debar, the contractor is excused from its obligations under paragraph (b) of this clause. If the suspension or debarment official determines not to suspend or debar the Contractor, then the Contractor must reenroll in E-Verify.

c. Web site. Information on registration for and use of the E-Verify program can be obtained via the Internet at the Department of Homeland Security Web site: http://www.dhs.gov/E-Verify.

d. Individuals previously verified. The Contractor is not required by this clause to perform additional employment verification using E-Verify for any employee

i. Whose employment eligibility was previously verified by the Contractor through the E-Verify program;

ii. Who has been granted and holds an active U.S. Government security clearance for access to confidential, secret, or top secret information in accordance with the National Industrial Security Program Operating Manual; or

iii. Who has undergone a completed background investigation and been issued credentials pursuant to Homeland Security Presidential Directive (HSPD)-12. Policy for a Common Identification Standard for Federal Employees and Contractors.

Subcontracts. The Contractor shall include the requirements of this clause, including this paragraph € (appropriately modified for identification of the parties in each subcontract that-

(1) Is for-

i. Commercial and noncommercial services (except for commercial services that are part of the purchase of a COTS item (or an item that would be a COTS item, but for minor modifications), performed by the COTS provider, and are normally provided for that COTS item); or

ii. Construction;

(2) Has a value of more than $3,500; and

(3) Includes work performed in the United States

GENERAL CONDITIONS

ARTICLE 1 – DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1.1. Access Road – The right-of-way, the roadway and all improvements constructed thereon connecting the County property to a public highway.

1.2. Addenda – Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Project Requirements or the Contract Documents.

1.3. Advertisement – A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

1.4. Agreement – The written contract between Owner and Contractor covering the Work to be per- formed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.5. Application for Payment – The form accepted by Engineer which is to be used by Contractor in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

1.6. Asbestos – Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

1.7. ASTM – The American Society for Testing and Materials.

1.8. Award – The acceptance, by the Owner, of the successful contractor's proposal.

1.9. Bid – The offer or proposal of the contractor submitted on the prescribed form setting forth the prices for the Work to be performed.

1.10. Contractor – Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

1.11. Project Documents – The advertisement or invitation to Bid, instructions to contractors, the Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.12. Project Requirements – The advertisement or invitation to Bid, instructions to contractors, and the Bid Form.

1.13. Building Area – An area on the County property to be used, considered, or intended to be used for County property buildings, or other facilities or rights-of-way together with all County property buildings and facilities located thereon.

1.14. Bonds – Performance and Payment bonds and other instruments of security.

1.15. Calendar Day – Every day shown on the calendar.

1.16. Certificates of Compliance – Written statements by the manufacturer stating the material furnished is in conformance with the Specifications.

1.17. Change Order – A document recommended by Engineer, which is signed by Contractor and Owner and authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement. The work covered by a change order shall be within the scope of the contract.

1.18. Contract Documents – The Agreement, Addenda (which pertain to the Contract Documents), Contractor's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders and Engineer's written interpretations and clarifications issued pursuant to paragraphs 3.5, 3.6.1, and 3.6.3 on or after the Effective Date of the Agreement. Shop Drawing submittals approved pursuant to paragraphs 6.19 and 6.20 and the reports and drawings referred to in paragraphs 4.2.1.1 and 4.2.2.2 are not Contract Documents.

1.19. Contract Price – The money payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.9.1 in the case of Unit Price Work).

1.20. Contract Times – The numbers of days or the dates stated in the Agreement: (i) to achieve Substantial Completion, and (ii) to complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment in accordance with paragraph 14.13.

1.21. Contract Item (Pay Item) – A specific unit of work for which a price is provided in the Contract.

1.22. Contractor – The person, firm or corporation with whom Owner has entered into the Agreement.

1.23. Defective – An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with paragraph 14.8 or 14.10).

1.24. Drainage System – *The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the area.*

1.25. Drawings – The drawings which show the scope, extent, and character of the Work to be furnished and performed by Contractor and which have been prepared or approved by Engineer and are referred to in the Contract Documents. Shop drawings are not Drawings as so defined.

1.26. Effective Date of the Agreement – The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

1.27. Engineer – The person, firm, or corporation named as such in the Agreement.

1.28. Engineer's Consultant – A person, firm, or corporation having a contract with Engineer to furnish services as Engineer's independent professional associate or consultant with respect to the Project and who is identified as such in the General Conditions. The following list of independent professional associates and consultants are considered the Engineer's consultant for this Construction Contract: AVCON, Inc.

1.29. Equipment – All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

1.30. *Extra Work – An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which if found by the Engineer to be necessary to complete the work within the intended scope of the contract as previously modified.*

1.31. Federal Specifications – The Federal Specifications and Standards, and supplements, amendments, and indices thereto are prepared and issued by the General Services Administration of the Federal Government. They may be obtained from the Specifications Activity, Printed Materials Supply Division, Building 197, Naval Weapons Plant, Washington, D.C. 20407.

1.32. Field Order – A written order issued by Engineer which orders minor changes in the Work in accordance with paragraph 9.5 but which does not involve a change in the Contract Price or the Contract Times.

1.33. General Requirements – Sections of Division 1 of the Specifications.

1.34. Hazardous Waste – The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

1.35. Inspector – An authorized representative of the Engineer assigned to make all necessary inspections and/or tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

1.36. Intention of Terms – Whenever, in these specifications or on the plans, the words, "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of the like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words "approved," "acceptable," "Satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject in each case to the final determination of the Owner.

1.37. Laboratory – The official testing laboratories of the Owner or such other laboratories as may be designated by the Engineer.

1.38. Laws and Regulations; Laws or Regulations – Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.39. Liens – Liens, charges, security interests, or encumbrances upon real property or personal property.

1.40. Lighting – A system of fixtures providing or controlling the light sources used on or near the County property or within the buildings. The field lighting includes all luminous signals, markers, floodlights, and illuminating devices used on or near the County property or to aid in the operation of aircraft landing at, taking off from, or taxiing on the County property surface.

1.41. Major and Minor Contract Items – A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 25 percent of the total amount of the award contract. All other items shall be considered minor contract items.

1.42. Materials – Any substance specified for use in the construction of the Contract work.

1.43. *Mil Specifications – The Military Specifications and Standard, and indices thereto, that are prepared and issued by the Department of Defense.*

1.44. Milestone – A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.45. Notice of Award – The written notice by Owner to the apparent successful contractor stating

that upon compliance by the apparent successful contractor with the conditions precedent enumerated therein, within the time specified, Owner will sign and deliver the Agreement.

1.46. Notice to Proceed – A written notice given by Owner to Contractor (with a copy to Engineer) fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform Contractor's obligations under the Contract Documents.

1.47. Owner – The public body or authority, corporation, association, firm, or person with whom Contractor has entered into the Agreement and for whom the Work is to be provided.

1.48. Partial Utilization – Use by Owner of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.49. Pavement – The combined surface course, base course, and subbase course, if any, considered as a single unit.

1.50. *Payment Bond – The approved form of security furnished by the Contractor and his/her surety as a guaranty that he will pay in full all bills and accounts for materials and labor used in the construction of the work.*

1.51. PCBs – Polychlorinated biphenyls.

1.52. *Performance Bond – The approved form of security furnished by the Contractor and his/her surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.*

1.53. Petroleum – Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

1.54. *Plans – The official drawings or exact reproductions which show the location, character, dimensions, and details of the work and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications.*

1.55. Project – The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

1.56. Radioactive Material – Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

1.57. Resident Project Representative - The authorized representative of Engineer who may be assigned to the site or any part thereof.

1.58. Samples – Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.59. Shop Drawings – All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

1.60. Special Provisions – The specific clauses setting forth conditions or requirements peculiar to the project under consideration, covering work or materials involved in the proposal and estimate, which are not thoroughly or satisfactorily stipulated in these specifications.

1.61. Specifications – Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

1.62. Structures – County facilities such as bridges; culverts; catch basins; inlets; retaining walls; cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; flexible and rigid pavements; navigational aids; buildings; vaults; and, other manmade features of the County that may be encountered in the work and not otherwise classified herein.

1.63. Subcontractor – An individual, firm, or corporation having a direct contract with Contractor or with any other Subcontractor for performance of a part of the Work at the site.

1.64. Subgrade – The soil which forms the pavement foundation.

1.65. Superintendent – The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instruction from the Engineer, and who shall supervise and direct the construction.

1.66. Substantial Completion – The Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer as evidenced by Engineer's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by Engineer's written recommendation of final payment in accordance with paragraph 14.13. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.67. Supplemental Agreement – A written agreement between the Contractor and the Owner covering: (1) work that would increase or decrease the total amount of the awarded contract, or any major contract item, by more than 25 percent, such increased or decreased work being

within the scope of the originally awarded contract; or (2) work that is not within the scope of the originally awarded contract.

1.68. Supplementary Conditions – The part of the Contract Documents which amends or supplements these General Conditions. None are provided with this contract.

1.69. Supplier – A manufacturer, fabricator, supplier, distributor, materialman, or vendor having direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

1.70. Surety – The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds which are furnished to the Owner by the Contractor.

1.71. Underground Facilities – All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone, or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

1.72. Unit Price Work – Work to be paid for on the basis of unit prices.

1.73. Work – The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishings and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

1.74. Work Change Directive - A written directive to Contractor, issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 4.2 or 4.3 or to emergencies under paragraph 6.18. A Work Change Directive will not change the Contract Price or the Contract Times, but is evidence that the parties expect that the change directed or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times as provided in Article 10.

1.75. *Working Day – A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least 6 hours toward completion of the Contract. Unless work is suspended for causes beyond the Contractor's control, Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work, requiring the presence of an inspector, will be considered as working days.*

1.76. Work Period – A work period shall consist of any designated block of time on which the normal working forces of the Contractor may proceed with regular work for at least 5 hours toward completion of the contract. Unless work is suspended for causes beyond the Contractor's control, work occurring on any day, regardless of it being a weekend or holiday, which requires an Inspector, will be considered a work period. Work periods are limited to between 7:00 a.m. and 5:00 p.m. local time Monday through Friday. Weekend work will not be permitted unless contractor obtains written permission from Owner.

1.77. Written Amendment – A written amendment of the Contract Documents, signed by Owner and Contractor on or after the Effective Date of the Agreement and normally dealing with the non-engineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

ARTICLE 2 – PRELIMINARY MATTERS

Delivery of Bonds:

2.1. When Contractor delivers the executed Agreements to Owner, Contractor shall also deliver to Owner such Bonds as Contractor may be required to furnish in accordance with paragraph 5.1.

Copies of Documents:

2.2. Owner shall furnish to Contractor up to five copies (unless otherwise specified in the General Conditions) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

Commencement of Contract Times; Notice to Proceed:

2.3. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement, or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty days after the Effective Date of the Agreement. In no event will the Contract Time commence to run later than the *one hundred twentieth (120th)* day after the day of Bid opening or the *ninetieth (90th)* day after the Effective Date of the Agreement, whichever date is earlier.

Starting the Work:

2.4. Contractor shall start to perform the Work on the date when the Contract Times commence to run, but no Work shall be done at the site prior to the date on which the Contract Times commence to run.

Before Starting Construction:

2.5. Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby; however, Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents, unless Contractor knew or reasonably should have known thereof.

2.6. Within ten days after the Construction Notice to Proceed contractor shall submit to Engineer for review:

2.6.1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2.6.2. a preliminary schedule of Shop Drawings and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal;

2.6.3. a preliminary schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include and appropriate amount of overhead and profit applicable to each item of Work.

2.7. Before any Work at the site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with paragraphs 5.4 and 5.6.

Preconstruction Conference:
2.8. Within twenty *(20)* days *prior to Construction Notice to Proceed*, but before any Workat thesite is started, a conference attended by Contractor, Engineer and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.6, procedures for handling Shop Drawings, and other submittals, processing Applications for Payment and maintaining required records.

Initially Acceptable Schedules:
2.9. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with paragraph 2.6. Contractor shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until the schedules are submitted to and acceptable to Engineer as provided below. The progress schedule will be acceptable to Engineer as providing an orderly progression of the Work to completion within any specified Milestones and the Contract Times, but such acceptance will neither impose on Engineer responsibility for the sequencing, scheduling, or progress of Work nor interfere with or relieve Contractor from Contractor's full responsibility therefore, Contractor's schedule of Shop Drawing and Sample submissions will be acceptable to Engineer as providing a workable arrangement for reviewing and processing the required submittals. Contractor's schedule of values will be acceptable to Engineer as to form and substance.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

Intent:
3.1. The Contract Documents comprise the entire agreement between Owner and Con tractor

concerning the Work. The Contract Documents are complementary: what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the place of the Project.

3.2. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for. When words or phrases, which have a well-known technical or construction industry or trade meaning are used to describe Work, materials, or equipment, such words or phrases shall be interpreted in accordance with the meaning. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in paragraph 9.4.

3.3. **Reference to Standards and Specifications of Technical Societies: Reporting and Resolving Discrepancies:**

3.3.1. Reference to standards, specifications, manuals or codes of any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

3.3.2. If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the Work or of any such standard, specification, manual, or code or of any instruction of any Supplier referred to in paragraph 6.5., Contractor shall report it to Engineer in writing at once, and, Contractor shall not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.18) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.5 or 3.6; provide, however, that Contractor shall not be liable to Owner or Engineer for failure to report any such conflict, error, ambiguity or discrepancy unless Contractor knew or reasonably should have known thereof.

3.3.3. Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement thereto issued by one of the methods indicated in paragraph 3.5 or 3.6, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

3.3.3.1. the provisions of any such standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents): or

3.3.3.2. the provisions of any such Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

No provision of any such standard, specification, manual, code, or instruction shall be effective to change the duties and responsibilities of Owner, Contractor, or Engineer, or any of their

subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to Owner, Engineer, or any of Engineer's Consultants, agents, or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of paragraph 9.13 or any other provision of the Contract Documents.

3.3.4. Whenever the plans or specifications are in conflict, resolution of such conflict shall be in the following order of precedence subject to agreement by Engineer:

Contract Agreement
Addenda, with those of later date having precedence over those of earlier dates
Bid Documents
General Conditions
Construction Drawings
Technical Specifications

In case of our inconsistency within the Contract Drawings, the order of procedure is as follows:

Schedules
Specific Details
Typical Details
Construction Drawings

3.4. Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as approved" or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of Engineer as to the Work, it is intended that such requirement, direction, review, or judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to Engineer any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.13 or any other provision of the Contract Documents.

Amending and Supplementing Contract Documents:

3.5. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

3.5.1. a formal Written Amendment.

3.5.2. a Change Order (pursuant to paragraph 10.4) or

3.5.3. a Work Change Directive (pursuant to paragraph 10.1).

3.6. In addition, the requirements of the Contract Documents may be supplemented and minor variations, and deviations of the Work may be authorized, in one or more of the following ways:

3.6.1. a Field Order (pursuant to paragraph 9.5).

3.6.2. Engineer's approval of a Shop Drawing or Sample (pursuant to paragraphs 6.19 and 6.20), or

3.6.3. Engineer's written interpretation or clarification (pursuant to paragraph 9.4).

Reuse of Documents:
3.7. Contractor and any Subcontractor or Suppler or other person or organization performing or furnishing any of the Work under a direct or indirect contract with Owner (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's Consultant, and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaption by Engineer.

ARTICLE 4 – AVAILABILITY OF LANDS: SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.1 Availability of Lands:

Owner shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of Contractor. Upon reasonable written request, Owner shall furnish Contractor with a correct statement of record legal title and legal description of the lands upon which the Work it to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's lien against such lands in accordance with applicable Laws and Regulations. Owner shall identify any encumbrances or restrictions not of general application but specifically related to use of lands so furnished with which Contractor will have to comply in performing the Work. Easements for permanent structures or permanent in existing facilities will be obtained and paid for by Owner, unless otherwise provided in the Contract Documents. If Contractor and Owner are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times as a result of any delay in Owner's furnishing these lands, rights-of-way or easements. Contractor may make a claim therefore as provided in Articles 11 and 12. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.2. Subsurface and Physical Conditions:

4.2.1. **Reports and Drawings:** Reference is made to the *Information Available to Contractors* for identification of:

4.2.1.1. **Subsurface Conditions:** Those reports of explorations and tests of subsurface conditions at or contiguous to the site that have been utilized by Engineer in preparing the Contract Documents; and

4.2.1.2. **Physical Conditions:** Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) that have been utilized by Engineer in preparing the Contract Documents.

4.2.2. **Limited Reliance by Contractor Authorized; Technical Data:** Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the *Information Available to Contractors*. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner, Engineer, or any of Engineer's Consultants with respect to:

4.2.2.1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto, or

4.2.2.2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings, or

4.2.2.3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions, or information.

4.2.3. **Notice of Differing Subsurface or Physical Conditions:** If Contractor believes that any subsurface or physical condition at or contiguous to the site that is uncovered or revealed either:

4.2.3.1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is materially inaccurate, or

4.2.3.2. is of such a nature as to require a change in the Contract Documents, or

4.2.3.3. differs materially from that shown or indicated in the Contract Documents, or

4.2.3.4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then Contractor shall, promptly, but in no event later than fifteen (15) days, after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.18), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

4.2.4. **Engineer's Review:** Engineer will promptly review the pertinent conditions, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

4.2.5. **Possible Contract Documents Change:** If Engineer concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in paragraph 4.2.3., a Work Change Directive or a Change Order will be issued as provided in Article 10

to reflect and document the consequences of such change.

4.2.6. **Possible Price and Times Adjustments:** An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of such uncovered or revealed condition causes an increase or decrease in Contractor's cost of, or time required for performance of the Work; subject, however, to the following:

4.2.6.1. such condition must meet any one or more of the categories described in paragraphs 4.2.3.1 through 4.2.3.4. inclusive;

4.2.6.2. a change in the Contract Documents pursuant to paragraph 4.2.5 will not be an automatic authorization of nor a condition precedent to entitlement to any such adjustment:

4.2.6.3. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract price will be subject to the provisions of Article 10 and Paragraph 11.9; and

4.2.6.4. Contractor shall not be entitled to any adjustment in the Contract Price or Times if;

4.2.6.4.1. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner in respect of Contract Price and Contract Times by the submission of a bid or becoming bound under a contract: or

4.2.6.4.2. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the site and contiguous areas required by the Project Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

4.2.6.4.3. Contractor failed to give the written notice within the time and as required by paragraph 4.2.3.

If Owner and Contractor are unable to agree on entitlement to or as to the amount or length of any such equitable adjustment in the Contract Price or Contract Times, a claim may be made therefore as provided in Articles 11 and 12. However, Owner, Engineer, and Engineer's Consultants shall not be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

4.3. Physical Conditions – Underground Facilities:

4.3.1. **Shown or Indicated:** The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities or by others. Unless it is otherwise expressly provided in the *Information Available to Contractors*:

4.3.1.1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

4.3.1.2. The cost of all of the following will be included in the Contract Price and Contractor shall have full responsibility for: (i) reviewing and checking all such information and data, (ii) locating

all Underground Facilities shown or indicated in the Contract Documents, (iii) coordination of the Work with the owners of such Underground Facilities during construction, and (iv) the safety and protection of all such Underground Facilities as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work.

4.3.2. **Not Shown or Indicated:** If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents. Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.18), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence of the Underground Facility. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document such consequences. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.15. Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or the amount or length of any such adjustment in Contract Price or Contract Times, Contractor may make a claim, therefore, as provided in Articles 11 and 12. However, Owner, Engineer, and Engineer's Consultants shall not be liable to Contractor for any claims, costs, losses or damages incurred or sustained by Contractor on or in connection with any other project or anticipated project.

Reference Points:

4.4. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of Owner, Contractor shall report to Engineer whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

4.5. Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material:

4.5.1. Owner shall be responsible for any Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material uncovered or revealed at the site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. Owner shall not be responsible for any such materials brought to the site by Contractor, Subcontractor, Suppliers, or anyone else for whom Contractor is responsible.

4.5.2. Contractor shall immediately: (i) stop all Work in connection with such hazardous condition and in any area affected thereby (except in an emergency as required by paragraph 6.18), and (ii) notify Owner and Engineer (and thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such hazardous condition to take corrective action, if any. Contractor shall not be required to resume Work in connection with such hazardous condition or in any such affected area until after Owner has obtained

any required permits related thereto and delivered to Contractor special written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of such Work stoppage or such special conditions under which Work is agreed by Contractor to be resumed, either party may make a claim therefore as provided in Articles 11 and 12.

4.5.3. If after receipt of such special written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order such portion of the Work that is in connection with such hazardous condition or in such affected area to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a claim therefore as provided in Articles 11 and 12. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

4.5.4. The provisions of paragraphs 4.2 and 4.3 are not intended to apply to Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site.

ARTICLE 5 – BONDS AND INSURANCE

Performance, Payment, and Other Bonds:

5.1. Contractor shall furnish Performance and Payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all Contractor's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff. Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

5.2. If the surety on any Bond furnished by Contractor is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.1. Contractor shall within ten days thereafter substitute another bond and surety, both of which must be acceptable to Owner.

5.3. Licensed Sureties and Insurers; Certificates of Insurance:

5.3.1. All Bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required.

5.3.2. Contractor shall deliver to Owner, with copies to each additional insured, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain in accordance with paragraph 5.4.

Contractor's Liability Insurance:

5.4. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and furnished and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance and furnishing of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed or furnished by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

5.4.1. claims under workers' compensation, disability benefits and other similar employee benefit acts;

5.4.2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

5.4.3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

5.4.4. claims for damages insured by customary personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or by any other person for any other reason;

5.4.5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

5.4.6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

The policies of insurance so required by this paragraph 5.4 to be purchased and maintained shall:

5.4.7. with respect to insurance required by paragraphs 5.4.3 through 5.4.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) Owner, Engineer, Engineer's Consultants, of whom shall be listed as additional insureds, and include coverage for the respective officers and employees of all such additional insureds;

5.4.8. include the specific coverages and be written for not less than the limits of liability provided in the contract documents or required by Laws or Regulations, whichever is greater;

5.4.8.1 Contractor's Liability Insurance and the Owner's Protective Liability Insurance specified above shall be provided in not less than the following amount:

a.	Injury or death to more than one person or single occurrence	$1,000,000
b.	On and Off Premises Operations Liability	$1,000,000
c.	Explosion and Collapse Hazard	$1,000,000
d.	Underground Hazard	$1,000,000
e.	Completed Operations and Products Liability	$1,000,000
f.	Property damage in account of all occurrences	$1,000,000
g.	Independent Contractors Liability	$1,000,000
h.	Personal Injury Liability Insurance	$1,000,000

Contractor's Vehicle Insurance as follows:

1.	Injury or death to one person	$1,000,000
2.	Injury or death to more than one person or a single occurrence	$1,000,000
3.	Property Damage	$1,000,000
4.	Business Auto Liability, Including all owned, non owned and hired vehicles	$1,000,000

An Umbrella Policy may be used to meet the above limits.

All policies shall be drawn to cover a period of not less than one (1) year from the date of issue.

5.4.9. include contractual liability insurance covering Contractor's indemnity obligations under paragraphs 6.9, 6.13.1, and 6.22.1 through 6.22.2.8;

5.4.10. contain a provision or endorsement that the coverage afforded will not be cancelled, materially changed or renewal refused until at least thirty days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to paragraph 5.3.2 will so provide);

5.4.11. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing or replacing defective Work in accordance with paragraph 13.12; and

5.4.12. with respect to completed operations insurance, and any insurance coverage written on an occurrence basis, remain in effect for at least two years after final payment (and Contractor shall furnish Owner and each other additional insured to whom a certificate of insurance has been issued evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter).

Owner's Liability Insurance:

5.5. In addition to the insurance required to be provided by Contractor under paragraph 5.4, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents. Any liability insurance carried by Owner is excess and non-contributory to any and all other coverage whether collectable or not.

Property Insurance:

5.6 Contractor shall purchase and maintain property insurance upon the Work at the site in amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the contract documents or required by Laws and Regulations). This insurance shall:

5.6.1 include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's Consultants and any other persons or entities identified in the contract documents each of whom is deemed to have an insurable interest an shall be listed as an insured or additional insured;

5.6.2 include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

5.6.3 cover materials and equipment in transit for incorporation in the Work or stored at the site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer; and

5.6.4 be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with thirty days written notice to each other additional insured to whom a certificate of insurance has been issued.

5.7. NOT USED

5.8. NOT USED

5.9. Owner shall not be responsible for purchasing and maintaining any property insurance to protect the interests of Contractor, Subcontractors or others in the Work to the extent of any deductible amounts that are identified in the General Conditions. The risk of loss within such identified deductible amount, will be borne by Contractor, Subcontractor, or others suffering any such loss and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.10. NOT USED

5.11. NOT USED

Receipt and Application of Insurance Proceeds:

5.12. Any insureds loss under the policies of insurance required by paragraphs 5.5 and 5.6 will be adjusted with Owner and made payable to Owner as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.13. Owner shall deposit in a separate account any money so received, and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

5.13. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of

the parties in interest shall object in writing within fifteen days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

Acceptance of Bonds and Insurance; Option to Replace:

5.14. If either party (Owner or Contractor) has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within ten days after receipt of the certificates (or other evidence requested) required by paragraph 2.7. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

Partial Utilization – Property Insurance:

5.15. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with paragraph 14.10; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be cancelled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1. Contractor shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but Contractor shall not be responsible for the negligence of others in the design or specification of a specific means, method, technique, sequence or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. Contractor shall be responsible to see that the completed Work complies accurately with the Contract Documents.

6.2. Contractor shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances. The superintendent will be Contractor's representative at the site and shall have authority to act on behalf of Contractor. All communications to the superintendent shall be as binding as if given to CONTRACTOR.

Labor, Materials and Equipment:

6.3. Contractor shall provide competent, suitably qualified personnel to survey, lay out and construct the Work as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the site. Except as otherwise required for the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours and Contractor will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without Owner's written consent given after prior written notice to Engineer.

6.4. Unless otherwise specified in the General Requirements, Contractor shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.5. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

Progress Schedule:

6.6. Contractor shall adhere to the progress schedule established in accordance with paragraph 2.9 as it may be adjusted from time to time as provided below:

6.6.1. Contractor shall submit to Engineer for acceptance (to the extent indicated in paragraph 2.9) proposed adjustments in the progress schedule that will not change the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

6.6.2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of paragraph 12.1. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.7. Substitutes and "Or-Equal" Items:

6.7.1. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be accepted by Engineer under the following circumstances:

6.7.1.1. "Or-Equal": If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in

related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.

6.7.1.2. Substitute Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under subparagraph 6.7.2, it will be considered a proposed substitute item. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. The procedure for review by the Engineer will include the following as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor. If Contractor wishes to furnish or use a substitute item of material or equipment, Contractor shall first make written application to Engineer for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice Contractor's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by Engineer in evaluating the proposed substitute. Engineer may require Contractor to furnish additional data about the proposed substitute.

6.7.1.3. Contractor's Expense: All data to be provided by Contractor in support of any proposed "or-equal" or substitute item will be at Contractor's expense.

6.7.2. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence or procedure of construction is shown or indicated in an expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by Engineer will be similar to that provided in subparagraph 6.7.3.

6.7.3. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.7.1.1 and 6.7.1.2. Engineer will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without Engineer's prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any "or-equal" or substitute. Engineer will

record time required by Engineer and Engineer's Consultants in evaluating substitutes proposed or submitted by Contractor pursuant to paragraphs 6.7.1.1 and 6.7.1.2 and in making changes in the Contract Documents (or in the provisions of any other direct contract with Owner for work on the Project) occasioned thereby. Whether or not Engineer accepts a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the changes of Engineer and Engineer's Consultants for evaluating each such proposed substitute item.

6.8. Concerning Subcontractors, Suppliers and Others:

The Contractor shall submit a list of Subcontractors and major Material Suppliers for the Owner's approval within (24) hours after Bid Opening. Such list shall be accompanied by an experience statement with pertinent information as to similar projects and other evidence of qualifications from each such Subcontractor, person and organization requested by Owner. If Owner, after due investigation has reasonable objections to any proposed Subcontractor, other person or organization, the Owner may before giving the Notice of Award request the apparent successful Contractor to submit an acceptable Subcontractor without an increase in Bid Price. If the apparent successful Contractor declines to make any such substitution, the Contract shall notbe awarded to such Contractor, but his declining to make any such substitution will not constitute grounds for sacrificing his Bid Security. Any Subcontractor, other person or organization so listed and to whom Owner does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner.

6.8.1. Contractor shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to Owner and Engineer as indicated in paragraph 6.8.2), whether initially or as a substitute, against whom Owner or Engineer may have reasonable objection. Contractor shall not be required to employ any subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom Contractor has reasonable objection.

6.8.2. If the General Conditions require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials or equipment) to be submitted to Owner in advance of the specified date prior to the Effective Date of the Agreement for acceptance by Owner and Engineer, and if Contractor has submitted a list thereof in accordance with the General Conditions, Owner's or Engineer's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the project documents or the Contract Documents) of any such Subcontractor, Supplier or other person or organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case Contractor shall submit an acceptable substitute, the Contract Price will be adjusted by the difference in the cost occasioned by such substitution and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by Owner or Engineer of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

6.8.3. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with Contractor just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other person or organization any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other person or organization,

nor shall it create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws and Regulations.

6.8.4. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with Contractor. Contractor shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the Engineer through Contractor.

6.8.5. The divisions and sections of the Specifications and the identifications of any drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6.8.6. All Work performed by Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.5. or 5.6. the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, Engineer, Engineer's Consultants and all other additional insureds for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.9 Patent Fees and Royalties:

Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner, Engineer, Engineer's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents.

6.10. Permits:

Unless otherwise provided in the contract document, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for

the prosecution of the Work, which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Contractor shall pay all charges of utility owners for connections to the Work, and Owner shall pay all charges of such utility owners for capital costs related thereto such as plant investment fees.

6.11. Laws and Regulations:

6.11.1. Contractor shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

6.11.2. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses and damages caused by, arising out of or resulting therefrom: however, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor or Contractor's obligations under paragraph 3.3.2.

6.12. Taxes:

Contractor shall pay all sales, consumer, use and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.13. Use of Premises:

6.13.1 Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land and areas identified in and permitted by the Contract Documents, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by dispute resolution proceeding or at law. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner, Engineer, Engineer's Consultant and anyone directly or indirectly employed by any of them from and against all claims costs, losses and damages arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

6.13.2. During the progress of the Work, Contractor shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work Contractor shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. Contractor shall leave the site clean and ready for occupancy by Owner at Substantial Completion of the Work. Contractor shall restore to original condition all property not designated for alteration by the Contract Documents.

6.13.3. Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.14. Record Documents:

Contractor shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings will be delivered to Engineer for Owner.

6.15. Safety and Protection:

Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.15.1. all persons on the Work site or who may be affected by the Work;

6.15.2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

6.15.3. other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.

Contractor shall comply with all applicable Laws and Regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury of loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 6.15.2. or 6.15.3. caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or Engineer's Consultant or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with paragraph 14.13. that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.16. Safety Representative:

Contractor shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.17. Hazard Communication Programs:

Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with Laws or Regulations.

6.18. Emergencies:

In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, Contractor, without special instruction or authorization from Owner or Engineer, is obligated to act to prevent threatened damage, injury or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued to document the consequences of such action.

6.19. Shop Drawings and Samples:

6.19.1. Contractor shall submit Shop Drawings to Engineer for review and approval in accordance with the accepted schedule of Shop Drawings and Sample submittals (see paragraph 2.9.). All submittals will be identified as Engineer may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to shown Engineer the materials and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by paragraph 6.26.

6.19.2. Contractor shall also submit Samples to Engineer for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as Engineer may require to enable Engineer to review the submittal for the limited purposes required by paragraph 6.20. The numbers of each Sample to be submitted will be as specified in the Specifications.

6.20. Submittal Procedures:

6.20.1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

6.20.1.1 all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto,

6.20.1.2. all materials with respect to intended use, fabrication, shipping, handling storage, assembly and installation pertaining to the performance of the Work, and

6.20.1.3. all information relative to Contractor's sole responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

Contractor shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

6.20.2 Each submittal will bear a stamp or specific written indication that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

6.20.3. At the time of each submission, Contractor shall give Engineer specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to Engineer for review and approval of each such variation.

6.20.4. Engineer will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by Engineer as required by paragraph 2.9. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer's review and approval will not extend to means, methods, techniques, sequences or procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make corrections required by Engineer, and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.20.5. Engineer's review and approval of Shop Drawings or Samples shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has in writing called Engineer's attention to each such variation at the time of submission as required by paragraph 6.20.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying Shop Drawing or Sample approval; nor will any approval by Engineer relieve Contractor from responsibility for complying with the requirements of paragraph 6.20.

6.20.6. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by Engineer as required by paragraph 2.9, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

6.21. Continuing the Work:

Contractor shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.5 or as Owner and Contractor may otherwise agree in writing.

6.22. Contractor's General Warranty and Guarantee:

6.22.1. Contractor warrants and guarantees to Owner, Engineer and Engineer's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

6.22.1.1. abuse, modification or improper maintenance or operation by persons other than Contractor, Subcontractors or Suppliers; or

6.22.1.2. normal wear and tear under normal usage.

6.22.2. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

6.22.2.1. observations by Engineer;

6.22.2.2. recommendation of any progress or final payment by Engineer;

6.22.2.3. the issuance of a certificate of Substantial Completion or any payment by Owner to Contractor under the Contract Documents;

6.22.2.4. use or occupancy of the Work or any part thereof by Owner;

6.22.2.5. any acceptance by Owner or any failure to do so;

6.22.2.6. any review and approval of Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer pursuant to paragraph 14.13;

6.22.2.7. any inspection, test or approval by others; or

6.22.2.8. any correction of defective Work by Owner.

6.23 Indemnification:

6.23.1. To the fullest extent permitted by Laws and Regulations. Contractor shall indemnify and hold harmless Owner, Engineer, Engineer's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or dispute resolution costs) caused by, arising out of or resulting

from the performance of the Work, provided that any such claim, cost, loss or damage: (i) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, and (ii) is caused in whole or in part by any negligent act or omission of Contractor, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.

6.23.2. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.23.1 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for Contractor or any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

6.23.3. The indemnification obligations of Contractor under paragraph 6.23.1 shall not extend to the liability of Engineer and Engineer's Consultants, officers, directors, employees or agents caused by the professional negligence, errors or omissions of any of them.

6.24. Survival of Obligations:

All representations, indemnifications, warranties and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Agreement.

ARTICLE 7 – OTHER WORK

Related Work at Site:

7.1. Owner may perform other work related to the Project at the site by Owner's own forces, or let other direct contracts therefore which shall contain General Conditions similar to these, or have other work performed by utility owners. If the fact that such other work is to be performed was not noted in the Contract Documents, then; (i) written notice thereof will be given to Contractor prior to starting any such other work, and (ii) Contractor may make a claim therefore as provided in Articles 11 and 12 if Contractor believes that such performance will involve additional expense to Contractor or requires additional time and the parties are unable to agree as to the amount or extent thereof.

7.2. Contractor shall afford each other contractor who is a party to such a direct contract and each utility owner (and Owner if Owner is performing the additional work with Owner's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents. Contractor shall do all cutting, fitting, and patching of the Work that may be required to make its several parts come together properly

and integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

7.3. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7. Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure so to report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent or non-apparent defects and deficiencies in such other work.

Coordination:

7.4. If Owner contracts with others for the performance of other work on the Project at the site, the following will be set forth:

7.4.1. the person, firm or corporation who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified;

7.4.2. the specific matters to be covered by such authority and responsibility will be itemized: and

7.4.3. the extent of such authority and responsibilities will be provided.

Owner shall have sole authority and responsibility in respect of such coordination.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.1. Except as otherwise provided in these General Conditions, Owner reserves the right to issue all communications to Contractor directly and/or through Engineer to make minor comments that do not affect the contract terms and conditions

8.2. In case of termination of the employment of Engineer, Owner shall maintain final approval of an engineer, whose status under the Contract Documents shall be that of the former Engineer.

8.3. Owner shall furnish the data required of Owner under the Contract Documents promptly and shall make payments to Contractor promptly when they are due as provided in paragraphs 14.4 and 14.13.

8.4. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions at the site and drawings of physical conditions in existing structures at or contiguous to the site that have been utilized by Engineer in preparing the Contract Documents.

8.5. Owner's responsibilities in respect of purchasing and maintaining liability and property insurance are set forth in paragraphs 5.5 through 5.6.

8.6. Owner is obligated to execute Change Orders as indicated in paragraph 10.4.

8.7. Owner's responsibility in respect of certain inspections, tests and approvals is set forth in paragraph 13.4.

8.8. In connection with Owner's right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 deals with Owner's right to terminate services of Contractor under certain circumstances.

8.9. The Owner shall not supervise, direct or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences or procedures of construction or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the furnishing or performance of the Work. Owner will not be responsible for Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.

8.10. Owner's responsibility in respect of undisclosed Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Materials uncovered or revealed at the site is set forth in paragraph 4.5.

8.11. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Contract Documents.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

Owner's Representative:

9.1. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of Owner and Engineer. The Engineer will provide services below in accordance with set Task Order agreement for limited on-call construction phase services. The Engineer’s tasks, non-inclusive, will include on-call construction phase services such as reviewing and approving shop drawings, payment applications, RFI coordination, attending contractor meetings, review and approve substantial and final completion inspections. All Engineer’s limited on-call construction phase services shall be at the request of Okaloosa County Water and Sewer on behalf of Owner.

Visits to Site:

9.2. Engineer will make visits to the site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer will endeavor for the benefit of Owner to determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and on-site observations, Engineer will keep Owner informed of the progress of the Work and will

endeavor to guard Owner against defective Work. Engineer's visits and on-site observations are subject to all the limitations on Engineer's authority and responsibility set forth in paragraph 9.13, and particularly, but without limitation, during or as a result of Engineer's on- site visits or observations of Contractor's Work Engineer will not supervise, direct, control or have authority over or be responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the furnishing or performance of the Work.

Project Representative:

9.3. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more continuous observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.13. If Owner designates another representative or agent to represent Owner at the site who is not Engineer's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other person will be as provided in the General Conditions.

9.3.1 Engineer may furnish a Resident Project Representative, assistants and other field staff as needed, to assist Owner in observing performance of the Work. The Resident Project Representative is to observe and inspect, in the Owner's interest, the materials furnished and the work done as the work progresses in order to insure full and complete compliance with the contract and to verify quantities of work completed.

9.3.2 Owner may also designate one of its employees to represent Owner for these purposes.

9.3.3 Engineer, Resident Project Representative, Owner and all such other persons referred to shall have unrestricted access to all parts of the Work. Contractor shall cooperate by supplying necessary facilities and assistance required by above persons to carry out their work of observation and inspection.

9.3.4 It is not the function of the Engineer, Resident Project Representative or Owner to supervise or direct the manner in which the work to be done under this Contract is carried on or conducted. The Engineer, Resident Project Representative or Owner is not responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work, and they will not be responsible for the Contractor's failure to carry out the work in accordance with the Contract Documents. Nevertheless, Contractor agrees that any method or procedure, which in the opinion of the Engineer or Owner does not achieve the required results or quality of the work specified, shall be discontinued immediately upon the order of the Engineer.

9.3.5 Duties and Responsibilities of Resident Project Representative (RPR):

1) RPR will act as directed by and under the supervision of Engineer and/or Owner, and will confer with Engineer and Owner regarding RPR's actions. RPR's dealings in matters pertaining to the on-site work shall in general be with Engineer and Contractor keeping Owner advised as necessary. RPR's dealings with subcontractors shall only be through or

with the full knowledge and approval of Contractor.

2) Review progress schedule, schedule of Shop Drawing submittals and schedule of values prepared by Contractor and consult with Engineer and Owner concerning acceptability.

3) Attend meetings with Contractor, such as pre-construction conferences, progress meetings, job conferences and other project-related meetings, and prepare and circulate copies of minutes thereof.

4) Serve as Engineer's and Owner's liaison with Contractor, working principally through Contractor's superintendent and assist in understanding the intent of the Contract Documents.

5) Advise Engineer, Owner and Contractor of the commencement of any Work requiring a Shop Drawing or sample if the submittal has not been approved by Engineer.

6) Conduct on-site observations of the Work in progress to assist Engineer and Owner in determining if the Work is in general proceeding in accordance with the Contract Documents. Report to Engineer and Owner whenever RPR believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer and Owner of Work that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

7) Report to Engineer and Owner when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

8) Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report with RPR's recommendations to Engineer and Owner. Transmit to Contractor decisions as issued by Engineer and/or Owner.

9) Maintain orderly files for correspondence, reports of job conferences, Shop Drawings and samples, reproductions of original Contract Documents including all Work Directive Changes, Addenda, Change Orders, Field Orders, additional Drawings issued subsequent to the execution of the Contract, Engineer's clarifications and interpretations of the Contract Documents, progress reports, and other Project related documents.

10) Record names, addresses and telephone numbers of all Contractors, subcontractors and major suppliers of materials and equipment.

11) Furnish Engineer and Owner periodic reports as required of progress of the Work and of Contractor's compliance with the progress schedule and schedule of Shop Drawing and sample submittals.

12) Draft proposed Change Orders and Work Directive Changes, obtaining backup material from Contractor and recommend to Engineer and Owner Change Orders, Work Directive Changes, and Field Orders.

13) Report immediately to Engineer and Owner upon the occurrence of any accident.

14) Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the schedule of values, Work completed and materials and equipment delivered at the site but not incorporated in the Work.

15) During the course of the Work, verify that certificates, maintenance and operation manuals and other data required to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have this material delivered to Engineer for review and forwarding to Owner prior to final payment for the work.

16) Before Engineer issues a Certificate of Substantial Completion, submit to Contractor a list of observed items requiring completion or correction.

17) Conduct final inspection in the company of Engineer, Owner and Contractor and prepare a final list of items to be completed or corrected.

18) Observe that all items on final list have been completed or corrected and make recommendations to Engineer and Owner concerning acceptance.

9.3.6 Limitations of Authority of Resident Project Representative (RPR):

1) Shall not authorize any deviation from the Contract Documents or substitution of materials or equipment, unless authorized by Engineer or Owner.

2) Shall not exceed limitations of Engineer's authority as set forth in the Contract Documents.

3) Shall not undertake any of the responsibilities of Contractor, subcontractors or Contractor's superintendent.

4) Shall not advise on, issue directions relative to or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction unless such advice or directions are specifically required by the Contract Documents.

5) Shall not advise on, issue directions regarding or assume control over safety precautions and programs in connection with the Work.

6) Shall not accept Shop Drawing or sample submittals from anyone other than Contractor.

9.3.7 The Engineer and or Owner shall have the authority to reject any work, or materials, or any part thereof, which does not in his opinion conform to the plans, drawings, specifications and contract, and it shall be permissible for him to do so at any time during the progress of the work and until its acceptance.

No material of any kind shall be used upon the work until it has been inspected and accepted by the Engineer. All materials rejected shall be removed immediately from the work and not again offered for inspection. Any materials or workmanship found at any time to be defective or not of the quality or character required by the plans and specifications shall be remedied at once regardless of previous inspection.

Such inspection shall not relieve the Contractor from any obligation to perform said work strictly in accordance with the plans and specifications and work not so constructed shall be removed and made good by the Contractor at his own expense, and free from all expense to the Owner whenever so ordered by the Owner without reference to any previous oversight or error in inspection.

9.4. Clarifications and Interpretations:

Engineer will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as Engineer may determine necessary, which shall be consistent with the intent of and reasonably inferable from Contract Documents. Such written clarifications and interpretations will be binding on Owner and Contractor. If Owner or Contractor believes that a written clarification or interpretation justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree to the amount or extent thereof, if any, Owner or Contractor may make a written claim therefore as provided in Article 11 or Article 12.

9.5. Authorized Variations in Work:

Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree as to the amount or extent thereof, Owner or Contractor may make a written claim therefore as provided in Article 11 or 12.

9.6. Rejecting Defective Work:

Engineer will have authority to disapprove or reject Work which Engineer believes to be defective, or that Engineer believes will not produce a complete Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or

testing of the Work as provided in paragraph 13.9, whether or not the Work is fabricated, installed or completed.

9.7. Shop Drawings, Change Orders and Payments:

9.7.1 In connection with Engineer's authority as to Shop Drawings and Samples, see paragraphs 6.19 through 6.20.4 inclusive.

9.7.2. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

9.7.3. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.8. Determinations for Unit Prices:

Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding upon Owner and Contractor, unless, within ten days after the date of any such decision, either Owner or Contractor delivers to the other and to Engineer written notice of intention to appeal from Engineer's decision and, a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to Engineer's decision, unless otherwise agreed in writing by Owner and Contractor. Such appeal will not be subject to procedures of paragraph 9.9.

9.9. Decisions on Disputes:

9.9.1. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work there under. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work and Claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Times will be referred initially to Engineer in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be delivered by the claimant to Engineer and the other party to the Agreement promptly, but in no event later than fifteen (15) days, after the start of the occurrence or event giving rise thereto, and written supporting data will be submitted to Engineer and the other party within forty-five (45) days after the start of such occurrence or event unless Engineer allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to Engineer and the claimant within thirty days after receipt of the claimant's last submittal (unless Engineer allows additional time). Engineer will render a formal decision in writing within thirty days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. Engineer's written decision on such claim, dispute or other matter will be final and binding upon Owner and Contractor unless: a written notice of intention to appeal from Engineer's written decision is delivered by Owner or Contractor to the other and to Engineer within thirty days after the date of such decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable Laws and Regulations within sixty days of the date of such decision, unless

otherwise agreed in writing by Owner and Contractor.

9.9.2. When functioning as interpreter and judge under paragraph 9.9.1, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by Engineer pursuant to paragraphs 9.8 or 9.9 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.15) will be a condition precedent to any exercise by Owner or Contractor of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter.

9.10. Not Used

9.11. Not Used

9.12. Not Used

9.13. Limitations on Engineer's Authority and Responsibilities:

9.13.1. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by Engineer shall create, impose or give rise to any duty owed by Engineer to Contractor, any Subcontractor, and Supplier, any other person or organization, or to any surety for employee or agent of any of them.

9.13.2. Engineer will not supervise, direct, control or have authority over or be responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the furnishing or performance of the Work. Engineer will not be responsible for Contractor's failure to perform or furnish the Work in accordance with the Contract Documents.

9.13.3. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

9.13.4. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests, and approvals and Other documentation required to be delivered by paragraph 14.12 will only be to determine generally that their content complies with the requirements of, and in the case of, certificates of inspections, tests and approvals that the results certified indicate compliance with the Contracted Documents.

9.13.5. the limitations upon authority and responsibility set forth in this paragraph 9.13 shall also apply to Engineer's Consultants, Resident Project Representative and assistants.

ARTICLE 10 – CHANGES IN THE WORK

10.1. Without invalidating the Agreement and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions or revisions in the Work. Such additions, deletions or revisions will be authorized by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

10.2. If Owner and Contractor are unable to agree as to the extent, if any, of an adjustment in the Contract Price or an adjustment of the Contract Times that should be allowed as a result of a Work Change Directive, a claim may be made therefore as provided in Article 11 or Article 12.

10.3. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.5 and 3.6 except in the case of an emergency as provided in paragraph 6.23 or in the case of uncovering Work as provided in paragraph 13.9.

10.4. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

10.4.1. changes in the Work which are (i) ordered by Owner pursuant to paragraph 10.1, (ii) required because of acceptance of defective Work under paragraph 13.13 or correcting defective Work under paragraph 13.14, or (iii) agreed to by the parties;

10.4.2. changes in the Contract Price or Contract Times which are agreed to by the parties; and

10.4.3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to paragraph 9.9;

Provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.21.

10.5. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be Contractor's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

ARTICLE 11 – CHANGE OF CONTRACT PRICE

11.1. The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at Contractor's expense without change in the Contract Price.

11.2. The Contract Price may only be changed by a Change Order. Any claim for an adjustment in the

Contract Price shall be based on written notice delivered by the party making the claim to the other party and to Engineer promptly (but in no event later than ten days) after the start of the occurrence or event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within thirty days after the start of such occurrence or event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of the claim) and shall be accompanied by claimant's written statement that the adjustment claimed covers all known amounts to which the claimant is entitled as a result of said occurrence or event. All claims for adjustment in the Contract Price shall be determined by Engineer in accordance with paragraph 9.8 if Owner and Contractor cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this paragraph 11.2.

11.3 The value of any Work covered by a Change Order or of any claim for an adjustment in the Contract Price will be determined as follows:

11.3.1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraphs 11.9.1. through 11.9.3. inclusive);

11.3.2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 11.6.2):

11.3.3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 11.3.2, on the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5) plus a Contractor's fee for overhead and profit (determined as provided in paragraph 11.6).

Cost of the Work Covered by a Change Order:

11.4. The term Cost of the Work means the sum of all costs necessarily incurred and paid by Contractor in the proper performance of the Work. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in paragraph 11.5.

11.4.1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include without limitation superintendents, foremen and other personnel employed full-time at the site. Payroll costs for employees not employed full-time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by Owner.

11.4.2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith.

All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

11.4.3. Payments made by Contractor to the Subcontractors for Work performed or furnished by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner who will then determine, with the advice of Engineer, which bids, if any, will be accepted. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in paragraphs 11.4, 11.5, 11.6 and 11.7. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

11.4.4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work.

11.4.5. Supplemental costs including the following:

11.4.5.1. The proportion of necessary transportation, travel and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

11.4.5.2. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of Contractor.

11.4.5.3. Rentals of all construction equipment and machinery and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof – all in accordance with the terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

11.4.5.4. Sales, consumer, use or similar taxes related to the work, and for which Contractor is liable, imposed by Laws and Regulations.

11.4.5.5. Deposits lost for causes other than negligence of Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

11.4.5.6. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by Owner in accordance with paragraph 5.9), provided they have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of

them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee. If, however, any such loss or damage requires reconstruction and Contractor is placed in charge thereof, Contractor is placed in charge thereof, Contractor shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7. The cost of utilities, fuel and sanitary facilities at the site.

11.4.5.8. Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

11.4.5.9. Cost of premiums for additional Bonds and insurance required because of changes in the Work.

11.5. The term Cost of the Work Covered by a Change Order shall not include any of the following:

11.5.1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by Contractor whether at the site or in Contractor's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.4.1 or specifically covered by paragraph 11.4.4 – all of which are to be considered administrative costs covered by the Contractor's fee.

11.5.2. Expenses of Contractor's principal and branch offices other than Contractor's office at the site.

11.5.3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

11.5.4. Cost of premiums for all Bonds and for all insurance whether or not Contractor is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

11.5.5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.4.

11.6. The Contractor's fee allowed to Contractor for overhead and profit shall be determined as follows:

11.6.1. a mutually acceptable fixed fee; or

11.6.2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

11.6.2.1. for costs incurred under paragraphs 11.4.1 and 11.4.2, the Contractor's fee shall be ten percent;

11.6.2.2. for costs incurred under paragraph 11.4.3, the Contractor's fee shall be five percent.

11.6.2.3. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraphs 11.4.1, 11.4.2, 11.4.3 and 11.6.2 is that the Subcontractor who actually performs or furnishes the Work, at whatever tier, will be paid a fee of ten percent of the costs incurred by such Subcontractor under paragraphs 11.4.1 and 11.4.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor:

11.6.2.4. no fee shall be payable on the basis of costs itemized under paragraphs 11.4.4, 11.4.5 and 11.5;

11.6.2.5. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

11.6.2.6. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with paragraphs 11.6.2.1 through 11.6.2.5, inclusive.

11.7. Whenever the cost of any work is to be determined pursuant to paragraphs 11.4 and 11.5, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.8. Not Used

11.9. Unit Price Work:

11.9.1. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer in accordance with paragraph 9.10.

11.9.2. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

11.9.3. Owner or Contractor may make a claim for an adjustment in the Contract Price in

accordance with Article 11 if:

11.9.3.1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

11.9.3.2. there is no corresponding adjustment with respect to any other item of Work; and

11.9.3.3. if Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT TIMES

12.1. The Contract Times (or Milestones) may only be changed by a Change Order or a Written Amendment. Any claim for an adjustment of the Contract Times (or Milestones) shall be based on written notice delivered by the party making the claim to the other party and to Engineer promptly (but in no event later than thirty days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within sixty days after such occurrence (unless Engineer allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Times (or Milestones) shall be determined by Engineer in accordance with paragraph 9.11 if Owner and Contractor cannot otherwise agree. No claim for an adjustment in the Contract Times (or Milestones) will be valid if not submitted in accordance with the requirements of this paragraph 12.1.

12.2. All time limits stated in the Contract Documents are of the essence of the Agreement.

12.3. Where Contractor is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of Contractor, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a claim is made therefore as provided in paragraph 12.1. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions or acts of God. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

12.4. Should Contractor be obstructed or delayed in the prosecution of or completion of the Work as a result of unforeseeable causes beyond the control of Contractor, and not due to its fault or neglect, including but not restricted to acts of God or of the public enemy, acts of government, fires, floods, epidemics, quarantine regulation, strikes or lockouts, Contractor shall notify the Owner in writing within forty-eight (48) hours after the commencement of such delay, stating the cause or causes thereof, or be deemed to have waived any right which Contractor may have had to request a time extension.

12.5. No interruption, interference, inefficiency, suspension or delay in the commencement or progress of the Work from any cause whatever, including those for which the Owner may be responsible, in whole or in part, shall relieve Contractor of his duty to perform or give rise to any right to

damages or additional compensation from the Owner. Contractor expressly acknowledges and agrees that it shall receive no damages for delay. Contractor's sole remedy, if any, against the Owner will be the right to seek an extension to the Contract Time; provided, however, the granting of any such time extension shall not be a condition precedent to the aforementioned "No Damage For Delay" provision. This paragraph shall expressly apply to claims for early completion, as well as to claims based on late completion.

ARTICLE 13 – TESTS AND INSPECTION: CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.1. **Notice of Defects:** Prompt notice of all defective Work of which Owner or Engineer have actual knowledge will be given to Contractor. All defective Work may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

13.2. Owner, Engineer, Engineer's Consultants, other representatives and personnel of Owner, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's site safety procedures and programs so that they may comply therewith as applicable.

Tests and Inspections:

13.3. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

13.4. Contractor shall employ and pay for services of an independent testing laboratory to perform all Quality Control inspections, test or approvals required by the contract documents. Contractor shall allow the Engineer access to all work done in the project for Acceptance Testing by the owner. This testing will be in addition to Quality Control Testing required by the Contractor. Owner shall arrange and pay all costs associated with Acceptance Testing done by an independent testing laboratory of the Owners choosing except:

13.4.1. for inspections, tests or approvals covered by paragraph 13.5 below.

13.4.2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.9 below shall be paid as provided in said paragraph 13.9; and

13.4.3. as otherwise specifically provided in the Contract Documents.

13.4.4 Owner shall perform the following test as part of quality assurance / acceptance testing:

All material testing included in the Bidding Documents.

All other required testing is to be completed by the contractor as part of the contractor's quality control procedures and submittals. This section shall take precedence over all other sections that describe testing requirements.

13.5. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection, or approval. Contractor shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work, or of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Quality Control Testing of materials and equipment shall be the responsibility of the Contractor who shall pay all costs associated with the required testing. Contractor shall provide the Engineer adequate advance notice of intended tests to allow the Engineer to be present during the Testing.

13.6. If any Work (or the work of others) that is to be inspected, tested or approved is covered by Contractor without written concurrence of Engineer, it must, if requested by Engineer, be uncovered for observation.

13.7. Uncovering Work as provided in paragraph 13.6 shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

Uncovering Work:

13.8. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

13.9. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose or otherwise make available for observation, inspection or testing as Engineer may require that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, Contractor shall pay all claims, costs, losses and damages caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others; and Owner shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, may make a claim therefore as provided in Article 11. If, however, such Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction; and, if the parties are unable to agree as to the amount or extent therefore, Contractor may make a claim therefore as provided in Articles 11 and 12.

Owner May Stop the Work:

13.10. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor or any surety or other party.

Correction or Removal of Defective Work:

13.11. If required by Engineer or Owner, Contractor shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by Engineer or Owner, remove it from the site and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.12. Correction Period:

13.12.1. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instruction: (i) correct such defective Work, or, if it has been rejected by Owner, remove it from the site and replace it with Work that is not defective, and (ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If Contractor does not promptly comply with the terms of such instructions, or in any emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

13.12.2. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

13.12.3. Where defective Work (and damage to other Work resulting therefrom) has been corrected, removed or replaced under this paragraph 13.12, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

13.13. Acceptance of Defective Work:

If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, also Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness). If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, Owner may make a claim therefore as provided in Article 11. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.14. Owner May Correct Defective Work:

If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work

or to remove and replace rejected Work as required by Engineer or Owner in accordance with paragraph 13.11, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days' written notice to Contractor, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph Owner shall proceed expeditiously. In connection with such corrective and remedial action, Owner may exclude Contractor from all or part of the site, take possession of all or part of the Work, and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representative, agents and employees, Owner's other contractors and Engineer and Engineer's Consultants access to the site to enable Owner to exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by Owner in exercising such rights and remedies will be charged against Contractor and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, Owner may make a claim therefore as provided in Article 11. Such claims, costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal or replacement of Contractor's defective Work. Contractor shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies hereunder.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values:

14.1. The schedule of values established as provided in paragraph 2.9 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

Application for Progress Payment:

14.2. At least ten days before the date established for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect Owner's interest therein, all of which will be satisfactory to Owner. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

Contractor's Warranty of Title:

14.3. Contractor warrants and guarantees that title to all Work, materials and equipment covered by

any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

Review of Applications for Progress Payment:

14.4. Engineer will, within *fifteen (15)* days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application. *Thirty (30)* days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due and when due will be paid by Owner to Contractor.

14.5. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's on-site observations of the executed Work as an experienced and qualified design professional and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

14.5.1. the Work has progressed to the point indicated.

14.5.2. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.8, and to any other qualifications stated in the recommendation), and

14.5.3. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

However, by recommending any such payment Engineer will not thereby be deemed to have represented that: (i) exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents or (ii) that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

14.6. Engineer's recommendation of any payment, including final payment, shall not mean that Engineer is responsible for Contractor's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the furnishing or performance of Work, or for any failure of Contractor to perform or furnish Work in accordance with the Contract Documents.

14.7. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner referred to in paragraph 14.5. Engineer may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

14.7.1. the Work is defective, or completed Work has been damaged requiring correction or replacement.

14.7.2. the Contract Price has been reduced by Written Amendment or Change Order.

14.7.3. Owner has been required to correct defective Work or complete Work in accordance with paragraph 13.14. or

14.7.4. Engineer has actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.4 inclusive.

Owner may refuse to make payment of the full amount recommended by Engineer because:

14.7.5. claims have been made against Owner on account of Contractors performance or furnishing of the Work.

14.7.6. Liens have been filed in connection with the Work, except where Contractor has delivered a specific Bond satisfactory to Owner to secure the satisfaction and discharge of such Liens,

14.7.7. there are other items entitling Owner to a set-off against the amount recommended, or

14.7.8. Owner has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.7.1 through 14.7.3 or paragraphs 15.2.1 through 15.2.4 inclusive;

but Owner must give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

Substantial Completion:

14.8. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion. Within a reasonable time thereafter, Owner, Contractor and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefore. If Engineer considers the Work substantially complete, Engineer will prepare and deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will within fourteen days after submission of the tentative certificate to Owner notify Contractor in writing, stating the reasons therefore. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will within said fourteen days execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be

completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner. At the time of delivery of the tentative certificate of Substantial Completion Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

14.9. Owner shall have the right to exclude Contractor from the Work after the date of Substantial Completion, but Owner shall allow Contractor reasonable access to complete or correct items on the tentative list.

Partial Utilization:

14.10. Use by Owner at Owner's option of any substantially completed part of the Work which: (i) has specifically been identified in the Contract Documents, or (ii) Owner, Engineer and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

14.10.1. Owner at any time may request Contractor in writing to permit Owner to use any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, Owner, Contractor and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefore. If Engineer considers that part of the Work to be substantially complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

14.10.2. No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.6 in respect of property insurance.

Owner may at any time request Contractor in writing to permit Owner to take over operation of any such part of the work although it is not substantially complete. A copy of such request will be sent to Engineer and within a reasonable time thereafter Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If Contractor does not object in writing to Owner and Engineer that such part of the Work is not ready for separate operation by Owner, Engineer will finalize the list if items to be completed or corrected and will deliver such lists to Owner and Con- tractor together with a written recommendation as to the division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, maintenance,

utilities, insurance, warranties and guarantees for that part of the Work which will become binding upon Owner and Contractor at the time when Owner takes over such operation (unless they shall have otherwise agreed in writing and so informed Engineer). During such operation and prior to Substantial Completion of such part of the Work, Owner shall allow Contractor reasonable access to complete or correct items on said list and to complete other related Work.

Final Inspection:

14.11. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

Final Application for Payment:

14.12. After Contractor has completed all such corrections to the satisfaction of Engineer and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by paragraph 5.4, certificates of inspection, marked-up record documents (as provided in paragraph 6.14) and other documents, Contractor may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied (except as previously delivered) by:

(i) consent of the surety, if any, to final payment.

(ii) complete and legally effective releases or waivers (satisfactory to Owner) of all Liens arising out of or filed in connection with the Work. In lieu of such releases or waivers of Liens and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and (ii) all payrolls, material and equipment bills and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a Bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

(iii) certification from surety that payment and performance bond shall remain in effect one (1) year following final payment.

(iv) contractor’s advertisement of completion – advertisement for a period of four (4) successive weeks in the newspaper or largest circulation published within the county where the work is performed.

(v) certification from insurance company that any insurance coverage written on a claims-made basis, remain in effect for at least two (2) years following final payment.

Final Payment and Acceptance:

14.13. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and

Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of paragraph 14.15 Otherwise, Engineer will return the Application to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. Thirty days after the presentation to Owner of the Application and accompanying documentation, in appropriate form and substance and with Engineer's recommendation and notice of acceptability, the amount recommended by Engineer will become due and will be paid by Owner to Contractor

14.14. If, through no fault of Contractor, final completion of the Work is significantly delayed and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment and recommendation of Engineer, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Waiver of Claims:

14.15. The making and acceptance of final payment will constitute:

14.15.1. a waiver of all claims by Owner against Contractor, except claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.11, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

14.15.12. a waiver of all claims by Contractor against Owner other than those previously made in writing and still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

Owner May Suspend Work:

15.1. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than ninety days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes an approved claim therefore as provided in Articles 11 and 12.

Owner May Terminate:

15.2. Upon the occurrence of any one or more of the following events:

15.2.1. if Contractor persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.9 as adjusted from time to time pursuant to paragraph 6.6);

15.2.2. if Contractor disregards Laws or Regulations of any public body having jurisdiction;

15.2.3. if Contractor disregards the authority of Engineer; or

15.2.4. if Contractor otherwise violates in any substantial way any provisions of the Contract Documents;

15.2.5 if Contractor commences a voluntary case under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect, or if Contractor takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to the bankruptcy or insolvency;

15.2.5.1 if a petition is filed against Contractor under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against Contractor under any other federal or state law in effect at the time relating to bankruptcy or insolvency;

15.2.5.2 if Contractor makes a general assignment for the benefit of creditors;

15.2.5.3 if a trustee, receiver, custodian, or agent of Contractor is appointed under applicable law or under contract, whose appointment or authority to take charge of property of Contractor is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of Contractor's creditors;

15.2.5.4 if Contractor admits in writing an inability to pay its debts generally as they become due.

Owner may, after giving Contractor (and the surety, if any,) seven days' written notice and to the extent permitted by Laws and Regulations, terminate the services of Contractor, exclude Contractor from the site and take possession of the Work and of all Contractor's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which Owner has paid Contractor but which are stored elsewhere, and finish the Work as Owner may deem expedient. In such case Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses and damages sustained by Owner arising out of or resulting from completing the Work such excess will be paid to Contractor. If such claims, costs, losses and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and when so approved by Engineer incorporated in a Change Order, provided that when exercising any rights or remedies under this paragraph Owner shall not be required to obtain the lowest price for the Work performed.

15.3. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

15.4. Upon seven days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, elect to terminate the Agreement. In such case, Contractor shall be paid (without duplication of any items):

15.4.1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

15.4.2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

15.4.3. for all claims, costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers and other; and

15.4.4. for reasonable expenses directly attributable to termination.

Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

Contractor May Stop Work or Terminate:

15.5. If, through no act or fault of Contractor, the Work is suspended for a period of more than ninety days by Owner or under an order of court or other public authority, or Engineer fails to act on any Application for Payment within thirty days after it is submitted or Owner fails for thirty days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Agreement and recover from Owner payment on the same terms as provided in paragraph 15.4. In lieu of terminating the Agreement and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within thirty days after it is submitted, or Owner has failed for thirty days to pay Contractor any sum finally determined to be due, Contractor may upon seven day's written notice to Owner and Engineer stop the Work until payment of all such amounts due Contractor, including interest thereon. The provisions of this paragraph 15.5 are not intended to preclude Contractor from making claim under Articles 11 and 12 for an increase in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping Work as permitted by this paragraph.

ARTICLE 16 – MISCELLANEOUS

16.1 Giving Notice:

Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or

certified mail, postage prepaid, to the last business address known to the giver of the notice.

16.2 Computation of Times:

16.2.1. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

16.2.2. A calendar day of twenty-four hours measured from midnight to the next midnight will constitute a day.

16.3. Notice of Claim:

Should Owner or Contractor suffer injury or damage to person or property because of any error, omission or act of the other part or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party promptly, but in no event later than fifteen (15) days of the first observance of such injury or damage. The provisions of this paragraph 16.3 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

16.4. Cumulative Remedies:

The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon Contractor by paragraphs 6.2, 6.13, 6.22, 6.23, 13.1, 13.12, 13.14, 14.3 and 15.2 and all of the rights and remedies available to Owner and Engineer thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

16.5. Professional Fees and Court Costs Included:

Whenever reference is made to "claims, costs, losses and damages," it shall include in each case, but not be limited to, all fees and charges of engineers, architects, attorneys and other professionals and all court or other dispute resolution costs.

16.6. Labor Records and Schedules:

The Department of Jurisdiction on such public work shall require all Contractors and Subcontractors to keep the following records on the site of the public work project on which such Contractors, and Subcontractors are engaged:

16.6.1 Record of hours worked by each worker, laborer, and mechanic on each day.

16.6.2 Record of days worked each week by each worker, laborer, and mechanic.

16.6.3 Schedule of occupation or occupations at which each worker, laborer, and mechanic on the project is employed during each workday and week.

16.6.4 Schedule of hourly wage rates and supplements paid to each worker, laborer, and mechanic for each occupation.

16.7. Wage Schedules:

Pursuant to the Labor Law, each laborer, worker, or mechanic employed by the Contractor, Subcontractor, or other person shall be paid not less than the prevailing rate of wages for a legal day's work and shall be provided supplements not less than the prevailing supplements as determined by the Industrial Commissioner.

The Contractor and every Subcontractor shall post in a prominent and accessible place on the site of the work a legible statement of all wage rates and supplements as specified in the Contract to be paid or provided, as the case may be, for the various classes of mechanics, workers, and laborers employed on the work.

The Owner does not represent or warrant that the accompanying schedule of wage rates and supplements with the classification of workers, mechanics, and laborers, as required the Labor Law, is complete, and it reserves the right to revise such schedule when required. If any occupation is not mentioned in the schedule of wage rates and supplements it shall be requested from the Industrial Commissioner, by the Contractor through the Engineer and such schedules, shall, upon notice to the Contractor, become and be a part of the wage and supplement schedules embodied in the Contract.

Also included is the Federal Wage Rate Determination. Laborers, workmen, and mechanics employed on the work done in performance of said Contract shall be paid not less than the rate of wages listed thereon for the trade or occupation of such laborer, etc.

ARTICLE 17 – CERTIFICATE OF GOOD STANDING FOR STATE OF FLORIEDA

17.1 Certificate of Good Standing for State of Florida:

Florida Statute 607.1501 requires that all vendors who wish to do business in the State of Florida be licensed to do business through the department of State for Florida and be in good standing with the State of Florida. As such, to do business with Okaloosa County a vendor must provide a Certificate of Good Standing with their bid/proposal package to the County. For more information on doing business in the state of Florida, please refer to the Florida Department of State. The website to register is https://dos.myflorida.com/sunbiz.

TECHNICAL SPECIFICATIONS

SPECIAL PROVISION NO. 1
Okaloosa County Water & Sewer Scope of Work

A. Description
Special Provision No. 1 summarizes the work to be self-performed by Okaloosa County Water & Sewer throughout the duration of the project.

B. Contractor Coordination
The Contractor shall coordinate with Okaloosa County Water & Sewer to coordinate work, locations, and schedule of new utility services. No separate payment shall be made for coordination with the utility providers.

C. Utility Work
This work shall be self-performed by Okaloosa County Water & Sewer and excluded from bid.

Item 110-6	Building/Driveway/Gravel Demolition- Field Office	-per Lump Sum (LS)
Item 110-7	Building/Driveway/Gravel Demolition- Maint. Bldg.	-per Lump Sum (LS)
Item 110-8	Relocate Nuke Shed	-per Lump Sum (LS)
Item 522-8	Foundation and Power for Nuke Shed	-per Lump Sum (LS)
Item 02660-1	Potable Water Infrastructure- Field Office	-per Lump Sum (LS)
Item 02660-2	Potable Water Infrastructure- Maint. Bldg.	-per Lump Sum (LS)
Item 02730-3	Sanitary Sewer Infrastructure- Field Office	-per Lump Sum (LS)
Item 02730-4	Sanitary Sewer Infrastructure- Maint. Bldg.	-per Lump Sum (LS)

D. Materials
Materials for the above referenced work shall be furnished by Okaloosa County Water & Sewer.

E. Measurement
No separate measurement shall be made for Okaloosa County Water & Sewer work.

F. Basis of Payment
All work performed by Okaloosa County Water & Sewer shall be excluded from the contract. All labor, equipment tools, incidentals necessary for completing the item, shall be the responsibility of Okaloosa County Water & Sewer. Okaloosa County Water & Sewer shall complete an as-built survey of the self-performed work for the engineer of record to review prior to the contractor commencing with the contractor required civil items.

All pay items to be self-performed by Okaloosa County Water & Sewer. No basis of payment for this item.

SPECIAL PROVISION NO. 2
Utility Relocation/Replacement

A. Description

This item shall consist of any work requested but not specified in the project documents if separately directed and approved by the Owner. The allowance is intended to cover any unforeseen conflicts, the temporary removal and adjustment of the existing light poles location as in the construction drawings, and other modifications as desired by the Owner, if any, not otherwise addressed in the contract drawings.

An allowance of $10,000 for Utility Relocation/Replacement shall be included in each bidder's Base Bid amount for the Field Office Building as shown in the Bid Schedule. An allowance of $5,000 for Utility Relocation/Replacement shall be included in each bidder's Base Bid amount for the Maintenance Building as shown in the Bid Schedule.

The contractor shall only receive reimbursement from the allowance for the amount which is invoiced by an independent party or as otherwise approved in writing by the Owner prior to the work.

As a result, the amount paid to the contractor from the allowance may be less than the allowance amount. Any portions of the allowance not paid to the contractor shall be deducted from the contract price in the final change order.

B. Measurement

No separate measurement shall be made for Miscellaneous Modifications.

C. Basis of Payment

The Contractor's reimbursement shall be limited to reimbursement for costs which are invoiced by an independent party or as otherwise approved in writing by the Owner prior to the work. The full amount of the allowance may not be awarded.

Payment will be made under:

Item AL-1-1	Special Provision No. 2- Utility Relocation/Replacement- Field Office	-Allowance (AL)
Item AL-1-2	Special Provision No. 2- Utility Relocation/Replacement- Maint. Bldg.	-Allowance (AL)

Note: Payment for protecting and temporarily supporting existing utilities to remain and as identified in the contract drawings shall not be included in this item, but shall be incidental to the respective demolition item for which it is a part.

END OF SPECIAL PROVISION NO. 2

SECTION 101

MOBILIZATION

101-1 Description.
Perform preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site and for the establishment of temporary offices, buildings, safety equipment and first aid supplies, and sanitary and other facilities. Include the costs of bonds and any required insurance and any other preconstruction expense necessary for the start of the work, excluding the cost of construction materials.

101-2 Basis of Payment.

101-2.1 When a Separate Item is Included in the Proposal: When the proposal includes a separate item of payment for this work, the work and incidental costs specified as being covered under this Section will be paid for at the Contract lump sum price for the item of Mobilization.

Payment will be made under:

Item 101-1	Mobilization	-per Lump Sum (LS)

101-2.2 Partial Payments: When the proposal includes a separate pay item for Mobilization and the Notice to Proceed has been issued, partial payments will be made in accordance with the following: For contracts of 120 contract days duration or less, partial payment will be made at 50% of the bid price per month for the first two months.

For contracts in excess of 120 contract days duration, partial payment will be made at 25% of the bid price per month for the first four months. In no event shall more than 50% of the bid price be paid prior to commencing construction on the project site.

Total partial payments for Mobilization on any project, including when more than one project or job is included in the Contract, will be limited to 10% of the original Contract amount for that project. Any remaining amount will be paid upon completion of all work on the Contract.

Retainage, as specified in 9-5, will be applied to all partial payments.

Partial payments made on this item will in no way act to preclude or limit any of the provisions for partial payments otherwise provided for by the Contract.

101-2.3 When No Separate Item is Included in the Proposal: Not Used.

END OF SECTION 101

SECTION 102

MAINTENANCE OF TRAFFIC

102-1 Description.
Maintain traffic within the limits of the project for the duration of the construction period, including any temporary suspensions of the work. Construct and maintain detours. Provide facilities for access to residences, businesses, etc., along the project. Furnish, install and maintain traffic control and safety devices during construction. Furnish and install work zone pavement markings for maintenance of traffic (MOT) in construction areas. Provide any other special requirements for safe and expeditious movement of traffic specified in the Plans. MOT includes all facilities, devices and operations as required for safety and convenience of the public within the work zone.

Do not maintain traffic over those portions of the project where no work is to be accomplished or where construction operations will not affect existing roads. Do not obstruct or create a hazard to any traffic during the performance of the work, and repair any damage to existing pavement open to traffic.

102-2 Materials.
Meet the following requirements:

Bituminous Adhesive ..... Section 970
Temporary Raised Pavement Markers ..... Section 990
Paint ..... Section 971
Removable Tape ..... Section 990
Glass Spheres ..... Section 971
Temporary Traffic Control Device Materials ..... Section 990
Retroreflective and Nonreflective Sheeting for Temporary Traffic Control Devices ..... Section 994

102-2.1 Temporary Traffic Control Devices: Use only the materials meeting the requirements of Section 990, Section 994, Standard Plans and the Manual on Uniform Traffic Control Devices (MUTCD).

102-2.2 Detour: Provide all materials for the construction and maintenance of all detours.

102-2.3 Commercial Materials for Driveway Maintenance: Provide materials of the type typically used for base, including reclaimed asphalt pavement (RAP) material, and having stability and drainage properties that will provide a firm surface under wet conditions.

102-3 Specific Requirements.

102-3.1 Beginning Date of Contractor's Responsibility: Maintain traffic starting the day work begins on the project or on the first day Contract Time is charged, whichever is earlier.

102-3.2 Worksite Traffic Supervisor: Provide a Worksite Traffic Supervisor who is responsible for initiating, installing, and maintaining all temporary traffic control devices as described in this Section and the Contract Documents. Provide all equipment and materials needed to set up, take down, maintain traffic control, and handle traffic-related situations. Use approved alternate Worksite Traffic Supervisors when necessary.

The Worksite Traffic Supervisor must meet the personnel qualifications specified in Section 105.

The Worksite Traffic Supervisor is to perform the following duties:

1. On site direction of all temporary traffic control on the project.

2. Is on site during all set up and take down, and performs a drive through inspection immediately after set up.

3. Is on site during all nighttime operations ensuring proper temporary traffic control.

4. Immediately corrects all safety deficiencies and corrects minor deficiencies that are not immediate safety hazards within 24 hours.

5. Is available on a 24 hour per day basis and present at the site within 45 minutes after notification of an emergency situation and is prepared to respond to maintain temporary traffic control or to provide alternate traffic arrangements.

6. Conducts daily daytime and weekly nighttime inspections of projects with predominately daytime work activities, and daily nighttime and weekly daytime inspections of projects with predominantly nighttime work activities of all traffic control devices, traffic flow, pedestrian, bicyclist, and business accommodations.

   Advise the project personnel of the schedule of these inspections and give them the opportunity to join in the inspection as deemed necessary. Pedestrians are to be accommodated with a safe, accessible travel path around work sites separated from mainline traffic in compliance with the Americans with Disabilities Act (ADA) Standards for Transportation Facilities. Maintain existing or detour bicycle facilities satisfactorily throughout the project limits. Existing businesses in work areas are to be provided with adequate entrances for vehicular and pedestrian traffic during business hours.

The Owner may disqualify and remove from the project a Worksite Traffic Supervisor who fails to comply with the provisions of this Section. The Owner may temporarily suspend all activities, except traffic, erosion control and such other activities that are necessary for project maintenance and safety, for failure to comply with these provisions.

102-3.3 Lane Closures: Submit routine requests to the Engineer fourteen calendar days in advance of planned lane closures, mobile operations, and traffic pacing operations. For unforeseen events that require cancelling or rescheduling lane closures, mobile operations, and traffic pacing operations, revise the lane closure request as soon as possible.

102-4 Alternative Traffic Control Plan.

The Contractor may propose an alternative traffic control plan (TCP) to the plan presented in the Contract Documents. The Contractor's Engineer of Record must sign and seal the alternative plan and submit to the Engineer. Prepare the TCP in conformance with and in the form outlined in the current version of the FDOT Design Manual. Indicate in the plan a TCP foreach phase of activities. Take responsibility for identifying and assessing any potential impacts to a utility that may be caused by the alternate TCP proposed by the Contractor, and notify the Owner in writing of any such potential impacts to utilities.

For projects with nighttime lane closure restrictions where paving is expected to extend into the winter months, the Contractor may propose an alternative TCP allowing for daytime lane closures for friction course paving. The alternative TCP must be a lane closure analysis based on actual traffic counts and prepared in accordance with the FDOT Design Manual.

Engineer's approval of the alternate TCP does not relieve the Contractor of sole responsibility for all utility impacts, costs, delays or damages, whether direct or indirect, resulting from Contractor initiated changes in the design or construction activities from those in the original Contract Specifications, Design Plans (including TCPs) or other Contract Documents and which effect a change in utility work different from that shown in the Utility Plans, joint project agreements or utility relocation schedules.

The Owner reserves the right to reject any alternative TCP. Obtain the Engineer's written approval before beginning work using an alternate TCP. The Engineer's written approval is required for all modifications to the TCP. The Engineer will only allow changes to the TCP in an emergency without the proper documentation.

102-5 Traffic Control.

102-5.1 Standards: FDOT Standard Plans are the minimum standards for the use in the development of all TCPs. The MUTCD, Part VI is the minimum national standard for traffic control for highway construction, maintenance, and utility operations. Follow the basic principles and minimum standards contained in these documents for the design, application, installation, maintenance, and removal of all traffic control devices, warning devices and barriers which are necessary to protect the public and workers from hazards within the project limits.

102-5.2 Maintenance of Roadway Surfaces: Maintain all lanes that are being used for the MOT, including those on detours and temporary facilities, under all weather conditions. Keep the lanes reasonably free of dust, potholes and rutting. Provide the lanes with the drainage facilities necessary to maintain a smooth riding surface under all weather conditions.

102-5.3 Number of Traffic Lanes: Maintain one lane of traffic in each direction. Maintain two lanes of traffic in each direction at existing four (or more) lane cross roads, where necessary to avoid undue traffic congestion. Construct each lane used for MOT at least as wide as the traffic lanes existing in the area before commencement of construction. Do not allow traffic control and warning devices to encroach on lanes used for MOT.

The Engineer may allow the Contractor to restrict traffic to one-way operation for short periods of time provided that the Contractor employs adequate means of traffic control and does not unreasonably delay traffic. When a construction activity requires restricting traffic to one-way operations, locate the flaggers within view of each other when possible. When visual contact between flaggers is not possible, equip them with 2-way radios, official, or pilot vehicles, or use traffic signals.

102-5.4 Crossings and Intersections: Provide and maintain adequate accommodations for intersecting and crossing traffic. Do not block or unduly restrict any median opening, road or street crossing the project unless approved by the Engineer. Before beginning any construction, submit to the Engineer the names and phone numbers of persons that can be contacted when signal operation malfunctions.

102-5.5 Access for Residences and Businesses: Provide continuous access to all residences and all places of business.

102-5.6 Protection of the Work from Injury by Traffic: Where traffic would be injurious to a base, surface course, or structure constructed as a part of the work, maintain all traffic outside the limits of such areas until the potential for injury no longer exists.

102-5.7 Flagger: Provide flaggers to control traffic when traffic in both directions must use a single lane and in other situations as required. All flaggers must meet the personnel qualifications specified in Section 105.

102-5.8 Conflicting Pavement Markings: Where the lane use or where normal vehicle or pedestrian paths are altered during construction, remove all pavement markings (paint, tape, thermoplastic, raised pavement markers, etc.) that will conflict with the adjusted vehicle or pedestrian paths. Use of paint to cover conflicting pavement markings is prohibited. Remove conflicting pavement markings using a method that will not damage the surface texture of the pavement and which will eliminate the previous marking pattern regardless of weather and light conditions.

Remove all pavement markings that will be in conflict with "next phase of operation" vehicle pedestrian paths as described above, before opening to vehicle traffic or use by pedestrians.

Cost for removing conflicting pavement markings (paint, tape, thermoplastic, raised pavement markers, etc.) to be included in Maintenance of Traffic, lump sum.

102-5.9 Vehicle and Equipment Visibility: Equip all pickups and automobiles used on the project with a minimum of one Class 2 warning light that meets the Society of Automotive Engineers Recommended Practice SAE J595, dated November 1, 2008, or SAE J845, dated December 1, 2007, and incorporated herein by reference. Existing lights that meet SAE J845, dated March, 1992, or SAE J1318, dated April, 1986, may be used to their end of service life. The warning lights must be a high intensity amber or white rotating, flashing, oscillating or strobe light. Lights must be unobstructed by ancillary vehicle equipment such as ladders, racks or booms and be visible 360 degrees around the vehicle. If the light is obstructed, additional lights will be required. The lights must be operating when the vehicle is in a work area where a potential hazard exists, when operating at less than the average speed for the facility while performing work activities, making frequent stops or called for in the Plans or Standard Plans.

Equip all other vehicles and equipment with a minimum of 4 square feet of retroreflective sheeting or warning lights.

102-5.10 No Waiver of Liability: Conduct operations in such a manner that no undue hazard results due to the requirements of this Article. The procedures and policies described herein in no way acts as a waiver of any terms of the liability of the Contractor or his surety.

102-6 Detours.

102-6.1 General: Construct and maintain detour facilities wherever it becomes necessary to divert traffic from any existing roadway or bridge, or wherever construction operations block the flow of traffic.

102-6.2 Construction: Plan, construct, and maintain detours for the safe passage of traffic in all conditions of weather. Provide the detour with all facilities necessary to meet this requirement.

Where pedestrian facilities are detoured, blocked or closed during the work, provide safe alternate accessible routes through or around the work zone meeting the requirements of the ADA Standards for Transportation Facilities. When temporary walkway surfaces and ramps are required to be constructed, ensure surfaces are stable, firm, slip resistant, and kept free of any obstructions and hazards such as holes, debris, mud, construction equipment and stored materials.

When the Plans call for the Owner to furnish detour bridge components, construct the pile bents in accordance with the Plans, unless otherwise authorized by the Engineer.

Provide two Contractor representatives, who will be directly involved in the erection of Owner-owned temporary bridging, to attend a mandatory one-day training session to be conducted at the Owner's storage facility. No bridging will be released to the Contractor prior to the completion of this training.

Submit the following: company name, phone number, office address, project contact person, names of the representatives who will attend the training described above, project number, detour bridge type, bridge length, span length, location and usage time frames, to the Engineer at least 30 calendar days before the intended pick-up date, to obtain the storage facility location and list of components for the project. Upon receipt, the Engineer will, within 10 calendar days submit an approved material list to the Contractor and the appropriate Owner storage yard.

Submit the name of the representative with authority to pick up components, to the Engineer at least 10 calendar days before the proposed pick-up date. The Owner is not obligated to load the bridge components without this notice. Take responsibility and sign for each item loaded at the time of issuance.

Provide timber dunnage, and transport the bridge components from the designated storage facility to the job site. Unload, erect, and maintain the bridge, then dismantle the bridge and load and return the components to the designated storage facility.

Notify the Engineer in writing at least 10 calendar days before returning the components. Include in this notice the name of the Contractor's representative authorized to sign for return of the bridge components. The yard supervisor is not obligated to unload the bridge components without this notice.

The Owner will provide equipment and an operator at the Owner's storage facility to assist in loading and unloading the bridge components. Furnish all other labor and equipment required for loading and unloading the components.

The Owner's representative will record all bridge components issued or returned on the Detour Bridge Issue and Credit Ticket. The tickets must be signed by a Owner and a Contractor representative, after loading or unloading each truck to document the quantity and type of bridging issued or returned.

Bind together all bridge components to be returned in accordance with the instructions given by the storage facility. The yard supervisor will repack components that are not packed in compliance with these instructions. Upon request, written packing instructions will be made available to the Contractor, before dismantling of the bridge for return to the Owner's storage facility.

Assume responsibility for any shortage or damage to the bridge components. Monies due the Contractor will be reduced at the rate of $35.00 per hour plus materials for repacking, repairs or replacement of bridge components.

The skid resistance of open steel grid decking on the detour bridge may decrease gradually after opening the bridge to traffic. The Owner will furnish a pneumatic floor scabbler machine for roughening the roadway surface of the detour bridge decking. Provide an air compressor at the job site with 200 cubic feet per minute capacity, 90 psi air pressure for the power supply of the machine, and an operator. Transport the scabbler machine to and from the Owner's structures shop. Repair any damage to the scabbler machine caused by operations at no expense to the Owner. Perform scabbling when determined necessary by the Engineer. The Owner will pay for the cost of scabbling as Unforeseeable Work in accordance with 4-4.

Return the bridge components to the designated storage facility beginning no later than 10 calendar days after the date the detour bridge is no longer needed, the date the new bridge is placed in service, or the date Contract Time expires, whichever is earliest. Return the detour bridging at an average of not less than 200 feet per week. Upon failure to return the bridge components to the Owner within the time specified, compensate the Owner for the bridge components not returned at the rate of $5.00 per 10 feet, per day, per bridge, for single lane; and $10.00 per 10 feet, per day, per bridge, for dual lane until the bridge components are returned to the Owner.

102-6.3 Construction Methods: Select and use construction methods and materials that provide a stable and safe detour facility. Construct the detour facility to have sufficient durability to remain in good condition, supplemented by maintenance, for the entire period that the detour is required.

102-6.4 Removal of Detours: Remove detours when they are no longer needed and before the Contract is completed. Take ownership of all materials from the detour and dispose of them, except for the materials on loan from the Owner with the stipulation that they are returned.

102-6.5 Detours Over Existing Roads and Streets: When the Owner specifies that traffic be detoured over roads or streets outside the project area, do not maintain such roads or streets. However, maintain all signs and other devices placed for the purpose of the detour.

102-6.6 Operation of Existing Movable Bridges: The Owner will maintain and operate existing moveable bridges that are to be removed by the Contractor until such time as they are closed to traffic. During this period, make immediate repairs of any damage to such structures caused by use or operations related to the work at no expense to the Owner, but do not provide routine repairs or maintenance. In the event that use or operations result in damage to a bridge requiring repairs, give such repairs top priority to any equipment, material, or labor available.

102-6.7 Special Detour: A special detour is defined as a diversion or lane shift for vehicular traffic that requires temporary pavement.

102-6.8 Pedestrian Special Detour: A pedestrian special detour is defined as a temporary pedestrian way that requires temporary pavement or other stable, firm, slip-resistant surface.

102-7 Traffic Control Officer.

Provide uniformed law enforcement officers, including marked law enforcement vehicles, to assist in controlling and directing traffic in the work zone when the following types of work is necessary on projects:

1. When directing traffic/overriding the signal in a signalized intersection.

2. When Standard Plans, Index 102-619 is used on freeway facilities (interstates, toll roads, and expressways) at nighttime for work within the travel lane.

3. When Standard Plans, Index 102-655 Traffic Pacing is called for in the Plans or approved by the Engineer.

4. When pulling conductor/cable above an open traffic lane on limited access facilities, when called for in the Plans or approved by the Engineer.

5. When Standard Plans, Index 102-625 Temporary Road Closure 5 Minutes or Less is used.

6. When performing lane closures during nighttime operations on roadways with posted speed limits 55 mph or greater.

At the Contractor's option, traffic control officers may be used for operations other than those listed above.

Cost for traffic control officers will be paid for as described in 102-11.2.

The Owner will not consider any claim arising from the failure of a traffic control officer to be present or available on the project. A noncompensable time extension may be granted when a state or local emergency requires all area law enforcement officers to be on-duty and not available for hire.

102-8 Driveway Maintenance.

102-8.1 General: Ensure that each residence and business has safe, stable, and reasonable access.

102-8.2 Construction Methods: Place, level, manipulate, compact, and maintain the material, to the extent appropriate for the intended use.

As permanent driveway construction is accomplished at a particular location, the Contractor may salvage and reuse previously placed materials that are suitable for reuse on other driveways.

102-9 Temporary Traffic Control Devices.

102-9.1 Installation and Maintenance: Install and maintain temporary traffic control devices as detailed in the Plans, Index 102-600 of the Standard Plans and when applicable, in accordance with the approved vendor drawings. Erect the required temporary traffic control devices to prevent any hazardous conditions and in conjunction with any necessary traffic re-routing to protect the traveling public, workers, and to safeguard the work area. Use only those devices that are on the APL or meeting the requirements of the Standard Plans. Immediately remove or cover any devices that do not apply to existing conditions.

The APL number is to be permanently marked on the device at a readily visible location. Sheeting used on devices is exempt from this marking requirement.

Notify the Engineer in writing of any scheduled operation that will affect traffic patterns or safety sufficiently in advance of commencing such operation to permit review of the plan for the proposed installation of temporary traffic control devices.

Assign an employee the responsibility of maintaining the position and condition of all temporary traffic control devices throughout the duration of the Contract. Keep the Engineer advised at all times of the identification and means of contacting this employee on a 24 hour basis.

Maintain temporary traffic control devices in the correct position, properly oriented, clearly visible and clean, at all times. All applicable temporary traffic control devices must meet the classification category of Acceptable as defined in the American Traffic Safety Services Association (ATSSA) Quality Guidelines for Temporary Traffic Control Devices and Features. Temporary concrete barriers must meet the classification category of Acceptable defined in the FDOT's Temporary Concrete Barrier Evaluation Guide, which may be viewed at the following URL:
https://fdotwww.blob.core.windows.net/sitefinity/docs/defaultsource/programmanagement/implemented/urlinspecs/files/docs/default-source/contentdocs/programmanagement/implemented/urlinspecs/files/temporaryconcretebarrierguide.pdf.pdf?_sfvrsn=343b4c97_10.
Pedestrian longitudinal channelizing devices (LCDs) must meet the classification category of Acceptable as defined in the Pedestrian LCD Evaluation Guide, which may be viewed at the following URL:
https://fdotwww.blob.core.windows.net/sitefinity/docs/defaultsource/programmanagement/implemented/urlinspecs/files/lcdevaluationguide.pdf?sfvrsn=166e0f_16_2. Immediately repair, replace or clean damaged, defaced or dirty devices. Traffic control devices must not be cleaned while installed/used. Use of warning lights on any temporary traffic control device is prohibited, with the exception of the trailer mounted portable regulatory signs.

Employ an approved independent Channelizing Device Supplier (CDS) to provide and maintain the condition of the following non-fixed channelizing devices: drums, cones, vertical panels, barricades, tubular markers, and longitudinal channeling devices. Cones may be provided and maintained by the Contractor.

The CDS shall not be affiliated with the Contractor and shall be approved by the Engineer in accordance with 102-9.1.1. The CDS shall submit a monthly certification on letterhead that the channelizing devices mentioned above installed/used within the work zone meet classification category of Acceptable as defined in the Pedestrian LCD Evaluation Guide and the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features. The CDS shall submit the monthly certification on letterhead for channelizing devices installed/used within the work zone. The CDS certification shall include the following statement, "I certify that I have provided and maintained the following devices <list devices covered under the certification> in accordance with Pedestrian LCD Evaluation Guide and the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features." If the Contractor chooses to provide and maintain cones, the Contractor must submit a monthly Contractor certification on letterhead that all cones installed/used within the work zone meet acceptable standards as outlined in the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features. The Contractor certification shall include the following statement, "I certify that

I have provided and maintained cones in accordance with the ATSSA Quality Guidelines for Temporary Traffic Control Devices and Features."

102-9.1.1 Approved Independent Channelizing Device Supplier (CDS) Requirements: Not Used

102-9.2 Work Zone Signs: Furnish, install, maintain, remove and relocate signs in accordance with the Plans and Standard Plans, Index 102-600. Use signs that meet the material and process requirements of Section 994. Use Type IV sheeting for fluorescent orange work zone signs. Roll-up signs must meet the requirements of Type VI sheeting. Use Type IV or Type XI sheeting for all other work zone signs. Attach the sign to the sign support using hardware meeting the manufacturer's recommendations on the APL vendor drawings or as specified in the Standard Plans.

102-9.2.1 Post Mounted Signs: Meet the requirements of 990-8.

102-9.2.2 Portable Signs: Use only approved systems, which includes sign stands and attachment hardware (nuts, bolts, clamps, brackets, braces, etc.), meeting the vendor requirements specified on the APL drawings. Provide Federal Highway Administration's (FHWA) accepted sign substrate for use with accepted sign stands on the National Highway System (NHS) under the provisions of the NCHRP Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

102-9.2.3 Barrier Mounted Signs: If post mounting criteria cannot be achieved in accordance with Standard Plans, Index 102-600 and a barrier or traffic railing exists, use temporary sign criteria provided in Standard Plans, Index 700-013.

102-9.3 Business Signs: Provide and place signs in accordance with the Plans and Standard Plans, Index 102 series. Furnish signs having retroreflective sheeting meeting the requirements of Section 990.

102-9.4 Project Information Signs: Provide and place signs in accordance with the Plans and Standard Plans, Index 102 series. Furnish signs having retroreflective sheeting meeting the requirements of Section 990.

102-9.5 Channelizing Devices: Furnish, install, maintain, remove and relocate channelizing devices in accordance with the Plans and Standard Plans.

102-9.5.1 Retroreflective Collars for Traffic Cones: Use collars for traffic cones listed on the APL that meet the requirements of Section 990. Use cone collars at night designed to properly fit the taper of the cone when installed. Place the upper 6-inch collar a uniform 3-1/2 inches distance from the top of the cone and the lower 4 inch collar a uniform 2 inches distance below the bottom of the upper 6 inch collar.

Collars must be capable of being removed for temporary use or attached permanently to the cone in accordance with the manufacturer's recommendations. Provide a white sheeting having a smooth outer surface and that has the property of a retroreflector over its entire surface.

102-9.5.2 Longitudinal Channelizing Devices (LCDs): Use LCDs listed on the APL and meeting the requirements of Section 990 and the Standard Plans. LCDs must be interlocked except for the stand-alone unit placed perpendicular to a sidewalk. For LCDs requiring internal ballasting, an

indicator that clearly identifies the proper ballast level will be required. For LCDs requiring external ballasting, the ballasting methods must be detailed in the APL drawings including ballasting type and minimum weight.

Ensure that joints on the pedestrian LCDs are free of sharp edges and have a maximum offset of 1/2 inch in any plane.

Use alternating orange and white solid color vehicular LCDs. Vehicular LCDs may be substituted for drums, vertical panels, or barricades.

102-9.6 Temporary Barrier: Furnish, install, maintain, remove and relocate temporary barrier in accordance with the Plans and Standard Plans. Temporary concrete barrier must meet the material and construction requirements of Section 521 unless noted otherwise in the Standard Plans. Proprietary temporary concrete, steel, or water filled barrier used must be listed on the APL.

The maximum allowable height increase between consecutive temporary barrier units in the direction of traffic is 1 inch.

Temporary barrier must comply with Standard Plans, Index 102-100 or 102-120. Install temporary barriers as either anchored or freestanding as shown in the Plans or the Standard Plans. An anchored unit is defined as having at least one stake or bolt into the underlying pavement or bridge deck. All other units, including those with keeper pins, are considered freestanding.

Remove temporary asphalt pads and repair all attachment scars to permanent structures and pavements after barrier removal. Make necessary repairs due to defective material, work, or Contractor operations at no cost to the Owner. Restore barrier damaged by the traveling public within 24 hours after notification as authorized by the Engineer.

Trailer mounted barriers listed on the APL may be used at the option of the Contractor. Trailer mounted barriers listed on the APL must have an FHWA eligibility letter and be successfully crash tested in accordance with MASH TL-3 criteria. All trailer mounted barriers must be equipped with an APL listed truck mounted attenuator, an APL listed vehicle mounted arrow board and vehicle warning lights in accordance with this Section.

102-9.6.1 Temporary Barrier Meeting the Requirements of Standard Plans, Index 102-120 and 102-110: Ensure the marking requirements of the respective Index are met.

102-9.6.2 Proprietary Precast Temporary Concrete Barrier Fabricated prior to 2005: The Contractor must submit a certification stating that all unmarked barrier units meet the requirements of the Specifications and the Standard Plans. Certifications will be project specific and non-transferable.

102-9.6.3 Proprietary Precast Temporary Concrete Barrier Fabricated in 2005 or later: Ensure each barrier unit has permanent clear markings, showing the manufacture date, serial number, manufacturer's name or symbol, and the APL number. Label the markings on a plate, plaque, or cast in the unit. Proprietary barrier fabricated prior to 2016 and marked with the "INDX 521" in lieu of the APL number will be permitted.

102-9.6.4 Temporary Concrete Barrier Repair: Before beginning the repair, remove all laitance, loose material, and any other deleterious matter to sound concrete or a minimum depth of one inch. Additionally, when reinforcing bars, inserts or weldments are exposed, remove the concrete to provide a minimum one inch clearance all around. Fill the repair area with an approved high performance concrete repair material in accordance with 930-5 and the manufacturer's recommendations. Restore surfaces and edges to the original dimensions and shape of the barrier.

Repairs are not allowed on barrier units that have one or more of the following deficiencies: structural cracking or cracks that exist through the entire cross-section; unit-to-unit connection assemblies or anchor slots are broken or no longer in a fixed position.

Do not paint repaired barriers.

102-9.7 Barrier Delineators: Install barrier delineators on top of temporary barrier and vehicular LCDs meeting the requirements of Section 705.

102-9.8 Temporary Glare Screen: Use temporary glare screens listed on the APL that meet the requirements of Section 990. Furnish, install, maintain, remove and relocate glare screen systems in conjunction with temporary barrier at locations identified in the Plans.

The anchorage of the glare screen to the barrier must be capable of safely resisting an equivalent tensile load of 600 pounds per foot of glare screen, with a requirement to use a minimum of three fasteners per barrier section.

When glare screen is utilized on temporary barrier, barrier delineators will not be required.

102-9.9 Temporary Crash Cushion (Redirective or Gating): Furnish, install, maintain and subsequently remove temporary crash cushions in accordance with the details and notes shown in the Plans, Standard Plans, and requirements of the pre-approved alternatives listed on the APL.

Temporary crash cushions can be either new or used functionally sound refurbished devices. Performance of intended function is the only condition for acceptance. All metallic components must be galvanized in accordance with Section 967.

Anchor abutting temporary barrier in accordance the Standard Plans or APL drawings, as required. Bidirectional installations must have a transition panel installed between the crash cushion and the abutting barrier. Delineate the crash cushion in accordance with Section 544. Maintain the crash cushions until their authorized removal. Do not place any materials or equipment within the length of the crash cushion.

Remove temporary asphalt or concrete pads and repair all attachment scars to permanent structures and pavements after crash cushion removal. Make necessary repairs due to defective material, work, or Contractor operations at no cost to the Owner. Restore crash cushions damaged by the traveling public within 24 hours after notification as authorized by the Engineer.

102-9.10 Temporary Guardrail: Furnish temporary guardrail in accordance with the Plans and Standard Plans. Meet the requirements of Section 536.

102-9.11 Arrow Board: Furnish arrow boards that meet the requirements of Section 990 as required by the Plans and Standard Plans to advise approaching traffic of lane closures or shoulder work. Ensure that the arrow board display panel is raised to a minimum mounting height of 7 feet from the bottom of the panel to the edge of the travel way elevation when in the upright position. Type B arrow boards may be used on low to intermediate speed (0 mph to 50 mph) facilities or for maintenance or moving operations on any speed facility. Type C arrow boards must be used for all other operations on high-speed (50 mph and greater) facilities and may be substituted for Type B arrow boards on any speed facility.

102-9.12 Portable Changeable Message Sign (PCMS): Furnish PCMSs or truck mounted changeable message signs that meet the requirements of Section 990 as required by the Plans and Standard Plans to supplement other temporary traffic control devices used in work zones. Ensure that the PCMS display panel is raised to a fully upright position and is fully visible to motorists.

Messages must have no more than two phases. The display time for each phase must be at least two seconds but no more than three seconds. The sum of the display time must be a maximum of six seconds.

102-9.13 Portable Regulatory Signs (PRS): Furnish PRSs that meet the requirements of Section 990 as required by the Plans and Standard Plans. Ensure that the PRS sign panel is raised to a fully upright position and is fully visible to motorists.

Activate portable regulatory signs only during active work activities and deactivate when no work is being performed.

102-9.14 Radar Speed Display Unit (RSDU): Furnish RSDUs that meet the requirements of Section 990 as required by the Plans and Standard Plans to inform motorists of the posted speed and their actual speed. Ensure that the RSDU display panel is raised to a minimum mounting height of 5 feet from the bottom of the panel to the edge of the travel way elevation when in the upright position.

Activate the radar speed display unit only during active work activities and deactivate when no work is being performed.

102-9.15 Temporary Signalization and Maintenance: Provide temporary signalization and maintenance at existing, temporary, and new intersections including but not limited to the following:

1. Installation of temporary poles and span wire assemblies as shown in the Plans,

2. Temporary portable traffic signals as shown in the Plans,

3. Adding or shifting signal heads,

4. Trouble calls,

5. Maintaining intersection and coordination timing and preemption devices. Coordination timing will require maintaining functionality of system communications.

Restore any loss of operation within 12 hours after notification. Provide alternate temporary traffic control until the signalization is restored.

Provide traffic signal equipment that meets the requirements of the Standard Plans and 603-2. The Engineer may approve used signal equipment if it is in acceptable condition. Replacement components for traffic signal cabinet assemblies will be provided by the maintaining agency. For temporary signals used for lane closure operations on two-lane, two-way roadways meet the requirements in 102-9.21.

102-9.16 Temporary Traffic Detection and Maintenance: Provide temporary traffic detection and maintenance at existing, temporary, and new signalized intersections. Provide temporary traffic detection equipment listed on the APL. Restore any loss of detection within 12 hours. Ensure 90% accuracy per signal phase, measured at the initial installation and after any lane shifts, by comparing sample data collected from the detection system with ground truth data collected by human observation. Collect the sample and ground truth data for a minimum of five minutes during a peak and five minutes during an off-peak period with a minimum three detections for each signal phase. Perform the test in the presence of the Engineer.

102-9.17 Truck Mounted Attenuators and Trailer Mounted Attenuators: Furnish, operate and maintain APL listed truck mounted and trailer mounted attenuators in accordance with the manufacturer's recommendations.

For posted speeds of 50 mph or greater, use either truck mounted attenuators or trailer mounted attenuators that meet TL-3 criteria (NCHRP Report 350 or MASH). For posted speeds of 45 mph or less, use either truck mounted attenuators or trailer mounted attenuators that meet TL-2 or TL-3 criteria (NCHRP Report 350 or MASH).

Attenuators will not be paid for separately. Include the cost of the truck with either a truck mounted attenuator or a trailer mounted attenuator in Maintenance of Traffic, lump sum. Payment includes all costs, including furnishing, operating maintaining and removal when no longer required, and all materials, labor, tools, equipment and incidentals required for attenuator maintenance.

102-9.18 Temporary Raised Rumble Strip Set: Furnish, install, maintain, remove, and reinstall temporary raised rumble strips per the manufacturer's recommendations and in accordance with Standard Plans, Index 102-603.

The temporary raised rumble strip may be either a removable polymer striping tape or a molded engineered polymer material.

102-9.19 Automated Flagger Assistance Devices (AFAD): Furnish, install, maintain, remove, and relocate AFADs in accordance with the Plans, Standard Plans, Index 102-603, and APL vendor drawings.

Position AFADs where they are clearly visible to oncoming traffic. AFADs may be placed on the centerline if they have been successfully crash tested in accordance with MASH TL-3 criteria. A gate arm is required in accordance with Section 990 if a single AFAD is used on the shoulder to control one direction of traffic.

The devices may be operated either by a single flagger at one end of the traffic control zone, from a central location, or by a separate flagger near each device location. Use only flaggers trained in accordance with Section 105 and in the operation of the AFAD. When in use, each AFAD must be in view of, and attended at all times by, the flagger operating the device.

Provide two flaggers on-site and use one of the following methods in the deployment of AFADs:

1. Place an AFAD at each end of the temporary traffic control zone, or

2. Place an AFAD at one end of the temporary traffic control zone and a flagger at the opposite end.

A single flagger may simultaneously operate two AFADs as described in (1) or a single AFAD as described in (2) if all of the following conditions are met:

1. The flagger has an unobstructed view of the AFAD(s),

2. The flagger has an unobstructed view of approaching traffic in both directions,

3. For two AFADs, the AFADs are less than 800 feet apart. For one AFAD, the AFAD and the flagger are less than 800 feet apart.

4. Two flaggers are available on-site to provide normal flagging operations should an AFAD malfunction.

AFADs may be either a remotely controlled Stop/Slow AFAD mounted on either a trailer or a movable cart system, or a remotely controlled Red/Yellow Lens AFAD.

Illuminate the flagging station when the AFAD is used at night. When the AFAD is not in use, remove or cover signs and move the AFAD device outside the clear zone or shield it with a barrier.

AFADs will not be paid for separately. AFADs may be used as a supplement or an alternate to flaggers in accordance with the Plans, Standard Plans, Index 102-603, and the APL vendor drawings. Include the cost for AFADs in Maintenance of Traffic, Lump Sum.

102-9.20 Temporary Lane Separator: Furnish, install, maintain, remove and relocate temporary lane separator in accordance with the Plans and Standard Plans, Index 102-600. Anchor the portable temporary lane separator with a removable anchor bolt. Use epoxy on bridge decks where anchoring is not allowed. Remove the epoxy from the bridge deck by hydroblasting or other method approved by the Engineer.

102-9.21 Temporary Signals for Lane Closures on Two-Lane, Two-Way Roadways: Furnish, install, maintain, remove, and relocate temporary signals for lane closure operations on two-lane, two-way roadways at the locations shown in the Plans. Temporary signals may be used, at the Contractor's option, as an alternate to flaggers for lane closure operations on twolane, two-way roadways in accordance with Standard Plans, Index 102-606. Temporary signals can either be portable signals or span wire signals and must be listed on the APL.

102-10 Work Zone Pavement Marking.

102-10.1 Description: Furnish and install work zone pavement markings for MOT in construction areas and in close conformity with the lines and details shown in the Plans and Standard Plans.

Centerlines, lane lines, edge lines, stop bars, standard crosswalks, and turn arrows will be required in work zones prior to opening the road to traffic.

102-10.2 Painted Pavement Markings:

102-10.2.1 General: Use painted pavement markings meeting the requirements of Section 710. Use standard paint unless otherwise identified in the Plans or approved by the Engineer.

102-10.3 Removable Tape:

102-10.3.1 General: Use removable tape listed on the APL as shown in the Plans and meeting the requirements of 990-4.

102-10.3.2 Application: Apply removable tape with a mechanical applicator to provide pavement lines that are neat, accurate and uniform. Equip the mechanical applicator with a film cut-off device and with measuring devices that automatically and accumulatively measure the length of each line placed within an accuracy tolerance of plus or minus 2%. Ensure removable tape adheres to the road surface. Removable tape may be placed by hand on short sections, 500 feet or less, if it is done in a neat accurate manner.

102-10.3.3 Retroreflectivity: Apply white and yellow pavement markings that will attain an initial retroreflectivity of not less than 300 mcd/lx·m2 for white and contrast markings and not less than 250 mcd/lx·m2 for yellow markings. Black portions of contrast tapes and black masking tapes must be non-reflective and have a reflectance of less than 5 mcd/lx m2. At the end of the six month service life, the retroreflectance of white and yellow removable tape shall not be less than 150 mcd/lx·m2.

102-10.3.4 Removability: Provide removable tape capable of being removed from bituminous concrete and portland cement concrete pavement intact or in substantially large strips, either manually or by a mechanical roll-up device, at temperatures above 40ºF, without the use of heat, solvents, grinding or blasting.

102-10.4 Temporary Raised Pavement Markers (RPMs): Use Class B RPMs except for work that consists of ground-in rumble strips at centerline locations. For ground-in rumble strips at centerline locations, use temporary RPMs in accordance with Section 710. Provide only temporary RPMs listed on the APL. Install all markers in accordance with the manufacturer's recommendations, the Standard Plans, and Section 706. After initial installation, replace broken or missing temporary RPMs in locations where more than three consecutive temporary RPMs are broken or missing at no expense to the Owner.

102-11 Method of Measurement.

102-11.1 General: Devices installed/used on the project on any calendar day or portion thereof, within the Contract Time, including time extensions which may be granted, will be paid for at the Contract unit price for the applicable pay item. Include the cost of any work that is necessary to meet the requirements of the Contract Documents for MOT under Maintenance of Traffic, lump sum when separate payment is not provided.

102-11.2 Traffic Control Officers: The quantity to be paid for traffic control officers as specified in 102-7(1) through (5) will be at the Contract unit price per hour (4 hour minimum) for the actual number of officers certified to be on the project site, including any law enforcement vehicles and all other direct and indirect costs. Payment will be made only for those traffic control officers specified in the Plans and authorized by the Engineer.

Cost for traffic control officers as specified in 102-7(6) or used at the Contractor's option will be paid for under Maintenance of Traffic, lump sum.

102-11.3 Special Detours: When a special detour is shown in the Plans, the work of constructing, maintaining, and subsequently removing such detour facilities will be paid for under Special Detour, lump sum. However, traffic control devices, warning devices, barriers, signing, pavement markings, and restoration to final configuration will be paid for under their respective pay items.

When the Plans show more than one special detour, each special detour will be paid for separately, at the Contract lump sum price for each.

102-11.4 Commercial Material for Driveway Maintenance: The quantity to be paid for will be the certified volume, in cubic yards, of all materials authorized by the Engineer, acceptably placed and maintained for driveway maintenance. The volume, which is authorized to be reused, and which is acceptably salvaged, placed, and maintained in other designated driveways will be included again for payment.

102-11.5 Work Zone Signs: The number of temporary post-mounted signs (temporary regulatory, warning and guide) certified as installed/used on the project will be paid for at the Contract unit price for work zone signs. When multiple signs are located on single or multiple posts, each sign panel will be paid individually. Signs greater than 20 square feet and detailed in the Plans will be paid for under Maintenance of Traffic, lump sum.

Temporary portable signs (excluding mesh signs) and vehicular mounted signs will be included for payment under work zone signs, only if used in accordance with the Standard Plans.

The number of temporary barrier mounted signs (temporary regulatory, warning and guide) certified as installed/used on the project will be paid for at the Contract unit price for barrier mounted work zone signs.

Work zone signs may be installed fourteen days prior to the start of Contract Time with the approval of the Engineer and at no additional cost to the Owner.

102-11.6 Business Signs: The number of business signs certified as installed/used on the project will be paid for at the Contract unit price for business signs.

102-11.7 Project Information Signs: No separate payment will be made for project information signs. Payment will be included under Maintenance of Traffic, lump sum.

102-11.8 Channelizing Devices: The number of drums, vertical panels, and Type I, Type II, Type III, or direction indicator barricades, certified as installed/used on the project meeting the requirements of Standard Plans, Index 102-600 and have been properly maintained will be paid for at the Contract unit prices for channelizing device.

Payment for drums, vertical panels, and Type I, Type II, Type III, and direction indicator barricades will be paid per each per day.

Payment for vehicular LCDs will be paid as the length in feet installed divided by the device spacing for barricades, vertical panels, and drums and certified as installed/used on the project meeting the

requirements of Standard Plans, Index 102-600 and have been properly maintained will be paid for at the Contract unit price for channelizing device.

Payment for pedestrian LCDs will be paid as the plan quantity length in feet, in place and accepted. For sidewalk closures, the plan quantity length will be based on the width of the sidewalk. The quantity of pedestrian LCDs will be paid for regardless of whether materials are new, used, or relocated from a previous installation on the project. Placement of pedestrian LCDs at locations not shown in the Plans, or not authorized by the Engineer, will be at the Contractor's expense. Payment for pedestrian LCD mounted signs will be made under Work Zone Signs, per each per day.

Payment will not be made for channelizing devices unsatisfactorily maintained, as determined by the Engineer. Payment will be made for each channelizing device that is used to delineate trailer mounted devices. Payment will be made for channelizing devices delineating portable changeable message signs during the period beginning 14 working days before Contract Time begins as authorized by the Engineer.

102-11.9 Temporary Barrier: The quantity to be paid for will be the length, in feet, of freestanding units or anchored units certified as installed/used on the project. The quantity to be paid for relocating barrier will be based on the relocated installation type. No separate payment will be made for the asphalt pad.

102-11.10 Barrier Delineators: No separate payment will be made for barrier delineators installed on top of temporary barrier and vehicular LCDs. Include the cost for barrier delineators in the cost of the barrier or vehicular LCD.

102-11.11 Temporary Glare Screen: The certified quantity to be paid for will be determined by the number of sections times the nominal length of each section.

102-11.12 Temporary Crash Cushions: No separate payment will be made for the concrete or asphalt pad.

102-11.12.1 Redirective: The quantity to be paid for will be the number of temporary crash cushions (redirective) certified as installed/used and maintained on the project, including anchoring of temporary barrier necessary for transition to the crash cushion and delineation.

102-11.12.2 Gating: The quantity to be paid for will be the number of temporary crash cushions (gating) certified as installed/used and maintained on the project, including anchoring of temporary barrier necessary for transition to the crash cushion and delineation.

102-11.13 Temporary Guardrail: The quantity to be paid for will be the length, in feet, of temporary guardrail constructed and certified as installed/used on the project. The length of a run of guardrail will be determined as a multiple of the nominal panel lengths.

102-11.14 Arrow Board: The quantity to be paid at the contract unit price will be for the number of arrow boards certified as installed/used on the project on any calendar day or portion thereof within the Contract Time.

102-11.15 Portable Changeable Message Sign: The quantity to be paid at the Contract unit price will be for the number of PCMSs or truck mounted changeable message signs certified as installed/used

on the project on any calendar day or portion thereof within the Contract Time. Payment will be made for each portable changeable message sign that is used during the period beginning fourteen working days before Contract Time begins as authorized by the Engineer.

102-11.16 Portable Regulatory Signs: The quantity to be paid for will be the number of portable regulatory signs certified as installed/used on the project on any calendar day or portion thereof within the Contract Time, will be paid for the Contract unit price for portable regulatory sign.

102-11.17 Radar Speed Display Unit: The quantity to be paid for will be the number of radar speed display units certified as installed/used on the project on any calendar day or portion thereof within the Contract Time, will be paid for the Contract unit price for radar speed display unit.

102-11.18 Temporary Signalization and Maintenance: For existing intersections, the certified quantity to be paid for will be the number of signalized intersections per day for the full duration of the Contract. For temporary intersections, the certified quantity to be paid for will be the number of signalized intersections per day for the duration of the temporary intersection. No separate payment will be made for temporary signalization and maintenance at new intersections.

102-11.19 Temporary Traffic Detection and Maintenance: For existing intersections, the certified quantity to be paid for will be the number of signalized intersections per day beginning the day Contract Time begins and ending the day the permanent detection is operational and the final lane configuration is in place. For temporary and new intersections, the certified quantity to be paid for will be the number of signalized intersections per day beginning the day the temporary detection is functional and ending the day: the permanent detection is operational and the final lane configuration is in place for a new intersection; or, when the detection is removed for a temporary intersection.

102-11.20 Work Zone Pavement Markings: The quantities of work zone pavement markings authorized and acceptably applied under this Section and certified as installed/used on the project, will be paid for as follows:

1. The length in gross miles, of solid, 10’-30’ skip, 3’-9’ dotted, 6’-10’ dotted, and 2’-4’ dotted lines. The gross mile measurement will be taken as the distance from the beginning of the painted line to the end of the painted line and will include the unmarked gaps for skip and dotted lines. The gross mile measurement will not include designated unmarked lengths at intersections, turn lanes, etc. Final measurement will be determined by plan dimensions or stations, subject to 9-1.3.1.

2. The length, in linear feet, of transverse lines, diagonal lines, chevrons, and parking spaces.

3. The number of pavement messages, symbols, and arrows. Each arrow is paid as a complete marking, regardless of the number of “points” or directions.

4. The number of temporary RPM’s authorized and acceptably applied.

102-11.21 Temporary Raised Rumble Strips: The quantity to be paid for will be the number of calendar days, or portions thereof, that temporary raised rumble strips are certified as installed/used on the project within the Contract Time. The number of strips used must meet the requirements of Standard Plans, Index 102-603. No adjustment will be made to the per day measurement for the number of strips or sets used, or for the number of times the sets are relocated.

102-11.22 Temporary Lane Separator: The quantity to be paid for will be the field measure, in feet, of temporary lane separator certified as installed/used on the project, including drainage gaps, completed and accepted.

102-11.23 Temporary Signals for Lane Closures on Two-Lane, Two-Way Roadways: The quantity to be paid for will be the number of temporary signals per day installed/used at the locations shown in the Plans. Temporary signals installed/used at the Contractor's option as an alternative to flaggers will be included in Maintenance of Traffic, lump sum.

102-11.24 Temporary Highway Lighting: When temporary highway lighting is required by the Plans, the work of constructing, maintaining, and removing the temporary highway lighting, including all materials and any necessary design work, will be paid for under temporary highway lighting, lump sum.

102-11.25 Pedestrian Special Detours: When a pedestrian special detour is shown in the Plans, the work of constructing, maintaining, and subsequently removing such detour facilities will be paid for under pedestrian special detour, lump sum. However, traffic control devices, warning devices, barriers, signing, pavement markings, and restoration to final configuration will be paid for under their respective pay items.

102-12 Submittals.

102-12.1 Submittal Instructions: Prepare a certification of quantities, for certified MOT payment items for each project in the Contract. Submit the certification of quantities to the Engineer. The Owner will not pay for any disputed items until the Engineer approves the certification of quantities.

102-12.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities no later than Twelve O'clock noon Monday after the estimate cut-off date or as directed by the Engineer, based on the amount of work done or completed. Ensure the certification consists of the following:

1. Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

2. The basis for arriving at the amount of the progress certification, less payments previously made and less an amount previously retained or withheld. The basis will include a detail breakdown provided on the certification of items of payment in accordance with 102-13. After the initial setup of the MOT items and counts, the interval for recording the counts will be made weekly on the certification sheet unless there is a change. This change will be documented on the day of occurrence. Some items may necessitate a daily interval of recording the counts

102-13 Basis of Payment.

102-13.1 Maintenance of Traffic (General Work): When an item of work is included in the proposal, price and payment will be full compensation for all work and costs specified under this Section except as may be specifically covered for payment under other items.

102-13.2 Traffic Control Officers: Price and payment will be full compensation for the services of the traffic control officers.

102-13.3 Special Detours: Not Used.

102-13.4 Commercial Materials for Driveway Maintenance: Price and payment will be full compensation for all work and materials specified for this item, including specifically all required shaping and maintaining of driveways.

102-13.5 Work Zone Signs: Price and payment will be full compensation for all work and materials for furnishing signs, supports and necessary hardware, installation, relocating, maintaining and removing signs.

102-13.6 Business Signs: Price and payment will be full compensation for all materials and labor required for furnishing, installing, relocating, maintaining, and removing the signs as well as the cost of installing any logos provided by business owners.

102-13.7 Project Information Signs: Price and payment will be full compensation for all materials and labor for furnishing, installing, relocating, maintaining and removing signs.

102-13.8 Channelizing Devices: Prices and payment will be full compensation for furnishing, installing, relocating, maintaining and removing the channelizing devices.

102-13.9 Temporary Barrier: Price and payment will be full compensation for furnishing, installing, maintaining, and removing the barrier and asphalt pad. When called for, temporary barrier (relocate) will be full compensation for relocating the barrier.

102-13.10 Temporary Glare Screen: Not Used.

102-13.11 Temporary Crash Cushion (Redirective or Gating): Not Used.

102-13.12 Temporary Guardrail: Not Used.

102-13.13 Arrow Board: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing arrow boards.

102-13.14 Portable Changeable Message Sign: Price and payment will be full compensation for furnishing, installing, operating, relocating, maintaining and removing portable changeable message signs.

102-13.15 Portable Regulatory Signs: Not Used.

102-13.16 Radar Speed Display Unit: Not Used.

102-13.17 Temporary Signalization and Maintenance: Not Used.

102-13.18 Temporary Traffic Detection and Maintenance: Not Used.

102-13.19 Work Zone Pavement Markings: Price and payment will be full compensation for all work specified including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Removable tape may be substituted for standard paint at no additional cost to the Owner.

Payment for temporary RPMs used to supplement line markings will be paid for under temporary raised pavement markers. Install these RPMs as detailed in the Standard Plans.

102-13.20 Temporary Raised Rumble Strips: Not Used.

102-13.21 Temporary Lane Separator: Not Used.

102-13.22 Temporary Signals for Lane Closures on Two-Lane, Two-Way Roadways: Not Used.

102-13.23 Temporary Highway Lighting: Not Used.

102-13.24 Pedestrian Special Detours: Not Used.

102-13.25 Payment Items: Payment will be made under:

Item 102-1	Maintenance of Traffic	-per Lump Sum (LS)

END OF SECTION 102

SECTION 104

PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION

104-1 Description.
Provide erosion control measures where work is accomplished in conjunction with the project, to prevent erosion, pollution of water, detrimental effects to public or private property adjacent to the project right-of-way and damage to work on the project.

104-2 General.
Coordinate the installation of temporary erosion control devices with the construction of the permanent erosion control devices to ensure economical, effective, and continuous control of erosion and water pollution throughout the life of the Contract.

104-3 Control of Contractor's Operations Which May Result in Water Pollution.
Prevent contaminants, pollutants or hazardous substances, as defined in Section 376.301, Florida Statutes, from migrating from the construction site or from materials and equipment into any surface waters, wetlands, groundwater or property beyond the project limits. Conduct and schedule operations to avoid and minimize pollution or siltation from the project to surface waters, wetlands, groundwater, or property beyond the project limits.

Do not drive in, operate, or place construction equipment or materials in surface waters, wetlands, groundwater, or property beyond the project limits without permitted authority for permanent or temporary impacts. Water crossings or other wetlands impacts must be authorized by permit. Obstructing or impeding the water flow or movement of the water or wildlife must be authorized by permit.

Where pumps are used to remove highly turbid waters from enclosed construction areas such as cofferdams or forms, treat the water by one or more of the following methods prior to discharge from the project: pumping into grassed swales or appropriate upland vegetated areas or constructed sediment basins, or confined by an appropriate enclosure such as turbidity barriers when other methods are not practical. Do not discharge, water that does not meet State water quality standards or does not meet the criteria specified in any applicable permit.

Remove sediment accumulated during construction from all existing or newly constructed stormwater facilities prior to final acceptance. Ensure that all stormwater conveyances and stormwater facilities meet final grade requirements at final acceptance. Remove silt or regrade as necessary to comply with the lines and grades shown in the Plans.

Do not enter onto lands or waters outside the limits of construction as staked, except as authorized by the Engineer. Do not allow water that does not meet state water quality standards or does not meet the permitted criteria to exit the project limits.

Obtain the Engineer's approval for the location and method of operation in borrow pits, material pits, and disposal areas furnished for waste material from the project (other than commercially operated sources) such that erosion during and after completion of the work will not result in detrimental siltation or water pollution.

104-4 Materials for Temporary Erosion Control.
The Engineer will not require testing of materials used in construction of temporary erosion control features other than as provided for geotextile fabric in 985-3 unless such material is to be incorporated into the completed project. When no testing is required, the Engineer will base acceptance on visual inspection.

The Contractor may use new or used materials for the construction of temporary silt fence, staked turbidity barriers, and floating turbidity barrier not to be incorporated into the completed project, subject to the approval of the Engineer.

104-5 Preconstruction Requirements.
Prior to the Preconstruction Conference, submit an Erosion and Sediment Control Plan meeting the requirements or special conditions of all permits authorizing project construction. If no permits are required or the approved permits do not contain special conditions or specifically address erosion and water pollution, the project's Erosion and Sediment Control Plan will be governed by 7-1.1, 7-2.2, 7-8.1, 7-8.2, and Section 104.

When a DEP Generic Permit for Stormwater Discharge from Large and Small Construction Activities permit is issued, the Contractor's Erosion and Sediment Control Plan shall be prepared to accompany the Owner's Stormwater Pollution Prevention Plan. Ensure the Erosion and Sediment Control Plan includes procedures to control off-site tracking of soil by vehicles and construction equipment and a procedure for cleanup and reporting of non-storm water discharges, such as contaminated groundwater or accidental spills. Do not begin any soil disturbing activities before receiving the Engineer's written approval of the Erosion and Sediment Control Plan, including the required signed certification statements.

Failure to sign and submit any required documents or certification statements will be considered a default of the Contract. Any soil disturbing activities performed without the required signed documents or certification statements is considered a violation of the DEP Generic Permit for Stormwater Discharge from Large and Small Construction Activities.

Prepare a site-specific Erosion and Sediment Control Plan in accordance with the planned sequence of operations and present it in a format acceptable to the Owner. The Erosion and Sediment Control Plan shall describe, but not be limited to, the following items or activities:

1. For each phase of construction operations or activities, supply the following information:

    a. Locations of all erosion control devices

    b. Types of all erosion control devices

    c. Estimated time erosion control devices will be in operation

    d. Monitoring schedules for maintenance of erosion control devices

    e. Methods of maintaining erosion control devices

    f. Dewatering plan

    g. Locations of all stored fuel or other containments, pollutants or hazardous waste

h. Spill prevention and response measures and disposal and removal methods

i. Submit any changes to the Erosion and Sediment Control Plan within seven calendar days.

1. The name and telephone number of the person responsible for monitoring and maintaining the erosion control devices.

2. Submit for approval the Erosion and Sediment Control Plans meeting paragraphs 3a, 3b, or 3c below:

   a. Projects permitted by the Southwest Florida Water Management District (SWFWMD), require the following:

      Submit the Erosion and Sediment Control Plan to the Engineer for review and to the appropriate SWFWMD Office for review and approval. Include the SWFWMD permit number on all submitted data or correspondence.

      The Contractor may schedule a meeting with the appropriate SWFWMD Office to discuss the Erosion and Sediment Control Plan in detail, to expedite the review and approval process. Advise the Engineer of the time and place of any meetings scheduled with SWFWMD.

      Do not begin construction activities until the Erosion and Sediment Control Plan receives written approval from both SWFWMD and the Engineer.

   b. Projects permitted by the South Florida Water Management District or the St. Johns River Water Management District, require the following:

      Obtain the Engineer's approval of the Erosion and Sediment Control Plan.

      Do not begin construction activities until the Erosion and Sediment Control Plan receives written approval from the Engineer.

   c. Projects authorized by permitting agencies other than the Water Management Districts or projects for which no permits are required require the following:

      The Engineer will review and approve the Contractor's Erosion and Sediment Erosion Control Plan.

      Do not begin construction activities until the Erosion and Sediment Control Plan receives written approval from the Engineer.

104-6 Construction Requirements.

104-6.1 Limitation of Exposure of Erodible Earth: Do not allow the surface area of erodible earth that clearing and grubbing operations, excavation and filling operations, or other earth disturbing activities to exceed 750,000 square feet without specific prior written approval by the Engineer. This limitation applies separately to clearing and grubbing operations and excavation and filling operations.

The Engineer may further limit the surface areas of unprotected erodible earth exposed by the construction operation and may direct the Contractor to provide additional erosion or pollution

control measures to prevent contamination of any surface waters, wetlands, or groundwater or to prevent detrimental effects on property outside the project limits or damage to the project.

104-6.2 Incorporation of Erosion and Sediment Control Features: Incorporate permanent erosion and sediment control devices into the project at the earliest practical time. Complete the installation of temporary erosion and sediment control devices prior to the commencement of any earthwork. Use temporary erosion and sediment control devices found in the State of Florida Erosion and Sediment Control Designer and Reviewer Manual (E&SC Manual) to control erosion and sediment generated by construction operations, to correct unforeseen conditions during construction, and to control erosion and sediment prior to the incorporation of permanent erosion and sediment control devices. An electronic version of the E&SC Manual can be found at the following URL: https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/FLErosionSedimentManual.shtm.

104-6.3 Scheduling of Successive Operations: Schedule operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations, and the duration of exposure of uncompleted construction to the elements is as short as practicable.

Schedule and perform clearing and grubbing so that grading operations can follow immediately thereafter. Schedule and perform grading operations so that permanent erosion control features can follow immediately thereafter if conditions on the project permit.

104-6.4 Details for Temporary Erosion and Sediment Control Features:

104-6.4.1 General: Use temporary erosion, sediment and water pollution control devices found in the E&SC Manual. These devices consist of, but are not limited to, temporary sod, rolled erosion control products, sediment containment systems, runoff control structures, sediment barriers, inlet protection systems, silt fences, turbidity barriers, and chemical treatment. For design details for some of these devices, refer to the E&SC Manual. Perform installation, inspection, maintenance, and removal of all temporary erosion and sediment control devices in accordance with applicable permits, manufacturer's directions, and the Contract Documents.

104-6.4.2 Temporary Turf: The Engineer may designate certain areas of turf or sod constructed in accordance with Section 570 as temporary erosion control features. For areas not defined as sod, constructing temporary turf by seeding only is not an option for temporary erosion control under this Section. The Engineer may waive the turf establishment requirements of Section 570 for areas with temporary turf that will not be a part of the permanent construction.

104-6.4.3 Runoff Control Structures: Construct runoff control structures in accordance with the details shown in the Contract Documents.

104-6.4.4 Sediment Containment Systems: Construct sediment containment systems in accordance with the details shown in the Contract Documents. Clean out sediment containment systems as necessary in accordance with the Contract Documents.

104-6.4.5 Sediment Barriers: Provide and install sediment barriers according to details shown in the Contract Documents or, as directed by the Engineer to protect against downstream accumulation of sediment. Sediment Barriers include, but are not limited to synthetic bales, silt fence, fiber logs and geosynthetic barriers. Reusable barriers that have had sediment deposits removed may be reinstalled on the project as approved by the Engineer.

104-6.4.6 Silt Fence:

104-6.4.6.1 General: Furnish, install, maintain, and remove silt fences, in accordance with the applicable permits, the manufacturer's directions, and the Contract Documents.

104-6.4.6.2 Materials and Installation: Use a geotextile fabric made from woven or nonwoven fabric, meeting the physical requirements of Section 985 according to those applications for erosion control.

Choose the type and size of posts and wire mesh reinforcement (if required). Do not use products which have a separate layer of plastic mesh or netting. Provide a durable and effective silt fence that controls sediment in accordance with the Contract Documents.

Erect silt fence at upland locations and at temporary locations shown in the Contract Documents or where continuous construction activities change the natural contour and drainage runoff. Do not attach silt fence to existing trees unless approved by the Engineer.

104-6.4.6.3 Inspection and Maintenance: Inspect all silt fences in accordance with any applicable permit. If the project does not have a permit, inspect within 24 hours after each rain event and at least daily during prolonged rainfall. Immediately correct any deficiencies. In addition, make a daily review of the location of silt fences in areas where construction activities have changed the natural contour and drainage runoff to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, repair or replace silt fences in accordance with the Contract Documents or as directed by the Engineer.

Remove sediment deposits when the deposit reaches approximately 1/2 the height of the silt fence or as directed by the Engineer. Shape any remaining sediment deposits to conform with the finished grade and prepare the area for turf in accordance with Section 570.

104-6.4.7 Floating Turbidity Barriers and Staked Turbidity Barriers: Furnish, install, maintain, and remove floating turbidity barriers in accordance with the applicable permits, the manufacturer's directions, and the Contract Documents. The Contractor may need to deploy turbidity barriers around isolated areas of concern (such as, seagrass beds, coral communities) both within as well as outside the project limits. The Engineer will identify such areas. Place the barriers prior to the commencement of any work that could impact the area of concern. Ensure that the type of barrier used and the deployment and maintenance of the barrier will minimize dispersion of turbid waters from the project. The Engineer may approve alternate methods or materials.

Install and maintain turbidity barriers to avoid or minimize the degradation of the water quality of the surrounding waters and minimize damage to areas where the floating barriers are installed

104-6.4.8 Inlet Protection System: Furnish and install inlet protection systems as shown in the Contract Documents.

104-6.4.9 Rolled Erosion Control Products (RECPs):

104-6.4.9.1 General: Install RECPs in locations where temporary protection from erosion is needed. Two common applications are described below.

1. Use RECPs composed of natural or synthetic fiber mats, plastic sheeting, or netting as protection against erosion, when directed by the Engineer, during temporary pauses in

construction caused by inclement weather or other circumstances. Remove the material when construction resumes.

2. Use RECPs as erosion control blankets, at locations shown in the Plans, to facilitate plant growth while permanent grassing is being established. For the purpose described, use non-toxic, biodegradable, natural or synthetic woven fiber mats. Install erosion control blankets capable of sustaining a maximum design velocity of 6.5 ft/sec as determined from tests performed by Utah State University, Texas Transportation Institute or an independent testing laboratory approved by the Owner. Submit to the Engineer, certified test reports from the manufacturer showing that the erosion control blankets meet the requirements of this Specification. Certification must be attested, by a person having legal authority to bind the manufacturing company. Also, furnish two 4 by 8 inch samples for product identification. The manufacturers test records shall be made available to the Owner upon request. Leave the material in place, as installed, to biodegrade.

104-6.4.10 Chemical Treatment: Provide chemical treatment in accordance with the E&SC Manual. Chemical treatment may be used to clarify turbid or sediment laden water that does not yet meet state water quality standards or as an amendment to other erosion prevention and sediment control products to aid in their performance. The contractor must provide all of the required toxicity testing information in accordance with the E&SC Manual to the Engineer for review and acceptance prior to using any chemical treatment on the project site.

104-6.5 Removal of Temporary Erosion Control Features: In general, remove or incorporate into the soil any temporary erosion control features existing at the time of construction of the permanent erosion control features in an area of the project in such a manner that no detrimental effect will result. The Engineer may direct that temporary features be left in place.

104-7 Maintenance of Erosion and Sediment Control Features.

104-7.1 General: Provide routine maintenance of permanent and temporary erosion and sediment control features, at no expense to the Owner, until the project is complete and accepted. If reconstruction of such erosion and sediment control features is necessary due to the Contractor's negligence or carelessness or, in the case of temporary erosion and sediment control features, failure by the Contractor to install permanent erosion control features as scheduled, the Contractor shall replace such erosion control features at no expense to the Owner. If reconstruction of permanent or temporary erosion and sediment control features is necessary due to factors beyond the control of the Contractor, the Owner will pay for replacement under the appropriate Contract pay item or items.

Inspect all erosion and sediment control features at least once every seven calendar days and within 24 hours of the end of a storm of 0.50 inches or greater. Maintain all erosion control features as required in the Stormwater Pollution Prevention Plan, Contractor's Erosion Control Plan and as specified in the State of Florida Department of Environmental Protection Generic Permit for Stormwater Discharge from Large and Small Construction Activities.

104-8 Protection During Suspension of Contract Time.
Initiate stabilization measures within seven calendar days upon suspension of construction activities. If it is necessary to suspend the construction operations for any appreciable length of time, shape the disturbed areas to facilitate stormwater runoff and construct earthen berms along the top edges of embankments to intercept stormwater runoff. Provide temporary slope drains in areas that are highly erodible to avoid pollution of surface waters, wetlands, groundwater, or property beyond the project limits. Locate slope drains at intervals of approximately 500 feet and stabilize by paving or covering with waterproof materials. Should such preventive measures fail, immediately take action as necessary to effectively prevent erosion and siltation. During suspension of operations, the Engineer may direct the Contractor to perform additional erosion and sediment control work as necessary.

104-9 Method of Measurement.
When separate items for temporary erosion control devices are included in the Contract, the quantities to be paid for will be:

1. the area, in square yards, of rolled erosion control products;

2. the length, in feet, of runoff control structures, measured along the surface of the work constructed;

3. the number of sediment containment systems constructed and accepted;

4. the number of sediment containment system cleanouts accomplished and accepted

5. the length, in feet, of sediment barriers;

6. the length, in feet, of floating turbidity barrier;

7. the length, in feet, of staked turbidity barrier;

8. the number of inlet protection systems, for existing inlets;

9. the area, in square yards, of chemical treatment.

10. the number of floc logs or drums of product for chemical treatment.

Upon acceptance by the Engineer, the quantity of floating turbidity barriers, sediment barriers, staked turbidity barriers, and inlet protection devices will be paid for regardless of whether materials are new, used, or relocated from a previous installation on the project. Protection of newly constructed inlets and drainage systems is incidental to their installation. No separate payment will be made for temporary erosion control devices used to protect newly constructed drainage systems

104-10 Basis of Payment.
Prices and payments will be full compensation for all work specified in this Section, including construction and routine maintenance of temporary erosion control devices.

Any additional costs resulting from compliance with the requirements of this Section, other than construction, routine maintenance, and removal of temporary erosion control devices, will be included in the Contract unit prices for the item or items to which such costs are related. Temporary sod used as a temporary erosion control device in accordance with 104-6.4.2 will be paid for under Section 570.

Separate payment will not be made for the cost of constructing temporary earth berms along the edges of the roadways to prevent erosion during grading and subsequent operations. The Contractor shall include these costs in the Contract prices for grading items.

In case of repeated failure on the part of the Contractor to control erosion, pollution, or siltation, the Engineer reserves the right to employ outside assistance or to use the Owner's own forces to provide the necessary corrective measures. Any such costs incurred, including engineering costs, will be charged to the Contractor and appropriate deductions made from the monthly progress estimate.

Payment will be made under:

Item 104-1 Prevention, Control, and Abatement of Erosion and Water Pollution -per Lump Sum (LS)

END OF SECTION 104

SECTION 105

CONTRACTOR QUALITY CONTROL GENERAL REQUIREMENTS

105-1 General.

105-1.1 Quality Control Documentation.

105-1.1.1 Submission of Materials Certification and Reporting Test Results: Submit certifications prior to placement of materials. Report test results at completion of the test and meet the requirements of the applicable Specifications.

105-1.1.2 Databases: Obtain access to the FDOT's databases prior to testing and material placement. Database access information is available through the FDOT's website. Enter all required and specified documentation and test results in the FDOT databases.

105-1.1.3 Worksheets: Make available to the Owner, when requested, worksheets used for collecting test information. Ensure the worksheets at a minimum contain the following:

1. Project Identification Number,
2. Time and Date,
3. Laboratory Identification and Name,
4. Training Identification Numbers (TIN) and initials,
5. Record details as specified within the test method.

105-1.2 Inspections to Assure Compliance with Acceptance Criteria.

105-1.2.1 General: The Owner is not obligated to make an inspection of materials at the source of supply, manufacture, or fabrication. Provide the Engineer with unrestricted entry at all times to such parts of the facilities that concern the manufacture, fabrication, or production of the ordered materials. Bear all costs incurred in determining whether the material meets the requirements of these Specifications.

105-1.2.2 Quality Control (QC) Inspection: Provide all necessary inspection to assure effective QC of the operations related to materials acceptance. This includes but is not limited to sampling and testing, production, storage, delivery, construction and placement. Ensure that the equipment used in the production and testing of the materials provides accurate and precise measurements in accordance with the applicable Specifications. Maintain a record of all inspections, including but not limited to, date of inspection, results of inspection, and any subsequent corrective actions taken. Make available to the Owner the inspection records, when requested.

105-1.2.3 Notification of Placing Order: Order materials sufficiently in advance of their incorporation in the work to allow time for sampling, testing and inspection. Notify the Engineer prior to placing orders for materials.

Submit to the Engineer a fabrication schedule for all items requiring commercial inspection at least 30 days before beginning fabrication. These items include steel bridge components, moveable bridge components, pedestrian bridges, castings, forgings, structures erected either partially or completely over the travelled roadway or mounted on bridges as overhead traffic signs (some of these may be further classified as cantilevered, overhead trusses, or monotubes) or any other item identified as an item requiring commercial inspection in the Contract Documents.

105-2 Additional Requirements for Lump Sum Projects.
Prepare and submit to the Engineer a project-specific list of material items and quantities to be used on the project as a Job Guide Schedule in the same format as the current Sampling, Testing, and Reporting Guide 21 calendar days prior to commencement of construction. Submit up-to-date quantities for the items on the Job Guide Schedule to the Engineer with each monthly progress estimate. The Owner may not authorize payment of any progress estimate not accompanied by updated Job Guide Schedule quantities. Maintain the Job Guide Schedule throughout the project including the quantity placed since the previous submittal, and total to date quantity and any additional materials placed. Do not commence work activities that require testing until the Job Guide Schedule has been reviewed and accepted by the Engineer. At final acceptance, submit a final Job Guide Schedule that includes all materials used on the project in the same format as the monthly reports.

105-3 Quality Control Program.
Certain operations require personnel with specific qualifications. Certain materials require production under an approved Quality Control (QC) Plan to ensure that these materials meet the requirements of the Contract Documents. Applicable materials include hot mix asphalt, portland cement concrete (Structural), earthwork, cementitious materials, timber, steel and miscellaneous metals, galvanized metal products, prestressed and/or precast concrete products, drainage products, and fiber reinforced polymer products. For all applicable materials included in the Contract, submit a QC Plan prepared in accordance with the requirements of this Section to the Engineer. Do not incorporate any of these materials into the project prior to the Engineer's approval of the QC Plan.

Steel and Miscellaneous Metal products, including aluminum, are defined as the metal components of bridges, including pedestrian and moveable bridges, overhead and cantilevered sign supports, ladders and platforms, bearings, end wall grates, roadway gratings, drainage items, expansion joints, roadway decking, shear connectors, handrails, galvanized products, fencing, guardrail, light poles, high mast light poles, standard mast arm assemblies and Monotube assemblies, stay in-place forms, casing pipe, strain poles, fasteners, connectors and other hardware.

105-4 Producer Quality Control Program.

105-4.1 General: When accreditation or certification is required, make supporting documents from the two previous inspections performed by the accrediting or certifying agency available to the Owner upon request.

Obtain Owner approval prior to beginning production. Meet and maintain the approved Producer Quality Control Program requirements at all times. Production of these products without the Owner's prior acceptance of the Producer Quality Control Program may result in rejection of the products. Continued approval will be subject to satisfactory results from Owner evaluations, including the Independent Assurance program. In cases of noncompliance with the accepted Producer Quality Control Program, identify all affected material and do not incorporate or supply to the Owner projects. The following conditions may result in suspension of a Producer Quality Control Program:

1. Failure to timely supply information required.

2. Repeated failure of material to meet Standard Specification requirements.

3. Failure to take immediate corrective action relative to deficiencies in the performance of the Producer Quality Control Program.

4. Certifying materials that are not produced under an accepted Producer Quality Control Program for use on Owner projects.

5. Failure to correct any deficiencies related to any requirement of the Producer Quality Control Program, having received notice from the Owner, within the amount of time defined in the notice.

105-4.2 Producer Quality Control Program Requirements:

105-4.2.1 Hot Mix Asphalt, Portland Cement Concrete (Structural), Earthwork, Cementitious Materials, Timber, Steel and Miscellaneous Metals, Galvanized Metal Products, Prestressed and/or Precast Concrete Products, Drainage Products, and Fiber Reinforced Polymer Products Quality Control Program: Have an accepted Producer Quality Control Program, developed in accordance with this Section, during the production of materials to be used on Owner projects.

105-4.2.2 Prestressed Concrete Quality Control Program: Not Used

105-4.2.3 Steel and Miscellaneous Metals Quality Control Program: Have an accepted Producer Quality Control Plan, developed in accordance with this Section and a current American Institute for Steel Construction (AISC) certification, provided that AISC certification program is available for the category of the fabrication products.

105-4.3 Submittal: Producers shall submit their proposed Producer Quality Control Programs to the Engineer.

105-4.4 Compliance with the Materials Manual. Producers of Flexible Pipe shall meet the requirements of Section 6.1, Volume II of the FDOT's Materials Manual, which may be viewed at the following URL:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section61V2.shtm.

Producers of Precast Concrete Pipe shall meet the requirements of Section 6.2, Volume II of the FDOT's Materials Manual, which may be viewed at the following URL:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section62V2.shtm.

Producers of Precast Concrete Drainage Structures shall meet the requirements of Section 6.3, Volume II of the FDOT's Materials Manual, which may be viewed at the following URL:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section63V2.shtm.

Producers of Precast/Prestressed Concrete Products shall meet the requirements of Sections 8.1 and 8.3 of the FDOT's Materials Manual, which may be viewed at the following URLs:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section81V1.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section83V1.shtm.

Producers of Precast Prestressed Concrete Products using Self Consolidating Concrete shall meet the requirements of Section 8.4, Volume II of the FDOT's Materials Manual, which may be viewed at the following URL:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section84V2.shtm.

Producers of Incidental Precast/Prestressed Concrete Products shall meet the requirements of Section 8.2, Volume II of the FDOT's Materials Manual, which may be viewed at the following URL:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section82V2.shtm.

Producers of Portland Cement Concrete shall meet the requirements of Section 9.2, Volume II of the FDOT's Materials Manual, which may be viewed at the following URL:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section92V2.shtm.

Producers of Structural Steel and Miscellaneous Metal Components shall meet the requirements of Sections 11.1, 11.2, 11.3, 11.4, 11.5 and 11.6 of the FDOT's Materials Manual, which may be viewed at the following URLs:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section111V1.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section112V2.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section113V2.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section114V2.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section115V2.shtm.
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section116V2.shtm.

Producers of Fiber Reinforced Polymer Composites shall meet the requirements of Section 12-1, Volume II of the FDOT's Materials Manual, which may be viewed at the following URL:
https://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Section121V2.shtm.

105-4.5 Producer Quality Control (QC) Plan Review and Acceptance: The Owner will respond to the producer within 21 calendar days of receipt of the proposed Producer Quality Control Program. The Owner may perform evaluation activities to verify compliance with submitted documents prior to acceptance.

If the Producer Quality Control Program must be revised for any reason, including non-compliance, submit the revision to the Owner. The Owner will respond to the producer within seven calendar days of receipt of the revised Producer Quality Control Program.

105-4.6 Producer's Quality Control (QC) Plan: Submit detailed policies, methods and procedures to ensure the specified quality of all applicable materials and related production operations. Include other items in addition to these guidelines as necessary.

105-4.6.1 Personnel:

105-4.6.1.1 Qualifications: Submit the Training Identification Numbers (TINs) or any other information which will be traceable to the certification agency's training location and dates for all technicians performing sampling, testing and inspection for both field and laboratory tests. Submit the names of the Construction Training and Qualification Program (CTQP) certifications and other pertinent certifications held and the expiration dates for each certification for each technician. Include employed and subcontracted technicians.

105-4.6.1.2 Level of Responsibility: Identify the primary contact for the Owner. Identify roles and responsibilities of various personnel involved in the QC process.

105-4.6.2 Raw Materials:

105-4.6.2.1 Source: Identify the sources of raw materials. Submit locations and plant or mine numbers when applicable.

105-4.6.2.2 Certification: Submit methods of verifying compliance of certification with the Specifications.

105-4.6.2.3 Disposition of Failing Materials: Describe the system for controlling non-conforming materials, including procedures for identification, isolation and disposition.

105-4.6.3 Storage Facilities for Raw Materials: Describe measures and methods, including bedding details, for preventing segregation, contamination and degradation.

Describe methods of identifying individual materials. Where applicable, submit a site plan showing the locations of various materials.

105-4.6.4 Production Equipment: Describe calibration frequencies, maintenance schedule and procedures for production equipment.

105-4.6.5 Plant Requirements:

105-4.6.5.1 Plant Identification: For those facilities producing materials listed in 105-3, submit the mailing address, physical address including county and X,Y (latitude and longitude) coordinates of the plant, telephone and fax numbers, email address, primary contact at the plant, responsible person in charge, facility number provided by the Owner, owner information including parent company, vendor number, designed production capacity, and other information as required.

105-4.6.5.2 Process Control System: Describe the methods and measures established to ensure Contract compliance for the produced materials that are supplemental to the QC sampling and testing program described in the Contract Documents. These methods and measures will include, but are not limited to, inspection schedule, additional sampling and testing, maintenance schedule, etc.

105-4.6.5.3 Loading and Shipping Control: Describe the methods and measures for preventing segregation, contamination and degradation during loading and shipping operations. Describe the methods established for materials to be in compliance with the Specifications at the point of use.

105-4.6.5.4 Types of Products Generated: Describe the products the plant is approved to produce under Owner guidelines.

105-4.7 Other Requirements:

105-4.7.1 Submittal of Certification: Submit certifications issued by the plant/Contractor for the applicable products approved by the Owner.

105-4.7.2 Statement of Compliance: Include a statement of compliance with all quality requirements set forth by the Owner in the Contract Documents and FDOT manuals.

105-4.7.3 Documentation Storage: Identify location of document storage to enable Owner review. Include QC charts, qualification and accreditation records, inspection reports, and other pertinent supporting documents.

105-4.8 Final Manufactured Product - Plant Operations: Describe inspection schedule and methods for identifying defects and non-compliance with the Specifications. Describe corrective actions and methods to resolve them.

105-4.8.1 Storage: When storage of the produced materials is required and it is not defined in the Contract Documents, describe the methods and duration for storage. Include measures and methods for preventing segregation, contamination and degradation during storage.

105-4.8.2 Disposition of Failing Materials: When not described in the Specifications, describe the methods and measures for identifying and controlling the failing materials. Include preventive and corrective measures. Describe disposition of failing materials.

105-4.9 Testing Laboratories: Identify the laboratories performing testing. Ensure that the testing laboratories comply with the Laboratory Qualification Program requirements of this Section or other applicable requirements.

105-4.10 Owner Inspection Access: Include a statement in the Quality Control Plan allowing the Owner inspectors access to the production facility to perform the inspections of the production process and the products produced for the Owner.

105-5 Contractor Quality Control (QC) Plan.

105-5.1 General: The QC Plan may be submitted as a whole or in portions for the work related to the Contract.

Update the QC Plan at least five working days prior to the implementation of any changes.

If at any time the Work is not in compliance with the Contract Documents, the Engineer may suspend operations in accordance with 8-6.1.

105-5.2 Personnel Qualification: Submit the Training Identification Numbers for all technicians performing sampling, testing and inspection for field tests. Include employed and subcontracted technicians.

105-5.3 Production Facilities: Identify the producers of materials listed in 105-4.4 for the project. Include the facility identification. All producers must have accepted Producer's Quality Control Program.

105-5.3.1 Structural Concrete Mix Designs: Identify the approved structural concrete mix designs for each structural concrete production facility for review and approval by the Engineer. Do not begin work on the material without the Engineer's approval. The Engineer will review and respond within five calendar days of submittal.

105-5.4 Testing Laboratories: Identify the laboratories performing testing. Ensure that the testing laboratories comply with the Laboratory Qualification Program requirements of this Section.

105-6 Contractor Certification of Compliance.

Provide the Engineer with a notarized monthly certification of compliance with the Contract Documents, to accompany each progress estimate, on a form provided by the Engineer. The Owner may not authorize payment of any progress estimate not accompanied by an executed certification document.

Final payment in accordance with 9-8 will not be made until a final notarized certification summarizing all QC exceptions has been submitted.

105-7 Lab Qualification Program.
Testing laboratories must have one of the following:

1. Current AASHTO (AAP) accreditation.

2. Inspected on a regular basis per ASTM D 3740 for earthwork, ASTM D 3666 for asphalt and ASTM C 1077 for concrete for test methods used in the Acceptance Program, with all deficiencies corrected, and under the supervision of a Specialty Engineer.

3. Current Construction Materials Engineering Council (CMEC) program accreditation or other independent inspection program accreditation acceptable to the Engineer and equivalent to (1) or (2) above.

After meeting the criteria described above, submit a Laboratory Qualification Application to the Owner. The application is available from the FDOT's website. Obtain the Owner's qualification prior to beginning testing. The Owner may inspect the laboratory for compliance with the accreditation requirements prior to issuing qualification.

Meet and maintain the qualification requirements at all times. Testing without Owner's qualification may result in a rejection of the test results. Continued qualifications are subject to satisfactory results from Owner evaluations, including Independent Assurance evaluations. In case of suspension or disqualification, prior to resumption of testing, resolve the issues to the Owner's satisfaction and obtain reinstatement of qualification. The following conditions may result in suspension of a laboratory's qualified status:

1. Failure to timely supply required information.

2. Loss of accredited status.

3. Failure to correct deficiencies in a timely manner.

4. Unsatisfactory performance.

5. Changing the laboratory's physical location without notification to the accrediting agency and the Engineer.

6. Delays in reporting the test data in the FDOT's database.

7. Incomplete or inaccurate reporting.

8. Using unqualified technicians performing testing.

Should any qualified laboratory falsify records, the laboratory qualification will be subject to revocation by the Engineer. Falsification of project-related documentation will be subject to further investigation and penalty under State and Federal laws.

It is prohibited for any contract laboratory or staff to perform Contractor QC testing and any other Acceptance Program testing on the same contract.

105-8 Personnel Qualifications.

105-8.1 General: Provide qualified personnel for sampling, testing and inspection of materials and construction activities. Ensure that qualifications are maintained during the course of sampling, testing and inspection.

105-8.2 Quality Control (QC) Manager: Designate a QC Manager who has full authority to act as the Contractor's agent to institute any and all actions necessary to administer, implement, monitor, and as necessary, adjust quality control processes to ensure compliance with the Contract Documents. The QC Manager must speak and understand English. The QC Manager must be on-site at the project on a daily basis or always available upon four hours notice. Ensure that the QC Manager is qualified as such through the Construction Training and Qualification Program. The QC Manager and the Superintendent must not be the same individual.

Under the direction of the QC Manager, and using FDOT's standard forms provided by the Engineer, summarize the daily QC activities including testing and material sampling. Since erasures are strictly prohibited on all reports and forms, use blue or colored ink. Do not use black ink. If manual corrections to original data are necessary, strike through, correct, and date the entry, including the initials of the person making the correction. Make copies of the completed forms available for the Owner to review daily unless otherwise required in the Specifications. Maintain all QC related reports and documentation for a period of three years from final acceptance of the project. Make copies available for review by the Owner upon request.

105-8.3 Temporary Traffic Control (Maintenance of Traffic) Personnel: Worksite Traffic Supervisors, flaggers, and other personnel responsible for work zone related transportation management and traffic control must obtain training and certification in accordance with the FDOT's Temporary Traffic Control (Maintenance of Traffic) Training Handbook located at the following URL address: https://www.fdot.gov/roadway/TTC/Default.shtm.

105-8.4 Earthwork Quality Control (QC) Personnel:

105-8.4.1 Earthwork Level I: Ensure the technician who samples soil and earthwork materials from the roadway project, takes earthwork moisture and density readings, and records those data in the Density Log Book holds a CTQP Earthwork Construction Inspection Level I qualification.

105-8.4.2 Earthwork Level II: Ensure the technician responsible for determining the disposition of soil and earthwork materials on the roadway, and for interpreting and meeting Contract Document requirements holds a CTQP Earthwork Construction Inspection Level II qualification.

105-8.5 Asphalt Quality Control (QC) Personnel:

105-8.5.1 Plant Technicians: For asphalt plant operations, provide a QC technician, qualified as a CTQP Asphalt Plant Level II Technician, available at the asphalt plant at all times when producing mix for the Owner. Perform all asphalt plant related testing with a CTQP Asphalt Plant Level I Technician. As an exception, measurements of temperature may be performed by someone under the supervision of a CTQP Plant Level II technician.

105-8.5.2 Paving Technicians: For paving operations (with the exception of miscellaneous or temporary asphalt), keep a qualified CTQP Asphalt Paving Level II Technician on the roadway at

all times when placing asphalt mix for the Owner, and perform all testing with a CTQP Asphalt Paving Level I Technician. As an exception, measurements of cross-slope, temperature, and yield (spread rate) can be performed by someone under the supervision of a CTQP Paving Level II Technician at the roadway.

105-8.5.3 Mix Designer: Ensure all mix designs are developed by individuals who are CTQP qualified as an Asphalt Hot Mix Designer.

105-8.5.4 Documentation: Document all QC procedures, inspection, and all test results and make them available for review by the Engineer throughout the life of the Contract. Identify in the asphalt producer's QC Plan the QC Managers and Asphalt Plant Level II technicians responsible for the decision to resume production after a quality control failure.

105-8.6 Concrete QC Personnel:

105-8.6.1 Concrete Field Technician - Level 1: Ensure technicians performing plastic property testing on concrete for materials acceptance are qualified CTQP Concrete Field Technicians Level 1. Plastic property testing will include but not be limited to slump, temperature, air content, water-to-cementitious materials ratio calculation, and making and curing concrete cylinders. Duties will include initial sampling and testing to confirm specification compliance prior to beginning concrete placements, ensuring timely placement of initial cure and providing for the transport of compressive strength samples to the designated laboratories. Ensure that personnel performing plastic property testing on self-consolidating concrete (SCC) possess an ACI Self-Consolidating Concrete Testing Technician Certification.

105-8.6.2 Concrete Field Inspector - Level 2: Ensure field inspectors responsible for the quality of concrete being placed on the following structure types are qualified CTQP Concrete Field Inspectors Level 2:

1. Moveable bridges
2. Bridges over a water opening of 1,000 feet or more
3. Bridges with a span of 190 feet or more
4. Cable supported or cable stayed bridges
5. Post-tensioned bridges
6. Steel girder or steel truss bridges
7. Multi-level roadways

With the exception of concrete traffic railing placements, a Level 2 Inspector must be present on the jobsite during all concrete placements. Prior to the placement of concrete, the inspector will inspect the element to be cast to ensure compliance with Contract Documents. A Level 2 Inspector's duties may include ensuring that concrete testing, inspection, and curing in the field are performed in accordance with the Contract Documents. The QC Inspector will inform the Verification Inspector of anticipated concrete placements and LOT sizes.

105-8.6.3 Concrete Laboratory Technician – Level 1: Ensure technicians testing cylinders and recording concrete strength for material acceptance are qualified CTQP Concrete Laboratory Technicians Level 1. Duties include final curing, compressive strength testing, and the recording/reporting of all test data.

105-8.7 Structural Concrete Production Facility Quality Control (QC) Personnel: Ensure that each portland cement structural concrete production facility (plant), has designated personnel including plant manager of QC, concrete mix designer, concrete batch plant operator, and testing technicians to provide QC inspections and testing.

Upon Owner approval, the functions of the above positions may be performed by the same person when it can be demonstrated that the plant's operation and quality of concrete will not be detrimentally affected and personnel have the qualifications required herein.

105-8.7.1 Plant Manager of QC: Ensure that the plant manager of QC has at least three years of concrete related experience and the following training certifications:

1. CTQP Concrete Laboratory Technician - Level 1 certificate.
2. CTQP Concrete Field Technician - Level 1 certificate.
3. CTQP Concrete Batch Plant Operator certificate.

As alternatives to these certifications, the Owner will accept, one of the following:

a. Prestressed Concrete Institute (PCI) QC Personnel Certification Level III.
b. Precast Concrete Pipe, Box Culverts, Drainage Structures or Incidental Precast Concrete Plants Level II QC Inspector Certifications.
c. National Ready Mixed Concrete Association (NRMCA) Certified Concrete Technologist Level 2.

105-8.7.2 Concrete Mix Designer: Ensure that the concrete mix designer has the CTQP Concrete Laboratory Technician Level 2 certification. As an alternative, the Owner will accept any of the following qualifications:

1. PCI QC Personnel Level III Certification, for concrete mix designs of prestressed concrete products.
2. National Ready Mix Concrete Association (NRMCA) Certified Concrete Technologist Level 3.
3. Any of the Level II QC certifications in accordance with 105-8.9.2.2.

105-8.7.3 Qualified Testing Technicians: Ensure that the testing technicians have the following certifications:

1. ACI Concrete Field Testing Technician Grade I, for personnel performing concrete plastic property tests and ACI Self-Consolidating Concrete Testing Technician if testing self-consolidating concrete (SCC).
2. ACI Concrete Strength Testing Technician, for personnel performing tests on hardened properties of concrete.

105-8.7.4 Concrete Batch Plant Operator: Ensure that the concrete batch plant operator has a CTQP Concrete Batch Plant Operator Certification.

105-8.8 Prestressed Concrete Plant Quality Control (QC) Personnel: Not Used

105-8.9 Pipe and Precast Concrete Products Manufacturing Facilities Quality Control (QC) Personnel: Not Used

105-8.10 Supervisory Personnel – Post-Tensioned and Movable Bridge Structures: Not Used

105-8.11 Signal Installation Inspector: Not Used

105-8.12 Structural Steel and Miscellaneous Metals Fabrication Facility Quality Control Personnel: Ensure each fabrication facility has an onsite production manager, an onsite facility manager for QC, a plant engineer, and onsite QC inspectors/technicians to provide complete QC inspections and testing.

Ensure that the facility manager for QC and QC inspectors/technicians meet the certification requirements set forth in the latest version of AASHTO/NSBA Steel Bridge Collaboration S 4.1, Steel Bridge Fabrication QC/QA Guide Specification, including the years of experience required in Table 105-1 below. The facility manager for QC must meet the requirements of Table 105-1 for every structural steel member type produced by a plant with QC being managed by the facility manager for QC. The facility manager for QC will report directly to the plant manager or plant engineer and must not be the plant production manager nor report to or be the subordinate of the plant production manager. QC inspectors/technicians must be the employees of, and must report directly to the facility manager for QC.

TABLE 105-1
Experience Requirements for QC Inspectors/Technicians and Facility Manager for Quality Control

Structural Steel Member Type	Minimum Years of Experience Required	
	QC Inspector / Technician	Facility Manager for QC
Rolled beam bridges	1 year	3 years
Welded plate girders (I sections, box sections, etc.)	2 years	4 years
Complex structures, such as trusses, arches, cable stayed bridges, and moveable bridges	3 years	5 years
Fracture critical (FC) members	3 years	5 years

END OF SECTION 105

SECTION 110

CLEARING AND GRUBBING

110-1 Description.
Clear and grub within the areas shown in the Plans. Remove and dispose of all trees, stumps, roots and other such protruding objects, buildings, structures, appurtenances, existing flexible asphalt pavement, and other facilities necessary to prepare the area for the proposed construction. Remove and dispose of all product and debris not required to be salvaged or not required to complete the construction.

Perform miscellaneous work necessary for the complete preparation of the overall project site as specified in 110-10.

110-2 Standard Clearing and Grubbing.

110-2.1 Work Included: Completely remove and dispose of all buildings, timber, brush, trees, stumps, roots, rubbish, debris, existing flexible pavement and base, drainage structures, culverts, and pipes. Remove all other obstructions resting on or protruding through the surface of the existing ground and the surface of excavated areas.

Perform standard clearing and grubbing within the following areas:

1. All areas where excavation is to be done, including borrow pits, lateral ditches, right-of-way ditches, etc.

2. All areas where roadway embankments will be constructed.

3. All areas where structures will be constructed, including pipe culverts and other pipe lines.

110-2.2 Depths of Removal of Roots, Stumps, and Other Debris: In all areas where excavation is to be performed, or roadway embankments are to be constructed, remove roots and other debris to a depth of 12 inches below the ground surface. Remove roots and other debris from all excavated material to be used in the construction of roadway embankment or roadway base. Plow the surface to a depth of at least 6 inches, and remove all roots thereby exposed to a depth of at least 12 inches. Completely remove and dispose of all stumps within the roadway right-of-way.

Remove all roots, etc., protruding through or appearing on the surface of the completed excavation within the roadway area and for structures, to a depth of at least 12 inches below the finished excavation surface.

Remove or cut off all stumps, roots, etc., below the surface of the completed excavation in borrow pits, material pits, and lateral ditches.

In borrow and material pits, do not perform any clearing or grubbing within 3 feet inside the right-of-way line.

Within all other areas where standard clearing and grubbing is to be performed, remove roots and other debris projecting through or appearing on the surface of the original ground to a depth of 12 inches below the surface, but do not plow or harrow these areas.

110-2.3 Boulders: Remove any boulders encountered in the roadway excavation (other than as permitted under the provisions of 120-7.2) or found on the surface of the ground. When approved by the Engineer place boulders in neat piles inside the right of way. The Contractor may stockpile boulders encountered in Owner-furnished borrow areas, which are not suitable for use in the embankment construction, within the borrow area.

110-2.4 Asbestos Containing Materials (ACM) Not Identified Prior to the Work: When encountering or exposing any condition indicating the presence of asbestos, cease operations immediately in the vicinity and notify the Engineer, in accordance with 110-6.5.

110-3 Selective Clearing and Grubbing.

110-3.1 General: Remove and dispose of vegetation, obstructions, etc., as shown in the Plans. Provide acceptable fill material, and grade and compact holes or voids created by the removal of the stumps. Perform all selective clearing and grubbing in accordance with ANSI A300.

No staging, storing, stockpiling, parking or dumping will be allowed in selective clearing and grubbing areas. Only mechanical equipment related to selective clearing and grubbing activities will be allowed in selective clearing and grubbing areas. Protect trees to remain from trunk, branch and root damage.

110-3.2 Trees to Remain: Protect trees as shown in the Plans or directed by the Engineer.

At the driplines of areas designated as trees to remain, construct a tree protection barrier in accordance with Standard Plans, Index 110-100.

When pruning cuts or root pruning to existing trees is shown in the Plans, work is to be supervised on site by an International Society of Arboriculture (ISA) Certified Arborist performed in accordance with ANSI A300.

110-3.3 Protection of Plant Preservation Areas: Areas to remain natural may be designated in the Plans. Protect these areas with a tree protection barrier in accordance with Standard Plans, Index 110-100. No clearing and grubbing, staging, storage, stockpiling, parking or dumping is allowed in these areas. Do not bring equipment into these areas.

110-4 Protection of Property Remaining in Place.

Protect property to remain in place in accordance with 7-11.

110-5 Removal of Buildings.

110-5.1 Parts to be Removed: Completely remove all parts of the buildings, including utilities, plumbing, foundations, floors, basements, steps, connecting concrete sidewalks or other pavement, septic tanks, and any other appurtenances, by any practical manner which is not detrimental to other property and improvements.

Remove utilities to the point of connection to the utility authority's cut-in. After removing the sewer connections to the point of cut-in, construct a concrete plug at the cut-in point, as directed by the Engineer, except where the utility owners may elect to perform their own plugging. Contact the appropriate utility companies prior to removal of any part of the building to ensure disconnection of services.

Submit demolition schedule 15 working days before beginning any demolition or renovation of a building. No method of measurement for this item. Okaloosa County Water & Sewer to self-perform work.

110-5.2 Removal by Others: Where buildings within the area to be cleared and grubbed are so specified to be removed by others, remove and dispose of any foundations, curtain walls, concrete floors, basements or other foundation parts which might be left in place after such removal of buildings by others.

110-6 Removal of Existing Bridges.
Not Used

110-7 Removal of Existing Concrete.
Remove and dispose of existing rigid portland cement concrete pavement, sidewalk, slope pavement, ditch pavement, curb, and curb and gutter, etc., where shown in the Plans.

Remove all gravity walls, noise/sound walls, retaining walls, MSE walls, perimeter walls, and roadway concrete barriers, where shown in the Plans. All ancillary elements of these concrete features being removed including, but not limited to, leveling pads, copings, reinforcing steel or straps, footings, etc, are incidental and included in the cost of the removal.

110-8 Ownership of Materials.
Except as may be otherwise specified in the Contract Documents, take ownership of all buildings, structures, appurtenances, and other materials removed and dispose of them in accordance with 110-9.

110-9 Disposal of Materials.

110-9.1 General: Either stack materials designated to remain the property of the Owner in neat piles within the right-of-way, load onto the Owner's vehicles, or deliver to location designated in the Plans.

Dispose of timber, stumps, brush, roots, rubbish, and other material resulting from clearing and grubbing in areas and by methods meeting the applicable requirements of all Federal, State and Local Rules and Regulations. Do not block waterways by the disposal of debris.

With the approval of the Engineer, wood chips may be evenly distributed to a depth of no more than one inch in designated areas in the Owner's right-of-way.

110-9.2 Burning Debris: Where burning of such materials is permitted, perform all such burning in accordance with the applicable Federal, State and Local rules and regulations. Perform all burning at locations where trees and shrubs adjacent to the cleared area will not be harmed.

110-9.3 Timber and Crops: The Contractor may sell any merchantable timber, fruit trees, and crops that are cleared under the operations of clearing and grubbing for his own benefit, subject to the provisions of 7-1.2, which may require that the timber, fruit trees, or crops be burned at or near the site of their removal, as directed by the Engineer. The Contractor is liable for any claims which may arise pursuant to the provisions of this Subarticle.

110-9.4 Disposal of Treated Wood: Treated wood must be handled and disposed of properly during removal. Treated wood should not be cut or otherwise mechanically altered in a manner that would generate dust or particles without proper respiratory and dermal protection. The treated wood must

be disposed of in at least a lined solid waste facility or through recycling/reuse. Treated wood shall not be disposed by burning or placement in a construction and demolition (C&D) debris landfill.

110-9.5 Hazardous Materials/Waste: Handle, transport, and dispose of hazardous materials/waste in accordance with all Federal, State, and Local Rules and Regulations including, but not limited to, the following:

1. SSPC Guide 7
2. Federal Water Pollution Control Act, and
3. Resource Conservation and Recover Act (RCRA).

Accept responsibility for the collection, sampling, classification, packaging, labeling, accumulation time, storage, manifesting, transportation, treatment and disposal of hazardous materials/waste, both solid and liquid. Separate all solid and liquid waste and collect all liquids used at hygiene stations and handle as hazardous materials/waste. Obtain written approval from the Engineer for all hazardous materials/waste stabilization methods before implementation.

Obtain an EPA/FDEP Hazardous Waste Identification Number (EPA/FDEP ID Number) before transporting and/or disposal of any hazardous materials/waste.

List the Owner as the generator for hazardous materials/waste resulting from removal or demolition of Owner materials.

Submit the following for the Engineers' approval before transporting, treatment or disposal of any hazardous materials/waste:

1. Name, address and qualifications of the transporter,
2. Name, address and qualifications of the treatment facility,
3. Proposed treatment and/or disposal of all Hazardous Materials/Waste.
4. EPA/FDEP Hazardous Waste Identification Number Application Form.
5. Manifest forms.

Transport all hazardous materials/waste in accordance with applicable Federal, State, and Local Rules and Regulations including, but not limited to, the 40 CFR 263 Standards. Submit all final Hazardous Materials/Waste manifest/bills of lading and certificates of disposal to the Engineer within 21 days of each shipment.

110-9.5.1 Steel Members with Hazardous Coating: Dispose of steel members with hazardous coating in one of the following manners:

1. Deliver the steel members and other hazardous waste to a licensed recycling or treatment facility capable of processing steel members with hazardous coating.

2. Deliver the steel members with hazardous coating to a site designated by the Engineer for use as an offshore artificial reef. Deliver any other hazardous materials/waste to a licensed hazardous materials/waste recycling treatment facility.

Dismantle and/or cut steel members to meet the required dimensions of the recycling facility, treatment facility or offshore artificial reef agency.

All compensation for the cost of removal and disposal of hazardous materials/waste will be included in the Cost of Removal of Existing Structures.

110-9.5.2 Certification of Compliance: Submit certification of Compliance from the firm actually removing and disposing of the hazardous materials/waste stipulating, the hazardous materials/waste has been handled, transported and disposed of in accordance with this Specification. The Certification of Compliance shall be attested to by a person having legal authority to bind the company.

Maintain all records required by this Specification and ensure these records are available to the Owner upon request.

110-10 Miscellaneous Operations.

110-10.1 Water Wells Required to be Plugged: Fill or plug all water wells within the right-of-way, including areas of borrow pits and lateral ditches, that are not to remain in service, in accordance with applicable Federal, State, and Local Rules and Regulations.

Cut off the casing of cased wells at least 12 inches below the ground line or 12 inches below the elevation of the finished excavation surface, whichever is lower. Water wells, as referred to herein, are defined either as artesian or non-artesian, as follows:

1. An artesian well is an artificial hole in the ground from which water supplies may be obtained and which penetrates any water-bearing rock, the water in which is raised to the surface by natural flow or which rises to an elevation above the top of the waterbearing bed. Artesian wells are further defined to include all holes drilled as a source of water that penetrate any water-bearing beds that are a part of the artesian water system of Florida, as determined by representatives of the applicable Water Management District.

2. A non-artesian (water-table) well is a well in which the source of water is an unconfined aquifer. The water in a non-artesian well does not rise above the source bed.

110-10.2 Leveling Terrain: Within the areas between the limits of construction and the outer limits of clearing and grubbing, fill all holes and other depressions, and cut down all mounds and ridges. Make the area of a sufficient uniform contour so that the Owner's subsequent mowing and cutting operations are not hindered by irregularity of terrain. Perform this work regardless of whether the irregularities were the result of construction operations or existed originally.

110-10.3 Mailboxes: When the Contract Documents require furnishing and installing mailboxes, permit each owner to remove the existing mailbox. Work with the Local Postmaster to develop a

method of temporary mail service for the period between removal and installation of the new mailboxes. Install the mailboxes in accordance with the Standard Plans.

110-11 Method of Measurement.

110-11.1 Clearing and Grubbing: The quantity to be paid for will be the lump sum quantity.

110-11.2 Selective Clearing and Grubbing: The quantity to be paid will be the plan quantity area in acres designated for selective clearing and grubbing.

110-11.3 Removal of Existing Bridges: The quantity to be paid for will be the lump sum quantity or quantities for the specific structures, or portions of structures to be removed.

110-11.4 Removal of Existing Concrete: The quantity to be paid for will be the number of square yards of existing concrete elements, acceptably removed and disposed of, as specified. The quantity will be determined by actual measurement along the surface of the element before its removal. Measurements for appurtenances which have irregular surface configurations, such as curb and gutter, steps, and ditch pavement, will be the area as projected to an approximate horizontal plane. Where the removal of pavement areas is necessary only for the construction of box culverts, pipe culverts, storm sewers, inlets, manholes, etc., these areas will not be included in the measurements.

Area measurements for walls will be based on exposed vertical face measurements times the horizontal length of the wall.

110-11.5 Delivery of Salvageable Material to the Owner: The quantity to be paid for will be the Lump Sum quantity for delivery of salvageable materials to the Owner, as indicated in the Plans.

110-11.6 General: In each case, except as provided below, where no item of separate payment for such work is included in the proposal, all costs of such work will be included in the various scheduled items in the Contract, or under specific items as specified herein below or elsewhere in the Contract.

110-12 Basis of Payment.

110-12.1 Clearing and Grubbing:

110-12.1.1 Lump Sum Payment: Price and payment will be full compensation for all clearing and grubbing required for the roadway right-of-way and for lateral ditches, channel changes, or other outfall areas, and any other clearing and grubbing indicated, or required for the construction of the entire project, including all necessary hauling, furnishing equipment, equipment operation, furnishing any areas required for disposal of debris, leveling of terrain and the landscaping work of trimming, etc.

Where construction easements are specified in the Plans and the limits of clearing and grubbing for such easements are dependent upon the final construction requirements, no adjustment will be made in the lump sum price and payment, either over or under, for variations from the limits of the easement defined in the Plans.

110-12.1.2 When No Direct Payment is Provided: When no item for clearing and grubbing is included in the proposal, the Contractor shall include the cost of any work of clearing and grubbing which is necessary for the proper construction of the project in the Contract price for the structure or other item of work for which such clearing and grubbing is required. The Contractor shall include the cost of all clearing and grubbing which might be necessary in pits or areas from which

base material is obtained in the Contract price for the base in which such material is used. The clearing and grubbing of areas for obtaining stabilizing materials, where required only for the purpose of obtaining materials for stabilizing, will not be paid for separately.

110-12.2 Selective Clearing and Grubbing: Price and payment will be full compensation for all selective clearing and grubbing, including all necessary hauling, furnishing equipment, Certified Arborist, equipment operation, furnishing any areas required for disposal of debris, leveling of terrain, root pruning and tree protection.

110-12.3 Removal of Existing Concrete: Price and payment will be full compensation for performing and completing all the work of removal and satisfactory disposal.

When no separate item for this work is provided and no applicable item of excavation or embankment covering such work (as provided in 120-13.1) is included, the Contractor shall include the costs of this work in the Contract price for the item of clearing and grubbing or for the pipe or other structure for which the concrete removal is required.

110-12.4 Delivery of Salvageable Material to the Owner: Price and payment will be full compensation for all work required for delivery of the materials to the Owner.

110-12.5 Payment Items: Payment will be made under:

Item 110-1	Complete Asphalt and Base Removal Within Exiting Parking Lot	-per Square Yard (SY)
Item 110-2	Miscellaneous Curbing/Sidewalk Demolition (Selective)	-per Lump Sum (LS)
Item 110-3	Utility/Storm/Structure Demolition- Field Office	-per Lump Sum (LS)
Item 110-4	Utility/Storm/Structure Demolition- Maint. Bldg.	-per Lump Sum (LS)
Item 110-5	Fence Demolition- Maint. Bldg.	-per Lump Sum (LS)

END OF SECTION 110

SECTION 120

EXCAVATION AND EMBANKMENT

120-1 Description.

120-1.1 General: Excavate and construct embankments as required for the roadway, ditches, channel changes and borrow material. Use suitable excavated material or authorized borrow to prepare subgrades and foundations. Construct embankments in accordance with Standard Plans, Index 120-001. Compact and dress excavated areas and embankments.

Meet the requirements of Section 110 for excavation of material for clearing and grubbing and Section 125 for excavation and backfilling of structures and pipe. Material displaced by the storm sewer or drainage structure system is not included in the earthwork quantities shown in the Plans.

120-1.2 Unidentified Areas of Contamination: When encountering or exposing any abnormal condition indicating the presence of contaminated materials, cease operations immediately in the vicinity and notify the Engineer. The presence of tanks or barrels; discolored earth, metal, wood, ground water, etc.; visible fumes; abnormal odors; excessively hot earth; smoke; or other conditions that appear abnormal may indicate the presence of contaminated materials and must be treated with extreme caution.

Make every effort to minimize the spread of contamination into uncontaminated areas. Immediately provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions. Ensure provisions adhere to all applicable laws, rules or regulations covering potentially hazardous conditions and will be in a manner commensurate with the gravity of the conditions.

The Engineer will notify the District Contamination Impact Coordinator (DCIC) who will coordinate selecting and tasking the Owner's Contamination Assessment/Remediation Contractor (CAR). Provide access to the potentially contaminated area. Preliminary investigation by the CAR Contractor will determine the course of action necessary for site security and the steps necessary under applicable laws, rules, and regulations for additional assessment and/or remediation work to resolve the contamination issue.

The CAR Contractor will delineate the contamination areas, any staging or holding area required; and, in cooperation with the Prime Contractor and Engineer, develop a work plan that will provide the CAR Contractor's operations schedule with projected completion dates for the final resolution of the contamination issue.

The CAR Contractor will maintain jurisdiction over activities inside any outlined contaminated areas and any associated staging holding areas. The CAR Contractor will be responsible for the health and safety of workers within the delineated areas. Provide continuous access to these areas for the CAR Contractor and representatives of regulatory or enforcement agencies having jurisdiction.

Both Contractors will use the schedule as a basis for planning the completion of both work efforts. The Engineer may grant the Contract Time extensions according to the provisions of 8-7.3.2.

Cooperate with the CAR Contractor to expedite integration of the CAR Contractor's operations into the construction project. The Prime Contractor is not expected to engage in routine construction

activities, such as excavating, grading, or any type of soil manipulation, or any construction processes required if handling of contaminated soil, surface water or ground water is involved. All routine construction activities requiring the handling of contaminated soil, surface water or groundwater will be by the CAR Contractor. Adjustments to quantities or to Contract unit prices will be made according to work additions or reductions on the part of the Prime Contractor in accordance with 4-3.

The Engineer will direct the Prime Contractor when operations may resume in the affected area.

120-2 Classifications of Excavation.

120-2.1 General: The Owner may classify excavation specified under this Section for payment as any of the following: regular excavation, subsoil excavation, lateral ditch excavation, and channel excavation.

If the proposal does not show subsoil excavation or lateral ditch excavation as separate items of payment, include such excavation under the item of regular excavation.

If the proposal shows lateral ditch excavation as a separate item of payment, but does not show channel excavation as a separate item of payment, include such excavation under the item of lateral ditch excavation. Otherwise, include channel excavation under the item of regular excavation.

120-2.2 Regular Excavation: Regular excavation includes roadway excavation and borrow excavation, as defined below for each.

120-2.2.1 Roadway Excavation: Roadway excavation consists of the excavation and the utilization or disposal of all materials necessary for the construction of the roadway, ditches, channel changes, etc., except as may be specifically shown to be paid for separately and that portion of the lateral ditches within the limits of the roadway right-of-way as shown in the Plans.

120-2.2.2 Borrow Excavation: Borrow excavation consists of the excavation and utilization of material from authorized borrow pits, including only material that is suitable for the construction of roadway embankments or of other embankments covered by the Contract.

A Cost Savings Initiative Proposal (CSIP) submittal based on using borrow material from within the Project limits will not be considered.

120-2.3 Subsoil Excavation: Subsoil excavation consists of the excavation and disposal of muck, clay, rock, or any other material that is unsuitable in its original position and that is excavated below the finished grading template. For stabilized bases and sand bituminous road mixes, consider the finished grading template as the top of the finished base, shoulders and slopes. For all other bases and rigid pavement, consider the finished grading template as the finished shoulder and slope lines and bottom of completed base or rigid pavement. For pond and ditches that identify the placement of a blanket material, consider the finished grading template as the bottom of the blanket material. Subsoil excavation also consists of the excavation of all suitable material within the above limits as necessary to excavate the unsuitable material. Consider the limits of subsoil excavation indicated in the Plans as being particularly variable, in accordance with the field conditions actually encountered.

The quantity of material required to replace the excavated material and to raise the elevation of the roadway to the bottom of the template will be paid for under embankment or borrow excavation (Truck Measure).

120-2.4 Lateral Ditch Excavation: Lateral ditch excavation consists of all excavation of inlet and outlet ditches to structures and roadway, changes in channels of streams, and ditches parallel to the roadway right-of-way. Dress lateral ditches to the grade and cross-section shown in the Plans.

120-2.5 Channel Excavation: Channel excavation consists of the excavation and satisfactory disposal of all materials from the limits of the channel as shown in the Plans.

120-3 Preliminary Soils Investigations.
When the Plans contain the results of a soil survey, do not assume such data is a guarantee of the depth, extent, or character of material present.

120-4 Removal of Unsuitable Materials and Existing Roads.

120-4.1 Subsoil Excavation: Where muck, rock, clay, or other material within the limits of the roadway is unsuitable in its original position, excavate such material to the cross-sections shown in the Plans or indicated by the Engineer, and backfill with suitable material. Shape backfill material to the required cross-sections. Where the removal of plastic soils below the finished earthwork grade is required, meet a construction tolerance, from the lines shown in the Plans as the removal limits, of plus or minus 0.2 feet in depth and plus or minus 6 inches (each side) in width.

120-4.2 Construction over Existing Old Road: Where a new roadway is to be constructed over an old one, plow or scarify the old road, and break it up full width, regardless of height of fill. If the Plans provide that paving materials may be incorporated into the fill, distribute such material in a manner so as not to create voids. Recompact the old road meeting the requirements of 120-10.2.

120-4.3 Obliterating Old Road: Where the Plans call for obliteration of portions of an old road outside of the proposed new roadway, obliterate such sections of the old road by grading to fill ditches and to restore approximately the original contour of the ground or a contour which produces a pleasing appearance.

120-5 Disposal of Surplus and Unsuitable Material.

120-5.1 Ownership of Excavated Materials: Dispose of surplus and excavated materials as shown in the Plans or, if the Plans do not indicate the method of disposal, take ownership of the materials and dispose of them outside the right-of-way.

120-5.2 Disposal of Muck on Side Slopes: As an exception to the provisions of 120-5. 1, when approved by the Engineer, in rural undeveloped areas, the Contractor may place muck (A-8 material) on the slopes, or store it alongside the roadway, provided there is a clear distance of at least 6 feet between the roadway grading limits and the muck, and the Contractor dresses the muck to present a neat appearance. In addition, the Contractor may also dispose of this material by placing it on the slopes in developed areas where, in the opinion of the Engineer, this will result in an aesthetically pleasing appearance and will have no detrimental effect on the adjacent developments. Where the Engineer permits the disposal of muck or other unsuitable material inside the right-of-way limits, do not place such material in a manner which will impede the inflow or outfall of any channel or side ditches. The Engineer will determine the limits adjacent to channels within which such materials may be disposed.

120-5.3 Disposal of Paving Materials: Unless otherwise noted, take ownership of paving materials, such as paving brick, asphalt block, concrete slab, sidewalk, curb and gutter, etc., excavated in the removal of existing pavements, and dispose of them outside the right-of-way. If the materials are to

remain the property of the Owner, place them in neat piles as directed. Existing limerock base that is removed may be incorporated in the stabilized portion of the subgrade. If the construction sequence will allow, incorporate all existing limerock base into the project as allowed by the Contract Documents.

120-5.4 Disposal Areas: Where the Contract Documents require disposal of excavated materials outside the right-of-way, and the disposal area is not indicated in the Contract Documents, furnish the disposal area without additional compensation.

Provide areas for disposal of removed paving materials out of sight of the project and at least 300 feet from the nearest roadway right-of-way line of any State maintained road. If the materials are buried, disregard the 300-foot limitation.

120-6 Borrow.

120-6.1 Materials for Borrow: Do not open borrow pits until the Engineer has approved their location.

Do not provide borrow materials that are polluted as defined in Chapter 376 of the Florida Statutes (oil of any kind and in any form, gasoline, pesticides, ammonia, chlorine, and derivatives thereof, excluding liquefied petroleum gas) in concentrations above any local, State, or Federal standards.

Prior to placing any borrow material that is the product of soil incineration, provide the Engineer with a copy of the Certificate of Materials Recycling and Post Burn Analysis showing that the material is below all allowable pollutant concentrations.

120-6.2 Furnishing of Borrow Areas: To obtain the Engineer's approval to use an offsite construction activity area that involves excavation such as a borrow pit or local aggregate pit, request in writing, a review for -cultural resources involvement. Send the request to the Division of Historical Resources (DHR), Department of State, State Historic Preservation Officer, Tallahassee, FL. As a minimum, include in the request the Project Identification Number, the County, a description of the property with Township, Range, Section, etc., the dimensions of the area to be affected, and a location map. Do not start any work at the off-site construction activity area prior to receiving clearance from the DHR that no additional research is warranted.

For certain locations, the DHR will require a Cultural Resources Assessment (CRA) Survey before approval can be granted. When this is required, secure professional archaeological services to complete an historical and archaeological survey report. Submit the report to the DHR and to the Owner. The Engineer will determine final approval or rejection of off-site construction activity areas based on input from the DHR.

Before receiving approval or before use of borrow areas, obtain written clearance from the Engineer concerning compliance with the Federal Endangered Species Act and other Wildlife Regulations as specified in 7-1.4 and Section 4(f) of the USDOT Act as specified in 71.8.

The Owner will adjust Contract Time in accordance with 8-7 for any suspension of operations required to comply with this Article. The Owner will not accept any monetary claims due to delays or loss of off-site construction activity areas.

Except where the Plans specifically call for the use of a particular borrow or dredging area, the Contractor may substitute borrow or dredging areas of his own choosing provided the Engineer

determines the materials from such areas meet the Owner's standards and other requirements for stability for use in the particular sections of the work in which it is to be placed, and the Contractor absorbs any increase in hauling or other costs. Stake the corners of the proposed borrow area and provide the necessary equipment along with an operator in order for the Engineer to investigate the borrow area. The Engineer will determine test locations, collect samples, and perform tests to investigate the proposed borrow area based on soil strata and required soil properties. The Engineer will approve use of materials from the proposed area based on test results and project requirements. Final acceptance of materials will be based on Point of Use Test as described in 6-1.2.4.

Before using any borrow material from any substitute areas, obtain the Engineer's approval, in writing, for the use of the particular areas, and, where applicable, ensure that the Engineer has cross-sectioned the surface. Upon such written approval by the Engineer, consider the substitute areas as designated borrow areas.

When furnishing the dredging or borrow areas, supply the Owner with evidence that the necessary permits, rights, or waivers for the use of such areas have been secured.

Do not excavate any part of a Contractor furnished borrow area which is less than 300 feet from the right-of-way of the project or any State Road until the Engineer has approved a plan for landscaping and restoring the disturbed area. Perform this landscaping and land restoration at no expense to the Owner, prior to final acceptance of the project. Do not provide a borrow area closer than 25 feet to the right-of-way of any state road. In Owner furnished borrow pits, do not excavate material within 5 feet of adjacent property lines.

Upon completion of excavation, neatly shape, dress, grass, vegetate, landscape, and drain all exposed areas including haul roads, as necessary so as not to present an objectionable appearance.

Meet the requirements of Section 104 when furnishing borrow areas, regardless of location.

120-6.3 Borrow Material for Shoulder Build-up: When so indicated in the Plans, furnish borrow material with a specific minimum bearing value, for building up of existing shoulders. Blend materials as necessary to achieve this specified minimum bearing value prior to placing the materials on the shoulders. Take samples of this borrow material at the pit or blended stockpile. Include all costs of providing a material with the required bearing value in the Contract unit price for borrow material.

120-6.4 Haul Routes for Borrow Pits: Provide and maintain, at no expense to the Owner, all necessary roads for hauling the borrow material. Where borrow area haul roads or trails are used by others, do not cause such roads or trails to deteriorate in condition.

Arrange for the use of all non-public haul routes crossing the property of any railroad. Incur any expense for the use of such haul routes. Establish haul routes which will direct construction vehicles away from developed areas when feasible, and keep noise from hauling operations to a minimum. Advise the Engineer in writing of all proposed haul routes.

120-6.5 Authorization for Use of Borrow: When the item of borrow excavation is included in the Contract, use borrow only when sufficient quantities of suitable material are not available from roadway and drainage excavation, to properly construct the embankment, subgrade, and shoulders, and to complete the backfilling of structures. Do not use borrow material until so ordered by the Engineer, and then only use material from approved borrow pits.

120-7 Materials for Embankment.

120-7.1 Use of Materials Excavated from the Roadway and Appurtenances: Assume responsibility for determining the suitability of excavated material for use on the project in accordance with the applicable Contract Documents. Consider the sequence of work and maintenance of traffic phasing in the determination of the availability of this material.

120-7.2 General Requirements for Embankment Materials: Construct embankments of acceptable material including reclaimed asphalt pavement (RAP), recycled concrete aggregate (RCA) and portland cement concrete rubble, but containing no muck, stumps, roots, brush, vegetable matter, rubbish, reinforcement bar or other material that does not compact into a suitable and enduring roadbed. Do not use RAP or RCA in the top 3 feet of slopes and shoulders that are to be grassed or have other type of vegetation established. Do not use RAP or RCA in stormwater management facility fill slopes.

Remove all waste material designated as undesirable. Use material in embankment construction in accordance with plan details or as the Engineer directs.

Complete the embankment using maximum particle sizes (in any dimension) as follows:

1. In top 12 inches: 3-1/2 inches (in any dimension).

2. 12 to 24 inches: 6 inches (in any dimension).

3. In the depth below 24 inches: not to exceed 12 inches (in any dimension) or the compacted thickness of the layer being placed, whichever is less.

Spread all material so that the larger particles are separated from each other to minimize voids between them during compaction. Compact around these rocks in accordance with 120-9.2.

When and where approved by the Engineer, the Contractor may place larger rocks (not to exceed 18 inches in any dimension) outside the one to two slope and at least 4 feet or more below the bottom of the base. Compact around these rocks to a firmness equal to that of the supporting soil. Construct grassed embankment areas in accordance with 120-9.2.5. Where constructing embankments adjacent to bridge end bents or abutments, do not place rock larger than 3-1/2 inches in diameter within 3 feet of the location of any end-bent piling.

120-7.3 Materials Used at Pipes, Culverts, etc.: Construct embankments over and around pipes, culverts, and bridge foundations with selected materials.

120-8 Embankment Construction.

120-8.1 General: Construct embankments in sections of not less than 300 feet in length or for the full length of the embankment. Do not construct another LOT over an untested LOT without the Engineer's approval in writing.

For construction of mainline pavement lanes, turn lanes, ramps, parking lots, concrete box culverts and retaining wall systems, a LOT is defined as a single lift of finished embankment not to exceed 500 feet.

For construction of shoulder-only areas, shared use paths, and sidewalks areas, a LOT is defined as a single lift of finished embankment not to exceed 2000 feet.

Isolated compaction operations will be considered as separate LOTs. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

120-8.2 Dry Fill Method:

120-8.2.1 General: Construct embankments to meet the compaction requirements in 120-9 and in accordance with the acceptance program requirements in 120-10.

As far as practicable, distribute traffic over the work during the construction of embankments so as to cover the maximum area of the surface of each layer.

Construct embankment using the dry fill method whenever normal dewatering equipment and methods can accomplish the needed dewatering.

120-8.2.1.1 Maximum Compacted Lift Thickness Requirements: Construct the embankment in successive layers with lifts up to a maximum listed in the table below based on the embankment material classification group.

Group	AASHTO Soil Class	Maximum Lift Thickness	Thick Lift Control Test Section Requirements
1	A-3	12 inches	Not Needed
	A-2-4 (No. 200 Sieve ≤ 15%)		
2	A-1	6 inches without Control Test Section	Maximum of 12 inches per 120-8.2.1.2
	A-2-4 (No. 200 Sieve >15%		
	A-2-5, A-2-6, A-2-7, A-4, A-5, A-6		
	A-7 (Liquid Limit <50)		

120-8.2.1.2 Thick Lift Requirements: For embankment materials classified as Group 2 in the table above, the option to perform thick lift construction in successive layers of not more than 12 inches compacted thickness may be used after meeting the following requirements:

1. Notify the Engineer and obtain approval in writing prior to beginning construction of a test section.

    a. Demonstrate the possession and control of compacting equipment sufficient to achieve density required by 120-10.2 for the full depth of a thicker lift.

2. Construct a test section of the length of one full LOT of not less than 500 feet.

3. Perform five Quality Control (QC) tests at random locations within the test section.

    a. All five QC tests and a Owner Verification test must meet the density required by 120-10.2.

    b. Identify the test section with the compaction effort and soil classification in the Owner's Earthwork Records System (ERS).

4. Obtain Engineer's approval in writing for the compaction effort after completing a successful test section.

In case of a change in compaction effort or soil classification, failing QC test or when the QC tests cannot be verified, construct a new test section. The Contractor may elect to place material in 6 inches compacted thickness at any time. Construct all layers approximately parallel to the centerline profile of the road.

The Engineer reserves the right to terminate the Contractor's use of thick lift construction. Whenever the Engineer determines that the Contractor is not achieving satisfactory results, revert to the 6-inch compacted lifts.

120-8.2.1.3 Equipment and Methods: Provide normal dewatering equipment including, but not limited to, surface pumps, sump pumps and trenching/digging machinery. Provide normal dewatering methods including, but not limited to, constructing shallow surface drainage trenches/ditches, using sand blankets, sumps and siphons.

When normal dewatering does not adequately remove the water, the Engineer may require the embankment material to be placed in the water or on low swampy ground in accordance with 120-9.2.3.

120-8.2.2 Placing in Unstable Areas: When depositing fill material in water, or on low swampy ground that will not support the weight of hauling equipment, construct the embankment by dumping successive loads in a uniformly distributed layer of a thickness not greater than necessary to support the hauling equipment while placing subsequent layers. Once sufficient material has been placed so that the hauling equipment can be supported, construct the remaining portion of the embankment in layers in accordance with the applicable provisions of 120-9.2.2.

120-8.2.3 Placing on Steep Slopes: When constructing an embankment on a hillside sloping more than 20 degrees from the horizontal, before starting the fill, deeply plow or cut steps into the surface of the original ground on which the embankment is to be placed.

120-8.2.4 Placing Outside the Standard Minimum Slope: The standard minimum slope is defined as the plane described by a one (vertical) to two (horizontal) slope downward from the roadway shoulder point or the gutter line, in accordance with Standard Plans, Index 120-001 and 120-002. Where material that is unsuitable for normal embankment construction is to be used in the embankment outside the standard minimum slope, place such material in layers of not more than 18 inches in thickness, measured loose. The Contractor may also place material which is suitable for normal embankment, outside such standard minimum slope, in 18 inch layers. Maintain a constant thickness for suitable material placed within and outside the standard minimum slope, unless placing in a separate operation.

120-8.3 Hydraulic Method:

120-8.3.1 Method of Placing: When the hydraulic method is used, as far as practicable, place all dredged material in its final position in the embankment by such method. Place and compact any dredged material that is reworked, or moved and placed in its final position by any other method, as specified in 120-9.2. Baffles or any other form of construction may be used if the slopes of the embankments are not steeper than indicated in the Plans. Remove all timber used for temporary bulkheads or baffles from the embankment, and fill and thoroughly compact all voids. When placing fill on submerged land, construct dikes prior to beginning of dredging, and maintain the dikes throughout the dredging operation.

120-8.3.2 Excess Material: Do not use any excess material placed outside the prescribed slopes or below the normal high-water table to raise the fill areas. Remove only the portion of this material required for dressing the slopes.

120-8.3.3 Protection of Openings in Embankment: Leave openings in the embankments at the bridge sites. Remove any material which invades these openings or existing channels without additional compensation to provide the same existing channel depth as before the construction of the embankment. Do not excavate or dredge any material within 200 feet of the toe of the proposed embankment.

120-8.4 Reclaimed Asphalt Pavement (RAP) Method:

120-8.4.1 General: Use only RAP material stored at facilities with an approved Florida Department of Environmental Protection Stormwater permit or, transferred directly from a milling project to the Owner project. Certify the source if RAP material is from an identifiable Owner project. Do not use RAP material in the following areas: construction areas that are below the seasonal high groundwater table elevation; MSE Wall backfill; underneath MSE Walls or the top 6 inches of embankment.

Prior to placement, submit documentation to the Engineer for his approval, outlining the proposed location of the RAP material.

120-8.4.2 Soil and RAP Mixture: Place the RAP material at the location and spread uniformly, using approved methods to obtain a maximum layer thickness of 4 inches. Mix this 4 inches maximum layer of RAP with a loose soil layer 8 to 10 inches thick. After mixing, meet all embankment utilization requirements of Standard Plans, Index 120-001 for the location used. The total RAP and other embankment material shall not exceed 12 inches per lift after mixing and compaction if the contractor can demonstrate that the density of the mixture can be achieved. Perform mixing using rotary tillers or other equipment meeting the approval of the Engineer. The Engineer will determine the order in which to spread the two materials. Mix both materials to the full depth. Ensure that the finished layer will have the thickness and shape required by the typical section. Demonstrate the feasibility of this construction method by successfully completing a 500 foot long test section.

120-8.4.3 Alternate Soil and RAP Layer Construction: Construct soil in 6 to 12-inch compacted lifts and RAP in alternate layers with 6 inch maximum compacted lifts. Use soil with a minimum LBR value of 40 to prevent failure during compaction of the overlying RAP layer. Demonstrate the feasibility of this construction method by successfully completing a 500-foot long test section.

120-9 Compaction Requirements.

120-9.1 Moisture Content: Compact the materials at a moisture content such that the specified density can be attained. If necessary to attain the specified density, add water to the material, or lower the moisture content by manipulating the material or allowing it to dry, as is appropriate.

120-9.2 Compaction of Embankments:

120-9.2.1 General: Uniformly compact each layer, using equipment that will achieve the required density, and as compaction operations progress, shape and manipulate each layer as necessary to ensure uniform density throughout the embankment.

120-9.2.2 Compaction Over Unstable Foundations: Where the embankment material is deposited in water or on low swampy ground, and in a layer thicker than 12 inches (as provided in 120-8.2.2), compact the top 6 inches (compacted thickness) of such layer to the density as specified in 120-10.2.

120-9.2.3 Compaction Where Plastic Material Has Been Removed: Where unsuitable material is removed and the remaining surface is of the A-4, A-5, A-6, or A-7 Soil Groups (see AASHTO M145), as determined by the Engineer, compact the surface of the excavated area by rolling with a sheepsfoot roller exerting a compression of at least 250 psi on the tamper feet, for the full width of the roadbed (subgrade and shoulders). Perform rolling before beginning any backfill, and continue until the roller feet do not penetrate the surface more than 1 inch. Do not perform such rolling where the remaining surface is below the normal water table and covered with water. Vary the procedure and equipment required for this operation at the discretion of the Engineer.

120-9.2.4 Compaction of Grassed Shoulder Areas: For the upper 6-inch layer of all shoulders which are to be grassed, since no specific density is required, compact only to the extent directed.

120-9.2.5 Compaction of Grassed Embankment Areas: Do not compact the outer layers of any embankments where plant growth will be established. Leave this layer in a loose condition to a minimum depth of 6 inches for the subsequent seeding or planting operations. Do not place RAP or RAP blended material within the top 12 inches of areas to be grassed.

120-9.3 Compaction for Pipes, Culverts, etc.: Compact the backfill of trenches to the densities specified for embankment or subgrade, as applicable, and in accordance with the requirements of 125-9.2.

Thoroughly compact embankments over and around pipes, culverts, and bridges in a manner which will not place undue stress on the structures, and in accordance with the requirements of 125-9.2.

120-9.4 Compaction of Subgrade: If the Plans do not provide for stabilizing, compact the subgrade as defined in 1-3 in both cuts and fills, to the density specified in 120-10.2. For cut areas, determine Standard Proctor Maximum Density in accordance with FM 1-T099 at a frequency of one per mile or when there is a change in soil type, whichever occurs first. For undisturbed soils, do not apply density requirements where constructing paved shoulders 5 feet or less in width.

Where trenches for widening strips are not of sufficient width to permit the use of standard compaction equipment, perform compaction using vibratory rollers, trench rollers, or other type compaction equipment approved by the Engineer.

Maintain the required density until the base or pavement is placed on the subgrade.

120-10 Acceptance Program.

120-10.1 General Requirements:

120-10.1.1 Initial Equipment Comparison: Before initial production, perform an initial nuclear moisture density gauge comparison with the Verification and Independent Assurance (IA) gauges. When comparing the computed dry density of one nuclear gauge to a second gauge, three sets of calculations must be performed (IA to QC, IA to Verification, and QC to Verification). Ensure that the difference between any two computed dry densities does not exceed 2 lb/ft3 between gauges

from the same manufacturer, and 3 lb/ft3 between gauges from different manufacturers. Repair or replace any gauge that does not compare favorably with the IA gauge.

Perform a comparison analysis between the QC nuclear gauge and the Verification nuclear gauge any time a nuclear gauge or repaired nuclear gauge is first brought to the project. Repair and replace any QC gauge that does not compare favorably with the Verification gauge at any time during the remainder of the project. Calibrate all QC gauges annually.

120-10.1.2 Initial Production LOT: Before construction of any production LOT, prepare a 500-foot initial control section consisting of one full LOT. Notify the Engineer in writing at least 24 hours prior to production of the initial control section. Perform all QC tests required in 120-10.1.4. When the initial QC test results pass specifications, the Engineer will perform a Verification test to verify compliance with the specifications. Do not begin constructing another LOT until successfully completing the initial production LOT. The Engineer will notify the Contractor in writing of the initial production LOT approval within three working days after receiving the Contractor's QC data when test results meet the following conditions:

1. QC and Verification tests must meet the density requirements.

2. Difference between QC and Verification computed dry density results shall meet the requirements of 120-10.1.1.

If Verification test result fails the density requirements of 120-10.2, correct the areas of non-compliance. The QC and Verification tests will then be repeated.

120-10.1.3 Density over 105%: When a QC computed dry density results in a value greater than 105% of the applicable Proctor maximum dry density, the Engineer will perform an Independent Verification (IV) density test within 5 feet. If the IV density results in a value greater than 105%, the Engineer will investigate the compaction methods, examine the applicable Standard Proctor Maximum Density and material description. The Engineer may collect and test an IV Standard Proctor Maximum Density sample for acceptance in accordance with the criteria of 120-10.2.

120-10.1.4 Quality Control (QC) Tests:

120-10.1.4.1 Standard Proctor Maximum Density Determination: Determine the QC standard Proctor maximum density and optimum moisture content by sampling and testing the material in accordance with the specified test method listed in 120-10.2.

120-10.1.4.2 Density Testing Requirements: Ensure compliance to the requirements of 120-10.2 by Nuclear Density testing in accordance with FM 1-T238. Determine the in-place moisture content for each density test. Use FM 1-T238, FM 5-507 (Determination of Moisture Content by Means of a Calcium Carbide Gas Pressure Moisture Tester), or ASTM D4643 (Laboratory Determination of Moisture Content of Granular Soils by use of a Microwave Oven) for moisture determination.

120-10.1.4.3 Soil Classification: Perform soil classification tests on the sample collected in 120-10.1.4.1, in accordance with AASHTO T88, T89, T90, and FM 1-T267. Classify soils in accordance with AASHTO M145 in order to determine compliance with embankment utilization requirements as specified in Standard Plans, Index 120-001.

120-10.1.5 Owner Verification: The Engineer will conduct Verification tests in order to accept all materials and work associated with 120-10.1.4. The Engineer will verify the QC results if they meet the Verification Comparison Criteria, otherwise the Engineer will implement Resolution procedures.

The Engineer will select test locations, including Station, Offset, and Lift, using a random number generator, based on the LOTs under consideration. Each Verification test evaluates all work represented by the QC testing completed in those LOTs.

In addition to the Verification testing, the Engineer may perform additional Independent Verification (IV) testing. The Engineer will evaluate and act upon the IV test results in the same manner as Verification test results.

When the project requires less than four QC tests per material type, the Engineer reserves the right to accept the materials and work through visual inspection.

120-10.1.6 Reduced Testing Frequency: Obtain the Engineer's written approval for the option to reduce density testing frequency to one test every two LOTs if Resolution testing was not required for 12 consecutive verified LOTs, or if Resolution testing was required, but the QC test data was upheld and all substantiating tests are recorded in the Earthwork Records System (ERS).

Generate random numbers based on the two LOTs under consideration. When QC test frequency is reduced to one every two LOTs, obtain the Engineer's approval to place more than one LOT over an untested LOT. Assure similar compaction efforts for the untested LOTs. If the Verification test fails, and QC test data is not upheld by Resolution testing, the QC testing will revert to the original frequency of one QC test per LOT. Do not apply reduced testing frequency in construction of shoulder-only areas, shared use paths, sidewalks, and first and last lift.

120-10.1.7 Payment for Resolution Tests: If the Resolution laboratory results compare favorably with the QC results, the Owner will pay for Resolution testing. No additional compensation, either monetary or time, will be made for the impacts of any such testing.

If the Resolution laboratory results do not compare favorably with the QC results, the costs of the Resolution testing will be deducted from monthly estimates. No additional time will be granted for the impacts of any such testing.

120-10.2 Acceptance Criteria: Obtain a minimum QC density of 100% of the standard Proctor maximum density as determined by FM 1-T099, Method C, with the following exceptions: embankment constructed by the hydraulic method as specified in 120-8.3; material placed outside the standard minimum slope as specified in 120-8.2.4 except when a structure is supported on existing embankment; and, other areas specifically excluded herein.

120-10.3 Additional Requirements:

120-10.3.1 Frequency: Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

Test Name	Quality Control	Verification	Verification of Shoulder-Only Areas, Shared Use Paths, and Sidewalks
Standard Proctor Maximum Density	One per soil type	One per soil type	One per soil type
Density	One per LOT	One per four LOTS and for wet conditions, the first lift not affected by water	One per two LOTs
Soil Classification and Organic Content	One per Standard Proctor Maximum Density	One per Standard Proctor Maximum Density	One per Standard Proctor Maximum Density

120-10.3.2 Test Selection and Reporting: Determine test locations including stations and offsets, using the random number generator approved by the Engineer. Do not use notepads or worksheets to record data for later transfer to the Density Log Book. Notify the Engineer upon successful completion of QC testing on each LOT prior to placing another lift on top.

120-10.4 Verification Comparison Criteria and Resolution Procedures:

120-10.4.1 Standard Proctor Maximum Density Determination: The Engineer will verify the QC results if the results compare within 4.5 lb/ft3 of the Verification test result. Otherwise, the Engineer will take one additional sample of material from the soil type in question. The State Materials Office (SMO) or an AASHTO accredited laboratory designated by the SMO will perform Resolution testing. The material will be sampled and tested in accordance with FM 1-T099, Method C.

The Engineer will compare the Resolution test results with the QC test results. If all Resolution test results are within 4.5 lb/ft3 of the corresponding QC test results, the Engineer will use the QC test results for material acceptance purposes for each LOT with that soil type. If the Resolution test result is not within 4.5 lb/ft3 of the Contractor's QC test, the Verification test result will be used for material acceptance purposes.

120-10.4.2 Density Testing: When a Verification or IV density test fails the acceptance criteria, retest the site within a 5 foot radius and the following actions will be taken:

1. If the QC retest meets the acceptance criteria and meets the 12010.1.1 criteria when compared with the Verification or IV test, the Engineer will accept those LOTs.

2. If the QC retest does not meet the acceptance criteria and compares favorably with the Verification or IV test, rework and retest the LOT. The Engineer will re-verify those LOTs.

3. If the QC retest and the Verification or IV test do not compare favorably, complete a new comparison analysis as defined in 120-10.1.1. Once acceptable comparison is achieved, retest the LOTs. The Engineer will perform new verification testing. Acceptance testing will not begin on a new LOT until the Contractor has a gauge that meets the comparison requirements.

Record QC test results in the density logbook on approved Owner forms provided by the Engineer. Submit the original, completed density logbook to the Engineer at final acceptance.

120-10.4.3 Soil Classification: The Engineer will verify the QC test results if the Verification and the QC test results both match the soil utilization symbol listed in Standard Plans, Index 120-001. Otherwise, the Engineer will test the sample retained for Resolution testing. The SMO or an AASHTO accredited laboratory designated by the SMO will perform the Resolution testing. The material will be sampled and tested in accordance with AASHTO T88, T89, and T90, and classified in accordance with AASHTO M145.

The Engineer will compare the Resolution test results with the QC test results. If the Resolution test matches the QC soil utilization symbol, the Engineer will use the QC soil utilization symbol for material acceptance purposes. If the Resolution test result does not match the Contractor's QC soil utilization symbol, the Verification test results will be used for material acceptance purposes.

120-10.4.4 Organic Content: The Engineer will verify the QC test results if the Verification test results satisfy the organic content test criteria in Standard Plans, Index 120-001. Otherwise, the Engineer will test the sample retained for Resolution testing. The SMO or an AASHTO accredited laboratory designated by the SMO will perform Resolution testing. The material will be sampled and tested in accordance with FM 1-T267. If the Resolution test results satisfy the required criteria, material of that soil type will be verified and accepted. If the Resolution test results do not meet the required criteria, reject the material and reconstruct with acceptable material.

120-10.5 Disposition of Defective Materials: Assume responsibility for removing and replacing all defective material, as defined in Section 6.

Alternately, submit an Engineering Analysis Scope in accordance with 6-4 to determine the disposition of the material.

120-11 Maintenance and Protection of Work.

While construction is in progress, maintain adequate drainage for the roadbed at all times. Maintain a shoulder at least 3 feet wide adjacent to all pavement or base construction in order to provide support for the edges.

Maintain all earthwork construction throughout the life of the Contract, and take all reasonable precautions to prevent loss of material from the roadway due to the action of wind or water. Repair, at no expense to the Owner except as otherwise provided herein, any slides, washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of the work. Perform maintenance and protection of earthwork construction in accordance with Section 104.

Maintain all channels excavated as a part of the Contract work against natural shoaling or other encroachments to the lines, grades, and cross-sections shown in the Plans, until final acceptance of the project.

120-12 Construction.

120-12.1 Construction Tolerances: Shape the surface of the earthwork to conform to the lines, grades, and cross-sections shown in the Plans. In final shaping of the surface of earthwork, maintain a tolerance of 0.3 foot above or below the cross-section with the following exceptions:

1. Shape the surface of shoulders to within 0.1 foot of the cross-section shown in the Plans.

2. Shape the earthwork to match adjacent pavement, curb, sidewalk, structures, etc.

3. Shape the bottom of conveyance ditches so that the ditch impounds no water.

4. When the work does not include construction of base or pavement, shape the entire roadbed (shoulder point to shoulder point) to within 0.1 foot above or below the Plan cross-section.

5. When the work includes permitted linear stormwater management facilities, shape the swales and ditch blocks to within 0.1 feet of the cross-section shown in the Plans.

Ensure that the shoulder lines do not vary horizontally more than 0.3 foot from the true lines shown in the Plans.

120-12.2 Operations Adjacent to Pavement: Carefully dress areas adjacent to pavement areas to avoid damage to such pavement. Complete grassing of shoulder areas prior to placing the final wearing course. Do not manipulate any embankment material on a pavement surface.

When shoulder dressing is underway adjacent to a pavement lane being used to maintain traffic, exercise extreme care to avoid interference with the safe movement of traffic.

120-13 Method of Measurement.

No separate measurement will be made for Excavation and Embankment. Payment for this item shall be incidental to the subgrade preparation.

120-14 Basis of Payment.

No separate payment will be made for Excavation and Embankment. Payment for this item shall be incidental to the subgrade preparation.

120-14.1 Payment Items: Payment will be made under:

Item 120-1	Unclassified Excavation and Embankment- Field Office	-per Lump Sum (LS)
Item 120-2	Unclassified Excavation and Embankment- Maint. Bldg.	-per Lump Sum (LS)

END OF SECTION 120

SECTION 125

EXCAVATION FOR STRUCTURES AND PIPE

125-1 Description.
Excavate for box culverts, pipes, retaining walls, headwalls for pipes and drains, catch basins, drop inlets, manholes, and similar structures. Construct and remove cofferdams, sheeting, bracing, etc.; pump or otherwise dewater foundations; remove and dispose of any existing structures or portions of structures not covered by other items in the Contract, including foundations, abutments, piers, wings, and all other materials, obstructions, etc., found necessary to clear the site for the proposed work; backfill, dispose of surplus material, and perform final cleaning, as may be necessary for the proper execution of the work. This Section does not include excavation for bases or pavements, curbs, curb and gutter, valley gutter, ditch pavement, or rubble gutter.

125-1.1 Trench Excavation Safety System and Shoring, Special (Trench Excavation): When performing trench excavation in excess of 5 feet in depth, comply with the Occupational Safety and Health Administration's (OSHA) trench safety standards, 29 CFR 1926, Subpart P, and all subsequent revisions or updates adopted by the Department of Labor and Employment Security. Ensure that trench boxes are wide enough to accommodate compaction and density testing.

Submission of bid and subsequent execution of the Contract will serve as certification that all trench excavation in excess of 5 feet in depth will be in compliance with Section 553.62, Florida Statutes.

Consider all available geotechnical information when designing the trench excavation safety system.

Consider these and any more stringent trench safety standards as minimum Contract requirements.

125-2 Classification.
Consider all materials excavated as unclassified and as excavation regardless of the material encountered.

125-3 Cofferdams.

125-3.1 Construction:

125-3.1.1 Methods: Construct all foundations by open excavation, and shore, brace, or protect the foundation openings with cofferdams. Provide cofferdams or cribs for foundation construction below the bottom of the footings. Provide sufficient clearance in the cofferdam interiors to permit construction of forms and inspection of their exteriors, and for pumping equipment.

125-3.1.2 Protection of Concrete: Construct cofferdams to protect green concrete against damage from a sudden rising of the water and to prevent damage by erosion. Do not leave timber or bracing in cofferdams or cribs that extend into the substructure masonry except where permitted in writing by the Engineer.

125-3.1.3 Placing in the Dry: For placing footings in the dry, the Engineer may require cofferdam sheeting to be driven to an elevation 6 feet below the elevation of the bottom of the footings and require sufficient pumping equipment to dewater and maintain the cofferdam in a comparatively dry condition.

125-3.1.4 Working Drawings: For substructure work, submit drawings showing the proposed method of cofferdam construction and other details left to choice or not fully shown in the Plans. Obtain the Engineer's approval of the type and clearance of cofferdams, insofar as such details affect the character of the finished work. For other details of design that do not affect the character of the finished work, assume responsibility for the successful construction of the work. Retain a Professional Engineer, registered in the State of Florida, to prepare the above construction drawing, and keep a signed and sealed copy on hand at the site at all times.

125-3.2 Removal: Unless otherwise provided, remove cofferdams or cribs, with all sheeting and bracing, after completion of the substructure without disturbing or marring the finished masonry.

125-4 Excavation.

125-4.1 Requirements for all Excavation: Perform all excavation to foundation materials, satisfactory to the Engineer, regardless of the elevation shown in the Plans. Remove rock, boulders or other hard lumpy or unyielding material to a depth of 12 inches below the bottom of pipes and box culverts elevations. Remove muck or other soft material to the depth indicated in the Plans or as directed by the Engineer.

125-4.2 Earth Excavation:

125-4.2.1 Foundation Material other than the Rock: When masonry is to rest on an excavated surface other than rock, take special care to avoid disturbing the bottom of the excavation, and do not remove the final foundation material to grade until just before placing the masonry. In case the foundation material is soft or mucky, the Engineer may require excavation to a greater depth and to backfill to grade with approved material.

125-4.2.2 Foundation Piles: Where foundation piles are used, complete the excavation of each pit before driving the piles. After the driving is completed, remove all loose and displaced material, leaving a smooth, solid, and level bed to receive the masonry.

125-4.2.3 Removal of Obstructions: Remove boulders, logs, or any unforeseen obstacles encountered in excavating. Compensation will be in accordance with the requirements of 4-3.

125-4.3 Rock Excavation: Clean all rock and other hard foundation material, remove all loose material, and cut all rock to a firm surface. Either level, step vertically and horizontally, or serrate the rock, as may be directed by the Engineer. Clean out all seams, and fill them with concrete or mortar.

125-4.4 Pipe Trench Excavation: Excavate trenches for pipes to the elevation of the bottom of the pipe and to a width sufficient to provide adequate working room. Remove soil not meeting the classification specified as suitable backfill material in 125-8.3.2.2, to a depth of 4 inches below the bottom of the pipe elevation. Where the soils permit, ensure that the trench sides are vertical up to at least the mid-point of the pipe.

For pipe lines placed above the natural ground line, place and compact the embankment, prior to excavation of the trench, to an elevation at least 2 feet above the top of the pipe and to a width equal to four pipe diameters, and then excavate the trench to the required grade.

For pipe trenches utilizing trench boxes, ensure that the trench box used is of sufficient width to permit thorough tamping of bedding material under and around the pipes as specified in 125-8.1.6.

Do not disturb the installed pipe and its embedment when moving trench boxes. Move the trench box carefully to avoid excavated wall displacement or damage. As the trench box is moved, fill any voids left by the trench box and continuously place and compact the backfill material adjacent to and all along the side of the trench box walls to fill any voids created by the trench box.

125-5 Preservation of Channel.

125-5.1 General: Unless shown in the Plans, do not excavate outside of caissons, cribs, cofferdams, or sheet piling, and do not disturb the natural stream bed adjacent to the structure. If excavating or dredging at the site of the structure before sinking caissons, cribs, or cofferdams, complete the foundation and backfill all such excavations to the original ground surface or other required elevation, with material satisfactory to the Engineer.

125-5.2 Removal of Excavated Materials: Do not allow materials that are deposited adjacent to the stream area to infiltrate the water areas. Leave the stream in its original condition.

125-6 Disposal of Surplus.

Use suitable excavated materials for backfilling over or around the structure. Dispose of unsuitable materials. Meet the disposal requirements pertaining to water pollution contained in Section 104 and in 7-1.1.

125-7 Pumping.

Pump from the interior of any foundation enclosure in such manner as to preclude the possibility of any portion of the concrete materials being carried away. Do not pump while placing concrete, or for a period of at least 24 hours thereafter, unless using a suitable pump separated from the concrete work by a watertight wall.

125-8 Backfilling.

125-8.1 General Requirements for Structures and Pipe:

125-8.1.1 General: Backfill in the dry whenever normal dewatering equipment and methods can accomplish the needed dewatering. A LOT is defined as one lift of backfill material placement, not to exceed 500 feet in length or a single run of pipe connecting two successive structures, whichever is less. Backfill for structures and pipe compacted in one operation will be considered as one LOT within the cover zone. Backfill around structures compacted separately from the pipe will be considered as separate LOTs. Backfill on each side of the pipe for the first lift will be considered a separate LOT. Backfill on opposite sides of the pipe for the remaining lifts will be considered separate LOTs, unless the same compactive effort is applied. Same compactive effort is defined as the same type of equipment (make and model) making the same number of passes on both sides of the pipe. For multiple phase backfill, a LOT shall not extend beyond the limits of the phase. When placing backfill within trench box each lift of backfill is considered a LOT. Placement of backfill within trench box limits will be considered a complete operation before trench box is moved for next backfill operation. When the trench box is moved for next backfill operation this will start new LOTs for each lift. Follow the density testing frequency in 125-9.3.1.

125-8.1.2 Equipment and Methods: Provide normal dewatering equipment including, but not limited to, surface pumps, sump pumps, wellpoints and header pipe and trenching/digging machinery. Provide normal dewatering methods including, but not limited to, constructing shallow surface drainage trenches/ditches, using sand blankets, perforated pipe drains, sumps and siphons.

125-8.1.3 Backfill Materials: Backfill to the original ground surface or subgrade surface of openings made for structures, with a sufficient allowance for settlement. The Engineer may require that the material used for this backfill be obtained from a source entirely apart from the structure. Use only material accepted by the Engineer. Maintain a clearance of at least 1 foot of clean select soil between recycled concrete aggregate (RCA) and aluminum or metalized drainage pipe.

Do not allow heavy construction equipment to cross over culvert or storm sewer pipes until placing and compacting backfill material to the finished earthwork grade or to an elevation at least 4 feet above the crown of the pipe.

125-8.1.4 Use of A-7 Material: In the backfilling of trenches, A-7 material may be used from a point 12 inches above the top of the pipe up to the elevation shown in the Standard Plans as the elevation for undercutting of A-7 material.

125-8.1.5 Time of Placing Backfill: Do not place backfill against any masonry or concrete abutment, wingwall, or culvert until the Engineer has given permission to do so, and in no case until the masonry or concrete has been in place seven days or until the specified 28 day compressive strength occurs.

125-8.1.6 Placement and Compaction: Place the material in horizontal layers not exceeding 6 inches compacted thickness, in depth above water level, behind abutments, wingwalls and end bents or end rest piers, under the haunches of the pipes and around box culverts and all structures including pipe culverts. When the backfill material is deposited in water, compact as specified in 125-8.2.5 and 125-8.3.4.

125-8.1.6.1 Thick Lift Requirements: The Contractor may elect to place material in thicker lifts of no more than 12 inches compacted thickness above the Soil Envelope if the embankment material is classified as Group 1 in the table below. If the embankment material is classified as Group 2 in the table below and the Contractor chooses to place material in thicker lifts of no more than 12 inches compacted thickness above the soil envelope then the Contractor must demonstrate with a successful test section that density can be achieved. Thick lift around structures is only allowed above the soil envelope of the connecting pipe. Notify the Engineer in writing prior to beginning construction of a test section. Construct a test section of the length of one LOT. Perform five quality control (QC) tests at random locations within the test section. All five tests must meet the density required by 125-9.2 and be verified by the Owner. Identify the test section with the compaction effort and soil classification in the Log Book. In case of a change in compaction effort or soil classification, construct a new test section. When a QC test fails the requirements of 125-9.2 or when the QC tests cannot be verified, construct a new test section. The Contractor may elect to place material in 6 inches compacted thickness at any time.

Group	AASHTO Soil Class	Maximum Lift Thickness		Thick Lift Control Test Section Requirements	
		Within Cover Zone	Above Soil Envelope	Within Cover Zone	Above Soil Envelope
1	A-3	6 inches	12 inches	N/A	Not Needed
	A-2-4 (No. 200 Sieve ≤ 15%)				
2	A-1	6 inches without control test section		N/A	Maximum of 12 inches per 120-8.2.1.2
	A-2-4 (No. 200 Sieve > 15%)				
	A-2-5, A-2-6, A-2-7, A-4, A-5, A-6				
	A-7 (Liquid Limit <50)				

125-8.2 Additional Requirements for Structures Other than Pipe:

125-8.2.1 Density: Where the backfill material is deposited in water, obtain a 12 inch layer of comparatively dry material, thoroughly compacted by tamping, before verifying the layer and density requirements. Meet the requirements of 125-9.2.

125-8.2.2 Box Culverts: For box culverts over which pavement is to be constructed, compact around the structure to an elevation not less than 12 inches above the top of the structure, using rapid-striking mechanical tampers.

125-8.2.3 Other Limited Areas: Compact in other limited areas using mechanical tampers or approved hand tampers, until the cover over the structure is at least 12 inches thick. When hand tampers are used, deposit the materials in layers not more than 4 inches thick using hand tampers suitable for this purpose with a face area of not more than 100 square inches. Take special precautions to prevent any wedging action against the masonry, and step or terrace the slope bounding the excavation for abutments and wingwalls if required by the Engineer.

125-8.2.4 Culverts and Piers: Backfill around culverts and piers on both sides simultaneously to approximately the same elevation.

125-8.2.5 Compaction Under Wet Conditions: Where wet conditions do not permit the use of mechanical tampers, compact using hand tampers. Use only A-3 material for the hand tamped portions of the backfill. When the backfill has reached an elevation and condition such as to make the use of the mechanical tampers practical, perform mechanical tamping in such manner and to such extent as to transfer the compaction force into the sections previously tamped by hand.

125-8.3 Additional Requirements for Pipe Greater than 12 Inches Inside Diameter:

125-8.3.1 General: Trenches for pipe may have up to four zones that must be backfilled.

Lowest Zone: The lowest zone is backfilled for deep undercuts up to within 4 inches of the bottom of the pipe.

Bedding Zone: The zone above the lowest zone is the bedding zone. Usually it will be the backfill which is the 4 inches of soil below the bottom of the pipe. When rock or other hard material has been removed to place the pipe, the bedding zone will be the 12 inches of soil below the bottom of the pipe.

Cover Zone: The next zone is backfill that is placed after the pipe has been laid and will be called the cover zone. This zone extends to 12 inches above the top of the pipe. The cover zone and the bedding zone are considered the Soil Envelope for the pipe.

Top Zone: The top zone extends from 12 inches above the top of the pipe to the base or final grade.

125-8.3.2 Material:

125-8.3.2.1 Lowest Zone: Backfill areas undercut below the bedding zone of a pipe with coarse sand, or other suitable granular material, obtained from the grading operations on the project, or a commercial material if no suitable material is available.

125-8.3.2.2 Soil Envelope: In both the bedding zone and the cover zone of the pipe, backfill with materials classified as A-1, A-2, or A-3. Material classified as A-4 may be used if the pipe is concrete pipe.

125-8.3.2.3 Top Zone: Backfill the area of the trench above the soil envelope of the pipe with materials allowed on Standard Plans, Index 120-001.

125-8.3.3 Compaction:

125-8.3.3.1 Lowest Zone: Compact the soil in the lowest zone to approximately match the density of the soil in which the trench was cut.

125-8.3.3.2 Bedding Zone: If the trench was not undercut below the bottom of the pipe, loosen the soil in the bottom of the trench immediately below the approximate middle third of the outside diameter of the pipe.

If the trench was undercut, place the bedding material and leave it in a loose condition below the middle third of the outside diameter of the pipe. Compact the outer portions to meet the density requirements of the acceptance criteria. Place the material in lifts no greater than 6 inches (compacted thickness).

125-8.3.3.3 Cover Zone: Before placing the cover zone material, lay pipe according to Section 430. Excavate for pipe bells before laying pipe. Place the material in 6 inch layers (compacted thickness), evenly deposited on both sides of the pipe, and compact with mechanical tampers suitable for this purpose. Hand tamp material below the pipe haunch that cannot be reached by mechanical tampers. Meet the requirements of in 125-9.2.

125-8.3.3.4 Top Zone: Place the material in layers not to exceed 12 inches in compacted thickness. Meet the requirements of the density acceptance criteria.

125-8.3.4 Backfill Under Wet Conditions: Where wet conditions are such that dewatering by normal pumping methods would not be effective, the procedure outlined below may be used when specifically authorized by the Engineer in writing. The Owner will pay for any select material which is not available from the grading as Unforeseeable Work. The Owner will not pay for select material that might be used by the Contractor for his own convenience instead of dewatering.

The Engineer will permit the use of granular material below the elevation at which mechanical

tampers would be effective, but only material classified as A-3. Place and compact the material using timbers or hand tampers until the backfill reaches an elevation such that its moisture content will permit the use of mechanical tampers. When the backfill has reached such elevation, use normally acceptable backfill material. Compact the material using mechanical tampers in such manner and to such extent as to transfer the compacting force into the material previously tamped by hand.

The Engineer will permit the use of coarse aggregate below the elevation at which mechanical tampers would be effective. Use coarse aggregate as specified in Section 901 for Aggregate Size Number 89, 8, 78, 7, 68, 6, or 57. Place the coarse aggregate such that it will be stable and firm. Fully wrap the aggregate with a layer of Type D-4 filter fabric, as specified in Section 985. Do not place coarse aggregate within 4 feet of the ends of the trench or ditch. Use normally accepted backfill material at the ends.
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125-9 Acceptance Program.

125-9.1 General Requirements: Meet the requirements of 120-10, except replace the requirements of 120-10.1.6 with 125-9.1.1, 120-10.2 with 125-9.2, and 120-10.3 with 125-9.3.

125-9.1.1 Reduced Testing Frequency: Obtain the Engineer's approval in writing for the option to reduce density testing frequency to one test every two LOTs or one every four LOTs for trench box operations if the following requirements are met:

a. Resolution testing was not required for six consecutive verified LOTs.

b. Resolution testing was required for any of the six consecutive verified LOTs, but QC test data was upheld.

Identify the substantiating tests in the Density Log Book and notify the Engineer in writing prior to starting reduced frequency of testing. Generate random numbers for selecting test locations for the LOTs under consideration. When QC test frequency is reduced , obtain the Engineer's approval in writing to place more than one LOT over an untested LOT. Do not apply reduced testing frequency for the first and last lift of pipe. Assure similar compaction efforts for the untested sections. If the Verification test fails, and QC test data is not upheld by Resolution testing the QC testing will revert to the original frequency.

125-9.2 Acceptance Criteria:

125-9.2.1 Density: Obtain a minimum QC density in any LOT of 100% of the Standard Proctor maximum density as determined by FM 1-T099 or the requirements of 125-8.3.3.1 when applicable. When the cover height below the bottom of base under asphalt pavement, below concrete pavement, or below unpaved ground, exceeds 15 inches, compact the pipe backfill in the cover zone to a density of at least 95% of the Standard Proctor maximum density as determined by FM1-T099.

For density requirements around drainage structures, obtain a minimum QC density in any LOT of 100% of the Standard Proctor maximum density as determined by FM 1-T099 for a distance of one pipe diameter but not less than 3 feet from the outside face of the structure.

125-9.2.2 Exceptions to Structures and Pipe Density Requirements: Compact the backfill to a

firmness approximately equal to that of the soil next to the pipe trench in locations outside the plane described by a one (vertical) to two (horizontal) slope downward from the roadway shoulder point or the gutter line in accordance with Standard Plans, Index 120001 or 120-002. Apply 125-9.2.1 when compacting side-drain pipe backfill under driveways serving a property that is not a single residential lot.

125-9.3 Additional Requirements:

125-9.3.1 Frequency: Conduct Standard Proctor maximum density sampling and testing at a minimum frequency of one test per soil type. The summary of tests and frequency is shown in the table below.

Test Name	Quality Control	Verification
Standard Proctor Maximum Density	One per soil type	One per soil type
Density	One per LOT	One per four consecutive LOTs and for wet conditions, the first lift not affected by water
Soil Classification and Organic Content	One per Standard Proctor Maximum density	One per Standard Proctor Maximum density

125-10 Verification Comparison Criteria and Resolution Procedures.

Meet the requirements of 120-10.4.

125-11 Site Restoration.

Wherever the existing site is disturbed solely for the purpose of constructing or removing box culverts, pipes, inlets, manholes, etc., completely replace and restore the site to the Engineer's satisfaction, without additional compensation.

125-12 Cleaning Up.

Upon completion of the work, leave the structure and all adjacent areas in a neat and presentable condition, clear up all temporary structures, rubbish and surplus materials and leave the space under the structure unobstructed and in such shape that drift will not collect nor scour or be induced. Pile all material from existing structures that have been removed neatly on the bank, unless otherwise directed by the Engineer. Pull false work piling unless the Engineer permits it to be cut or broken off in which case it will be cut or broken off at least 2 feet below the ground line or stream bed.

125-13 Method of Measurement.

No separate measurement shall be made for excavation or embankment for structures or pipes. Payment for excavation and embankment for structures or pipes shall be included in the respective pay items requiring excavation or embankment.

125-14 Basis of Payment.

125-14.1 When No Direct Payment Provided: When direct payment for excavation for structures is not provided for in the proposal, all work specified in this Section, other than as specified in 125-14.3 through 125-14.7, shall be included in the Contract price for the concrete or for other items covering the applicable structure.

125-14.2 Direct Payment: When direct payment for work under this Section is provided, the Contract price per cubic yard (measured as provided in 125-13), as shown in the proposal, shall be

full compensation for all the work specified in this Section, except such work as is specifically stipulated to be paid for separately, in 125-14.3 through 125-14.7.

125-14.3 Excavation Below Plan Grade: When excavation of material below plan grade is called for in the Plans or authorized by the Engineer, and payment for Excavation for Structures is on a cubic yard basis, the material excavated below plan grade will be included in the measurement for this item. Payment for the material used for the backfill will be made as specified in 125-14.7.

125-14.4 Strengthening Foundations: The work of strengthening the foundations (as provided in 125-4.2) shall be paid for as provided in 4-4, unless such work is covered by a bid item**.**

125-14.5 Backfilling for Additional Support: The work of providing additional support by backfilling with sand or other satisfactory material, where called for by the Engineer (as specified in 125-8), shall be paid for as provided in 4-4.

125-14.6 Removal and Replacement of Existing Pavement: For pavement, curb, etc., which is removed only in order to construct pipe culverts or storm sewers, as specified in 125-11, all costs of such removal and replacement shall be included in the costs of the pipe or other structure for which it is removed, unless otherwise provided for in the contract.

125-14.7 Removal and Replacement of Material Unsuitable for Backfill: When it cannot reasonably be anticipated from information contained in the Plans, that material excavated for the structure will be unsuitable for use as backfill, and such material proves to be unsuitable for this use, the work of disposing of such material away from the site will be paid for as Unforeseeable Work, and the work of bringing in substitute material for the backfill will be paid for as specified for the particular case shown below:

1. No additional payment will be made for backfill materials obtained from surplus material available from the normal excavation or grading operations.
2. When the necessary material is not available from the normal excavation or grading operations, and the Contract includes an item for borrow excavation, backfill material authorized to be obtained from designated borrow areas will be included in the volume of borrow excavation to be paid for.
3. When the necessary material is not available from the normal excavation or grading operations and no separate item for borrow excavation is included in the Contract, any backfill material obtained by increasing the volume of excavation within the roadway right of way will be measured and paid for as regular excavation subject to the provisions of 9-3.2.2.
4. When authorization is given for obtaining the material from outside the right of way and from other than designated borrow areas, such excavation will be paid for as unforeseeable work.
5. Where pipe bedding is provided, as specified in 125-8, by the use of select granular material, the quantity of such select material obtained either as commercial material or from material from the grading operations other than in the immediate vicinity of the pipe to be bedded, as authorized by the Engineer, will be paid for at the Contract price per cubic yard for select bedding material. No payment for this material will be made for material available from the excavation for the pipe culvert or from other material available from the grading operations at a location not sufficiently remote as to require loading on trucks.

125-14.8 Pay Items: No separate payment shall be made for this Section. The cost associated with excavation shall be incidental to the respective pay items.

END OF SECTION 125

SECTION 160

STABILIZING

160-1 Description.
Stabilize designated portions of the roadbed to provide a firm and unyielding subgrade, having the required bearing value specified in the Plans.

160-2 Materials.

160-2.1 Commercial Material: Meet the requirements of Section 914-2.1.

160-2.2 Local Material: Submit test results to the Engineer at least 14 days prior to the stabilization operation.

160-2.2.1 Local Stabilizing Material: Sample and test material from each source and meet the requirements of Section 914. The Engineer will verify the Quality Control (QC) test results meet the requirements of Section 914. If the QC and Verification results do not compare, the Engineer will take one additional sample of material from the source in question and the State Materials Office (SMO) or an AASHTO accredited laboratory designated by the SMO will perform Resolution testing. If the Resolution test results satisfy the required criteria, material from that source will be verified and accepted. If the Resolution test results do not meet the required criteria, reject the material.

160-2.2.2 Reclaimed Asphalt Pavement (RAP): Obtain the Engineer's approval in writing for the option to use 100% RAP material. Material must be milled and stockpiled without blending or contaminating with any other material.

160-2.2.3 Reclaimed Asphalt Pavement (RAP) Blended Material: RAP blended material is defined as material meeting the requirements of 914-1 and 914-2.2 except for the limits for organic content. If the RAP blended material meets the requirements of 914-1 and 914-2, then the blended material will be classified as local stabilizing material. Provide test results to the Engineer and obtain their approval in writing before using RAP blended material. The Engineer will verify that the QC test results meet the acceptance criteria, otherwise the Engineer will perform Resolution testing procedures specified in 160-2.2.1.

160-2.3 Existing Base: Obtain the Engineer's approval in writing before using existing base. When the material from an existing base is used as all, or a portion, of the stabilizing additives, no further testing is required unless directed by the Engineer.

160-2.4 Granular Subbase: The Engineer may allow, at no additional cost to the Owner, the substitution of 6 inches of granular subbase meeting the requirements of 290-2 and 290-3, only when 12 inches of Type B stabilization requiring a Limerock Bearing Ratio (LBR) value of 40 is specified in accordance with Standard Plans, Index 120-001.

160-3 Construction Methods.

160-3.1 General: Prior to the beginning of stabilizing operations, construct the area to be stabilized to an elevation such that, upon completion of stabilizing operations, the completed stabilized subgrade will conform to the lines, grades, and cross-section shown in the Plans. Prior to spreading

any additive stabilizing material, bring the surface of the roadbed to a plane approximately parallel to the plane of the proposed finished surface.

Construct mainline pavement lanes, turn lanes, ramps, parking lots, concrete box culverts, retaining wall systems, shoulder-only areas, sidewalk, and shared use path areas meeting the requirements of 120-8.1, except replace "embankment" with "subgrade".

Isolated mixing operations will be considered as separate LOTs. Curb pads and shoulders compacted separately shall be considered separate LOTs. Isolated compaction operations will be considered as separate LOTs. For multiple phase construction, a LOT shall not extend beyond the limits of the phase.

160-3.2 Application and Acceptance of Stabilizing Material: After completing the roadbed grading operations, determine the type and quantity (if any) of stabilizing material necessary for compliance with the bearing value requirements. Before using any Fossil Fuel Combustion Products (FFCPs), submit documentation, at the preconstruction meeting or no later than 30 days prior to delivery of FFCP's to the project, signed and sealed by the Specialty Engineer that these materials meet the requirements of 403.7047 F.S. Notify the Engineer of the approximate quantity to be added before spreading. When additive stabilizing materials are required, spread the material uniformly over the area to be stabilized.

The Engineer may perform Independent Verification (IV) sampling and testing if variability in the stabilizing material is observed during inspection after spreading on the roadway. If the IV test results do not meet the requirements of Section 914, then remove and replace the failing LOTs with acceptable material. The Engineer reserves the right to reject stabilizing material that contains excessive deleterious substances.

160-3.3 Mixing: Perform mixing using rotary tillers, a plant or other equipment meeting the approval of the Engineer. The subgrade may be mixed in one course if the equipment and method of construction provides the uniformity, particle size limitation, compaction and other desired results of 160-4. Thoroughly mix the area to be stabilized throughout the entire depth and width of the stabilizing limits.

Perform the mixing operations, as specified, (either in place or in a plant) regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

160-3.4 Mixed Material Requirements: At the completion of the mixing, ensure the gradation of the material within the limits of the area being stabilized is such that 97% will pass a 3-1/2 inch sieve. Break down or remove from the stabilized area materials, including clay lumps or lumps made of clay-size particles (any particle size 2 microns or less), not meeting the gradation requirements. After mixing, remove any existing lumps of clay or clay-sized particles greater than one inch that do not meet the requirements of 160-3.2 or this Section from the stabilized area. The final product must meet the acceptance requirements of 160-4.

160-3.4.1 Classification and Bearing Value: Meet the soil utilization and bearing value requirements for the subgrade in accordance with 160-4.

160-3.4.2 Compaction: After completing the mixing operations and satisfying the requirements for bearing value, uniformity, and particle size, compact the materials at a moisture content

permitting the specified compaction in 160-4.2.3. If the moisture content of the material is improper for attaining the specified density, either add water or allow the material to dry until reaching the proper moisture content for the specified compaction.

160-3.4.3 Finish Grading: Shape the completed stabilized subgrade to conform with the finished lines, grades, and cross-section indicated in the Plans. Check the subgrade using elevation stakes or other means approved by the Engineer.

160-3.4.4 Condition of Completed Subgrade: After completing the stabilizing and compacting operations, ensure that the subgrade is firm and substantially unyielding to the extent that it will support construction equipment and will have the bearing value required by the Plans.

Remove all soft and yielding material, and any other portions of the subgrade which will not compact readily, and replace it with suitable material so that the whole subgrade is brought to line and grade, with proper allowance for subsequent compaction.

160-3.4.5 Maintenance of Completed Subgrade: After completing the subgrade as specified above, maintain it free from ruts, depressions, and any damage resulting from the hauling or handling of materials, equipment, tools, etc. The Contractor is responsible for maintaining the required density until the subsequent base or pavement is in place including any repairs, replacement, etc., of curb and gutter, sidewalk, etc., which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Perform any such recompaction at no expense to the Owner. Construct and maintain ditches and drains along the completed subgrade section.

160-4 Acceptance Program for Mixed Materials.

160-4.1 General Requirements:

160-4.1.1 Initial Equipment Comparison: Meet the requirements of 120-10.1.1.

160-4.1.2 Initial Production LOT: Meet the requirements of 120-10.1.2.

160-4.1.3 Density over 105%: Meet the requirements of 120-10.1.3.

160-4.1.4 Quality Control Tests:

160-4.1.4.1 Modified Proctor Maximum Density Determination: Collect enough material to split and create three separate samples. Determine test locations, including stations and offsets, using the Random Number generator approved by the Owner. Retain the Verification and Resolution samples for the Owner until the Engineer accepts the LOTs represented by the samples. Determine modified Proctor maximum density and optimum moisture content by sampling and testing the material in accordance FM 1-T180.

160-4.1.4.2 Density Testing Requirements: Meet the requirements of 120-10.1.4.2.

160-4.1.4.3 Bearing Value Requirements: Test the stabilized subgrade sample collected in 160-4.1.4.1 to determine the LBR in accordance with FM 5-515. Within the entire limits of the width and depth of the areas to be stabilized, obtain the required minimum bearing value at the frequency in 160-4.4.1. For any area where the bearing value obtained is deficient from the value indicated in the Plans, in excess of the tolerances established herein, spread and mix additional stabilizing material in accordance with 160-3.3. Perform this reprocessing for

the full width of the roadway being stabilized and longitudinally for a distance of 50 feet beyond the limits of the area in which the bearing value is deficient.

Determine the quantity of additional stabilizing material to be used in reprocessing.

160-4.1.4.3.1 Under-tolerances in Bearing Value Requirements: The under-tolerances are allowed for the following specified Bearing Values:

Specified Bearing Value	Under-tolerance
LBR 40	5.0
LBR 35	4.0
LBR 30 (and under)	2.5

160-4.1.4.3.2 Unsoaked LBR Requirements: If unsoaked LBR is desired, submit request for approval to the Engineer. Upon approval by the Engineer to consider the use of unsoaked LBR, randomly sample and test from three locations in the initial LOT for both soaked and unsoaked LBR in accordance with FM 5-515. Ensure all of the tests achieves the LBR value shown in the table below. Continue testing unsoaked LBR at the frequency shown in 160-4.4.1. Discontinue unsoaked LBR testing if any unsatisfactory QC LBR test result is obtained or resolution determines an unsatisfactory LBR.

The following unsoaked bearing value requirement is based on tests performed on samples obtained after completing mixing operations:

Specified Bearing Value	Unsoaked Bearing Value Required	Under-tolerance
LBR 40	LBR 43	0.0

160-4.1.4.4 Soil Classification and Organic Content Testing: Perform soil classification tests on the sample collected in 160-4.1.4.1, in accordance with AASHTO T88, AASHTO T89, AASHTO T90, and FM 1-T267. The Engineer may waive the soil classification and organic content testing requirements for existing base or granular subbase materials. Classify soils in accordance with AASHTO M145 to determine compliance with soil utilization requirements as specified in Standard Plans, Index 120-001. If the stabilizing material used is 100% RAP or RAP blended material, then replace FM 1-T267 with FM 5-563 (excluding gradation analysis). The following testing requirements must be met.

Test Method	Criteria
AASHTO M145	Soil Symbol = S
FM 1-T267	Average of 3 Organic Content ≤ 2.5%
	Individual Organic Content Results ≤ 4.0%
AASHTO T89	Liquid Limit ≤ 30
AASHTO T90	Plastic Index ≤ 8
FM 5-563*	Asphalt Content ≤ 4.0%
*Replace FM 1-T 267 with FM 5-563 (excluding gradation analysis) for 100% RAP or RAP blended material	

160-4.1.5 Owner Verification: Meet the requirements of 120-10.1.5 except the Engineer will conduct the Verification tests in order to accept all materials and work associated with 160-4.1.4.

160-4.1.6 Reduced Testing Frequency: Meet the requirements of 120-10.1.6.

160-4.1.7 Payment for Resolution Tests: Meet the requirements of 120-10.1.7.

160-4.2 Mixing Depth Requirements: Report depth requirements in the Earthwork Records System (ERS) measured to the nearest 0.25 inch. The difference between the individual measured depth thickness on the roadway and the plan target thickness must not exceed 2 inches. The difference between the LOT average (average of the three individual measured depth thickness) and the plan target thickness must not exceed 1 inch. No undertolerance of mixing depth is allowed.

As an exception to the above mixing requirements, where the subgrade is of rock, the Engineer may waive the mixing operations (and the work of stabilizing), and the Owner will not pay for stabilization for such sections of the roadway.

Meet the required Plan mixing-depths by measuring from the proposed final grade line. Determine test locations, including stations and offsets, using the Random Number generator approved by the Owner. Notify the Engineer a minimum of 24 hours before checking mixing depths. Record results.

160-4.3 Density Acceptance Criteria:

160-4.3.1 General: Within the entire limits of the width and depth of the areas to be stabilized, other than as provided in 160-4.3.2, obtain a minimum density at any location of 98% of the Modified Proctor maximum density as determined by FM 1-T 180.

160-4.3.2 Exceptions to Density Requirements: The Contractor need not obtain the minimum density specified in 160-4.3.1 in the upper 6 inches of areas to be grassed under the same Contract. Compact these areas to a reasonably firm condition as directed by the Engineer.

160-4.4 Additional Requirements:

160-4.4.1 Frequency: Conduct QC sampling and testing at a minimum frequency listed in the table below. The Engineer will perform Verification sampling and tests at a minimum frequency listed in the table below.

<table>
<tr><th>Test Name</th><th>Quality Control</th><th>Verification</th><th>Verification for Shoulder-Only, Shared Use Path and Sidewalk Construction</th></tr>
<tr><td>Modified Proctor Maximum Density</td><td rowspan="5">One per two consecutive LOTs</td><td rowspan="5">One per eight consecutive LOTs</td><td rowspan="5">One per four LOTs</td></tr>
<tr><td>LBR</td></tr>
<tr><td>Gradation, LL/PI, and Soil Classification</td></tr>
<tr><td>Organic Content</td></tr>
<tr><td>Asphalt Content*</td></tr>
<tr><td>Density</td><td>One per LOT</td><td>One per four LOTs</td><td>One per two LOTs</td></tr>
<tr><td>Stabilizing Mixing Depth</td><td>Three per 500 feet</td><td>Witness QC</td><td>Witness QC</td></tr>
<tr><td colspan="4">*Replace organic content with asphalt content for 100% RAP or RAP blended material only.</td></tr>
</table>

160-4.5 Verification Comparison Criteria and Resolution Procedures:

160-4.5.1 Bearing Value: The Engineer will collect a sample at a location other than the location where the sample was collected in 160-4.1.4.1, and test the stabilized subgrade for determination of the LBR in accordance with FM 5-515. The Engineer will select test locations, including stations and offsets, using a Random Number generator, based on the LOTs under consideration.

160-4.5.1.1 Unsoaked LBR: The Engineer will sample and test the initial LOT for one soaked and one unsoaked LBR if consideration of the unsoaked LBR has been approved.

160-4.5.1.2 Resolution Procedure: If the Owner's Verification test meets the requirements of 160-4.1.4.3, the Engineer will accept the corresponding LOTs. Otherwise, the Engineer will collect an additional sample in the same LOT the Verification sample was obtained. SMO or an AASHTO accredited laboratory designated by SMO will perform Resolution testing on the additional sample. The material will be sampled and tested in accordance with FM 5-515.

If the resolution testing results meet the requirements of 1604.1.4.3, then the Engineer will accept the LOTs in question. Otherwise reprocess the corresponding LOTs in accordance with 160-3 and retest in accordance with 160-4.1.4.3.

160-4.5.2 Modified Proctor Maximum Density Determination: Meet the requirements of 120-10.4.1 except replace FM 1-T099 with FM 1-T180.

160-4.5.3 Density Testing: Meet the requirement of 120-10.4.2

160-4.5.4 Soil Classification: Meet the requirements of 120-10.4.3 with the exception that the limits will be in accordance with 160-4.1.4.4.

160-4.5.5 Organic Content: Meet the requirements of 120-10.4.4 with the exception that the limits will be in accordance with 160-4.1.4.4.

160-4.5.6 Asphalt Content: If the material used to stabilize is 100% RAP or RAP blended material, meet the requirement of 120-10.4.4, except replace FM 1-T267 with FM 5-563 (exclude gradation analysis) and meet the limits of 160-4.1.4.4.

160-4.5.7 Mixing Depth: The Engineer will witness the Contractor's mixing depth checks to ensure compliance with 160-4.2. The Engineer will select test locations, including stations and offsets, using a Random Number generator. The Owner will witness the mixing depth checks.

1. If the depth checks meet the requirements of 160-4.2, the Engineer will accept that 500-foot section.

2. If the depth checks confirm shallow depth, re-mix the 500-foot section to an appropriate depth and re-measure in accordance with 160-4.2. The Engineer will repeat the witness process.

3. If the depth checks confirm extra deep mixing, conduct an additional QC density test after compaction for the bottom 12 inches of the subgrade for that 500-foot section in addition to a QC density test for the top 12 inches. The additional density test must meet the requirements of 160-4.3.

160-4.6 Disposition of Defective Materials: Meet the requirements of 120-10.5.

160-5 Method of Measurement.
The quantity to be paid for will be the plan quantity, in square yards, completed and accepted.

160-6 Basis of Payment.
Price and payment will constitute full compensation for all work and materials specified in this Section, including furnishing, spreading and mixing of all stabilizing material required and any reprocessing of stabilization areas necessary to attain the specified bearing value. The Owner will make full payment for any areas where the existing subgrade materials meet the design bearing value requirements without the addition of stabilizing additives, as well as areas where the Contractor may elect to place select high-bearing materials from other sources within the limits of the stabilizing. If the item of borrow excavation is included in the Contract, any stabilizing materials obtained from designated borrow areas will be included in the pay quantity for borrow excavation.

Payment will be made under:

Item 160-1	12” Stabilized Subgrade- Field Office	-per Square Yard (SY)
Item 160-2	12” Stabilized Subgrade- Maint. Bldg.	-per Square Yard (SY)

END OF SECTION 160

SECTION 285

OPTIONAL BASE COURSE

285-1 Description.
Construct a base course composed of one of the optional materials shown on the typical cross-sections.

285-2 Materials.
Meet the material requirements as specified in the Section covering the particular type of base to be constructed.

Graded Aggregate	Section 204
Asphalt	Section 234
Reclaimed Asphalt Pavement (RAP)*	Section 283
Limerock	Section 911
Shell Base	Section 911
Shell-Rock	Section 911
Cemented Coquina	Section 911
Recycled Concrete Aggregate (RCA)**	Section 911

* Only for use on non-limited access paved shoulders, shared use paths, or other non-traffic bearing applications.
** Do not use on interstate roadways.

285-3 Selection of Base Option.
The Plans will include typical cross-sections indicating the various types of base construction (material and thickness) allowable. When base options are specified in the Plans, use only those options.

When base options are not specified, select one base option as allowed for each typical cross-section shown in the Plans. Only one base option is permitted for each typical cross-section. See Tables 285-1 and 285-2 for optional base materials, thickness and additional restrictions.

Notify the Engineer in writing of the base option selected for each typical cross-section at least 45 calendar days prior to beginning placement of base material.

Table 285-1: Optional Base Groups 1 through 7							
	Base Group (Base Group Pay Item)						
Base Materials	1 (701)	2 (702)	3 (703)	4 (704)	5 (705)	6 (706)	7 (707)
Limerock, LBR 100	4”	5”	5 ½”	6”	7”	8”	8 ½”
Cemented Coquina, LBR 100	4”	5”	5 ½”	6”	7”	8”	8 ½”
Shell Rock, LBR 100	4”	5”	5 ½”	6”	7”	8”	8 ½”
Bank Run Shell, LBR 100	4”	5”	5 ½”	6”	7”	8”	8 ½”
Recycled Concrete Aggregate LBR 150[(1)]	4”	5”	5 ½”	6”	7”	8”	8 ½”
Graded Aggregate Base, LBR 100	4 ½”	5 ½”	6 ½”	7 ½”	8 ½”	9”	10”
Type B-12.5	4”[(3)]	4”[(3)]	4”[(3)]	4”[(3)]	4 ½”	5”	5 ½”
B-12.5 and 4” Granular Subbase, LBR 100[(2)]	-	-	-	-	-	-	-
RAP Base[(4)]	5”[(4)]	-	-	-	-	-	-

[(1)] Do not use on interstate roadways

[(2)] The construction of both the subbase and Type B-12.5 will be bid and used as Optional Base. Granular subbases include limerock, cemented coquina, shell rock, bank run shell, recycled concrete aggregate and graded aggregate base. All subbase thicknesses are 4” minimum.

[(3)] Based on minimum practical thickness.

[(4)] Only for use on non-limited access paved shoulders, shared use paths, or other non-traffic bearing applications.

[(5)] To be used for widening, three feet or less.

Table 285-1 (continued): Optional Base Groups 8 through 15

Base Materials	Base Group (Base Group Pay Item) 8 (708)	9 (709)	10 (710)	11 (711)	12 (712)	13 (713)	14 (714)	15 (715)
Limerock, LBR 100	9 ½"	10"	11"	12"	12 ½"	13 ½"[5]	14"[5]	-
Cemented Coquina, LBR 100	9 ½"	10"	11"	12"	12 ½"	13 ½"[5]	14"[5]	-
Shell Rock, LBR 100	9 ½"	10"	11"	12"	12 ½"	13 ½"[5]	14"[5]	-
Bank Run Shell, LBR 100	9 ½"	10"	11"	12"	12 ½"	13 ½"[5]	14"[5]	-
Recycled Concrete Aggregate LBR 150[1]	9 ½"	10"	11"	12"	12 ½"	13 ½"[5]	14"[5]	-
Graded Aggregate Base, LBR 100	11"	12"	13"	14"	-	-	-	-
Type B-12.5	5 ½"	6"	6 ½"	7"	7 ½"	8"	8 ½"	9"
B-12.5 and 4" Granular Subbase, LBR 100[2]	-	4"	4 ½"	5"	5 ½"	6"	6 ½"	7"
RAP Base[4]	-	-	-	-	-	-	-	-

[1] Do not use on interstate roadways

[2] The construction of both the subbase and Type B-12.5 will be bid and used as Optional Base. Granular subbases include limerock, cemented coquina, shell rock, bank run shell, recycled concrete aggregate and graded aggregate base. All subbase thicknesses are 4" minimum.

[3] Based on minimum practical thickness.

[4] Only for use on non-limited access paved shoulders, shared use paths, or other non-traffic bearing applications.

[5] To be used for widening, three feet or less.

Table 285-2: Limited Use Optional Base Groups[1]

Base Materials	Base Group (Base Group Pay Item) 1 (701)	2 (702)	3 (703)	4 (704)	5 (705)	6 (706)	7 (707)	8 (708)
Limerock Stabilized, LBR 70	5"	6 ½"	8"	9"	10"	11"	12 ½"	-
Shell, LBR 70	5"	6 ½"	8"	9"	10"	11"	12 ½"	-
Shell Stabilized, LBR 70	7"	8 ½"	9 ½"	10 ½"	12"	-	-	-
Sand-Clay, LBR 75	5"	6 ½"	8"	9"	10"	11"	12 ½"	-
Soil Cement (300 psi (Plant Mixed)	5"	5 ½"	6 ½"	7 ½"	8 ½"	9"	10"	11"
Soil Cement (300 psi) (Road Mixed)	5"	5 ½"	6 ½"	7 ½"	8 ½"	-	-	-
Soil Cement (500 psi) (Plant Mixed)	4"[2]	4"	5"	5 ½"	6"	7"	7 ½"	8 ½"

[1] Use only when specified in the Plans

[2] Based on minimum practical thicknesses.

285-4 Construction Requirements.
Construct the base in accordance with the Section covering the particular type of base to be constructed.

Graded Aggregate	Section 204
Asphalt	Section 234
Reclaimed Asphalt Pavement (RAP)*	Section 283
Limerock	Section 200
Shell Base	Section 200
Shell Rock	Section 200
Cemented Coquina	Section 200
Recycled Concrete Aggregate (RCA)**	Section 200

*Only for use on non-limited access paved shoulders, shared use paths, or other non-traffic bearing applications.
**Do not use on interstate roadways.

285-5 Variation in Earthwork Quantities.
The Plans will identify the optional materials used by the Owner for determining the earthwork quantities (Roadway Excavation, Borrow Excavation, Subsoil Excavation, Subsoil Earthwork, or Embankment). The Owner will not revise the quantities, for those items having final pay based on plan quantity, to reflect any volumetric change caused by the Contractor's selection of a different optional material.

285-6 Thickness Requirements.

285-6.1 Measurements: For non-asphalt bases, meet the requirements of 200-7.3.1.2. For subbases, meet the thickness requirements of 290-4. The Engineer will determine the thickness of asphalt base courses in accordance with 234-8.1.

285-6.2 Correction of Deficient Areas: For non-asphalt bases, correct all areas of the completed base having a deficiency in thickness in excess of 1/2 inch by scarifying and adding additional base material. As an exception, if authorized by the Engineer, such areas may be left in place without correction and with no payment.

For asphalt bases, correct all areas of deficient thickness in accordance with 234-8.

285-7 Calculation of Average Thickness of Base.
For bases that are not mixed in place, the Engineer will determine the average thickness from the measurements specified in 285-6.1, calculated as follows:

1. When the measured thickness is more than 1/2 inch greater than the design thickness shown on the typical cross-section in the Plans, it will be considered as the design thickness plus 1/2 inch.

2. Average thickness will be calculated per typical cross-section for the entire job as a unit.

3. Any areas of base left in place with no payment will not be included in the calculations.

4. Where it is not possible through borings to distinguish the base materials from the underlying materials, the thickness of the base used in the measurement will be the design thickness.

5. For Superpave asphalt base course, the average spread rate of each course shall be constructed in compliance with 234-8.

285-8 Method of Measurement.
The quantity to be paid for will be the plan quantity area in square yards, omitting any areas where under-thickness is in excess of the allowable tolerance as specified in 285-6. The pay area will be the surface area, determined as provided above, adjusted in accordance with the following formula:

$$Pay\ Area = Surface\ Area\left(\frac{Calculated\ Average\ Thickness\ per\ 285\text{–}7}{Plan\ Thickness}\right)$$

The pay area shall not exceed 105% of the surface area.

There will be no adjustment of the pay area on the basis of thickness for base courses constructed utilizing mixed-in-place operations.

For Superpave asphalt base course, the quantity to be paid for will be the plan quantity area in square yards. The pay area will be adjusted in accordance with 234-9.

285-9 Basis of Payment.
Price and payment will be full compensation for all work specified in this Section, including tack coat between base layers, prime coat, cover material for prime coat, bituminous material used in bituminous plant mix, and cement used in soil-cement.

For superpave asphalt base course, a pay adjustment based upon the quality of the material will be applied in accordance with 334-8.

Where the Plans include a typical cross-section which requires the construction of an asphalt base only, price adjustments for bituminous material provided for in 9-2.1.2 will apply to that typical cross-section. For typical cross-sections which permit the use of asphalt or other materials for construction of an optional base, price adjustments for bituminous material provided for in 9-2.1.2 will not apply.

Payment will be made under:

Item 285-1	6” Base Course	-per Square Yard (SY)
Item 285-2	8” Graded Aggregate	-per Square Yard (SY)

END OF SECTION 285

SECTION 334

SUPERPAVE ASPHALT CONCRETE

334-1 Description.

334-1.1 General: Construct a Superpave Asphalt Concrete pavement with the type of mixture specified in the Contract Documents, or when offered as alternates, as selected. Superpave mixes are identified as Type SP-9.5, Type SP-12.5 or Type SP-19.0.

Producers must meet the requirements of Section 320 for plant and equipment and the general construction requirements of Section 330.

334-1.2 Traffic Levels: The requirements for Type SP Asphalt Concrete mixtures are based on the design traffic level of the project. The traffic levels for the project are as specified in the Contract Documents.

334-1.3 Gradation Classification: The Superpave mixes are classified as fine and are defined in 334-3.2.2.

The equivalent AASHTO nominal maximum aggregate size Superpave mixes are as follows:

Type SP-9.5 ..... 9.5 mm
Type SP-12.5 ..... 12.5 mm
Type SP-19.0 ..... 19.0 mm

334-1.4 Thickness: The total thickness of the Type SP asphalt layers will be the plan thickness as shown in the Contract Documents. Before paving, propose a thickness for each individual layer meeting the requirements of this specification, which when combined with other layers (as applicable) will equal the plan thickness. For construction purposes, the plan thickness and individual layer thickness will be converted to spread rate based on the maximum specific gravity of the asphalt mix being used, as well as the minimum density level, as shown in the following equation:

$$Spread\ rate\ \left(\frac{lbs}{yd^2}\right) = t * G_{mm} * 43.3$$

Where: t = Thickness (in.) (plan thickness or individual layer thickness)
G_{mm} = Maximum specific gravity from the verified mix design

The weight of the mixture shall be determined as provided in 320-3.2. For target purposes only, spread rate calculations should be rounded to the nearest whole number.

Note: Plan quantities are based on a G_{mm} of 2.540, corresponding to a spread rate of 110 lbs/yd^2-in. Pay quantities will be based on the actual maximum specific gravity of the mix being used.

334-1.4.1 Layer Thicknesses: The allowable layer thicknesses for Type SP Asphalt Concrete mixtures are as follows:

Type SP-9.5 ..... 1 to 1-1/2 inches
Type SP-12.5 ..... 1-1/2 to 2-1/2 inches
Type SP-19.0 ..... 2 to 4 inches

In addition to the minimum and maximum thickness requirements, the following restrictions are placed on mixes when used as a structural course:

Type SP-9.5 - Limited to the top two structural layers, two layers maximum.

Type SP-9.5 – Do not use on Traffic Level D and E applications.

Type SP-19.0 - Do not use in the final (top) structural layer below FC-5 mixtures. Type SP-19.0 mixtures are permissible in the layer directly below FC-9.5 and FC-12.5 mixtures. Do not use in the final (top) layer of shoulders.

334-1.4.2 Additional Requirements: The following requirements also apply to Type SP Asphalt Concrete mixtures:

1. A minimum 1-1/2 inch initial lift is required over an Asphalt Membrane Interlayer (AMI).

2. When construction includes the paving of adjacent shoulders (less than or equal to 5 feet wide), the layer thickness for the upper pavement layer and shoulder must be the same and paved in a single pass, unless called for differently in the Contract Documents.

3. All overbuild layers must be Type SP Asphalt Concrete designed at the traffic level as stated in the Contract Documents. Use the minimum and maximum layer thicknesses as specified above unless called for differently in the Contract Documents. On variable thickness overbuild layers, the minimum and maximum allowable thicknesses will be as specified below, unless called for differently in the Contract Documents.

   Type SP-9.5 ..... 3/8 to 2 inches
   Type SP-12.5 ..... 1/2 to 3 inches
   Type SP-19.0 ..... 1-1/2 to 4 inches

4. Variable thickness overbuild layers constructed using a Type SP-9.5 or SP-12.5 mixtures may be tapered to zero thickness provided the contract documents require a minimum of 1-1/2 inches of dense-graded mix placed over the variable thickness overbuild layer.

334-2 Materials.

334-2.1 General Requirements: Meet the material requirements specified in Division III. Specific references are as follows:

Superpave PG Asphalt Binder .....Section 916
Coarse Aggregate .....Section 901
Fine Aggregate .....Section 902

334-2.2 Superpave Asphalt Binder: Unless specified otherwise in the Contract Documents, use an asphalt binder grade as determined from Table 334-1.

334-2.3 Reclaimed Asphalt Pavement (RAP) Material:

334-2.3.1 General requirements: RAP may be used as a component of the asphalt mixture subject to the following requirements:

1. When using a PG 76-22 asphalt binder, limit the amount of RAP material used in the mix to a maximum of 20% by weight of total aggregate. As an exception, amounts greater than 20% RAP by weight of total aggregate can be used if no more than 20% by weight of the total asphalt binder comes from the RAP material. RAP is not allowed in mixtures containing High Polymer asphalt binder. High Polymer asphalt is defined in Section 916.

2. Assume full responsibility for the design, production and construction of asphalt mixes which incorporate RAP as a component material.

3. Provide stockpiled RAP material that is reasonably consistent in characteristics and contains no aggregate particles which are soft or conglomerates of fines.

4. Provide RAP material having a minimum average asphalt binder content of 4.0% by weight of RAP. As an exception, when using fractionated RAP, the minimum average asphalt binder content for the coarse portion of the RAP shall be 2.5% by weight of the coarse portion of the RAP. The coarse portion of the RAP shall be the portion of the RAP retained on the No. 4 sieve. The Engineer may sample the stockpiles to verify that this requirement is met.

334-2.3.2 Material Characterization for Mix Design: Assume responsibility for establishing the asphalt binder content, gradation, and bulk specific gravity (G_{sb}) of the RAP material based on a representative sampling of the material by roadway cores or stockpile samples. For roadway core samples, assume responsibility for the degradation that will occur during the milling operation.

334-2.3.3 RAP Stockpile Approval: Prior to the incorporation of RAP into the asphalt mixture, stockpile the RAP material and obtain approval for the stockpile by one of the following methods:

1. Continuous stockpile: When RAP is obtained from one or multiple sources and is either processed, blended, or fractionated, and stockpiled in a continuous manner, assure an adequate number of test results are obtained for stockpile approval. Test the RAP material for gradation and asphalt content at a minimum frequency of one sample per 1000 tons with a minimum of six test results. Test the RAP material for G_{mm} (for G_{sb} determination) at a minimum frequency of one sample per 5000 tons with a minimum of two test results. Based on visual inspection and a review of the test data, the Engineer will determine the suitability of the stockpiled material. In addition, address the details and specifics of the processing, sampling, testing and actions to be taken in the Producer Quality Control (QC) Plan.

2. Non-continuous single stockpile: When an individual stockpile is being constructed, obtain representative samples at random locations and test the RAP material for gradation and asphalt content at a minimum frequency of one sample per 1000 tons with a minimum of six test results. Test the RAP material for G_{mm} (for G_{sb} determination) at a minimum frequency of one sample per 5000 tons with a minimum of two test results. Based on visual inspection and a review of the test data, the Engineer will determine the suitability of the stockpiled material. Once the RAP stockpile has been approved, do not add additional material without prior approval of the Engineer.

   Determine the asphalt binder content and gradation of the RAP material in accordance with FM 5-563 and FM 1-T 030, respectively. Establish the G_{sb} of the RAP material by using one of the following methods:

a. Calculate the G_{sb} value based upon the effective specific gravity (G_{se}) of the RAP material, determined on the basis of the asphalt binder content and maximum specific gravity (G_{mm}) of the RAP material. The Engineer will approve the estimated asphalt binder absorption value used in the calculation.

b. Measure the G_{sb} of the RAP aggregate, in accordance with FM 1-T 084 and FM 1-T 085. Obtain the aggregate by using a solvent extraction method.

334-2.3.4 Pavement Coring Report: When the Contract includes milling of the existing asphalt pavement, the Pavement Coring Report may be available on the FDOT's website.

334-2.3.5 Asphalt Binder for Mixes with RAP: Select the appropriate asphalt binder grade based on Table 334-1. Obtain a sample of the mixture for the Engineer within the first 1,000 tons of production and at a continuing frequency of one sample per 4,000 tons of mix. The Engineer reserves the right to change the asphalt binder grade at design based on the characteristics of the RAP asphalt binder, and reserves the right to make changes during production.

Table 334-1
Asphalt Binder Grade for Mixes Containing RAP

Percent RAP	Asphalt Binder Grade
0-15	PG 67-22
16-30	PG 58-22
>30	PG 52-28

334-2.4 Recycled Crushed Glass: Recycled crushed glass may be used as a component of the asphalt mixture subject to the following requirements:

1. Consider the recycled crushed glass a local material and meet all requirements specified in 902-6.

2. Limit the amount of recycled crushed glass to a maximum of 15% by weight of total aggregate.

3. Use an asphalt binder that contains a minimum of 0.5% anti-stripping agent by weight of binder. The anti-strip additive shall be one of the products listed on the Approved Product List (APL). The anti-strip additive shall be introduced into the asphalt binder by the supplier during loading.

4. Do not use recycled crushed glass in friction course mixtures or in structural course mixtures which are to be used as the final wearing surface.

334-3 General Composition of Mixture.

334-3.1 General: Compose the asphalt mixture using a combination of aggregate (coarse, fine or mixtures thereof), mineral filler, if required, and asphalt binder material. Size, grade and combine the aggregate fractions to meet the grading and physical properties of the mix design. Aggregates from various sources may be combined.

334-3.2 Mix Design:

334-3.2.1 General: Design the asphalt mixture in accordance with AASHTO R 35-12, except as noted herein. Prior to the production of any asphalt mixture, submit the proposed mix design with supporting test data indicating compliance with all mix design criteria to the Engineer. For Traffic

Level B through E mix designs, include representative samples of all component materials, including asphalt binder. Allow the Director of the Office of Materials a maximum of four weeks to either conditionally verify or reject the mix as designed.

For a Traffic Level A mixture, meet the mix design criteria for a Traffic Level B mixture and for a Traffic Level D mixture meet the mix design criteria for a Traffic Level E mixture. In addition, a Type SP mix one traffic level higher than the traffic level specified in the Contract Documents may be substituted, at no cost to the Owner. Based on the previous conditions, the following substitutions are allowed:

Traffic Level E can be substituted for Traffic Level D.

Traffic Level D or E can be substituted for Traffic Level C.

Traffic Level C can be substituted for Traffic Level B.

Traffic Level B or C can be substituted for Traffic Level A.

The same traffic level and binder type that is used for the mainline traffic lanes may be placed in the shoulder at no additional cost to the Owner, even if the conditions stated above are not met for the shoulder.

Do not use more than four mix designs per nominal maximum aggregate size per traffic level per binder grade per year, where the year starts at the Notice to Proceed. Exceeding this limitation will result in a maximum Composite Pay Factor (CPF) of 1.00 as defined in 334-8.2 for all designs used beyond this limit.

Warm mix technologies (additives, foaming techniques, etc.) listed on the FDOT's website may be used in the production of the mix. The URL for obtaining this information, if available, is: http://www.fdot.gov/materials/mac/production/warmmixasphalt/

When warm mix technologies are used, for mixtures containing a PG 52-28, PG 58-22, or PG 67-22 binder, a mixture will be considered a warm mix asphalt design if the mixing temperature is 285°F or less. For mixtures containing a PG 76-22 or High Polymer binder, a mixture will be considered a warm mix asphalt design if the mixing temperature is 305°F or less.

The Engineer will consider any marked variations from original test data for a mix design or any evidence of inadequate field performance of a mix design as sufficient evidence that the properties of the mix design have changed, and the Engineer will no longer allow the use of the mix design.

334-3.2.2 Mixture Gradation Requirements: Combine the coarse and fine aggregate in proportions that will produce an asphalt mixture meeting all of the requirements defined in this specification and conform to the gradation requirements at design as defined in AASHTO M 323-12, Table 3. Aggregates from various sources may be combined.

334-3.2.2.1 Mixture Gradation Classification: Plot the combined mixture gradation on an FHWA 0.45 Power Gradation Chart. Include the Control Points from AASHTO M 323-12, Table-3, as well as the Primary Control Sieve (PCS) Control Point from AASHTO M 323-12, Table 4.

Fine mixes are defined as having a gradation that passes above the primary control sieve control point and above the maximum density line for all sieve sizes smaller than the primary control sieve and larger than the No. 100 sieve.

334-3.2.3 Aggregate Consensus Properties: For Traffic Level C through E mixtures, meet the following consensus properties at design for the aggregate blend. Aggregate consensus properties do not apply to Traffic Level A and B mixtures.

334-3.2.3.1 Coarse Aggregate Angularity: When tested in accordance with ASTM D 5821-01 (2006), meet the percentage of fractured faces requirements specified in AASHTO M 323-12, Table 5.

334-3.2.3.2 Fine Aggregate Angularity: When tested in accordance with AASHTO T 304-11, Method A, meet the uncompacted void content of fine aggregate specified in AASHTO M 323-12, Table 5.

334-3.2.3.3 Flat and Elongated Particles: When tested in accordance with ASTM D 4791-10, (with the exception that the material passing the 3/8 inch sieve and retained on the No. 4 sieve shall be included), meet the requirements specified in AASHTO M 323-12, Table 5. Measure the aggregate using the ratio of 5:1, comparing the length (longest dimension) to the thickness (shortest dimension) of the aggregate particles.

334-3.2.3.4 Sand Equivalent: When tested in accordance with AASHTO T 176-08, meet the sand equivalent requirements specified in AASHTO M 323-12, Table 5.

334-3.2.4 Gyratory Compaction: Compact the design mixture in accordance with AASHTO T 312-12, with the following exception: use the number of gyrations at N_{design} as defined in Table 334-2. Measure the inside diameter of gyratory molds in accordance with AASHTO T 312-12.

Table 334-2
Gyratory Compaction Requirements

Traffic Level	N_{design} Number of Gyrations
A	50
B	65
C	75
D	100
E	100

334-3.2.5 Design Criteria: Meet the requirements for nominal maximum aggregate size as defined in AASHTO M 323-12, as well as for relative density, VMA, VFA, and dust-to-binder ratio as specified in AASHTO M 323-12, Table 6. $N_{initial}$ and $N_{maximum}$ requirements are not applicable.

334-3.2.6 Moisture Susceptibility: For all traffic levels, use a liquid anti-strip agent listed on the APL at the specified dosage rate. Hydrated lime may be used instead of the liquid anti-strip agent.

Provide a mixture having a retained tensile strength ratio of at least 0.80 and a minimum tensile strength (unconditioned) of 100 psi.

334-3.2.7 Additional Information: In addition to the requirements listed above, provide the following information with each proposed mix design submitted for verification:

1. The design traffic level and the design number of gyrations (N_{design}).

2. The source and description of the materials to be used.

3. The source and product code of the aggregate components furnished from a source.

4. The gradation and proportions of the raw materials as intended to be combined in the paving mixture. The gradation of the component materials shall be representative of the material at the time of use. Compensate for any change in aggregate gradation caused by handling and processing as necessary.

5. A single percentage of the combined mineral aggregate passing each specified sieve. Degradation of the aggregate due to processing (particularly material passing the No. 200 sieve) should be accounted for and identified.

6. The bulk specific gravity (G_{sb}) value for each individual aggregate and RAP component, as identified in the FDOT's aggregate control program.

7. A single percentage of asphalt binder by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%.

8. A target temperature for the mixture at the plant (mixing temperature) and a target temperature for the mixture at the roadway (compaction temperature) in accordance with 320-6.3. Do not exceed a target temperature of 340°F for High Polymer asphalt binder, 330°F for PG 76-22 asphalt binders, and 315°F for unmodified asphalt binders.

9. Provide the physical properties achieved at four different asphalt binder contents. One of which must be at the optimum asphalt content, and must conform to all specified physical requirements.

10. The name of the Construction Training Qualification Program (CTQP) Qualified Mix Designer.

11. The ignition oven calibration factor.

12. The warm mix technology, if used.

334-3.3 Mix Design Revisions: During production, the Contractor may request a target value revision to a mix design, subject to meeting the following requirements: the target change falls within the limits defined in Table 334-3, appropriate data exists demonstrating that the mix complies with production air voids specification criteria, and the mixture gradation meets the basic gradation requirements defined in 334-3.2.2.

Table 334-3 Limits for Potential Adjustments to Mix Design Target Values	
Characteristic	Limit from Original Mix Design
No. 8 sieve and Coarser	± 5.0%
No. 16 sieve	± 4.0%
No. 30 sieve	± 4.0%
No. 50 sieve	± 3.0%
No. 100 sieve	± 3.0%
No. 200 sieve	± 1.0%
Asphalt Binder Content (1)	± 0.3%
Each Component of Aggregate Blend (2)	± 5.0%
(1) Reductions to the asphalt binder content will not be permitted if the VMA during production is lower than 1.0% below the design criteria. (2) Revisions to FC-5 mixtures to be determined by the Engineer.	

Submit all requests for revisions to mix designs, along with supporting documentation, to the Engineer. In order to expedite the revision process, the request for revision or discussions on the possibility of a revision may be made verbally, but must be followed up by a written request. The verified mix design will remain in effect until the Engineer authorizes a change. In no case will the effective date of the revision be established earlier than the date of the first communication between the Contractor and the Engineer regarding the revision.

A new design mix will be required if aggregate sources change, or for any substitution of an aggregate product with a different aggregate code, unless approved by the Engineer.

334-4 Producer Process Control (PC).

Assume full responsibility for controlling all operations and processes such that the requirements of these Specifications are met at all times. Perform any tests necessary at the plant and roadway for process control purposes. Enter all PC test data into the FDOT's database. The Engineer will not use these test results in the acceptance payment decision.

Address in the Producer QC Plan how PC failures will be handled. When a PC failure occurs, investigate, at a minimum, the production process, testing equipment and/or sampling methods to determine the cause of the failure, and make any necessary changes to assure compliance with these Specifications. Obtain a follow up sample immediately after corrective actions are taken to assess the adequacy of the corrections. In the event the follow-up PC sample also fails to meet Specification requirements, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the QC Manager.

334-5 Acceptance of the Mixture.

334-5.1 General: The mixture will be accepted at the plant with respect to gradation (P-8 and P-200), asphalt content (Pb), and volumetrics (volumetrics is defined as air voids at N_{design}). The mixture will be accepted on the roadway with respect to density of roadway cores. Acceptance will be on a LOT by LOT basis (for each mix design) based on tests of random samples obtained within each sublot taken at a frequency of one set of samples per sublot. A roadway LOT and a plant production LOT shall be the same. Acceptance of the mixture will be based on Contractor QC test results that have been verified by the Owner.

334-5.1.1 Sampling and Testing Requirements: Obtain the samples in accordance with FM 1-T 168. Obtain samples at the plant of a sufficient quantity to be split into three smaller samples; one for QC, one for Verification testing and one for Resolution testing; each sample at approximately 35 pounds. The split samples for Verification testing and Resolution testing shall be reduced in size and stored in three boxes each. The approximate size of each box must be 12 inches x 8 inches x 4 inches. Provide, label and safely store sample boxes in a manner agreed upon by the Engineer for future testing.

The asphalt content of the mixture will be determined in accordance with FM 5-563. The gradation of the recovered aggregate will be determined in accordance with FM 1-T 030. Volumetric testing will be in accordance with AASHTO T 312-12and FM 1-T 209. Prior to testing volumetric samples, condition the test-sized sample for one hour, plus or minus five minutes, at the target roadway compaction temperature in a shallow, flat pan, such that the mixture temperature at the end of the one hour conditioning period is within plus or minus 20°F of the roadway compaction temperature. Test for roadway density in accordance with FM 1-T 166.

334-5.1.2 Acceptance Testing Exceptions: When the total combined quantity of hot mix asphalt for the project, as indicated in the Plans for Type SP and Type FC mixtures only, is less than 2000 tons, the Engineer will accept the mix on the basis of visual inspection. The Engineer may require the Contractor to run process control tests for informational purposes, as defined in 334-4, or may run independent verification tests to determine the acceptability of the material.

Density testing for acceptance will not be performed on widening strips or shoulders with a width of 5 feet or less, open-graded friction courses, variable thickness overbuild courses, leveling courses, any asphalt layer placed on subgrade (regardless of type), miscellaneous asphalt pavement, shared use paths, crossovers, gore areas, or any course with a specified thickness less than 1 inch or a specified spread rate that converts to less than 1 inch as described in 334-1.4. Density testing for acceptance will not be performed on asphalt courses placed on bridge decks or approach slabs; compact these courses in static mode only per the requirements of 330-7.7. In addition, density testing for acceptance will not be performed on the following areas when they are less than 500 feet (continuous) in length: turning lanes, acceleration lanes, deceleration lanes, shoulders, parallel parking lanes or ramps. Do not perform density testing for acceptance in situations where the areas requiring density testing is less than 50 tons within a sublot.

Density testing for acceptance will not be performed in intersections. The limits of the intersection will be from stop bar to stop bar for both the mainline and side streets. A random core location that occurs within the intersection shall be moved forward or backward from the intersection at the direction of the Engineer.

Where density testing for acceptance is not required, compact these courses (with the exception of open-graded friction courses) in accordance with the rolling procedure (equipment and pattern) as approved by the Engineer or with Standard Rolling Procedure as specified in 330-7.2. In the event that the rolling procedure deviates from the procedure approved by the Engineer, or the Standard Rolling Procedure, placement of the mix shall be stopped.

The density pay factor (as defined in 334-8.2) for areas not requiring density testing for acceptance will be paid at the same density pay factor as for the areas requiring density testing within the same LOT. If the entire LOT does not require density testing for acceptance, the LOT will be paid at a density pay factor of 1.00.

334-5.2 Full LOTs: Each LOT will be defined (as selected by the Contractor prior to the start of the LOT) as either (1) 2,000 tons, with each LOT subdivided into four equal sublots of 500 tons each, or (2) 4,000 tons, with each LOT subdivided into four equal sublots of 1,000 tons each. As an exception to this, the initial LOT of all new mix designs shall be defined as 2,000 tons, subdivided into four equal sublots of 500 tons each. Before the beginning of a LOT, the Engineer will develop a random sampling plan for each sublot and direct the Contractor on sample points, based on tonnage, for each sublot during construction.

334-5.3 Partial LOTs: A partial LOT is defined as a LOT size that is less than a full LOT. A partial LOT may occur due to the following:

1. The completion of a given mix type or mix design on a project.

2. Closure of the LOT due to time. LOTs will be closed 30 calendar days after the start of the LOT. Time periods other than 30 calendar days may be used if agreed to by both the Engineer and the Contractor, but under no circumstances shall the LOT be left open longer than 60 days.

3. A LOT is terminated per 334-5.4.4.

All partial LOTs will be evaluated based on the number of tests available, and will not be redefined. If a LOT is closed before the first plant random sample is obtained, then the LOT will be visually accepted by the Engineer and the LOT pay factor will be 1.00.

334-5.4 QC Sampling and Testing: Obtain all samples randomly as directed by the Engineer.

Should the Engineer determine that the QC requirements are not being met or that unsatisfactory results are being obtained, or should any instances of falsification of test data occur, acceptance of the Producer's QC Plan will be suspended and production will be stopped.

334-5.4.1 Lost or Missing Verification/Resolution Samples: In the event that any of the Verification and/or Resolution asphalt mixture samples that are in the custody of the Contractor are lost, damaged, destroyed, or are otherwise unavailable for testing, the minimum possible pay factor for each quality characteristic as described in 334-8.2 will be applied to the entire LOT in question, unless called for otherwise by the Engineer. Specifically, if the LOT in question has more than two sublots, the pay factor for each quality characteristic will be 0.55. If the LOT has two or less sublots, the pay factor for each quality characteristic will be 0.80. If only the roadway cores are lost, damaged, destroyed, or are otherwise unavailable for testing, then the minimum possible pay factor for density will be applied to the entire LOT in question. In either event, the material in question will also be evaluated in accordance with 334-5.9.5.

If any of the Verification and/or Resolution samples that are in the custody of the Owner are lost, damaged, destroyed or are otherwise unavailable for testing, the corresponding QC test result will be considered verified, and payment will be based upon the Contractor's data.

334-5.4.2 Plant Sampling and Testing Requirements: Obtain one random sample of mix per sublot in accordance with 334-5.1.1 as directed by the Engineer. Test the QC split sample for gradation, asphalt binder content and volumetrics in accordance with 334-5.1.1. Complete all QC testing within one working day from the time the samples were obtained.

334-5.4.3 Roadway Sampling and Testing Requirements: Obtain five 6-inch diameter roadway cores within 24 hours of placement at random locations as directed by the Engineer within each sublot. Test these QC samples for density (G_{mb}) in accordance with 334-5.1.1. Obtain a minimum of three cores per sublot at random locations as identified by the Engineer in situations where the sublot/LOT was closed or terminated before the random numbers were reached or where it is impractical to cut five cores per sublot. Do not obtain cores any closer than 12 inches from an unsupported edge. The Engineer may adjust randomly generated core locations for safety purposes or as the Engineer deems necessary. Do not perform density testing for acceptance in a sublot if the plant random sample for that sublot has not been obtained. Maintain traffic during the coring operation; core the roadway, patch the core holes (within three days of coring); and trim the cores to the proper thickness prior to density testing.

Density for the sublot shall be based on the average value for the cores cut from the sublot with the target density being a percentage of the maximum specific gravity (G_{mm}) of the sublot, as defined in the Contract. Once the average density of a sublot has been determined, do not retest the samples unless approved by the Engineer. Ensure proper handling and storage of all cores until the LOT in question has been accepted.

334-5.4.4 Individual Test Tolerances for QC Testing: Terminate the LOT if any of the following QC failures occur:

1. An individual test result of a sublot for air voids does not meet the requirements of Table 334-4,

2. The average sublot density does not meet the requirements of Table 334-4,

3. Two consecutive test results within the same LOT for gradation or asphalt binder content do not meet the requirements of Table 334-4,

When a LOT is terminated due to a QC failure, stop production of the mixture until the problem is resolved to the satisfaction of the QC Manager and/or Asphalt Plant Level II technician responsible for the decision to resume production after a QC failure, as identified in Section 105. In the event that it can be demonstrated that the problem can immediately be or already has been resolved, it will not be necessary to stop production. When a LOT is terminated, make all necessary changes to correct the problem. Do not resume production until appropriate corrections have been made. Prior to resuming production, inform the Engineer of the problem and corrections made to correct the problem. After resuming production, sample and test the material to verify that the changes have corrected the problem. Summarize this information and provide it to the Engineer prior to the end of the work shift when production resumes.

In the event that a QC failure is not addressed as defined above, the Engineer's approval will be required prior to resuming production after any future QC failures.

Address any material represented by a failing test result, as defined above in this subarticle, in accordance with 334-5.9.5. Any LOT terminated under this subarticle will be limited to a maximum Pay Factor of 1.00 (as defined in 334-8.2) for all quality characteristics and will include all material placed up to the point when the LOT was terminated.

In the event that a G_{mm} test result differs by more than 0.040 from the mix design G_{mm}, investigate the causes of the discrepancy and report the findings and proposed actions to the Engineer.

Table 334-4 Master Production Range	
Characteristic	Tolerance [1]
Asphalt Binder Content (%)	Target ± 0.55
Passing No. 200 Sieve (%)	Target ± 1.50
Air Voids (%)	2.30 – 6.00
Density (minimum % G_{mm}) [2]	89.50
[1] Tolerances for sample size of n=1 from the verified mix design [2] Based on average of 5 randomly located cores	

334-5.5 Verification Testing: In order to determine the validity of the Contractor's QC test results prior to their use in the Acceptance decision, the Engineer will run verification tests.

334-5.5.1 Plant Testing: At the completion of each LOT, the Engineer will test a minimum of one Verification split sample randomly selected from the LOT. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed. Verification samples shall be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. In lieu of the 1-1/2 hours reheating procedure, the mixture may be reheated to within plus or minus 20°F of the roadway compaction temperature using a microwave oven. Stir the mixture as necessary during the reheating process to maintain temperature uniformity. Subsequently, condition and test the mixture as described in 334-5.1.1.

The Verification test results will be compared with the QC test results based on the between-laboratory precision values shown in Table 334-5.

Table 334-5 Between-Laboratory Precision Values	
Property	Maximum Difference
G_{mm}	0.016
G_{mb} (gyratory compacted samples)	0.022
G_{mb} (roadway cores)	0.014
P_b	0.44%
P_{-200}	FM 1-T 030 (Figure 2)
P_{-8}	FM 1-T 030 (Figure 2)

If all of the specified mix characteristics compare favorably, then the LOT will be accepted, with payment based on the Contractor's QC test data for the LOT.

If any of the results do not compare favorably, then the Resolution samples from the LOT will be sent to the Resolution laboratory for testing, as described in 3345.6.

334-5.5.2 Roadway Testing: At the completion of each LOT, the Engineer will determine the density (G_{mb}) of each core (previously tested by QC) as described in 334-5.1.1 from the same sublot as the plant samples. For situations where roadway density is not required for the random

sublot chosen, then another sublot shall be randomly chosen for roadway density cores only. Results of the testing and analysis for the LOT will be made available to the Contractor within one working day from the time the LOT is completed.

The individual Verification test results will be compared with individual QC test results by the Engineer based on the between-laboratory precision values given in Table 334-5.

If each of the core test results compare favorably, then the LOT will be accepted with respect to density, with payment based on the Contractor's QC test data for the LOT.

If any of the results do not compare favorably, then the core samples from the LOT will be sent to the Resolution laboratory for testing as specified in 334-5.6.

334-5.6 Resolution System:

334-5.6.1 Plant Samples: In the event of an unfavorable comparison between the Contractor's QC test results and the Engineer's Verification test results on any of the properties identified in Table 334-5, the Resolution laboratory will test all of the split samples from the LOT for only the property (or properties) in question. Resolution samples shall be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. In lieu of the 11/2 hours reheating procedure, the mixture may be reheated to within plus or minus 20°F of the roadway compaction temperature using a microwave oven. Stir the mixture as necessary during the reheating process to maintain temperature uniformity. Subsequently, condition and test the mixture as described in 334-5.1.1.

334-5.6.2 Roadway Samples: In the event of an unfavorable comparison between the Contractor's QC test data and the Engineer's Verification test data on the density results, the Resolution laboratory will test all of the cores from the LOT. Testing will be as described in 3345.1.1.

334-5.6.3 Resolution Determination: The Resolution test results (for the property or properties in question) will be compared with the QC test results based on the between-laboratory precision values shown in Table 334-5.

If the Resolution test results compare favorably with all of the QC results, then acceptance and payment for the LOT will be based on the QC results, and the Owner will bear the costs associated with Resolution testing. No additional compensation, either monetary or time, will be made for the impacts of any such testing.

If the Resolution test results do not compare favorably with all of the QC results, then acceptance and payment for the LOT will be based on the Resolution test data for the LOT, and the costs of the Resolution testing will be deducted from monthly estimates. No additional time will be granted for the impacts of any such testing.

In addition, the material failure requirements of 334-5.4.4 apply to the Resolution test data. Address any material represented by the failing test results in accordance with 334-5.9.5. For this situation, the LOT will be limited to a maximum Pay Factor of 1.00 (as defined in 334-8.2) for all quality characteristics.

In the event of an unfavorable comparison between the Resolution test results and QC test results, make the necessary adjustments to assure that future comparisons are favorable.

334-5.7 Independent Verification (IV) Testing:

334-5.7.1 Plant: The Contractor shall provide sample boxes and take samples as directed by the Engineer for IV testing. Obtain enough material for three complete sets of tests (two samples for IV testing by the Engineer and one sample for testing by the Contractor). If agreed upon by both the Engineer and the Contractor, only one sample for IV testing by the Engineer may be obtained. IV samples will be reheated at the target roadway compaction temperature for 1-1/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. The Contractor's split sample, if tested immediately after sampling, shall be reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. If the Contractor's sample is not tested immediately after sampling, then the sample shall be reheated at the target roadway compaction temperature for 11/2 hours, plus or minus 5 minutes, reduced to the appropriate testing size, and conditioned and tested as described in 334-5.1.1. For the IV and Contractor's samples, in lieu of the 1-1/2 hours reheating procedure, the mixture may be reheated to within plus or minus 20°F of the roadway compaction temperature using a microwave oven. Stir the mixture as necessary during the reheating process to maintain temperature uniformity. Subsequently, condition and test the mixture as described in 334-5.1.1. The Contractor's test results shall be provided to the Engineer within one working day from the time the sample was obtained.

If any of the IV test results do not meet the requirements of Table 334-4, then a comparison of the IV test results and the Contractor's test results, if available, will be made. If a comparison of the IV test results and the Contractor's test results meets the precision values of Table 334-5 for the material properties in question, or if the Contractor's test results are not available, then the IV test results are considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.9.5.

If a comparison of the IV test results and the Contractor's test results does not meet the precision values of Table 334-5 for the material properties in question, then the second IV sample shall be tested by the Engineer for the material properties in question. If a comparison between the first and second IV test results does not meet the precision values of Table 334-5 for the material properties in question, then the first IV test results are considered unverified for the material properties in question and no action shall be taken.

If a comparison between the first and second IV test results meets the precision values of Table 334-5 for the material properties in question, then the first IV sample is considered verified and the Contractor shall cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Address any material represented by the failing test results in accordance with 334-5.9.5.

The Engineer has the option to use the IV sample for comparison testing as specified in 334-6.

334-5.7.2 Roadway: Obtain five 6-inch diameter roadway cores within 24 hours of placement, as directed by the Engineer, for IV testing. In situations where it is impractical to cut five cores per sublot, obtain a minimum of three cores per sublot at random locations, as identified by the Engineer. These independent cores will be obtained from the same LOTs and sublots as the Independent Verification Plant samples, or as directed by the Engineer. The density of these cores will be obtained as described in 334-5.1.1. If the average of the results for the sublot does not meet the requirements of Table 334-4 for density, then a comparison of the IV G_{mm} test results and the Contractor's G_{mm} test results, if available, will be made in accordance with the procedure provided in 334-5.7.1. Address any material represented by the failing test results in accordance with 334-5.9.5.

334-5.8 Surface Tolerance: The asphalt mixture will be accepted on the roadway with respect to surface tolerance in accordance with the applicable requirements of 330-9.

334-5.9 Minimum Acceptable Quality Levels:

334-5.9.1 PFs Below 0.90: In the event that an individual pay factor for any quality characteristic of a LOT falls below 0.90, take steps to correct the situation and report the actions to the Engineer. In the event that the pay factor for the same quality characteristic for two consecutive LOTs is below 0.90, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.2 CPFs Less Than 0.90 and Greater Than or Equal to 0.80: If the composite pay factor for the LOT is less than 0.90 and greater than or equal to 0.80, cease production of the asphalt mixture until the problem is adequately resolved (to the satisfaction of the Engineer), unless it can be demonstrated to the satisfaction of the Engineer that the problem can immediately be (or already has been) resolved. Actions taken must be approved by the Engineer before production resumes.

334-5.9.3 CPFs Less Than 0.80 and Greater Than or Equal to 0.75: If the CPF for the LOT is less than 0.80 and greater than or equal to 0.75, address the defective material in accordance with 334-5.9.5.

334-5.9.4 CPFs Less Than 0.75: If the CPF for the LOT is less than 0.75, remove and replace the defective LOT at no cost to the Owner, or as approved by the Engineer.

334-5.9.5 Defective Material: Assume responsibility for removing and replacing all defective material placed on the project, at no cost to the Owner.

As an exception to the above and upon approval of the Engineer, obtain an engineering analysis in accordance with Section 6 by an independent laboratory (as approved by the Engineer) to determine the disposition of the material. The engineering analysis must be signed and sealed by a Professional Engineer licensed in the State of Florida.

The Engineer may determine that an engineering analysis is not necessary or may perform an engineering analysis to determine the disposition of the material.

Any material that remains in place will be accepted with a CPF as determined by 334-8, or as determined by the Engineer.

If the defective material is due to a gradation, asphalt binder content or density failure, upon the approval of the Engineer the Contractor may perform delineation tests on roadway cores in lieu of an engineering analysis to determine the limits of the defective material that may require removal and replacement. Prior to any delineation testing, all sampling locations shall be approved by the Engineer. All delineation sampling and testing shall be monitored and verified by the Engineer. For materials that are defective due to air voids, an engineering analysis is required.

When evaluating defective material by engineering analysis or delineation testing, at a minimum, evaluate all material located between passing QC, PC or IV test results. Exceptions to this requirement shall be approved by the Engineer.

334-6 Comparison Testing.
At the start of the project (unless waived by the Engineer) and at other times as determined necessary by the Engineer, provide split samples for comparison testing with the Engineer. The purpose of these tests is to verify that the testing equipment is functioning properly and that the testing procedures are being performed correctly. In the event that the Engineer determines that there is a problem with the Contractor's testing equipment and/or testing procedures, immediately correct the problem to the Engineer's satisfaction. In the event that the problem is not immediately corrected, cease production of the asphalt mixture until the problem is adequately resolved to the satisfaction of the Engineer.

If so agreed to by both the Contractor and the Engineer, the split sample used for comparison testing may also be used for the QC sample. The split sample used for comparison testing must also meet the requirements for IV testing described in 334-5.7.

334-7 Method of Measurement.
For pavement repair/replacement work specified in the drawings, the quantity to be paid for will be the square yards of pavement installed at the minimum thicknesses specified in the drawings and meeting the minimum density requirements specified for the required pavement components, including surface course, base course, and subgrade.

The bid price for the asphalt mix will include the cost of the liquid asphalt and the tack coat application as directed in 300-8. There will be no separate payment or unit price adjustment for the asphalt binder material in the asphalt mix.

Prepare and submit a Certification of Quantities to the Engineer in accordance with 92.1.2.

334-8 Basis of Payment.

334-8.1 General: 334-8.1 General: Price and payment will be full compensation for all the work specified under this Section (including the applicable requirements of Sections 320 and 330). For materials accepted in accordance with 334-5, based upon the quality of the material, a pay adjustment will be applied to the bid price of the material as determined on a LOT by LOT basis. The pay adjustment will be assessed by calculating a Pay Factor for the following individual quality characteristics: pavement density, air voids, asphalt binder content, and the percentage passing the No. 200 and No. 8 sieves. The pay adjustment will be computed by multiplying a Composite Pay Factor (CPF) for the LOT by the bid price per ton.

334-8.2 Pay Factors:

334-8.2.1 Partial LOTs: For Partial LOTs where no random sample is obtained due to insufficient tonnage, a CPF of 1.00 shall be applied.

334-8.2.2 Two or Less Sublot Test Results: In the event that two or less sublot test results are available for a LOT, Pay Factors will be determined based on Table 334-6, using the average of the accumulated deviations from the target value. (Except for density, deviations are absolute values with no plus or minus signs.) Use the 1-Test column when there is only one sublot test result and use the 2-Tests column when there are two sublots.

Table 334-6
Small Quantity Pay Table

Pay Factor	1 Sublot Test Deviation	2 Sublot Test Average Deviation
Asphalt Binder Content		
1.05	0.00-0.23	0.00-0.16
1.00	0.24-0.45	0.17-0.32
0.90	0.46-0.55	0.33-0.39
0.80	>0.55	>0.39
No.8 Sieve		
1.05	0.00-2.25	0.00-1.59
1.00	2.26-4.50	1.60-3.18
0.90	4.51-5.50	3.19-3.89
0.80	>5.50	>3.89
No. 200 Sieve		
1.05	0.00-0.55	0.00-0.39
1.00	0.56-1.10	0.40-0.78
0.90	1.11-1.50	0.79-1.06
0.80	>1.50	>1.06
Air Voids		
1.05	0.00-0.50	0.00-0.35
1.00	0.51-1.00	0.36-0.71
0.90	1.01-1.70	0.72-1.20
0.80	1.71-2.00	1.21-1.41
0.70	2.01-2.50	1.42-1.77
0.55	>2.50	>1.77
Density[(1)]		
1.05	+(0.00-2.00),-(0.00-0.50)	+(0.00-1.40),-(0.00-0.35)
1.00	+(2.01-3.00), (0.51-1.00)	+(1.41-2.10), (0.36-0.71)
Table 334-6 Small Quantity Pay Table		
0.95	+(3.01-3.50),-(1.01-2.00)	+(2.11-2.80), (0.72-1.41)
0.90	+(3.51-4.00),(2.01-3.00)	+(2.81-3.50),(1.42-2.12)
0.80	+(>4.00), (>3.00)	+(>3.50),(>2.12)

[(1)] Each density test result is the average of five cores. The target density is 93.00 percent of G_{mm} (92.00 percent when compaction is limited to the static mode or for layers specified to be one inch thick). When compaction is limited to the static mode, no vibratory mode in the vertical direction will be allowed. Other vibratory modes will be allowed, if approved by the Engineer. In this case, the target density is 92.00 percent of G_{mm}.

334-8.2.3 Three or More Sublot Test Results: When three or more sublot test results are available for a LOT, the variability-unknown, standard deviation method will be used to determine the

estimated percentage of the LOT that is within the specification limits. The number of significant figures used in the calculations will be in accordance with requirements of AASHTO R11-06, Absolute Method.

334-8.2.3.1 Percent Within Limits: The percent within limits (PWL) and Pay Factors for the LOT will be calculated as described below. Variables used in the calculations are as follows:

x = individual test value (sublot)
n = number of tests (sublots)
s = sample standard deviation
$\Sigma(x^2)$ = summation of squares of individual test values
$(\Sigma x)^2$ = summation of individual test values squared
Q_u = upper quality index
USL = upper specification limit (target value plus upper specification limit from Table 334-7)
Q_L = lower quality index
LSL = lower specification limit (target value minus lower specification limit from Table 334-7)
P_U = estimated percentage below the USL
P_L = estimated percentage above the LSL

1. Calculate the arithmetic mean ($\bar{X}$)of the test values:

$$\bar{X} = \frac{\sum x}{n}$$

2. Calculate the sample standard deviation (s)

$$s = \sqrt{\frac{n\sum(x^2)-(\sum x)^2}{n(n-1)}}$$

3. Calculate the upper quality index (Q_U):

$$Q_U = \frac{USL-\bar{X}}{s}$$

4. Calculate the lower quality index (Q_L):

$$Q_L = \frac{\bar{X}-LSL}{s}$$

5. From Table 334-8, determine the percentage of work below the USL (PU).

6. From Table 334-8, determine percentage of work above the LSL (PL) Note: If USL or LSL is not specified; percentages within (USL or LSL) will be 100.

7. If QU or QL is a negative number, then calculate the percent within limits for QU or QL as follows: enter Table 334-8 with the positive value of QU or QL and obtain the corresponding percent within limits for the proper sample size. Subtract this number from 100.00. The resulting number is the value to be used in the next step (Step 8) for the calculation of quality level.

8. Calculate the percent within limits $(PWL) = (PU + PL) - 100$

9. Calculate the Pay Factor (PF) for each quality characteristic using the equation given in 334-8.2.3.2.

Table 334-7 Specification Limits	
Quality Characteristic	Specification Limits
Passing No. 8 sieve (percent)	Target ± 3.1
Passing No. 200 sieve (percent)	Target ± 1.0
Asphalt Content (percent)	Target ± 0.40
Air Voids (percent)	4.00 ± 1.20
Density, vibratory mode (percent of G_{mm}):	93.00 +2.00, -1.20
Density, static mode (percent of G_{mm}):	92.00 + 3.00, -1.50 (1)
(1) No vibratory mode in the vertical direction will be allowed. Other vibratory modes will be allowed, if approved by the Engineer)	

Table 334-8 Percent Within Limits				
Quality Index	Percent within Limits for Selected Sample Size			
	n=3	n=4	n=5	n=6
0.00	50.00	50.00	50.00	50.00
0.05	51.38	51.67	51.78	51.84
0.10	52.76	53.33	53.56	53.67
0.15	54.15	55.00	55.33	55.50
0.20	55.54	56.67	57.10	57.32
0.25	56.95	58.33	58.87	59.14
0.30	58.37	60.00	60.63	60.94
0.35	59.80	61.67	62.38	62.73
0.40	61.26	63.33	64.12	64.51
0.45	62.74	65.00	65.84	66.27
0.50	64.25	66.67	67.56	68.00
0.55	65.80	68.33	69.26	69.72
0.60	67.39	70.00	70.95	71.41
0.65	69.03	71.67	72.61	73.08
0.70	70.73	73.33	74.26	74.71
0.75	72.50	75.00	75.89	76.32
0.80	74.36	76.67	77.49	77.89
0.85	76.33	78.33	79.07	79.43
0.90	78.45	80.00	80.62	80.93
0.95	80.75	81.67	82.14	82.39

Table 334-8 Percent Within Limits				
Quality Index	Percent within Limits for Selected Sample Size			
	n=3	n=4	n=5	n=6
1.00	83.33	83.33	83.64	83.80
1.05	86.34	85.00	85.09	85.18
1.10	90.16	86.67	86.52	86.50
1.15	97.13	88.33	87.90	87.78
1.20	100.00	90.00	89.24	89.01
1.25	100.00	91.67	90.54	90.19
1.30	100.00	93.33	91.79	91.31
1.35	100.00	95.00	92.98	92.37
1.40	100.00	96.67	94.12	93.37
1.45	100.00	98.33	95.19	94.32
1.50	100.00	100.00	96.20	95.19
1.55	100.00	100.00	97.13	96.00
1.60	100.00	100.00	97.97	96.75
1.65	100.00	100.00	98.72	97.42
1.70	100.00	100.00	99.34	98.02
1.75	100.00	100.00	99.81	98.55
1.80	100.00	100.00	100.00	98.99
1.85	100.00	100.00	100.00	99.36
1.90	100.00	100.00	100.00	99.65
1.95	100.00	100.00	100.00	99.85
2.00	100.00	100.00	100.00	99.97
2.05	100.00	100.00	100.00	100.00
2.10	100.00	100.00	100.00	100.00
2.15	100.00	100.00	100.00	100.00
2.20	100.00	100.00	100.00	100.00
2.25	100.00	100.00	100.00	100.00
2.30	100.00	100.00	100.00	100.00
2.35	100.00	100.00	100.00	100.00
2.40	100.00	100.00	100.00	100.00
2.45	100.00	100.00	100.00	100.00
2.50	100.00	100.00	100.00	100.00
2.55	100.00	100.00	100.00	100.00
2.60	100.00	100.00	100.00	100.00
2.65	100.00	100.00	100.00	100.00

334-8.2.3.2 Pay Factors (PF): Pay Factors will be calculated by using the following equation:

$$Pay\ Factor\ = \frac{55 + 0.5 \times PWL}{100}$$

The PWL is determined from Step (8) of 334-8.2.3.1.

334-8.3 Composite Pay Factor (CPF): A CPF for the LOT will be calculated based on the individual PFs with the following weighting applied: 40% Density (D), 25% Air Voids (Va), 20% asphalt binder content (Pb), 10% Passing No. 200 (P-200) and 5% Passing No. 8 (P-8). Calculate the CPF by using the following formula:

$$CPF = 0.400 \times PF\ D + 0.250 \times PF\ V_a + 0.200 \times PF\ P_b + 0.100 \times PF\ P_{-200} + 0.050 \times PF\ P_{-8}$$

Where the PF for each quality characteristic is determined in either 334-8.2.2 or 334-8.2.3, depending on the number of sublot tests. Note that the number after each multiplication will be rounded to the nearest 0.01.

The pay adjustment shall be computed by multiplying the CPF for the LOT by the bid price per ton.

334-8.4 Payment: Payment will be made under:

Item 334-1	1” Bituminous Surface Course	-per Ton (TN)
Item 334-2	2” Bituminous Surface Course	-per Ton (TN)

END OF SECTION 334

SECTION 346

PORTLAND CEMENT CONCRETE

346-1 Description.
Use concrete composed of a mixture of portland cement, aggregate, water, and, where specified, admixtures, and other cementitious materials. Deliver the portland cement concrete to the site of placement in a freshly mixed, unhardened state.

Obtain concrete from a plant that is currently on the Florida Department of Transportation's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105. If the concrete production facility's Quality Control (QC) Plan is suspended, the Contractor is solely responsible to obtain the services of another concrete production facility with an accepted QC Plan or await the reacceptance of the affected concrete production facility's QC Plan prior to the placement of any further concrete on the project. There will be no changes in the Contract Time or completion dates. Bear all delay costs and other costs associated with the concrete production facility's QC Plan acceptance or reacceptance.

346-2 Materials.

346-2.1 General: Meet the following requirements:

Coarse Aggregate	Section 901
Fine Aggregate*	Section 902
Portland Cement	Section 921
Water	Section 923
Admixtures**	Section 924
Pozzolans and Slag	Section 929

*Use only silica sand except as provided in 902-5.2.3.
**Use products listed on the Florida Department of Transportation's Approved Product List (APL).

Do not use materials containing hard lumps, crusts or frozen matter, or that is contaminated with dissimilar material in excess of that specified in the above listed Sections.

346-2.2 Types of Cement: Unless a specific type of cement is designated elsewhere, use Type I, Type IL, Type IP, Type IS, Type II, Type II (MH) or Type III cement in all classes of concrete. Use Type IL or Type II (MH) for all mass concrete elements.

Do not use high alkali cement in extremely aggressive environments or in mass concrete. Use only the types of cements designated for each environmental condition in structural concrete as shown in Table 1. A mix design for a more aggressive environment may be used in a less aggressive environmental condition.

TABLE 1 – Cement Use by Environmental Classification			
Component	Slightly Aggressive Environment	Moderately Aggressive Environment	Extremely Aggressive Environment(1)
Bridge Superstructures			
Precast Superstructure and Prestressed Elements	Type I or Type III	Type I, Type IL, Type II, Type III, Type IP, or Type IS	Type II (MH), Type IL, Type III(2) or Ternary Blend
Cast in Place	Type I	Type I, Type IL, Type II, Type IP, or Type IS	Type II (MH), Type IL, or Ternary Blend
Bridge Substructures, Drainage Structures, and other Structures			
All Elements	Type I or Type III	Type I, Type IL, Type II, Type IP, or Type IS	Type II (MH), Type IL, or Ternary Blend

Notes:
1. Cements used in a more aggressive environment may also be used in a less aggressive environment.
2. Type III cement may be used in an Extremely Aggressive Environment for precast superstructure and prestressed elements when the ambient temperature at the time of concrete placement is 60°F and below.

346-2.3 Pozzolans and Slag: Fly ash or slag materials are required in all classes of concrete except for the following when used in slightly aggressive environments:

Class I 3,000 psi, Class I 3,000 psi (Pavement), and Class II 3400 psi . The quantity of portland cement replaced with supplemental cementitious materials must be on an equal weight replacement basis of the total cementitious materials with the limitations, shown in Table 2.

Table 2 – Cementitious Materials Concrete Mix Proportions (%) (Environmental exposures are extremely aggressive, unless otherwise noted.)						
Application	Portland Cement	Fly Ash Type F	Slag	Highly Reactive Pozzolans		
				Silica Fume	Metakaolin	Ultra-Fine Fly Ash
General Use	70-82	18-30				
	66-78	15-25		7-9		
	66-78	15-25			8-12	
	66-78	15-25				8-12
	30-40	10-20	50-60			
	30-75(1)		25-70(1)			
	30-50		50-70			
	36-43		50-55	7-9		
	33-42		50-55		8-12	
	33-42		50-55			8-12

Table 2 – Cementitious Materials Concrete Mix Proportions (%)
(Environmental exposures are extremely aggressive, unless otherwise noted.)

Application	Portland Cement	Fly Ash Type F	Slag	Highly Reactive Pozzolans		
				Silica Fume	Metakaolin	Ultra-Fine Fly Ash
Precast Prestressed	70-85[1]	15-30[1]				
	70-82	18-30				
	66-78	15-25		7-9		
	66-78	15-25			8-12	
	66-78	15-25				8-12
	30-40	10-20	50-60			
	30-50		50-70			
	36-43		50-55	7-9		
	33-42		50-55		8-12	
	33-42		50-55			8-12
Drilled Shaft	63-67	33-37				
	38-42		58-62			
	30-40	10-20	50-60			
Mass Concrete	50-82[2]	18-50[2]				
	50-65[3]	35-50[3]				
	66-78	15-25		7-9		
	66-78	15-25			8-12	
	66-78	15-25				8-12
	30-40	10-20	50-60			
	30-50		50-70			
	36-43		50-55	7-9		
	33-42		50-55		8-12	
	33-42		50-55			8-12

[1] Slightly Aggressive and Moderately Aggressive environments.
[2] For Concrete with Core Temperature T≤165°F.
[3] For Concrete with Core Temperature T≥165°F.
[4] Highly reactive pozzolans may be used below the specified ranges to enhance strength and workability. Testing in accordance with AASHTO T358 is not required.

346-2.4 Coarse Aggregate Gradation: Produce all concrete using Size No. 57, 67 or 78 coarse aggregate. With the Engineer's approval and input from the District Materials Office with Producer QC Plan acceptance authority, Size No. 8, Size No. 89, or other gradations may be used either alone or blended with Size No. 57, 67 or 78 coarse aggregate. Submit sufficient statistical data to establish production quality and uniformity of the subject aggregates, and establish the quality and uniformity of the resultant concrete. Furnish aggregate gradations sized larger than nominal maximum size of 1.5 inch as two components.

For concrete Class I and Class II, excluding Class II (Bridge Deck), the coarse and fine aggregate gradation requirements set forth in Sections 901 and 902 are not applicable and the aggregates may be blended; however, the aggregate sources must be approved by the Engineer. Do not blend the aggregate if the size is smaller than Size No. 78.

346-2.5 Admixtures: Use admixtures in accordance with the requirements of this subarticle. Chemical admixtures not covered in this subarticle may be approved by the Engineer. Submit statistical evidence supporting successful laboratory and field trial mixes which demonstrate improved concrete quality or handling characteristics.

Use admixtures in accordance with the manufacturer's recommended dosage rate. Dosage rates outside of this range may be used with written recommendation from the admixture producer's technical representative. Do not use admixtures or additives containing calcium chloride, either in the raw materials or introduced during the manufacturing process, in reinforced concrete.

346-2.5.1 Water-Reducer/Water-Reducer Retardant Admixtures: When a water-reducing admixture is used, meet the requirements of a Type A. When a water-reducing and retarding admixture is used, meet the requirements of a Type D.

346-2.5.2 Air Entrainment Admixtures: Use an air entraining admixture in all concrete mixes except counterweight and dry cast concrete. For precast concrete products, the use of air entraining admixture is optional for Class I and Class II concrete.

346-2.5.3 High Range Water-Reducing Admixtures:

346-2.5.3.1 General: When a high range water-reducing admixture is used, meet the requirements of a Type F or Type I. When a high range water-reducing and retarding admixture is used, meet the requirements of a Type G or Type II. When silica fume or metakaolin is incorporated into a concrete mix design, use a high range water-reducing admixture Type I, II, F or G.

346-2.5.3.2 Flowing Concrete Admixtures for Precast/Prestressed Concrete: Use a Type I, II, F or G admixture for producing flowing concrete. If Type F or G admixture is used, verify the distribution of aggregates in accordance with ASTM C1610 except allow for minimal vibration for consolidating the concrete. The maximum allowable difference between the static segregation is less than or equal to 15 %. Add the flowing concrete admixtures at the concrete production facility.

346-2.5.4 Corrosion Inhibitor Admixture: Use only with concrete containing Type II cement, or Type II (MH) cement, and a water-reducing retardant admixture, Type D, or high range water-reducer retarder admixture, Type G, to normalize the setting time of concrete.

346-2.5.5 Accelerating Admixture for Precast Drainage and Incidental Concrete Products: The use of non-chloride admixtures Type C or Type E is allowed in the manufacturing of precast drainage and incidental concrete products

346-2.5.6 Type S Admixtures: When a workability retention, shrinkage reducing or a rheology modifying admixture is used, meet the requirements of a Type S admixture.

346-3 Classification, Strength, Slump and Air Content.

346-3.1 General: The separate classifications of concrete covered by this Section are designated as Class I, Class II, Class III, Class IV, Class V, Class VI, and Class VII. Strength and slump are specified in Table 3. The air content for all classes of concrete is less than or equal to 6.0%.

Substitution of a higher class concrete in lieu of a lower class concrete may be allowed when the substituted concrete mixes are included as part of the QC Plan, or for precast concrete, the Precast Concrete Producer QC Plan. The substituted higher class concrete must meet or exceed the requirements of the lower class concrete and both classes must contain the same types of mix ingredients. When the compressive strength acceptance data is less than the minimum compressive strength of the higher design mix, notify the Engineer. Acceptance is based on the requirements in Table 3 for the lower class concrete. Do not place concrete with a slump more than plus or minus 1.5 inches from the target slump value specified in Table 3.

Table 3 – Concrete Class, Compressive Strength, and Slump

Class of Concrete	Specified Minimum Strength (28-day) (psi)	Target Slump Value (inches) (c)
Structural Concrete		
I[(a)]	3,000	3[(b)]
I (Pavement)	3,000	2
II[(a)]	3,400	3[(b)]
II (Bridge Deck)	4,500	3[(b)]
III[(e)]	5,000	3[(b)]
III (Seal)	3,000	8
IV[(d)(f)]	5,500	3[(b)]
IV (Drilled Shaft)	4,000	8.5
V (Special)[(d)(f)]	6,000	3[(b)]
V[(d)(f)]	6,500	3[(b)]
VI[(d)(f)]	8,500	3[(b)]
VII[(d)(f)]	10,000	3[(b)]

[(a)] For precast three-sided culverts, box culverts, endwalls, inlets, manholes and junction boxes, the target slump value and air content will not apply. The maximum allowable slump is 6 inches, except as noted in (b). The Contractor is permitted to use concrete meeting the requirements of ASTM C478 4,000 psi in lieu of Class I or Class II concrete for precast endwalls, inlets, manholes and junction boxes.

[(b)] The Engineer may allow a maximum target slump of 7 inches when a Type F, G, I or II admixture is used. When flowing concrete is used, the target slump is 9 inches.

[(c)] For a reduction in the target slump for slip-form operations, submit a revision to the mix design to the Engineer. The target slump for slip-form mix is 1.50 inches.

[(d)] When silica fume, ultrafine fly ash, metakaolin, or a ternary blend cement is used in Class IV, Class V, Class V (Special), Class VI, or Class VII concrete, ensure that the concrete meets or exceeds a resistivity of 29 KOhm-cm at 28 days, when tested in accordance with AASHTO T358. Submit three 4 x 8 inch cylindrical test specimens to the Engineer for resistivity testing before mix design approval. Take the resistivity test specimens from the concrete of the laboratory trial batch or from the field trial batch of at least 3 cubic yards. Verify the mix proportioning of the design mix and take representative samples of trial batch concrete for the required plastic and hardened property tests. Cure the field trial batch specimens similar to the standard laboratory curing methods. Submit the resistivity test specimens at least 7 calendar days prior to the scheduled 28 day test. The average resistivity of the three cylinders, eight readings per cylinder, is an indicator of the permeability of the concrete mix.

[(e)] When precast three-sided culverts, box culverts, endwalls, inlets, manholes or junction boxes require a Class III concrete, the minimum cementitious materials is 470 pounds per cubic yard. Do not apply the air content range and the maximum target slump shall be 6 inches, except as allowed in (b).

[(f)] Highly reactive pozzolans may be used outside the lower specified ranges to enhance strength and workability. Testing in accordance with AASHTO T358 is not required.

346-3.2 Drilled Shaft Concrete: Notify the Engineer at least 48 hours before placing drilled shaft concrete. Obtain slump loss tests results demonstrating that the drilled shaft concrete maintains a slump of at least 5 inches throughout the concrete elapsed time before drilled shaft concrete operations begin. Ambient temperature conditions for placement of drilled shaft concrete for summer condition is 85°F or higher, and below 85°F for normal condition.

Perform the slump loss test at the anticipated ambient temperature for drilled shaft placements greater than 30 cubic yards and an elapsed time of greater than five hours.

Obtain slump loss test results from an approved laboratory or from a field demonstration. Slump loss test results for drilled shafts requiring 30 cubic yards of concrete or less and a maximum elapsed time of five hours or less may be done in a laboratory. Obtain all other slump loss test results in the field. Technicians performing the slump test must be ACI Field Grade I qualified.

The concrete elapsed time is defined in Section 455. Obtain the Engineer's approval for use of slump loss test results including elapsed time before concrete placement begins.

Test each load of concrete for slump to ensure the slump is within the limits of this Section. Initially cure acceptance cylinders for 48 hours before transporting to the laboratory.

If the elapsed time during placement exceeds the slump loss test data, submit an Engineering Analysis Scope in accordance with 6-4 by a Specialty Engineer knowledgeable in the area of foundations, to determine if the shaft is structurally sound and free from voids. At the direction of the Engineer, excavate the drilled shaft for inspection. Obtain approval from the Engineer before placing any additional shafts.

346-3.3 Mass Concrete: When mass concrete is designated in the Contract Documents, use a Specialty Engineer to develop and administer a Mass Concrete Control Plan (MCCP).

Develop the MCCP in accordance with section 207 of the ACI Manual of Concrete Practice to ensure concrete core temperatures for any mass concrete element do not exceed the maximum allowable core temperature of 180°F and that the temperature differential between the element core and surface do not exceed the maximum allowable temperature differential of 35°F. Submit the MCCP to the Engineer for approval at least 14 days prior to the first anticipated mass concrete placement. Ensure the MCCP includes and fully describes the following:

1. The Financial Project Identification Number (FPID).

2. Contact names and numbers for project information.

3. Names and qualifications of all designees who will inspect the installation of and record the output of temperature measuring devices, and who will implement temperature control measures directed by the Specialty Engineer.

4. The number, type, and dimensions of each mass concrete element to be constructed.

5. A sequential ID number assigned to each element indicating bridge number, element type, element size, element location.

6. The concrete mix design number used to construct each element.

7. Indicate which mass concrete elements will be monitored, or will be candidates for reduced or omitted monitoring.

8. Casting procedures,

9. Insulating systems,

10. Type and placement of temperature measuring and recording devices, as well as any remote monitoring devices and software.

11. Analysis of anticipated thermal developments for the various mass concrete elements for all anticipated ambient temperature ranges.

12. Measures to prevent thermal shock.

13. Active cooling measures, if used.

Fully comply with the approved MCCP. The Specialty Engineer or approved designee shall personally inspect and approve the installation of temperature measuring devices and verify that the process for recording temperature readings is effective for the first placement of each size and type mass component. The Specialty Engineer shall be available for immediate consultation during the monitoring period of any mass concrete element. Record temperature measuring device readings at intervals no greater than six hours, beginning at the completion of concrete placement and continuing until decreasing core temperatures and temperature differentials are confirmed in accordance with the approved MCCP. Leave temperature control mechanisms in place until the concrete core temperature is within 50°F of the ambient temperature. Within three days of the completion of temperature monitoring, submit a report to the Engineer which includes all temperature readings, temperature differentials, data logger summary sheets and the maximum core temperature and temperature differentials for each mass concrete element.

Upon successful performance of the MCCP, reduced monitoring of similar elements may be requested. Submit any such requests to the Engineer for approval at least

14 days prior to the requested date of reduced monitoring. If approved, the Specialty Engineer may monitor only the initial element of concrete elements meeting all of the following requirements:

1. All elements have the same least cross sectional dimension,

2. All elements have the same concrete mix design,

3. All elements have the same insulation R value and active cooling measures (if used), and

4. Ambient temperatures during concrete placement for all elements is within minus 10°F or plus 5°F of the ambient temperature during placement of the initial element.

Install temperature measuring devices for all mass concrete elements. Resume the recording of temperature monitoring device output for all elements if directed by the Engineer. The Owner will make

no compensation, either monetary or time, for any impacts associated with reduced monitoring of mass concrete elements.

Mass concrete control provisions are not required for drilled shafts supporting sign, signal, lighting or intelligent transportation (ITS) structures. At the Contractor's option, instrumentation and temperature measuring may be omitted for any mass concrete substructure element meeting all of the following requirements:

1. Least cross sectional dimension of six feet or less,

2. Insulation R value of at least 2.5 provided for at least 72 hours following the completion of concrete placement,

3. The environmental classification of the concrete element is slightly aggressive or moderately aggressive,

4. The concrete mix design meets the mass concrete proportioning requirements of 346-2.3, and

5. The total cementitious content of the concrete mix design is 750 pounds per cubic yard less.

6. Temperature of the concrete is 95˚F or less at placement.

If either the maximum allowable core temperature or temperature differential of any mass concrete element is exceeded, implement immediate corrective action as directed by the Specialty Engineer to remediate. The approval of the MCCP shall be revoked. Do not place any mass concrete elements until a revised MCCP has been approved by the Engineer. Submit an Engineering Analysis Scope in accordance with 6-4 for approval, which addresses the structural integrity and durability of any mass concrete element which is not cast in compliance with the approved MCCP or which exceeds the allowable core temperature or temperature differential.

Submit all analyses and test results requested by the Engineer for any noncompliant mass concrete element to the satisfaction of the Engineer. The Owner will make no compensation, either monetary or time, for the analyses and tests or any impacts upon the project.

346-3.4 Flowing Concrete for Precast/Prestressed Concrete: Produce flowing concrete mix with target slump of 9 inches.

Subsequent to the laboratory trial batch, perform a field demonstration of the proposed mix design by production and placement of at least three batches, 3 cubic yards minimum size each, of concrete containing flowing concrete high range water reducing admixture. Take representative samples from each batch and perform slump, air content, density (unit weight), and temperature tests on these samples. Cast specimens from each sample for compressive strength tests to verify the design mix trial. Record the ambient air temperature during the test. Ensure that the concrete properties are within the required specification limits.

The plants that are producing concrete with batch sizes of less than 3 cubic yards are required to produce and place at least a total amount of 9 cubic yards and perform the aforementioned tests on at least three randomly selected batches.

Determine the workability of the demonstration concrete batches by performing the slump tests on the samples taken at 15 minute intervals from each batch. Continue sampling and testing until the slump measures 6 inches or less. From the plot of slump versus time, determine the time for each batch when the slump is at 7.5 inches. The shortest time period determined from three consecutive batches, at 7.5 inches slump, is considered the cutoff time of the proposed concrete mix. For production concrete, ensure that the time between the batching and depositing of each load of concrete is less than the cutoff time of the mix and also does not exceed the allowable time limit specified in this Section.

Ensure that the demonstration concrete is mixed, delivered, placed, consolidated and cured in accordance with the proposed method and sequence. Produce the flowing concrete batches at slumps between 7.5 inches to 10.5 inches.

Perform inspection of the demonstration concrete during batching, delivery, placement and post placement. During placement, ensure that the concrete batches meet all plastic property requirements of the Specifications and maintain their cohesive nature without excessive bleeding, segregation, or abnormal retardation.

Dispose of concrete produced for demonstration purposes at no expense to the Owner. Subject to the Engineer's approval, the Contractor may incorporate this concrete into non-reinforced concrete items and may be included for payment, provided it meets Contract requirements for slump, entrained air, and strength.

After removal of the forms, perform the post-placement inspection of the in-place concrete. Observe for any signs of honeycombs, cracks, aggregate segregation or any other surface defects and ensure that the hardened concrete is free from these deficiencies. The Engineer may require saw cutting of the mock-up products to verify the uniform distribution of the aggregates within the saw cut surfaces and around the reinforcing steel and prestressing strands. The Engineer will require saw cutting of the demonstration mock-up products for plants that are demonstrating the use of the flowing concrete for the first time. Obtain core samples in accordance with FM 5-617, section 7 to inspect the aggregate distribution.

Submit the results of the laboratory trial batch tests and field demonstration of verified test data and inspection reports to the Engineer, along with certification stating that the results of the laboratory trial batch tests and field demonstration tests indicate that the proposed concrete mix design meets the requirements of the specifications. For the proposed mix design, state the anticipated maximum time limit between the batching and when the concrete of each batch is deposited during the production.

Upon the review and verification of the laboratory trial batch, field demonstration test data, inspection reports and contractor's certification statement, the Engineer will approve the proposed mix design.

The Engineer may approve proposed flowing concrete mixes, centrally mixed at the placement site, without the production of demonstration batches, provided that the proposed mix meets the following two criteria:

1. A previously approved flowing concrete mix of the same class has demonstrated satisfactory performance under the proposed job placing conditions with a minimum of fifteen consecutive acceptance tests, which met all plastic and hardened concrete test requirements.

2. The cementitious materials and chemical admixtures, including the flowing concrete high range water reducing admixture, used in the proposed mix are the same materials from the same source used in the previously approved mix, (1) above.

Do not produce or place concrete until the design mixes have been approved.

346-4 Composition of Concrete.

346-4.1 Master Proportion Table: Proportion the materials used to produce the various classes of concrete in accordance with Table 4:

Table 4 – Concrete Master Proportions

Class of Concrete	Minimum Total Cementitious Materials Content pounds per cubic yard	Maximum Water to Cementitious Materials Ratio pounds per pounds*
I	470	0.53
I (Pavement)	470	0.50
II	470	0.53
II (Bridge Deck)	611	0.44
III	611	0.44
III (Seal)	611	0.53
IV	658	0.41**
IV (Drilled Shaft)	658	0.41
V (Special)	752	0.37**
V	752	0.37**
VI	752	0.37**

* The calculation of the water to cementitious materials ratio (w/cm) is based on the total cementitious material including cement and any supplemental cementitious materials that are used in the mix.

** When silica fume or metakaolin is used, the maximum water to cementitious material ratio will be 0.35. When the use of ultrafine fly ash is required, the maximum water to cementitious material ratio will be 0.30.

346-4.2 Chloride Content Limits for Concrete Construction:

346-4.2.1 General: Use the following maximum chloride content limits for the concrete application and/or exposure environment shown:

Table 5 – Chloride Content Limits for Concrete Construction

Application / Exposure Environment		Maximum Allowable Chloride Content, pounds per cubic yard
Non-Reinforced Concrete		No Test Needed
Reinforced Concrete	Slightly Aggressive Environment	0.70
	Moderately or Extremely Aggressive Environment	0.40
Prestressed Concrete		0.40

346-4.2.2 Control Level for Corrective Action: If chloride test results exceed the limits of Table 5, suspend concrete placement immediately for every mix design represented by the failing test results, until corrective measures are made. Submit an Engineering Analysis Scope in accordance with 6-4 by a Specialty Engineer knowledgeable in the areas of corrosion and corrosion control, to determine if the material meets the intended service life of the structure on all concrete produced from the mix design failing chloride test results to the previous passing test results.

346-5 Sampling and Testing Methods.
Perform concrete sampling and testing in accordance with the following methods:

Table 6 – Sampling and Testing Methods	
Description	Method
Slump of Hydraulic Cement Concrete	ASTM C143
Air Content of Freshly Mixed Concrete by the Pressure Method*	ASTM C231
Air Content of Freshly Mixed Concrete by the Volumetric Method*	ASTM C173
Making and Curing Test Specimens in the Field**	ASTM C31
Compressive Strength of Cylindrical Concrete Specimens***	ASTM C39
Obtaining and Testing Drilled Core and Sawed Beams of Concrete	ASTM C42
Initial Sampling of Concrete from Revolving Drum Truck Mixers or Agitators	FM 5-501
Low Levels of Chloride in Concrete and Raw Materials	FM 5-516
Density (Unit Weight), Yield and Air Content (Gravimetric) of Concrete	ASTM C138
Temperature of Freshly Mixed Portland Cement Concrete	ASTM C1064
Sampling Freshly Mixed Concrete****	ASTM C172
Static Segregation of Self-Consolidating Concrete using Column Techniques	ASTM C1610
Slump Flow of Self-Consolidating Concrete	ASTM C1611
Relative Viscosity of Self-Consolidating Concrete	ASTM C1611
Visual Stability Index of Self-Consolidating Concrete	ASTM C1611
Passing Ability of Self-Consolidating Concrete by J-Ring	ASTM C1621
Rapid Assessment of Static Segregation Resistance of Self-Consolidating Concrete Using Penetration Test	ASTM C1712
Aggregate Distribution of Hardened Self-Consolidating Concrete	FM 5-617
Hardened Visual Stability Index of Self-Consolidating Concrete	AASHTO R81
Fabricating Test Specimens with Self-Consolidating Concrete	ASTM C1758
Concrete Resistivity as an Electrical Indicator of its Permeability	AASHTO T358

* The Owner will use the same type of meter for Verification testing as used for QC testing. When using pressure type meters, use an aggregate correction factor determined by the concrete producer for each mix design to be tested. Record and certify test results for correction factors for each type of aggregate at the concrete production facility.

** Provide curing facilities that have the capacity to store all QC, Verification, "hold" and Independent Verification cylinders simultaneously for the initial curing. Cylinders will be delivered to the testing laboratory in their molds. The laboratory will remove the specimens from the molds and begin final curing.

*** The Verification technician will use the same size cylinders as the Quality Control technician.

**** Take the test sample from the middle portion of the batch in lieu of collecting and compositing samples from two or more portions, as described in ASTM C172.

346-6 Quality Control.

346-6.1 General: Perform QC activities to ensure materials, methods, techniques, personnel, procedures and processes utilized during production meet the specified requirements. For precast/prestressed operations, ensure that the QC testing is performed

Accept the responsibility for QC inspections on all phases of work. Ensure all materials and workmanship incorporated into the project meet the requirements of the Contract Documents.

346-6.2 Concrete Design Mix: Provide concrete that has been produced in accordance with a Engineer approved design mix, in a uniform mass free from balls and lumps.

For slump target values in excess of 6 inches or self-consolidating concrete, utilize a grate over the conveyance equipment to capture any lumps or balls that may be present in the mix. The grate must cover the entire opening of the conveyance equipment and have an opening that is a maximum of 2-1/2 inches in any one direction. Remove the lumps or balls from the grate and discard them. Discharge the concrete in a manner satisfactory to the Engineer. Perform demonstration batches to ensure complete and thorough placements in complex elements, when requested by the Engineer.

Do not place concretes of different compositions such that the plastic concretes may combine, except where the Plans require concrete with a surface resistivity value of 29 KOhm-cm or below and one with higher than 29 KOhm-cm values in a continuous placement. Produce these concretes using separate design mixes. For example, designate the mix with calcium nitrite as the original mix and the mix without calcium nitrite as the redesigned mix. Ensure that both mixes contain the same cement, fly ash or slag, coarse and fine aggregates and admixtures. Submit both mixes for approval as separate mix designs, both meeting all requirements of this Section. Ensure that the redesigned mix exhibits plastic and hardened qualities which are additionally approved by the Engineer as suitable for placement with the original mix. The Engineer will approve the redesigned mix for commingling with the original mix and for a specific project application only. Alternately, place a construction joint at the location of the change in concretes.

346-6.3 Delivery Certification: Ensure that an electronic delivery ticket is furnished with each batch of concrete before unloading at the placement site. The delivery ticket may be proprietary software or in the form of an electronic spreadsheet, but shall be printed. Ensure that the materials and quantities incorporated into the batch of concrete are printed on the delivery ticket. Include the following information on the delivery ticket:

1. Arrival time at jobsite,

2. Time that concrete mix has been completely discharged,

3. Number of revolutions upon arrival at the jobsite,

4. Total gallons of water added at the jobsite,

5. Additional mixing revolutions when water is added,

6. Total number of revolutions.

Items (3) through (6) do not apply to non-agitating concrete transporting vehicles.

Ensure the batcher responsible for production of the batch of concrete signs the delivery ticket, certifying the batch of concrete was produced in accordance with the Contract Documents.

Sign the delivery ticket certifying that the design mix maximum specified water to cementitious materials ratio was not exceeded due to any jobsite adjustments to the batch of concrete, and that the batch of concrete was delivered and placed in accordance with the Contract Documents.

346-6.4 Plastic Property Tolerances: Reject concrete with slump or air content that does not fall within the specified tolerances and immediately notify the concrete production facility that an adjustment of the concrete mixture is required. If a load does not fall within the

by the tolerances, test each subsequent load and the first adjusted load. If failing concrete is not rejected or adjustments are not implemented, the Engineer may reject the concrete and terminate further production until the corrections are implemented.

Do not allow concrete to remain in a transporting vehicle to reduce slump. Water may be added only upon arrival of the concrete to the jobsite and not thereafter.

346-7 Mixing and Delivering Concrete.

346-7.1 General Requirements: Operate all concrete mixers at speeds and volumes per the manufacturer's design or recommendation as stipulated on the mixer rating plate.

346-7.2 Transit Truck Mixing: When water is added at the jobsite, mix the concrete 30 additional drum mixing revolutions. Do not add water after the total number of drum mixing revolutions exceeds 130, do not make additional mix adjustments. Discharge all concrete from truck mixers before total drum revolutions exceed 300, unless the approved mix design allows for an extended transit time. Seek approval from the Engineer prior to using a central mixer and depositing the batch into a truck mixer.

346-7.2.1 Transit Time: Ensure compliance with Table 7 between the initial introduction of water into the mix and completely discharging all of the concrete from the truck. Reject concrete exceeding the maximum transit time. For critical placements, the transit time may be extended to the allowable mixing time shown in the mix design.

Table 7 – Maximum Allowable Transit Time	
Non-Agitator Trucks	Agitator Trucks
45 minutes	60 minutes
75 minute*	90 minutes*
* When a water-reducing and retarding admixture (Type D, Type G, or Type II) is used.	

346-7.2.2 Placement Time: All the concrete in a load must be in its final placement position a maximum of 15 minutes after the transit time has expired unless a time extension is approved by the Engineer

346-7.3 On-site Batching and Mixing: Use a mixer of sufficient capacity to prevent delays that may be detrimental to the quality of the work. Ensure that the accuracy of batching equipment is in accordance with requirements of this Section.

346-7.4 Concreting in Cold Weather: Do not mix or place concrete when the air temperature is below 40ºF. Protect the fresh concrete from freezing in accordance with Section 400. The requirements of concreting in cold weather are not applicable to precast concrete mixing and placement operations occurring in a temperature-controlled environment.

346-7.5 Concreting in Hot Weather: Hot weather concreting is defined as the production, placing and curing of concrete when the concrete temperature at placing exceeds 85ºF but is 100ºF or less.

Unless the specified hot weather concreting measures are in effect, reject concrete exceeding 85ºF at the time of placement. Regardless of special measures taken, reject concrete exceeding 100ºF. Predict the concrete temperatures at placement time and implement hot weather measures to avoid production shutdown.

346-7.6 Adding Water to Concrete at the Placement Site: Water may be added at the placement site provided the addition of water does not exceed the water to cementitious materials ratio as defined by the mix design. After adding water, perform a slump test to confirm the concrete is within the slump tolerance range; if the slump is outside the tolerance range, reject the load. If an adjustment is made at the concrete production facility, perform a slump test on the next load to ensure the concrete is within the slump tolerance range. Do not place concrete represented by slump test results outside of the tolerance range. Include water missing from the water storage tanks upon arrival at the project site in the jobsite water added.

346-7.7 Sample Location: Obtain acceptance samples from the point of final placement.

Where concrete buckets are used to discharge concrete directly to the point of final placement or into the hopper of a tremie pipe, samples will be obtained from the discharge of the bucket. When the concrete is discharged directly from the mixer into the bucket and the bucket is discharged within 20 minutes, samples may be obtained from the discharge of the mixer.

Where conveyor belts, troughs, pumps, or chutes are used to transport concrete directly to the point of final placement or into the hopper of a tremie pipe, samples will be obtained from the discharge end of the entire conveyor belt, trough, pump, or chute system.

Where concrete is placed in a drilled shaft or other element using a tremie pipe and a concrete pump, samples will be obtained from the discharge of the pump line at the location of the tremie hopper.

For all other placement methods, prior to each placement, obtain Engineer approval for sampling at the discharge of the mixer in lieu of sampling at the point of final placement. Submit the sampling correlation procedure to the Engineer for approval prior to the placement of the concrete. Once the comparative sampling correlation is approved by the Engineer, apply this correlation to the plastic properties tolerances for samples obtained from the discharge of mixer.

Where a concrete pump is used to deposit concrete directly into a drilled shaft which is a wet excavation without the use of a tremie, or other applications as approved by the Engineer, ensure the discharge end of the pump line remains immersed in the concrete at all times after starting concrete placement.

346-8 Plastic Concrete Sampling and Testing.

QC tests include air content, temperature, slump, and preparing compressive strength cylinders for testing at later dates. In addition, calculate the water to cementitious materials ratio in accordance with FM 5-501 for compliance to the approved mix design.

Ensure that each truck has a rating plate and a valid mixer identification card issued by the FDOT. Ensure that the revolution counter on the mixer is working properly, and calibration of the water dispenser has been performed within the last twelve months. Reject any concrete batches that are delivered in trucks that do not have mixer identification cards. Remove the mixer identification card when a truck mixer is discovered to be in noncompliance and the mixer deficiencies cannot be repaired immediately. When the mixer identification card is removed for noncompliance, make note of the deficiency or deficiencies found,

and forward the card to the District Materials and Research Engineer who has Producer QC Plan acceptance authority.

Perform plastic concrete tests on the initial delivery from each plant of each concrete design mix each day. Ensure QC technicians meeting the requirements of Section 105 are present and performing tests throughout the placement operation. Ensure one technician is present performing tests throughout the placement operation at each placement site. If a project has multiple concrete placements at the same time, identify the technicians in the QC Plan to ensure minimum sampling and testing frequencies are met. Ensure that the equipment used for delivery, placement and finishing meets the requirements of this Specification.

When a truck designated for QC testing arrives at the discharge site, a subsequent truck may also discharge once a representative sample has been collected from the QC truck and while awaiting the results of QC testing. Reject non-complying loads at the jobsite. Ensure that corrections are made on subsequent loads. Immediately cease concrete discharge of all trucks if the QC truck has failing test. Perform plastic properties tests on all trucks prior to the first corrected truck and the corrected truck. When more than one truck is discharging into a pump simultaneously, only the truck designated for QC testing may discharge into the pump to obtain a representative sample of concrete from the QC truck only.

Furnish sufficient concrete of each design mix as required by the Engineer for verification testing. When the Engineer's verification test results do not compare with the QC plastic properties test results, within the limits defined by the Independent Assurance (IA) checklist comparison criteria, located in Materials Manual Chapter 5, disposition of the concrete will be at the option of the Contractor.

On concrete placements consisting of only one load of concrete, perform initial sampling and testing in accordance with this Section. The acceptance sample and plastic properties tests may be taken from the initial portion of the load.

If any of the QC plastic properties tests fail, reject the remainder of that load, and any other loads that have begun discharging, terminate the LOT and notify the Engineer. Make cylinders representing that LOT from the same sample of concrete.

Following termination of a LOT, obtain samples from a new load, and perform plastic properties tests until such time as the water to cementitious materials ratio, air content, temperature and slump comply with the Specification requirements. Initiate a new LOT once the testing indicates compliance with Specification requirements.

Suspend production when any five loads in two days of production of the same design mix are outside the specified tolerances. Increase the frequency of QC testing to one per load to bring the concrete within allowable tolerances. After production resumes, obtain the Engineer's approval before returning to the normal frequency of QC testing.

If concrete placement stops for more than 90 minutes, perform initial plastic properties testing on the next batch and continue the LOT. Cylinders cast for that LOT will represent the entire LOT.

When the Engineer performs Independent Verification, the Contractor may perform the same tests on the concrete at the same time. The Engineer will compare results based on the Independent Assurance Checklist tolerances.

346-9 Acceptance Sampling and Testing.

346-9.1 General: Perform plastic properties tests in accordance with 346-8 and cast a set of three QC cylinders, for all structural concrete incorporated into the project. Take these acceptance samples randomly as determined by a random number generator acceptable to the FDOT. The Contractor will independently perform verification plastic properties tests and cast a set of verification cylinders. The verification cylinders will be the same size cylinder selected by the Contractor, from a separate sample from the same load of concrete as the Contractor's QC sample.

For each set of QC cylinders verified by the Engineer, cast one additional cylinder from the same sample, and identify it as the QC "hold" cylinder. The Contractor will also cast one additional "hold" cylinder from each Verification sample. All cylinders will be clearly identified as outlined in the Sample/Lot Numbering System instructions located on the State Materials Office website. Deliver the QC samples, including the QC "hold" cylinder to the final curing facility in accordance with ASTM C31. At this same time, the Contractor will deliver the Verification samples, including the Verification "hold" cylinder, to their final curing facility.

Test the QC laboratory cured samples for compressive strength at the age of

28 days, in a laboratory meeting and maintaining at all times the qualification requirements listed in Section 105.

The QC testing laboratory will report the compressive strength test result to the engineer within 72 hours of determining the compressive strength of the cylinders.

The Engineer will compare the Verification sample results with the corresponding QC sample results. In the event that one set of compressive strength data for a set of cylinders falls outside the range of the other set of cylinders, use the lower range of average compressive strength to determine the comparison criteria. Based on this comparison, the Engineer will determine if the comparison criteria as shown in Table 8 has been met. When the difference between QC and Verification is less than or equal to the comparison criteria, the QC data is verified. When the difference between QC and Verification data exceeds the comparison criteria, the data is not verified and the Engineer will initiate the resolution procedure.

Table 8 - Comparison Criteria	
Range of Average Compressive Strength	Comparison Criteria
Less than 3500 psi	420 psi
3,501 – 4,500 psi	590 psi
4,501 – 6,500 psi	910 psi
6,501 – 8,500 psi	1,275 psi
8,501 – 10,500 psi	1,360 psi
Greater than 10,500 psi	*
* Consider the quality control and verification tests as favorable when the results of both tests are either passing or failing. The test results are not favorable when one of the test result passes and the other one fails. Proceed to the resolution inspection and testing if the comparison is not favorable.	

346-9.2 Sampling Frequency: As a minimum, sample and test concrete of each design mix for water to cementitious materials ratio, air content, temperature, slump and compressive strength once per LOT as defined by Table 9. The Engineer will randomly verify one of every four consecutive LOTs of each design mix based on a random number generator. The Owner may perform Independent Verification (IV) testing to verify compliance with specification requirements. All QC activities, calculations, and inspections will be randomly confirmed by the Engineer.

Table 9 – Sampling Frequency	
Class Concrete*	LOT Size
I	One day's production
I (Pavement)	2,000 square yards, or one day's production, whichever is less
II, II (Bridge Deck), III, IV, V (Special), V, VI, VII	50 cubic yards, or one day's production, whichever is less
IV (Drilled Shaft)	50 cubic yards, or two hours between the end of one placement and the start of the next placement, whichever is less
III (Seal)	Each Seal placement
* For any class of concrete used for roadway concrete barrier, the lot size is defined as 100 cubic yards, or one day's production, whichever is less.	

346-9.2.1 Reduced Frequency for Acceptance Tests: The LOT size may represent 100 cubic yards when produced with the same mix design at the same concrete production facility for the same prime Contractor and subcontractor on a given Contract. As an exception, the requirements for the precast/prestressed production facility will only include the same mix design at the same concrete production facility. Submit test results indicating the average compressive strength is greater than two standard deviations above the specified minimum strength for that class of concrete. Base calculations on a minimum of ten consecutive strength test results for a Class IV or higher; or a minimum of five consecutive strength results for a Class III or lower.

The average of the consecutive compressive strength test results, based on the class of concrete, can be established using historical data from a previous project. The tests from the previous project must be within the last 60 calendar days or may also be established by a succession of samples on the current project. Only one sample can be taken from each LOT. Test data must be from a laboratory meeting the requirements of Section 105. Obtain Engineer's approval before beginning reduced frequency LOT's.

If at any time a strength test is not verified or the average strength of the previous ten or five consecutive samples based on the class of concrete from the same mix design and the same production facility is less than the specified minimum plus two standard deviations, return to the maximum production quantity represented by the LOT as defined in Table 9. Notify the Engineer that the maximum production rate is reinstated. In order to reinitiate reduced frequency, submit a new set of strength test results.

346-9.3 Strength Test Definition: The strength test of a LOT is defined as the average of the compressive strengths tests of three cylinders cast from the same sample of concrete from the LOT.

346-9.4 Acceptance of Concrete: Ensure that the hardened concrete strength test results are obtained in accordance with 346-9.3. Do not discard a cylinder strength test result based on

low strength (strength below the specified minimum strength as per the provisions of this Section).

When one of the three QC cylinders from a LOT is lost, missing, damaged or destroyed, determination of compressive strength will be made by averaging the remaining two cylinders. If more than one QC cylinder from a LOT is lost, missing, damaged or destroyed, the Contractor will core the structure at no additional expense to the Owner to determine the compressive strength. Acceptance of LOT may be based on verification data at the discretion of the Engineer. Obtain the approval of the Engineer to core, and of the core location prior to coring.

For each QC and each QC hold cylinder that is lost, missing, damaged or destroyed, payment for that LOT will be reduced by $750.00 per 1,000 psi of the specified design strength [Example: loss of two Class IV (Drill Shaft) QC cylinders that has no verification data will require the element to be cored and a pay reduction will be assessed (4,000 psi / 1,000 psi) x $750 x 2 = $6,000]. This reduction will be in addition to any pay adjustment for low strength.

When QC compressive strength test results are not verified, the resolution procedure will be used to accept or reject the concrete. Maintain the "hold" cylinders until the verification of the compressive strength test results, but no more than one month after the age of the specified strength test.

When QC test results are verified, the Engineer will accept the concrete based on QC test results. The Engineer will accept at full pay only LOTs of concrete represented by plastic property results which meet the requirements of the approved mix design and strength test results which equal or exceed the respective specified minimum strength.

346-9.5 Resolution Procedure: The Engineer may initiate an IA review of sampling and testing methods. The resolution procedure may consist of, but need not be limited to, a review of sampling and testing of fresh concrete, calculation of water to cementitious materials ratio, handling of cylinders, curing procedures and compressive strength testing. Compare the Verification sample results with the verification hold cylinders results. Compare the QC sample results with the QC hold cylinders results. Comparison results must not be greater than the comparison requirements in Table 8. Core samples of the hardened concrete may be required.

The Engineer will determine through the resolution procedure whether the QC strength test results or the verification strength test are deemed to be the most accurate, LOTS will then be considered to be verified. When the Engineer cannot determine which strength test results are the most accurate, the concrete represented by the four consecutive LOTs will be evaluated based on the QC data. The Engineer will inform the QC and the Verification lab within three calendar days of the acceptance compressive strength test to transport their "hold" cylinders to the resolution lab. The QC and Verification laboratories will transport their own hold cylinder to the resolution testing laboratory within 72 hours after the Engineer notifies the Contractor that a resolution is required. In addition, the Engineer will ensure that the QC and verification "hold" cylinders are tested within 14 calendar days of the acceptance strength tests.

The resolution investigation will determine the strength test results for each of the four or less LOTs. When the QC strength test results are deemed to be the most accurate, the QC strength test results will represent the four or less consecutive LOTs and the Owner will pay for the resolution testing and investigation. When the verification strength test results are deemed to be the most accurate, the Owner will assess a $1,000 pay reduction for the cost of the Resolution Investigation.

The results of the resolution procedure will be forwarded to the Contractor within five working days after completion of the investigation

346-9.6 Small Quantities of Concrete: When a project has a total plan quantity of less than 50 cubic yards, that concrete will be accepted based on the satisfactory compressive strength of the QC cylinders. Submit certification to the Engineer that the concrete was batched and placed in accordance with the Contract Documents. Submit a QC Plan for the concrete placement operation in accordance with Section 105. In addition, the Engineer may conduct IV testing as identified in 346-9. Evaluate the concrete in accordance with 346-10 at the discretion of the Engineer.

346-10 Investigation of Low Strength Concrete and Structural Adequacy.

346-10.1 General: When a concrete acceptance strength test result falls 500 psi or less below the specified minimum strength, coring will not be allowed and the concrete will be considered structurally adequate.

When a concrete acceptance strength test result falls more than 500 psi below the specified minimum strength, submit an Engineering Analysis Scope in accordance with 6-4 to establish strength adequacy or; at the Engineer's discretion, obtain drilled core samples as specified in 346-10.3 to determine the in-place strength of the LOT of concrete in question, at no additional expense to the Owner. The Engineer will determine whether to allow coring or require an engineering analysis.

When the concrete is deemed to have low strength, obtain and test the cores and report the data to the Engineer within 14 calendar days of the 28 day compressive strength tests. Core strength test results obtained from the structure will be accepted by both the Contractor and the Engineer as the in-place strength of the LOT of concrete in question. The core strength test results will be final and used in lieu of the cylinder strength test results for determination of structural adequacy and any pay adjustment. The Contractor will calculate the strength value to be the average of the compressive strengths of the three individual cores. This will be accepted as the actual measured value. Obtain the Engineer's approval before taking any core samples.

346-10.2 Investigation and Determination of Structural Adequacy: When the Engineer determines that an investigation is necessary, make an investigation into the structural adequacy of the LOT of concrete represented by that acceptance strength test result, at no additional expense to the Owner. The Engineer may also require the Contractor to perform additional testing as necessary to determine structural adequacy of the concrete.

If core strength test results are 500 psi or less below the specified minimum strength, consider the concrete represented by the cores structurally adequate. If the core strength test results are more than 500 psi below the specified minimum strength, submit an Engineering Analysis Scope in accordance with 6-4 that includes a full structural analysis. If the results of the structural analysis indicate adequate strength to serve its intended purpose with adequate durability, and is approved by the Engineer, the Contractor may leave the concrete in place subject to the requirements of 346-11, otherwise, remove and replace the LOT of concrete in question at no additional expense to the Owner.

346-10.3 Coring for Determination of Structural Adequacy: Notify the Engineer 48 hours prior to taking core samples. The Engineer will select the size and location of the drilled cores so that the structure is not impaired and does not sustain permanent damage after repairing the core holes. Sample three undamaged cores taken from the same approximate location where the questionable concrete is represented by the low strength concrete test cylinders. Repair core holes after samples are taken with a product in compliance with Section 930 or 934 and meeting the approval of the Engineer.

346-10.4 346-10.4 Core Conditioning and Testing: Test the cores in accordance with ASTM C42. Test the cores after obtaining the samples within seven calendar days.

346-11 Pay Adjustments for Low Strength Concrete.

346-11.1 General: For any LOT of concrete failing to meet the specified minimum strength as defined in 346-3, 346-9, 346-10 and satisfactorily meeting all other requirements of the Contract Documents, including structural adequacy, the Engineer will individually reduce the price of each low strength LOT in accordance with this Section.

346-11.2 Basis for Pay Adjustments: When an acceptance strength test result falls more than 500 psi below the specified minimum strength, core samples may be obtained in accordance with ASTM C42 from the respective LOT of concrete represented by the low acceptance strength test result for determining pay adjustments. A price adjustment will be applied to the certified invoice price the Contractor paid for the concrete or the precast product.

Do not core hardened concrete for determining pay adjustments when the 28 day acceptance cylinder strength test results are less than 500 psi below the specified minimum strength.

The results of strength tests of the drilled cores, subject to 346-11.5 and 346-11.6, will be used as the acceptance results and will be used in place of the cylinder strength test results for determining pay adjustments.

In precast operations, excluding prestressed, ensure that the producer submits acceptable core sample test results to the Engineer. The producer may elect to use the products in accordance with 346-11. Otherwise, replace the concrete in question at no additional cost to the Owner. For prestressed concrete, core sample testing is not allowed for pay adjustment. The results of the cylinder strength tests will be used to determine material acceptance and pay adjustment.

346-11.3 Coring for Determination of Pay Adjustments: Obtain the cores in accordance with 346-10.3.

346-11.4 Core Conditioning and Testing: Test the cores in accordance with 346-10.4.

346-11.5 Core Strength Representing Equivalent 28 Day Strength: For cores tested no later than 42 calendar days after the concrete was cast, the Engineer will accept the core strengths obtained as representing the equivalent 28 day strength of the LOT of concrete in question. The Engineer will calculate the strength value to be the average of the compressive strengths of the three individual cores. The Engineer will accept this strength at its actual measured value.

346-11.6 Core Strength Adjustments: For cores tested later than 42 calendar days after the concrete was cast, the Engineer will establish the equivalency between 28 day strength and strength at ages after 42 calendar days. The Engineer will relate the strength at the actual test age to 28 day strength for the design mix represented by the cores using the following relationship:

346-11.6.1 Portland Cement Concrete without Pozzolan or Slag:
Equivalent 28 Day Strength, f'c (28) = 1/F (Average Core Strength) x 100 where:

$$F = 4.4 + 39.1(ln\ x) - 3.1(ln\ x)^2 \text{ (Type I Cement)}$$

$$F = -17.8 + 46.3(ln\ x) - 3.3(ln\ x)^2 \text{ (Type II Cement)}$$

$$F = 48.5 + 19.4(\ln x) - 1.4(ln\ x)^2 \text{ (Type III Cement)}$$

x = number of days since the concrete was placed
ln = natural log

346-11.6.2 Pozzolanic-Cement Concrete:
Equivalent 28 day compressive strength = *f'c* (28), where:

$$f'_c\ (28) = 0.490 f'_c(t) e^{(\frac{8.31}{t})^{0.276}} \text{(Type I Cement)}$$

$$f'_c\ (28) = 0.730 f'_c(t) e^{(\frac{2.89}{t})^{0.514}} \text{(Type II Cement)}$$

$$f'_c\ (28) = 0.483 f'_c(t) e^{(\frac{5.38}{t})^{0.191}} \text{(Type III Cement)}$$

f'_c(t) = Average Core Strength at time t (psi)
t = time compressive strength was measured (days)

346-11.6.3 Slag-Cement Concrete:
Equivalent 28 day compressive strength = *f'c* (28), where:

$$f'_c\ (28) = 0.794 f'_c(t) e^{(\frac{7.06}{t})^{1.06}} \text{(Type I Cement)}$$

$$f'_c\ (28) = 0.730 f'_c(t) e^{(\frac{6.02}{t})^{0.747}} \text{(Type II Cement)}$$

$$f'_c\ (28) = 0.826 f'_c(t) e^{(\frac{2.36}{t})^{0.672}} \text{(Type III Cement)}$$

f'_c(t) = Average Core Strength at time t (psi)
t = time compressive strength was measured (days)

346-11.6.4 Flyash-Slag-Cement Concrete (W/CM>0.41):
Equivalent 28 day compressive strength = *f'C* (28), where:

$$f'_c\ (28) = 0.80 f'_c(t) e^{(\frac{3.14}{t})^{0.72}} \text{(Type I/II Cement)}$$

f'_c(t) = Average Core Strength at time t (psi)
t = time compressive strength was measured (days)

346-11.6.5 Flyash-Slag-Cement Concrete (W/CM<0.41):
Equivalent 28 day compressive strength = *f'C* (28), where:

$$f'_c\ (28) = 0.88 f'_c(t) e^{(\frac{1.86}{t})^{0.90}}$$ (Type I/II Cement)

f'_c(t) = Average Core Strength at time t (psi)
t = time compressive strength was measured (days)

346-11.6.6 Flyash-Silica Fume-Cement Concrete (W/CM<0.41):
Equivalent 28 day compressive strength = *f'C* (28), where:

$$f'_c\ (28) = 0.84 f'_c(t) e^{(\frac{0.92}{t})^{0.50}}$$ (Type III Cement)

f'_c(t) = Average Core Strength at time t (psi)
t = time compressive strength was measured (days)

346-11.6.7 Flyash-Silica Fume-Cement Concrete (W/CM<0.41):
Equivalent 28 day compressive strength = *f'C* (28), where:

$$f'_c\ (28) = 0.86 f'_c(t) e^{(\frac{0.53}{t})^{0.47}}$$ (Type III Cement)

f'_c(t) = Average Core Strength at time t (psi)
t = time compressive strength was measured (days)

346-11.7 Calculating Pay Adjustments: The Engineer will determine payment reductions for low strength concrete accepted by the Engineer and represented by either cylinder or core strength test results below the specified minimum strength, in accordance with the following:

Reduction in Pay is equal to the reduction in percentage of concrete cylinder strength (specified minimum strength minus actual strength divided by specified minimum strength).

For the elements that payments are based on the per foot basis, the Engineer will adjust the price reduction from cubic yards basis to per foot basis, determine the total linear feet of the elements that are affected by low strength concrete samples and apply the adjusted price reduction accordingly.

346-12 Pay Reduction for Plastic Properties
A rejected load in accordance with 346-6.4 is defined as the entire quantity of concrete contained within a single ready-mix truck or other single delivery vehicle regardless of what percentage of the load was placed. If concrete fails a plastic properties test and is thereby a rejected load but its placement continues after completion of a plastic properties test having a failing result, payment for the concrete will be reduced.

The pay reduction for cast-in-place concrete will be twice the certified invoice price per cubic yard of the quantity of concrete in the rejected load.

The pay reduction for placing a rejected load of concrete into a precast product will be applied to that percentage of the precast product that is composed of the concrete in the rejected load. The percentage will be converted to a reduction factor which is a numerical value greater than zero but not greater than

one. The precast product payment reduction will be twice the Contractor's billed price from the producer for the precast product multiplied by the reduction factor.

If the Engineer authorizes placement of the concrete, even though plastic properties require rejection, there will be no pay reduction based on plastic properties failures; however, any other pay reductions will apply.

END OF SECTION 346

SECTION 425

INLETS, MANHOLES, AND JUNCTION BOXES

425-1 Description.
Construct inlets, manholes, and junction boxes from reinforced concrete as shown in the Standard Plans and the Plans. Furnish and install the necessary metal frames and gratings. Construct yard drains from concrete meeting the requirements of Section 347. Adjust structures shown in the Plans to be adjusted or requiring adjustment for the satisfactory completion of the work.

For precast structures, meet the requirements in 449-1.

425-2 Composition and Proportioning.

425-2.1 Concrete: For inlets, manholes, and junction boxes, use Class II or IV concrete, as designated in the Plans and Standard Plans and as specified in Section 346. For yard drains use concrete as specified in Section 347.

425-2.2 Mortar: For brick masonry, make the mortar by mixing one part cement to three parts sand. Miami Oolitic rock screenings may be substituted for the sand, provided the screenings meet the requirements of 902 except for gradation requirements. Use materials passing the No. 8 sieve that are well graded from coarse to fine. Submit documentation, from a Department approved mine or a Department approved concrete plant, confirming the sand or sand substitute meets the requirements of 902-3.2.

Preblended masonry cement mortar may be used in lieu of the above-specified mortar. Deliver the product in original and unopened packages properly identified by brand name of manufacturer, net weight of package, and type. Store the material in full compliance with the manufacturer's recommendations. Material must be used within manufacturer's recommended shelf life.

425-3 Materials.

425-3.1 General: Meet the following requirements:

Sand (for mortar)	Section 902
Portland Cement	Section 921
Water	Section 923
Reinforcing Steel	Sections 931 and 415
Liner Repair Systems	Section 948
Brick and Concrete Masonry Units	Section 949
Castings for Frames and Gratings	Section 962
Masonry Cement, Type M or S	ASTM C91
Preblended Dry Masonry Cement Mortar, Type M or S	ASTM C1714

425-3.2 Gratings, Covers, and Frames: Use gratings and frames fabricated from structural steel or cast iron as designated in the appropriate Standard Plans Index. When "Alt. G" grates are specified in the Plans, provide structural steel grates that are galvanized in accordance with the requirements of ASTM A123.

Use rigid frames and covers either 24 inches or 36 inches or optional three-piece adjustable frames

and covers as indicated in Standard Plans, Index 425-001.

For three-piece adjustable frames, the inner frame may include replaceable resilient seats to support the cover. In addition, the inner frame shall indicate it is adjustable, by clearly having the word “adjustable” imprinted into the exposed portion of the inner frame so ”adjustable” is visible from the roadway after installation.

425-4 Forms.
Design and construct wood or metal forms so that they may be removed without damaging the concrete. Build forms true to line and grade and brace them in a substantial and unyielding manner. Obtain the Engineer’s approval before filling them with concrete.

425-5 Precast Inlets, Manholes, and Junction Boxes.
Precast inlets, manholes, and junction boxes, designed and fabricated in accordance with the Plans, the Standard Plans and Section 449 may be substituted for cast-in-place units.

425-6 Construction Methods.

425-6.1 Excavation: Excavate as specified in Section 125.

Where unsuitable material for foundations is encountered, excavate the unsuitable material and backfill with suitable material prior to constructing or setting inlets, manholes and junction boxes.

As an option to the above and with the Engineer’s approval, the Contractor may carry the walls down to a depth required for a satisfactory foundation, backfill to 8 inches below the flowline with clean sand and cast a non-reinforced 8 inch floor.

425-6.2 Placing and Curing Concrete: Place the concrete in the forms, to the depth shown in the Plans, and thoroughly vibrate it. After the concrete has hardened sufficiently, cover it with suitable material and keep it moist for a period of three days. Finish the traffic surface in accordance with 522-7.2, or with a simulated broom finish approved by the Engineer.

425-6.3 Setting Manhole Castings: After curing the concrete as specified above, set the frame of the casting in a full mortar bed composed of one part portland cement to two parts of fine aggregate.

425-6.3.1 Standard Castings: Set manhole frames in a mortar bed and adjust to grade using brick or concrete grade rings, with a maximum 12 inch adjustment.

425-6.3.2 Optional Adjustable Castings: When using a three-piece adjustable frame and cover, install the frame and cover with brick or concrete grade rings to the base course height. Make adjustments using the inner frame in accordance with the manufacturer’s installation recommendations so the inner frame and cover meet the grade and slope of the pavement surface opened to traffic.

425-6.4 Reinforcing Steel: Follow the construction methods for the steel reinforcement as specified in Section 415.

425-6.5 Laying Brick: Brick masonry may be used if the structure is circular and constructed in place, or for adjustments of rectangular risers up to a maximum 12 inches in height. Saturate all brick with water before laying. Bond the brick thoroughly into the mortar using the shove-joint method to lay the brick. Arrange headers and stretchers so as to bond the mass thoroughly. Finish the joints properly as the work progresses and ensure that they are not less than 1/4 inch or more than 3/4 inch in thickness. Do not use spalls or bats except for shaping around irregular openings or when unavoidable at corners.

425-6.6 Backfilling: Backfill as specified in Section 125, meeting the specific requirements for backfilling and compaction around inlets, manholes, and junction boxes detailed in 125-8.1 and 125-8.2. However, for outfall lines beyond the sidewalk or future sidewalk area, where no vehicular traffic will pass over the pipe, inlets, manholes, and junction boxes, compact backfill as required in 125-9.2.2.

425-6.7 Adjusting Structures: Adjust existing manholes, catch basins, inlets, valve boxes, etc., within the limits of the proposed work, to meet the finished grade of the proposed pavement, or if outside of the proposed pavement area, to the finished grade designated in the Plans for such structures. Adjust structures prior to placement of final asphalt pavement surface layer. Adjust structures to match final pavement surface cross-slope. Use materials and construction methods which meet the requirements specified above to adjust the existing structures.

The Contractor may extend manholes needing to be raised using adjustable extension rings of the type which do not require the removal of the existing manhole frame. Use an extension device that provides positive locking action and permits adjustment in height as well as diameter and meets the approval of the Engineer. When adjusting structures in flexible pavement, restore final road surface in accordance with Standard Plans, Index 125-001.

425-7 Method of Measurement.

The quantities to be paid for will be the number of inlets, manholes, junction boxes, and yard drains, completed and accepted; and the number of structures of these types (including also valve boxes) satisfactorily adjusted.

425-8 Basis of Payment.

425-8.1 New Structures: Price and payment will be full compensation for furnishing all materials and completing all work described herein or shown in the Plans, including all clearing and grubbing outside the limits of clearing and grubbing as shown in the Plans, all excavation except the volume included in the measurement designated to be paid for under the items for the grading work on the project, all backfilling around the structures, the disposal of surplus material, and the furnishing and placing of all gratings, frames, covers, and any other necessary fittings.

425-8.2 Adjusted Structures: When an item of payment for adjusting manholes, valve boxes, or inlets is provided in the proposal, price and payment will be full compensation for the number of such structures designated to be paid for under such separate items, and which are satisfactorily adjusted, at the Contract unit prices each for adjusting inlets, adjusting manholes, and adjusting valve boxes. For any of such types of these structures required to be adjusted but for which no separate item of payment is shown in the proposal for the specific type, payment will be made under the item of adjusting miscellaneous structures.

425-8.3 Payment Items:

Item 425-1	FDOT Type “5” Top, FDOT TYPE “P” ALT B BOTTOM	-per Each (EA)
Item 425-2	FDOT Type “C” DBI	-per Each (EA)
Item 425-3	FDOT Type “F” DBI	-per Each (EA)
Item 425-4	FDOT Type “V” DBI	-per Each (EA)

END OF SECTION 425

SECTION 430

PIPE CULVERTS

430-1 Description.
Furnish and install drainage pipe and end sections at the locations called for in the Plans. Furnish and construct joints and connections to existing pipes, catch basins, inlets, manholes, walls, etc., as may be required to complete the work.

Obtain pipe culverts and drainage products from a plant that is currently on the Department's Production Facility Listing. Producers seeking inclusion on the list shall meet the requirements of Section 105.

At the beginning of each project, submit a notarized certification statement to the Engineer in accordance with Section 6. The Quality Control Manager's stamp on each product indicates certification that the product was fabricated in conformance with the Producer QC Plan, the Contract, and this Section. Ensure that each shipment of drainage products to the project site is accompanied with a QC signed or stamped delivery ticket providing the description and the list of the products.

When the Producer Quality Control Program is suspended by the Department, accept responsibility of either obtaining products from a plant with an approved Quality Control Program, or await re-approval of the plant. The Engineer will not allow changes in Contract Time or completion dates as a result of the plant's loss of qualification. Accept responsibility for all delay costs or other costs associated with the loss of the plant's qualification.

Construct structural plate pipe culverts or underdrains in accordance with Sections 435 and 440.

For pipe culverts installed by jack & bore, install in accordance with Section 556.

430-2 Materials.
430-2.1 Pipe: Meet the following requirements:

Concrete Pipe	Section 449
Steel Pipe	556-2.1
Round Rubber Gaskets	Section 942
Resilient Connectors*	Section 942
Corrugated Steel Pipe and Pipe Arch	Section 943
Corrugated Aluminum Pipe and Pipe Arch	Section 945
Corrugated Polyethylene Pipe	Section 948
Steel Reinforced Polyethylene Ribbed Pipe	Section 948
Corrugated Polypropylene Pipe	Section 948
Corrugated Polyvinyl Chloride (PVC) Pipe	Section 948
Fiberglass Reinforced Polymer Pipe	Section 948
Liner Repair Systems	Section 948

*Use resilient connector products listed on the Department's Approved Product List (APL).

430-2.2 Joint Materials: Use joint materials specified in 430-7 through 430-9 according to type of pipe and conditions of usage.

430-2.3 Mortar: Use mortar composed of one part Portland cement and two parts of clean, sharp sand, to which mixture the Contractor may add hydrated lime in an amount not to exceed 15% of the cement content. Use mortar within 30 minutes after its preparation.

430-3 Type of Pipe to Be Used.

430-3.1 General: Prior to the preconstruction conference, submit to the Engineer which optional pipe material from the optional materials tabulation sheet will be used. Once a pipe material is selected, do not change pipe materials without approval of the Engineer.

When the Plans designate a type (or types) of pipe, use only the type (or choose from the types) designated. As an exception, when the Plans designate reinforced concrete pipe as Class S, Class I, Class II, Class III and Class IV, the Contractor may use non-reinforced concrete pipe up to and including 36 inch in diameter.

430-3.2 Side Drain: If the Plans do not designate a type (or types) of pipe, the Contractor may use either a minimum Class I concrete pipe, corrugated steel pipe, corrugated aluminum pipe, corrugated high-density polyethylene pipe, steel reinforced polyethylene ribbed pipe, polypropylene pipe, or PVC pipe. If one of the metal types is chosen, use the minimum gage specified in Section 943 for steel pipe or Section 945 for aluminum pipe. Alternatively, when metal pipe is allowed and no future maintenance concerns exist, the Contractor may propose the pipe gage based on the Department's Drainage Manual and Culvert Service Life Estimator for approval by the Engineer. When extending existing pipes, construct the pipe extensions of the same size and kind as the existing pipe. Extensions of existing pipes, whose materials are no longer produced, shall be extended with the most similar pipe material available.

Non-reinforced concrete pipe may also be substituted for concrete pipe in side drains, subject to the provisions of 430-3.1.

430-4 Laying Pipe.

430-4.1 General: Lay all pipe, true to the lines and grades given, with hubs upgrade and tongue end fully entered into the hub. When pipe with quadrant reinforcement or circular pipe with elliptical reinforcement is used, install the pipe in a position such that the manufacturer's marks designating "top" and "bottom" of the pipe are not more than five degrees from the vertical plane through the longitudinal axis of the pipe. Do not allow departure from and return to plan alignment and grade to exceed 1/16 inch per foot of nominal pipe length, with a total of not more than 1 inch departure from theoretical line and grade. Take up and relay any pipe that is not in true alignment or which shows any settlement after laying at no additional expense to the Department.

Do not use concrete pipe with lift holes except round pipe which has an inside diameter in excess of 54 inches or any elliptical pipe.

Repair lift holes, if present, with hand-placed, stiff, non-shrink, 1-to-1 mortar of cement and fine sand, after first washing out the hole with water. Completely fill the void created by the lift hole with mortar. Cover the repaired area with a 24 by 24 inch piece of filter fabric secured to the pipe. Use a Type D-3 filter fabric meeting the requirements specified in Section 985.

Secure the filter fabric to the pipe using a method that holds the fabric in place until the backfill is placed and compacted. Use grout mixtures, mastics, or strapping devices to secure the fabric to the pipe.

When installing pipes in structures, construct inlet and outlet pipes of the same size and kind as the connecting pipe shown in the Plans. Use the same pipe material within each continuous run of pipe. Extend the pipes through the walls for a distance beyond the outside surface sufficient for the intended connections, and construct the concrete around them neatly to prevent leakage along their outer surface as shown on Standard Plans, Index 425-001. Keep the inlet and outlet pipes flush with the inside of the wall. Resilient connectors as specified in 942-3 may be used in lieu of a masonry seal.

Furnish and install a filter fabric jacket around all pipe joints and the joint between the pipe and the structure in accordance with Standard Plans, Indexes 425-001 and 430001. Use fabric meeting the physical requirements of Type D-3 specified in Section 985. Extend the fabric a minimum of 12 inches beyond each side of the joint or both edges of the coupling band, if a coupling band is used. The fabric must have a minimum width of 24 inches, and a length sufficient to provide a minimum overlap of 24 inches. Secure the filter fabric jacket against the outside of the pipe by metal or plastic strapping or by other methods approved by the Engineer.

Meet the following minimum joint standards:

Pipe Application	Minimum Standard
Storm and Cross Drains	Water-tight
Gutter Drain	Water-tight
Side Drains	Soil-tight

When rubber gaskets are to be installed in the pipe joint, the gasket must be the sole element relied on to maintain a tight joint. Soil tight joints must be watertight to 2 psi. Water-tight joints must be water-tight to 5 psi unless a higher pressure rating is required in the Plans.

When laying pipes that pass through mechanically stabilized earth (MSE) reinforced fill, connect the portion of the pipe within the wall to the external portion of the pipe run only after the full height of the wall supported embankment is in place.

When Wall Zone Pipes are shown in the Plans, meet the following requirements:

1. Use resilient connectors on pipes entering and leaving drainage structures.
2. Provide a 2 to 4 inch pipe overhang beyond the drainage structure internal walls.
3. For pipes without welded joints, meet the following additional requirements:
    a. Pipe joints must be watertight to 10.8 psi when pulled out 2 inches from the fully home joint alignment.
    b. Do not allow the gap between sections of pipe to exceed 5/8 inch for all pipe diameters.

430-4.2 Trench Excavation: Excavate the trench for storm and cross drains, and side drains as specified in Section 125.

430-4.3 Foundation: Provide a suitable foundation, where the foundation material is of inadequate supporting value, as determined by the Engineer. Remove the unsuitable material and replace it

with suitable material, as specified in 125-8. Where in the Engineer's opinion, the removal and replacement of unsuitable material is not practicable, he may direct alternates in the design of the pipe line, as required to provide adequate support. Minor changes in the grade or alignment will not be considered as an adequate basis for extra compensation.

Do not lay pipe on blocks or timbers, or on other unyielding material, except where the use of such devices is called for in the Plans.

430-4.4 Backfilling: Backfill around the pipe as specified in 125-8 unless specific backfilling procedures are described in the Contract Documents.

430-4.5 Plugging Pipe: When existing pipe culverts are to be permanently placed out of service, fill them with flowable fill that is non-excavatable, contains a minimum 350 pounds per cubic yard of cementitious material and meets the requirements of Section 121 and/or plug them with masonry plugs as shown in the Plans. Install masonry plugs that are a minimum of 8 inches in thickness, in accordance with Standard Plans, Index 430-001.

When proposed or existing pipe culverts are to be temporarily placed out of service, plug them with prefabricated plugs as shown in the Plans. Install prefabricated plugs in accordance with the manufacturer's recommendations. Do not fill or construct masonry plugs in any pipe culvert intended for current or future service.

430-4.6 End Treatment: Place an end treatment at each storm and cross drain, and side drain as shown in the Plans. Refer to the Standard Plans for types of end treatment details. As an exception to the above, when concrete mitered end sections are permitted, the Contractor may use reinforced concrete U-endwalls, if shop drawings are submitted to the Engineer for approval prior to use.

Provide end treatments for corrugated polyethylene pipe, polypropylene pipe, and PVC pipe as specified in Section 948, or as detailed in the Plans.

430-4.7 Metal Pipe Protection: Apply a bituminous coating to the surface area of the pipe within and 12 inches beyond the concrete or mortar seal prior to sealing, to protect corrugated steel or aluminum pipe embedded in a concrete structure, such as an inlet, manhole, junction box, endwall, or concrete jacket.

Ensure that the surface preparation, application methods (dry film thickness and conditions during application), and equipment used are in accordance with the coating manufacturers' published specifications.

Obtain the Engineer's approval of the coating products used.

430-4.8 Pipe Inspection: For pipes installed under the roadway, inspection is to be conducted when backfill reaches 3 feet above the pipe crown or upon completion of placement of the stabilized subgrade. For pipe installed within fills, including embankments confined by walls, inspection is to be conducted when compacted embankment reaches 3 feet above the pipe crown or the finished earthwork grade as specified in the Plans. Prior to conducting the inspection, submit to the Engineer a video recording schedule for videoing, dewater installed pipe, and remove all silt, debris and obstructions. Submit pipe videoing and reports to the Department for review prior to the continuation of paving.

For pipe 48 inches or less in diameter, submit to the Engineer a video DVD and report using low barrel distortion video equipment with laser profile technology, non-contact video micrometer and associated software. For all pipe types, provide a Pipe Observation Summary Report for each pipe run that includes:

1. Actual recorded length and width measurements of all cracks within the pipe.

2. Actual recorded separation measurement of all rigid pipe joints.
3. Detailed written observations of leaks, debris, or other damage or defects.

For flexible pipe types, submit a Pipe Ovality Report for each pipe run that includes:

1. Representative diameter of the pipe.
2. Pipe deformation/deflections measurements with the 5% deflection limit clearly delineated.

Laser profiling and measurement technology must be certified by the company performing the work to be in compliance with the calibration criteria posted at: http://www.fdot.gov/construction/contractorissues/laser.shtm. Reports submitted in electronic media are preferred.

The Engineer may waive this requirement for side drains and cross drains which are short enough to inspect from each end of the pipe.

430-4.8.1 Video Report: Provide video files via digital media (DVD, flash drive, or other) or by online digital distribution with a minimum standard resolution of 720 x 480. Use a camera with lighting suitable to allow a clear picture of the entire periphery of the pipe. Center the camera in the pipe both vertically and horizontally and be able to pan and tilt to a 90 degree angle with the axis of the pipe and rotating 360 degrees. Use equipment to move the camera through the pipe that will not obstruct the camera's view or interfere with proper documentation of the pipe's condition.

The video image shall be clear, focused, and relatively free from roll, static, or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe. The video will include identification before each section of pipe filmed. The identification will include the project number, the structure number corresponding to the structure number in the Plans for the project, size of pipe, the date and time, and indicate which pipe is being filmed if multiple pipes are connected to the structure. Notes should be taken during the video recording process. Submit these notes along with the video.

Move the camera through the pipe at a speed not greater than 30 feet per minute. Mark the video with the distance down the pipe. The distance shall have an accuracy of one foot per 100 feet. Film the entire circumference at each joint. Stop the camera and pan when necessary to document and measure defects. Position the camera head perpendicular to all defects requiring measurement by the video micrometer.

430-4.8.2 Reinspection: At any time after reviewing the submitted pipe inspection reports, the Engineer may direct additional inspections. If no defects are observed during the reinspection, the Department will pay for the cost of the reinspections in accordance with 4-3. If defects are observed, the reinspection and all work performed to correct the defects will be done at no cost to the Department. Acceptance of all replacements or repairs will be based on video documentation of the completed work prior to Final Acceptance.

430-5 Removing Existing Pipe.

If the Plans indicate that existing pipe is to remain the property of the Department, collect and stack along the right-of-way all existing pipe or pipe arch so indicated in the Plans to be removed, or that does not conform to the lines and grades of the proposed work and that is not to be re-laid, as directed by

the Engineer. Take care to prevent damage to salvageable pipe during removal and stacking operations.

430-6 Placing Pipe Under Railroad.

430-6.1 General: Construct pipe culverts under railroad tracks in accordance with the requirements of the railroad company.

Perform all the shoring under the tracks, and sheeting and bracing of the trench, required by the railroad company or deemed necessary by the Engineer in order to ensure safe and uninterrupted movement of the railroad equipment, at no expense to the Department.

430-6.2 Requirements of the Railroad Company: Install pipe using methods required by the railroad company and shown in the Contract Documents.

When the general method of installation required by the railroad company is indicated in the Plans, do not alter such method, or any other specific details of the installation which might be indicated in the Plans, without receiving approval or direction from the railroad, followed by written approval from the Engineer.

430-6.3 Notification to Railroad Company: Notify the railroad company and the Engineer at least ten days prior to the date on which pipe is to be placed under the railroad tracks.

430-6.4 Placing Pipe by Jacking: Obtain the Engineer's and the railroad company's approval of the details of the jacking method to be used, when placing pipe through the railroad embankment, before the work is started.

430-6.5 Use of Tunnel Liner: When the railroad company requires that a tunnel liner be used for placing the pipe in lieu of the jacking method, the Department will pay for the tunnel liner material separately in cases where the Contract Documents do not require the use of a tunnel liner. For these cases the Department will reimburse the Contractor for the actual cost of the liner, delivered at the site. The Department will base such cost on a liner having the minimum gage acceptable to the railroad.

430-7 Specific Requirements for Concrete Pipe.

430-7.1 Sealing Joints: Seal the pipe joints with round rubber or profile gaskets meeting the requirements of Section 449. Ensure that the gasket and the surface of the pipe joint, including the gasket recess, are clean and free from grit, dirt and other foreign matter, at the time the joints are made. In order to facilitate closure of the joint, application of a vegetable soap lubricant immediately before closing of the joint will be permitted. Prelubricated gaskets may be used in lieu of a vegetable soap lubricant when the lubricating material is certified to be inert with respect to the rubber material.

430-7.2 Laying Requirements for Concrete Pipe with Rubber Gasket Joints: Do not allow the gap between sections of pipe to exceed 5/8 inch for pipe diameters of 12 inches through 18 inches, 7/8 inch for pipe diameters of 24 through 66 inches, and 1 inch for pipe diameters 72 inches and larger. Where minor imperfections in the manufacture of the pipe create an apparent gap in excess of the tabulated gap, the Engineer will accept the joint provided that the imperfection does not exceed 1/3 the circumference of the pipe, and the rubber gasket is 1/4 inch or more past the pipe joint entrance taper. Where concrete pipes are outside of these tolerances, replace them at no expense to the Department. Do not apply mortar, joint compound, or other filler to the gap which would restrict the flexibility of the joint.

430-7.3 Field Joints for Elliptical Concrete Pipe: Use either a preformed plastic gasket material or an approved rubber gasket to make a field joint.

430-7.3.1 Plastic Gasket: Meet the following requirements when field joints are made from

preformed plastic gasket material:

430-7.3.1.1 General: Install field joints in accordance with the manufacturer's instructions and the following:

430-7.3.1.2 Material: Meet the requirements of 942-2.

430-7.3.1.3 Joint Design: Ensure that the pipe manufacturer submits details to the Engineer regarding configuration of the joint and the amount of gasket material required to affect a satisfactory seal. Do not brush or wipe joint surfaces which are to be in contact with the gasket material with a cement slurry. Fill minor voids with cement slurry.

430-7.3.1.4 Primer: Apply a primer of the type recommended by the manufacturer of the gasket material to all joint surfaces which are to be in contact with the gasket material, prior to application of the gasket material. Thoroughly clean and dry the surface to be primed.

430-7.3.1.5 Application of Gasket: Apply gasket material to form a continuous gasket around the entire circumference of the leading edge of the tongue and the groove joint, in accordance with the detail shown on Standard Plans, Index 430-001. Do not remove the paper wrapper on the exterior surface of the gasket material until immediately prior to joining of sections. Apply plastic gasket material only to surfaces which are dry. When the atmospheric temperature is below 60ºF, either store plastic joint seal gaskets in an area above 70ºF, or artificially warm the gaskets to 70ºF in a manner satisfactory to the Engineer.

430-7.3.1.6 Installation of Pipe: Remove and reposition or replace any displaced or contaminated gasket as directed by the Engineer. Install the pipe in a dry trench. Carefully shape the bottom of the trench to minimize the need for realignment of sections of pipe after they are placed in the trench. Hold to a minimum any realignment of a joint after the gaskets come into contact. Prior to joining the pipes, fill the entire joint with gasket material and ensure that when the pipes are joined there is evidence of squeeze-out of gasket material for the entire internal and external circumference of the joint. Trim excess material on the interior of the pipe to provide a smooth interior surface. If a joint is defective, remove the leading section of pipe and reseal the joint.

430-7.3.2 Rubber Gasket: Meet the following requirements when field joints are made with profile rubber gaskets:

430-7.3.2.1 General: Install field joints in accordance with the manufacturer's instructions and the following:

43-7.3.2.2 Material: Meet the requirements of 942-4.

430-7.3.2.3 Joint Design: Ensure that the pipe manufacturer submits details to the Engineer regarding configuration of the joint and gasket required to effect a satisfactory seal. Do not apply mortar, joint compound, or other filler which would restrict the flexibility of the gasket joint.

430-7.4 Requirements for Concrete Radius Pipe:

430-7.4.1 Design: Construct concrete radius pipe in segments not longer than 4 feet (along the pipe centerline), except where another length is called for in the Contract Documents. Join each segment using round rubber gaskets. Ensure that the pipe manufacturer submits details of the proposed joint, segment length and shape for approval by the Engineer, prior to manufacture.

430-7.4.2 Pre-Assembly: Ensure that the manufacturer pre-assembles the entire radius section in his yard, in the presence of the Engineer, to ensure a proper fit for all parts. At the option of the manufacturer, the Contractor may assemble the pipe without gaskets. Consecutively number the joints on both the interior and exterior surfaces of each joint, and make match marks showing proper position of joints. Install the pipe at the project site in the same order as

pre-assembly.

430-8 Specific Requirements for Corrugated Metal Pipe.

430-8.1 Field Joints:

430-8.1.1 General: Make a field joint with locking bands, as specified in Article 9 of AASHTO M36 and AASHTO M196M for aluminum pipe. For aluminum pipe, fabricate bands from the same alloy as the culvert sheeting.

When existing pipe to be extended is helically fabricated, make a field joint between the existing pipe and the new pipe using one of the following methods:

1. Cut the new pipe to remove one of the re-rolled annular end sections required in Sections 943 or 945, or fabricate the pipe so that the re-rolled annular section is fabricated only on one end. Use either a spiral (helical) band with a gasket or a flat band with gaskets as required by 430-8.1.2 (2) to join the pipe sections.
2. The Contractor may construct a concrete jacket as shown on Standard Plans, Index 430-001.

430-8.1.2 Side Drain, Storm and Cross Drain, and Gutter Drains: Where corrugated metal pipe is used as side drain, storm and cross drain, or gutter drain, use a rubber or neoprene gasket of a design shown to provide a joint as specified in 430-4.

Use a gasket of one of the following dimensions:

1. For annular joints with 1/2 inch depth corrugation: either a single gasket a minimum of 7 inches by 3/8 inch or two gaskets a minimum of 3-1/2 inches by 3/8 inch; and for annular joints with 1 inch depth corrugations: either a single gasket a minimum of 7 inches by 7/8 inch or two gaskets a minimum of 3-1/2 inches by 7/8 inch.
2. For helical joints with 1/2 inch depth corrugation: either a single gasket a minimum of 5 inches by 1 inch or two gaskets a minimum of 3-1/2 inches by 1 inch; and for helical joints with 1 inch depth corrugations: either a single gasket a minimum of 5 inches by 1-1/2 inches or two gaskets a minimum of 3-1/2 inches by 1-1/2 inches.
3. Such other gasket designs as may be approved by the Engineer.

If, in lieu of a single gasket spanning the joint, two gaskets are used, place these individual gaskets approximately 2 inches from each pipe end at the joint. When two gaskets are used, seal the overlapping area on the coupling band between the gaskets consistent with the joint performance specified. The Contractor may tuck a strip of preformed gasket material over the bottom lip of the band for this purpose. Use coupling bands that provide a minimum circumferential overlap of 3 inches. As the end connections on the coupling band are tightened, ensure that there is no local bending of the band or the connection. Use precurved coupling bands on pipe diameters of 24 inches or less.

Use flat gaskets meeting the requirements of ASTM D1056, designation 2C2 or 2B3. In placing flat gaskets on pipe prior to placing the coupling band, do not stretch the gasket more than 15% of its original circumference. Use circular gaskets meeting the requirements of ASTM C361. Do not stretch the circular gasket more than 20% of its original circumference in placing the gasket on pipe. Use preformed plastic gasket material meeting the composition requirements of 942-2.2.

Apply an approved vegetable soap lubricant, as specified for concrete pipe in 430-7.1.1.

430-8.1.3 Alternate Joint: In lieu of the above-specified combination of locking bands and flat gaskets, the Contractor may make field joints for these pipe installations by the following combinations:

1. Use the metal bands as specified in Article 9 of AASHTO M36M that are at least 10-1/2 inches wide and consist of a flat central section with a corrugated section near each end, designed to match the annular corrugation in the pipe with which they are to be used. Connect the bands in a manner approved by the Engineer, with a suitable fastening device such as the use of two galvanized 1/2 inch diameter bolts through a galvanized bar and galvanized strap, suitably welded to the band. Use a strap that is the same gage as the band.

   Where helically corrugated pipe is to be jointed by this alternate combination, ensure that at least the last two corrugations of each pipe section are annular, and designed such that the band will engage each pipe end with the next-to-outside annular corrugation.
2. For these bands, use a rubber gasket with a circular cross-section of the "O-ring" type conforming to ASTM C361. Use gaskets having the following cross-sectional diameter for the given size of pipe:

Non-SI Units	
Pipe Size	Gasket Diameter
12 inches through 36 inches (with 1/2 inch depth corrugations	13/16 inch
42 inches through 96 inches (with 1/2 inch depth corrugations)	7/8 inch
36 inches through 120 inches (with 1 inch depth corrugations)	1-3/8 inches

Use preformed gasket material to seal the overlapping area on the coupling band between gaskets.

3. Use channel band couplers in helical pipe with ends which have been reformed and flanged specifically to receive these bands. Use channel band couplers that are of a two piece design, are fabricated from galvanized steel stock conforming to AASHTO M36, have 2 inch by 2 inch by 3/16 inch angles fastened to the band ends to allow for proper tightening, and meet the following:

Non SI Units	
Band Thickness	Pipe Wall Thickness
0.079 inch	0.109 inch or lighter
0.109 inch	0.138 inch or heavier
3/4 inch wide	0.109 inch or lighter
1 inch wide	0.138 inch or heaver

Furnish two 1/2 inch diameter connection bolts with each band, that conform to ASTM A307, Grade A and are electroplated in accordance with ASTM B633.

Use a gasket with the joint that is a hydrocarbon blend of butyl rubber meeting the chemical composition and physical properties of 942-2.2. Use a 3/8 by 3/4 inch gasket for pipe fabricated from 0.109 inch or lighter material and a 3/8 by 1 inch gasket for pipe fabricated from 0.138 inch and heavier material.

The Contractor may use a flange band coupler without the gasket for all applications other than side drain, storm and cross drain, and gutter drain.

Do not use the flange band coupler to join dissimilar types of pipe.

The Contractor may join reformed flanged helical pipe to existing annular or reformed pipe having annular ends. On non-gasketed installations, use either an annular band or an alternate joint described in 430-8.1.3. On gasketed installations, use an annular band, minimum of five corrugations in width, in conjunction with two O-ring gaskets as specified in 430-8.1.3. Use mastic material to seal the area of band overlap.

The minimum joint performance standards specified in 430-4.1 apply.

430-8.2 Laying and Shape Requirements for Corrugated Metal Pipe: Install pipe using either a trench or open ditch procedure.

Check pipe shape regularly during backfilling to verify acceptability of the construction method used. Pipe deflected 5% or more of the certified actual mean diameter of the pipe at final inspection shall be replaced at no cost to the Department. Deflection measurements are taken at the point of smallest diameter on the corrugations.

430-9 Specific Requirements for Steel Reinforced Polyethylene Ribbed Pipe, Corrugated High-Density Polyethylene Pipe, Polypropylene Pipe, and Polyvinyl Chloride (PVC) Pipe.

430-9.1 Sampling Requirements: Submit a sample of each pipe material and diameter used on each project to the Engineer a minimum of two weeks prior to the installation, provided that the pipe meets all of the following:

1. Pipe material is PVC, HDPE, steel reinforced polyethylene, or polypropylene
2. Pipe is corrugated or ribbed
3. Pipe diameter is 12” or larger
4. Pipe is not perforated, unless the material is PVC or polypropylene
5. Pipe is intended for applications requiring 100 year design service life as defined in the Florida Department of Transportation Drainage Manual.

The length of each sample pipe section must comprise at least seven regular corrugations (not including the first three corrugations of the pipe on the bell or spigot ends).

430-9.2 Field Joints: Use gasketed joints to seal side drain, and storm and cross drain. Use gaskets meeting the requirements of Section 449. Ensure that the pipe manufacturer provides a joint design approved by the Engineer before use.

430-9.3 Installation Requirements Including Trenching, Foundation and Backfilling Operations: Check structure shape regularly during backfilling to verify acceptability of the construction method used. Replace pipe deflected 5% or more of the certified actual mean diameter of the pipe at final inspection at no cost to the Department.

430-10 Desilting Pipe or Concrete Box Culvert. Desilt pipe culvert and concrete box culvert as designated in the Plans.

430-11 Method of Measurement.

430-11.1 New Pipe Installed by Excavation or Trenching: The quantity of storm and cross drain pipe, storm drain trench, side drain and gutter drain pipe, installed by pipe culvert optional material - excavation or trenching, to be paid for will be plan quantity, in place and accepted. The plan quantity will be determined from the inside wall of the structure as shown in the Plans, along the centerline of the pipe.

Adjustment to bid quantities, prices and payment will not be allowed for increases, decreases or changes in material or installation requirements due to the use of any optional pipe materials.

If adjustments are required due to Plan errors or omissions or authorized field changes, the plotted material and not the material elected would be used to establish new pay quantities.

Pipe sizes other than round (elliptical/arch) are summarized and paid for using equivalent round pipe diameter.

430-11.2 New Pipe Installed by Jack & Bore: The quantity of storm and cross drain pipe, storm drain trench, side drain and gutter drain pipe, installed by pipe culvert optional material - jack & bore, to be paid for will be the plan quantity, in place and accepted. The measurement and payment will be the plan quantity length of the casing or carrier pipe installed by jack & bore.

Carrier pipe installed through/inside the casing is paid for as pipe culvert optional material – excavation or trenching.

430-11.3 Mitered End Section: The quantity of mitered end sections to be paid for will be the number completed and accepted.

430-12 Basis of Payment.

430-12.1 General: Prices and payments will be full compensation for all work specified in this Section, including all excavation except the volume included in the items for the grading work on the project, and except for other items specified for separate payment in Section 125; all backfilling material and compaction; disposal of surplus material; and all clearing and grubbing outside of the required limits of clearing and grubbing as shown in the Plans.

No payment will be made for failed bore paths, injection of excavatable flowable fill, products taken out of service, or incomplete installations. Payment will include all work and materials necessary for jack & bore, including boring, backfilling, flowable fill, and restoration materials necessary for a complete and accepted installation.

No payment will be made for jack & bore until a Bore Path Report has been submitted to the Engineer.

430-12.2 Removing Existing Pipe: When existing pipe is removed and replaced with new pipe approximately at the same location, the cost of excavating and removing the old pipe and of its disposal will be included in the Contract unit price for clearing and grubbing.

430-12.3 Site Restoration: The cost of restoring the site, as specified in 125-11, that is disturbed, solely for the purpose of constructing pipe culvert, will be included in the Contract unit price for the pipe culvert, unless designated specifically to be paid for under other items.

430-12.4 Plugging Pipes: The cost of temporarily plugging a pipe culvert, either proposed or existing, will be incidental to the contract unit price for new pipe culvert.

The cost of filling and/or plugging an existing pipe culvert that is to be permanently placed out of service will be paid for at the contract unit price for filling and plugging pipe, per cubic yard. Price and payment will be full compensation for flowable fill, masonry, concrete, mortar, and all labor and materials necessary to complete the work.

When the project includes no quantities for new pipe culverts, and temporary plugs are required for existing pipe culverts, the cost will be considered as extra work, in accordance with 4-3.5.

430-12.5 Desilting Pipe: Desilting pipe will be paid for at the contract unit price per foot for each pipe desilted. Price and payment will be full compensation for furnishing all equipment, tools and labor, disposal of silt and debris, and all incidentals necessary for satisfactorily performing the work.

430-12.6 Desilting Concrete Box Culverts: Price and payment will be full compensation for all work required.

430-12.7 Flared End Sections: Price and payment will be full compensation for all work and materials required.

430-12.8 Mitered End Sections: Price and payment will be full compensation for all pipe, grates when required, fasteners, reinforcing, connectors, anchors, concrete, sealants, jackets and coupling bands, and all work required.

430-12.9 Railroad Requirements: Where pipe culvert is constructed under railroad tracks, the Contract unit price for the pipe culvert will include the costs of any jacking operations and the operation of placing the pipe by use of a tunnel liner, (except as specified for unanticipated tunnel liner, in 430-6.5, where reimbursement is to be made for such unanticipated liner), and all other work necessary to meet the requirements of the railroad company, excluding the costs of watchman or flagman services provided by the railroad company, except as provided below.

The Department will reimburse the Contractor for the actual costs of any trestle bridge work which is performed by the railroad's forces, as billed to him by the railroad, less the value of any salvage materials derived there from, whether such salvage materials are retained by the railroad company or by the Contractor. When the work of shoring and bracing is to be performed by the railroad, such fact will be stipulated in the Contract Documents and the Contractor will be required to pay to the railroad the amount of such costs, which amount will be reimbursed to him by the Department. The Contract unit price for the pipe culvert shall include the costs of all other work of shoring and bracing.

430-12.10 Payment Items:

Item 430-1	18" ADS, N-12	-per Linear Foot (LF)
Item 430-2	24" ADS, N-12	-per Linear Foot (LF)
Item 430-3	24" MES	-per Each (EA)

END OF SECTION 430

SECTION 520

CONCRETE GUTTER, CURB ELEMENTS, AND TRAFFIC SEPARATOR

520-1 Description.
Construct portland cement concrete curb. Curb will include concrete curb and gutter, concrete traffic separator, valley gutter, special concrete gutter, curb for sidewalk curb ramps and driveways, and any other types of concrete curb not specified in other Sections.

520-2 Materials.

520-2.1 Concrete: Use concrete meeting the requirements of Section 347.

520-2.2 Reinforcement: For all steel reinforcement required by the Plans, meet the requirements of Section 415.

520-2.3 Joint Materials: Meet the requirements of Section 932.

520-3 Forms.

520-3.1 Form Materials: Construct forms for this work of either wood or metal. Provide forms that are straight, free from warp or bends, and of sufficient strength, when staked, to resist the pressure of the concrete without deviation from line and grade. For all items constructed on a radius, use flexible forms.

520-3.2 Depth of Forms: Ensure that forms have a depth equal to the plan dimensions for the depth of concrete being deposited against them.

520-3.3 Machine Placement: The Contractor may place these items by machine methods with the approval of the Engineer provided that the Contractor consistently produces an acceptable finished product, true to line, grade, and cross section.

520-4 Excavation.
Excavate to the required depth, and compact the foundation material upon which these items are to be placed as specified in 120-9.

520-5 Placing Concrete.
Place the concrete in the forms, and tamp and spade it to prevent honeycombing, and until the top of the structure can be floated smooth and the edges rounded to the radius shown in the Plans.

520-6 Joints.

520-6.1 Contraction Joints: Except for machine placed items, the Contractor may form joints by using dummy joints (either formed or sawed) or by using sheet metal templates. If using sheet metal templates, ensure that they are of the dimensions, and are set to the lines, shown in the Plans. Hold templates firmly while placing the concrete. Leave templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place.

Saw contraction joints, for machine placed items, unless the Engineer approves an alternate method. Saw the joints as soon as the concrete has hardened to the degree that excessive raveling will not occur and before uncontrolled shrinkage cracking begins.

Space contraction joints at intervals of 10 feet except where closure requires a lesser interval, but do not allow any section to be less than 4 feet in length.

520-6.2 Expansion Joints: Construct expansion joints at all inlets, at all radius points, and at other locations indicated in the Plans. Locate them at intervals of 500 feet between other expansion joints or ends of a run. Ensure that the joint is 1/2 inch in width.

520-7 Finishing.

520-7.1 Repair of Minor Defects: Remove the forms within 24 hours after placing the concrete, and then fill minor defects with mortar composed of one part portland cement and two parts fine aggregate. The Engineer will not allow plastering on the face of the curb. Remove and replace any rejected curb, curb and gutter, or valley gutter without additional compensation.

520-7.2 Final Finish: Finish all exposed surfaces while the concrete is still green. In general, the Engineer will only require a brush finish. For any surface areas, however, which are too rough or where other surface defects make additional finishing necessary, the Engineer may require the Contractor to rub the curb to a smooth surface with a soft brick or wood block, using water liberally. Also, if necessary to provide a suitable surface, the Engineer may require the Contractor to rub further, using thin grout or mortar.

520-7.3 Imprinted Concrete: Install imprinted concrete as shown in the Plans.

520-8 Curing.

520-8.1 General: Continuously cure the concrete for a period of at least 72 hours. Commence curing after completely finishing and as soon as the concrete has hardened sufficiently to permit application of the curing material without marring the surface. Immediately replace any curing material removed or damaged during the 72 hour period.

After removing the forms, cure the surfaces exposed by placing a berm of moist earth against them or by any of the methods described below, for the remainder of the 72 hour curing period.

520-8.2 Wet Burlap Method: Place burlap, as specified in 925-1, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 6 inches. Hold the burlap securely in place such that it will be in continuous contact with the concrete at all times, and do not allow any earth between the burlap surfaces at laps or between the burlap and the concrete. Saturate the burlap with water before placing it, and keep it thoroughly wet throughout the curing period.

520-8.3 Membrane Curing Compound Method: Apply clear membrane curing compound or white pigmented curing compound, as specified in 925-2, by a hand sprayer meeting the requirements of 350-3.10, in a single coat continuous film at a uniform coverage of at least one gallon per 200 square feet. Immediately recoat any cracks, checks, or other defects appearing in the coating. Thoroughly agitate the curing compound in the drum prior to application, and during application as necessary to prevent settlement of the pigment.

520-8.4 Polyethylene Sheeting Method: Place polyethylene sheeting, as specified in 925-3, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 6 inches. Hold the sheeting securely in place and in continuous contact with the concrete at all times.

520-9 Backfilling and Compaction.
After the concrete has set sufficiently, but not later than three days after pouring, refill the spaces in front and back of the curb to the required elevation with suitable material. Place and thoroughly compact the material in layers not thicker than 6 inches.

520-10 Surface Requirements.
Test the gutter section of curb and gutter with a 10-foot straightedge laid parallel to the centerline of the roadway and while the concrete is still plastic. Perform straight edging along the edge of the gutter adjacent to the pavement or along other lines on the gutter cross-section, as directed by the Engineer. Immediately correct irregularities in excess of 1/4 inch.

520-11 Method of Measurement.
For curb or curb and gutter, the quantity to be paid will be the plan quantity, in feet, measured along the face of the completed and accepted curb or curb and gutter. Curb for sidewalk curb ramps or driveways will be paid at the Contract unit price for the adjacent curb type.

For valley gutter or shoulder gutter, the quantity to be paid will be the plan quantity, in feet, measured along the gutter line of the completed and accepted valley gutter or shoulder gutter.

For concrete traffic separator of constant width, meeting the requirements of Standard Plans, Index 520-020, the quantity to be paid will be the plan quantity, in feet, measured along the center of its width, completed and accepted, including the length of the nose.

For concrete traffic separator of nonstandard or varying width, the quantity to be paid will be the plan quantity, in square yards, completed and accepted.

520-12 Basis of Payment.

520-12.1 Concrete Gutter, Curb Elements, and Traffic Separator: Price and payment will be full compensation for all work specified in this Section, including reinforcement steel, dowels, asphalt pavement and base under traffic separator, joint materials and asphalt curb pad.

520-12.2 Excavation: Excavation for new installations will be paid for as roadway excavation in accordance with 120-13.2.

520-12.3 Payment Items: Payment will be made under:

Item 520-1	Concrete Type “F” Curb- Field Office	-per Linear Foot (LF)
Item 520-2	Concrete Type “V” Curb- Field Office	-per Linear Foot (LF)
Item 520-3	Concrete Wheel Stop- Field Office	-per Each (EA)
Item 520-4	Concrete Type “F” Curb- Maint. Bldg.	-per Linear Foot (LF)
Item 520-5	Concrete Wheel Stop (Furnish Only)- Maint. Bldg.	-per Each (EA)

END OF SECTION 522

SECTION 522

CONCRETE SIDEWALK AND DRIVEWAYS

522-1 Description.
Construct concrete sidewalks and driveways in accordance with the Plans and the Standard Plans. Sidewalk will include curb ramps, landings, transition slopes, sidewalk curb, and edge beams

522-2 Materials.
Meet the requirements specified in 520-2.

522-3 Forms.
Provide forms as specified in 520-3.

522-4 Foundation.
Shape and compact the foundation materials to a firm, even surface, true to grade and cross-slope. Compact areas that have been excavated more than 6 inches below the bottom of the concrete, to a minimum of 95% of AASHTO T99 density. The area to be compacted includes the area directly under and 1 foot beyond each side of the sidewalk or driveway, when right-of-way allows.

522-5 Joints.
Install expansion and contraction joints in accordance with the Plans and the Standard Plans

522-6 Placing Concrete.
Place the concrete as specified in 520-5.

522-7 Finishing.

522-7.1 Screeding: Strike-off the concrete by means of a wood or metal screed, used perpendicular to the forms, to obtain the required grade and remove surplus water and laitance.

522-7.2 Surface Requirements: Imprint concrete as detailed in the Plans, otherwise provide a broom finish. Ensure that the surface variations are not more than 1/4 inch under a 10-foot straightedge or more than 1/8 inch on a 5 foot transverse section. Finish the outer edges of the concrete with an edging tool having a radius of 1/2 inch.

522-8 Curing.
Cure the concrete as specified in 520-8.

522-9 Opening Sidewalk to Pedestrian Traffic.
Install detectable warnings, when shown in the Plans, in accordance with Section 527 on completed sections of sidewalk before opening to pedestrian traffic.

522-10 Method of Measurement.
The quantity to be paid will be plan quantity, in square yards, completed and accepted.

522-11 Basis of Payment.
Price and payment will be full compensation for all work specified in this Section. Excavation for new installations will be paid for under the items for the grading work on the project.

Payment will be made under:

Item 522-1	Concrete Sidewalk- Field Office	-per Square Yard (SY)
Item 522-2	Concrete Bollards- Field Office	-per Each (EA)
Item 522-3	8” PCC Drive Approach- Field Office	-per Square Yard (SY)
Item 522-4	Concrete Parking with Sidewalk- Maint. Bldg.	-per Square Yard (SY)
Item 522-5	Concrete Bollards- Maint. Bldg.	-per Each (EA)
Item 522-6	8” PCC Drive Approach- Maint. Bldg.	-per Square Yard (SY)
Item 522-7	8” PCC Apron- Maint. Bldg.	-per Square Yard (SY)

END OF SECTION 522

SECTION 527

DETECTABLE WARNINGS

527-1 Description.
Furnish and install detectable warnings on newly constructed and/or existing concrete or asphalt walking surfaces (sidewalk curb ramps, sidewalks, shared use paths, etc.) constructed in accordance with Standard Plans, Index 522-002.

527-2 Materials.

527-2.1 Detectable Warnings: Provide detectable warnings in accordance with the Americans with Disabilities Act Standards for Transportation Facilities, Section 705. Use detectable warnings consisting of materials intended for exterior use subject to routine pedestrian traffic and occasional vehicular traffic. Use detectable warnings with size and pattern shown in the Plans comprised of truncated domes aligned in parallel rows in accordance with Standard Plans, Index 522-002. Do not use detectable warnings with a diagonal pattern.

527-2.1.1 Preformed Materials: Use detectable warnings consisting of weather resistant tiles or pavers that are cast into concrete, or tiles or mats that are surface-applied to concrete or asphalt surfaces with adhesives and mechanical fasteners or torch-applied preformed thermoplastic.

527-2.1.2 Field-Formed Materials: Use detectable warnings applied as a secondary application to the substrate. 527-2.2 Material Properties: Provide detectable warnings that meet the following minimum material property requirements when tested in accordance with the following:

527-2.2 Material Properties: Provide detectable warnings that meet the following minimum material property requirements when tested in accordance with the following:

PROPERTY	STANDARD	TEST VALUE
Slip Resistance	FM 3-C1028	Dry Coefficient of Friction-0.8 min Wet Coefficient of Friction-0.65 min. (include recessed areas between truncated domes)
Wear Resistance	FM 5-594	Average Volume Loss: no more than 0.06 cm^3
Water Absorption*	ASTM D570	Not to exceed 5%
Adhesion/Bond Strength**	FM 5-589	150 psi min. tensile adhesion strength
Non-Hazardous Classification	Submit Material Safety Data Sheet (SDS)	Non-Hazardous, per RCRA Subtitle C
* Applies only to plastic materials. ** Applies only to surface-applied materials.		

527-2.3 Color/Contrast: Use safety yellow, brick red or black colored detectable warnings on concrete walking surfaces. Use safety yellow colored detectable warnings on asphalt walking surfaces. Acceptable detectable warnings shall meet the following criteria for a duration of three years.

COLOR	LIGHT REFLECTANCE VALUES (LRV) CAP Y*
Safety Yellow	25-45
Brick Red	5-15
Black	0-5
* When measured with a spectrophotometer	

527-2.4 Approved Product List: Methods or products used to form detectable warnings in wet concrete will not be permitted.

527-3 Installation Procedures.

527-3.1 Surface Preparation and Installation: Prepare the surface in accordance with the manufacturer's recommendations. Use only products and materials appropriate for the surface on which they will be applied. Install in accordance with the manufacturer's instructions, using materials and equipment recommended and approved by the manufacturer. Install surface applied tiles or mats as soon as the sidewalk concrete has cured and before opening to pedestrian traffic using adhesives applied over the entire surface and mechanical fasteners.

527-4 Method of Measurement.

No separate measurement will be made for detectable warnings.

527-5 Basis of Payment.

No separate payment will be made for detectable warnings. Price shall be incidental to Items identified in specifications 520 & 522.

Payment will be made under:

Item 527-1	Detectable Warning Surfaces- Field Office	-per Each (EA)
Item 527-2	Detectable Warning Surfaces- Maint. Bldg.	-per Each (EA)

END OF SECTION 527

SECTION 550

FENCING

550-1 Description.

Furnish, erect and reset metal fence of the type and at the locations shown in the Plans.

550-2 Types of Fence.

The types of fence are designated as follows:

Type A (Farm Fence).
Type B (Chain-Link Fence).
Type R (Chain-Link Fence for Pedestrian Overpass).

550-3 Materials.

550-3.1 Type A Fence (Farm Fence): Meet the requirements of Section 954 for timber posts and braces. For metal posts and braces, and for recycled plastic fence posts, meet the requirements of the Standard Plans. For the fabric and all other accessories, meet the requirements of the Standard Plans.

550-3.2 Type B Fence (Chain-Link): For the posts, braces, fabric and all accessories other than the concrete for bases, meet the requirements of the Standard Plans. Use concrete as specified in Section 347, or a premix approved by the Engineer for bases. The requirements contained in 347-2.2, and 347-3 will not apply.

550-3.3 Type R Fence (Chain-Link for Pedestrian Overpass): Use the fabric and accessories specified in the Plans**.**

550-3.4 Resetting Fence: Use material from the existing fence. For any additional materials required, provide the same type of material as in the existing fence and as specified herein, including gates when applicable.

550-3.5 Optional Use of Materials: For Type A Fence, a combination of steel, aluminum, timber, recycled plastic or concrete posts may be used. Unless otherwise called for in the Plans, line posts of one material may be used with corner, pull and end post assemblies of a different material. The Engineer will permit the use of line posts of only one optional material and pull posts assemblies of only one optional material between corner and end post assemblies. Within individual corner and end post assemblies, the Engineer will allow the use of only one optional material. For Type B Fence, a combination of zinc-coated steel fence members, aluminum coated fence members and aluminum alloy fence members may be used. Unless otherwise indicated in the Plans, the Engineer will allow the use of only one type of fabric material, one type of line post material and one type of pull assembly material between corner and end post assemblies.

550-3.6 Certification: Provide the Engineer with certified test reports from the manufacturer confirming that all materials (posts, braces, fabric and all other accessories) conform to the requirements of this Section, Section 6 and the Standard Plans. Provide the Engineer a copy of the certification at least ten days prior to fence construction.

Also furnish the Engineer a Certificate of Compliance certifying that the fencing system, materials and construction practices comply with the applicable Standard Plans and Specifications.

Acceptance of furnished material will be based on the Certificate of Compliance, accompanying test reports and visual inspection by the Engineer.

550-4 Construction Methods.

550-4.1 General: Install the fence in accordance with the specific requirements of this Article and with the details shown on the Standard Plans for the particular type of fence called for, except for Type R Fence which shall be detailed in the Plans. Construct the fence in close proximity to the right of way line except as otherwise detailed in the Plans. Assume responsibility for obtaining satisfactory permits or permission from property owners for any encroachments required to perform the work, and for proper scheduling of the fence installation with the removal of existing fence where it is necessary to provide continuous security to adjacent areas already fenced. In order to meet this requirement, where necessary for maintaining security of livestock on adjacent property during construction of the new fence, the Engineer may require the erection and subsequent removal of temporary fencing.

550-4.2 Spacing of Posts: Space posts as shown in the Standard Plans, within a tolerance of 12 inches, except where definite spotting of corner posts is required. Ensure that in any line of fence, the over-spacings and the under-spacings shall approximately compensate. Set additional line posts at abrupt changes in grade.

550-4.3 Clearing: Where the clearing and grubbing for the project includes the area occupied by the fence, clear the area to the limits shown in the Plans. If the limits are not shown in the Plans, clear the area at least 2 feet wide on each side of the fence line. The Engineer may direct that desirable trees be left in place and may restrict clearing where permission from the property owners cannot be obtained**.**

550-4.4 Construction Over Irregular Terrain and Other Obstructions:

550-4.4.1 Clearance of Bottom of Fence: Install the fence such that the bottom of the fence, in general, follows the contour of the ground. The fence is detailed in the Plans at approximately 3 inches above ground line. Over irregular ground, however, the Engineer will permit a minimum clearance of 1 inch and a maximum of 6 inches for a length not to exceed 8 feet, and, for Type A fence, with the barbed wire spaced midway between ground and bottom of fabric.

550-4.4.2 Grading: Where necessary to secure proper vertical alignment and to meet the clearance requirements, fill depressions (except where filling would obstruct proper drainage) and cut down knolls and ridges. Provide a substantial and permanent foundation for the fence.

550-4.4.3 Use of Extra-Length Posts. At locations where it is impracticable to adjust the ground level, the Engineer may require that posts of additional length be set and that the opening at the bottom be closed by additional barbed wire, stretched taut between poles, with no vertical distance between wires greater than 3 inches. For all such posts requiring a concrete base, extend the concrete downward to the bottom of the extra-length post.

550-4.5 Setting Posts: If rock occurs within the required depth of the post hole, or pavement which is to remain in place exists at the location of a post, drill a hole of a diameter slightly larger than the greatest dimension of the post or footing and grout in the post or footing. Set timber posts either by digging or by driving. Set recycled plastic fence posts in accordance with the Standard Plans.

550-4.6 Placing Fabric: Do not place fabric and barbed wire until the posts have been permanently positioned and concrete foundations have attained adequate strength. Place the fabric by securing one end and applying sufficient tension to remove all slack before making permanent attachments at intermediate points. Fasten the fabric to all end, corner and pull posts by approved means. Fasten the fabric using tools designed for the purpose, in accordance with the manufacturer's recommendations. Apply the tension for stretching by mechanical fence stretchers or with single-wire stretchers designed for the purpose.

550-4.7 Electrical Grounds:

550-4.7.1 Grounding for Overhead Lines: Wherever an overhead power line crosses over the fence, install a ground rod directly below the point of crossing. Where an overhead power line runs parallel to, and within 100 feet of the fence, install a ground rod at each end of the fence and at intervals of no greater than 1,500 feet. Use copper-clad steel ground rods that are a minimum of 8 feet in length and 1/2 inch in diameter. Drive the rod vertically until the top of the rod is approximately 6 inches below the ground surface. Connect a conductor of No. 6 AWG solid copper wire to the ground rod and each metal fence element directly adjacent to the ground rod using non-corrosive ground rod clamps.

550-4.7.2 Fences with Non-Metal Posts: For all fences using non-metal posts, substitute a metal post for a non-metal post at intervals of no greater than 300 feet with at least one metal post in any length of fence. Tightly fasten a galvanized steel wire to the barbed wire, fence fabric, and metal post.

550-5 Method of Measurement.

550-5.1 General: The quantities to be paid for will be plan quantity for the number of gates and the length of each type of fence constructed and accepted. In addition, extra payment will be made, in accordance with 550-6.2, for additional lengths of post approved by the Engineer for the crossing of depressions in accordance with 550-4.4.3, muck areas, or other areas of inadequate support for a post of standard length.

550-5.2 Measurement of Fence Length, and Payment: The length of fence to be paid for will be plan quantity completed and accepted. Measurement for resetting fence will be the actual length of existing fence reset, including gates when applicable.

550-6 Basis of Payment.

550-6.1 Basic Items of Fencing: The Contract unit price per foot for the item of fencing, will be full compensation for all work and materials necessary for the complete installation, including line posts, corner, end, and pull posts. Such price and payment will include, but not be limited to, the following specific incidental work.

1. Any work required to level and prepare the terrain along the line of the fence.
2. Any additional clearing incidental to construction of the fence.
3. All preparation for post holes, in whatever type of material, as specified herein.
4. Any furnishing and installing of electrical grounds.
5. Any additional work or materials required for special construction over irregular terrain, or terrain of inadequate support for the posts, including the additional barbed wire, but not including the extra lengths of posts ordered by the Engineer.
6. Any cost of erection and removal of any temporary fencing, which may be necessary for maintaining security of livestock, etc., on adjacent property during construction of the new fence.

550-6.2 Payment Rates for Extra-Length Posts: Any extra length posts added to complete installation of the fence will require an invoice. The Contractor will be compensated for invoice price plus 10% as payment for any extra length posts. The standard length of steel, recycled plastic and aluminum posts will be the required length as indicated in the Plans or Standard Plans for each type and case. The payment for additional length of post will include the cost of additional concrete to extend concrete bases, as applicable.

550-6.3 Gate Payment: The quantities to be paid for will be full compensation for all labor, materials, posts, and associated hardware for the complete installation of the type gate specified in the Plans, and accepted by the Engineer.

550-6.4 Payment Items:

Item 550-1	Fencing- Field Office	-per Linear Foot (LF)
Item 550-2	Vehicular Double Gate- Field Office	-per Each (EA)
Item 550-3	Fencing- Maint. Bldg.	-per Linear Foot (LF)
Item 550-4	Vehicular Double Gate- Maint. Bldg.	-per Each (EA)

END OF SECTION 550

SECTION 700

HIGHWAY SIGNING

700-1 General Requirements.

700-1.1 Description: Furnish and erect roadway signs at the locations, and in accordance with the details, shown in the Plans.

The Owner designates ground traffic signs as signs erected on the shoulders, slopes, or medians, but not extending over the traveled roadway, and may further classify these signs as single post or multi-column.

The Owner designates signs erected partially or completely over the traveled roadway or mounted on bridges as overhead traffic signs, and may further classify these signs as overhead cantilever or span traffic signs. Meet the requirements of Section 603.

700-1.2 Materials:

700-1.2.1 General: Meet the materials requirements shown in the Specifications, Standard Plans, and any additional requirements identified in the Plans.

700-1.2.2 Concrete: Use concrete meeting the requirements of Section 346.

700-1.2.3 Static Sign Assembly Requirements: All sign panels shall be aluminum unless otherwise shown in the Plans. Sheets and plates for sign panels shall meet the requirements of ASTM B209, Aluminum Association Alloy 6061-T6, 5154-H38 or 5052-H38. Sign panels for single column ground mounted signs shall utilize aluminum plate with a minimum thickness of 0.08 inches. All other sign panels shall utilize aluminum plate with a minimum thickness of 0.125 inches. All panels shall have rounded corners.

700-1.2.4 Retroreflective Sign Sheeting: Use signs that meet the material and process requirements of Section 994.

Use Type XI sheeting for all regulatory, warning and overhead signs unless otherwise specified. The R1-1, R1-2, R5-1 and R5-1a signs must use a sheeting system that includes a colorless film overlay.

Type XI sheeting shall also be used for all limited access advance exit and exit guide signs.

Use Type IV yellow-green fluorescent sheeting for the following signs:

1. school: S1-1, S3-1, S3-2, S4-5, S4-5a, S5-1 (SCHOOL portion),
2. bicycle: W11-1,
3. pedestrian: R1-6, R1-6a, R1-6b, R1-6c, R1-9, R1-9a, R10-15, W11-2,
4. shared use path (trail): W11-15, W11-15a,
5. supplemental panels used with signs in (1) through (4), above.

Do not mix signs having fluorescent yellow-green sheeting with signs having yellow retroreflective sheeting.

Roll-up signs shall meet the requirements of Type VI sheeting.

Use Type IV sheeting for all other signs.

Use Type IV or Type XI sheeting for retroreflective strips on signs.

700-1.3 Sign Fabrication Requirements: Obtain multi-post and overhead sign structures compliant with this specification.

700-1.4 Storage, Handling and Labeling: If signs are stored prior to installation, store them in accordance with the manufacturer's recommendations. Properly package signs to protect them during storage, shipment and handling to prevent damage to the sign face and panel.

In addition to the information required in Section 994, all permanent roadway signs must be labeled on the back bottom edge with the date of installation. Make the labels unobtrusive, but legible enough to be easily read by an observer on the ground when the sign is in its final position. Apply the label in a manner that is at least as durable as the sign face.

700-1.5 Acceptance of Signs:

700-1.5.1 Sign Inspection: Submit certification that the sign assembly meets the material and installation requirements of the Contract Documents. The Engineer will inspect the signs upon delivery to the storage or project site and again at the final construction inspection. Repair and replace signs deemed unacceptable by the Engineer at no expense to the Owner.

700-1.5.2 Imperfections and Repairs: Repair or replace signs containing imperfections or damage regardless of the kind, type, or cause of the imperfections or damage. For sign panels exceeding 30 square feet, the Contractor may make one patch, if necessary, to each sign panel not to exceed two square inches. Make repairs according to the manufacturer's recommendations and to the satisfaction of the Engineer. Ensure that completed repairs provide a level of quality necessary to maintain the service life of the sign and are satisfactory in appearance to the Engineer.

700-2 Static Signs.

700-2.1 Ground Mounted Signs: Ground mounted signs consist of both single column and multi-column static signs.

700-2.1.1 Materials: Use aluminum tubing materials meeting the general provisions of Section 965 for all single column ground signs. Multi-column signs must be galvanized steel W or S beams steel columns meeting the general provisions of Section 962. All materials must meet the requirements of the appropriate Standard Plans.

700-2.1.2 Fabrication of Panel Messages: Fabricate standard sign panel messages in accordance with details included in the Standard Highway Signs (SHS) manual published by the U.S. Department of Transportation. Submit shop drawings to the Owner for approval as specified in Section 5.

700-2.1.3 Foundation: Construct foundations in accordance with the applicable Standard Plans. The Contractor may use precast foundations in augured or excavated holes a minimum of 12 inches larger than each axis dimension of the precast foundation. The holes must be clean and

without loose material. Temporary casing will be required if the soil is unstable. Fill the void around the precast foundation with flowable fill meeting the requirements of Section 121 or use clean sand placed using hydraulic methods.

700-2.1.4 Breakaway Support Mechanisms for Ground Traffic Signs:

700-2.1.4.1 Frangible Supports: Provide support posts for all frangible sign assemblies consisting of aluminum tubes up to 3 -1/2 inches outside diameter with 3/16 inch wall thickness in accordance with the requirements in the Standard Plans.

700-2.1.4.2 Slip Bases: Slip base assemblies for single column signs will use aluminum sleeves and base plates. Slip base assemblies for multi-column signs will use galvanized steel bases. All slip bases must be fabricated in accordance with the requirements of the Standard Plans.

700-2.1.5 Installation: Verify the length of the column supports in the field prior to fabrication to permit the appropriate sign mounting height. Fabricate the supports and wind beams in accordance with the Standard Plans. Columns must be plumb and panels must be level with the proper orientation.

700-2.1.6 Retroreflective Strips for Signs: Use only on signs where the retroreflective sign strip is called for in the Plans. Install retroreflective strips in accordance with the manufacturer's instructions. If panel is required to install the retroreflective sheeting, use 0.040 minimum aluminum panels or another material approved by the sheeting manufacturer. Use stainless steel attachment hardware for the installation. The retroreflective sign strips must be fastened in a manner that does not require drilling of holes in the column. Retroreflective sign strips must be 2 inches in width and a height of 5 feet for all signs except for when signs are mounted at 4 feet, then retroreflective sign strip will be 2 feet in height. If a panel is required for installation, the panel for the retroreflective sheeting must be the same dimensions as the retroreflective sheeting. For the back of Rail Road Crossbuck signs, the retroreflective sign strip will be 2 inches wide for the full length of the blade. Match the color of the retroreflective sheeting to the background color of the sign except for YIELD signs and DO NOT ENTER signs, where the color must be red.

700-2.2 Overhead Signs: Not Used

700-2.3 Method of Measurement: For single post and multi post sign assemblies, an assembly consists of all the signs mounted on a single structure. The Contract unit price per assembly for ground mounted signs (single post and multi-post), furnished and installed, will include furnishing the sign panels, support structure, foundation, hardware, and labor necessary for a complete and accepted installation.

The retroreflective sign strip will be paid for separately, and the Contract unit price per each will include furnishing the retroreflective sign strip, hardware and labor necessary for a complete and accepted installation.

For overhead signs, sign panels will be paid separately from support structures. The Contract unit price per each for sign panel, furnished and installed, will include furnishing the sign panels, hardware, and labor necessary for a complete and accepted installation. The Contract unit price for

each overhead static sign structure, furnished and installed, will include furnishing the support structure, foundation, hardware, and labor necessary for a complete and accepted installation.

Relocation of signs will consist of removing the existing sign assembly and installing the sign on a new foundation at the location shown in the Plans.

When the Plans call for existing ground-mounted signs to be relocated or removed, after removing the sign panel from the assembly, remove supports and footings. Restore the area of the sign removal or relocation to the condition of the adjacent area.

700-2.4 Basis of Payment: Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item 700-1	Vehicular Signage- Field Office	-per Lump Sum (LS)
Item 700-2	Vehicular Signage- Maint. Bldg.	-per Lump Sum (LS)

700-3 Illuminated Signs
Not Used

700-4 Dynamic Message Signs.
Not Used

700-5 Electronic Display Sign.
Not Used

700-6 Sign Beacon.
Not Used

END OF SECTION 700

SECTION 710

PAINTED PAVEMENT MARKINGS

710-1 Description.
Apply painted pavement markings, in accordance with the Contract Documents.

710-2 Materials.
Use only materials meeting the following requirements:

Materials for Raised Pavement Markers (RPMs) and Bituminous Adhesive	Section 970
Standard Paint	971-1 and 971-3
Durable Paint	971-1 and 971-4
Glass Spheres	971-1 and 971-2

The Engineer will take random samples of all material.

710-3 Equipment.
Use equipment that will produce continuous uniform dimensions of pavement markings of varying widths and meet the following requirements:

1. Capable of traveling at a uniform, predetermined rate of speed, both uphill and downhill, in order to produce a uniform application of paint and capable of following straight lines and making normal curves in a true arc.

2. Capable of applying glass spheres to the surface of the completed line by an automatic sphere dispenser attached to the pavement marking machine such that the glass spheres are dispensed closely behind the installed line. Use a glass spheres dispenser equipped with an automatic cut-off control that is synchronized with the cut-off of the paint and applies the glass spheres in a manner such that the spheres appear uniform on the entire pavement markings surface.

3. Capable of spraying the paint to the required thickness and width without thinning of the paint. Equip the paint tank with nozzles equipped with cut-off valves, which will apply broken or skip lines automatically.

710-4 Application.

710-4.1 General: Remove existing pavement markings, such that scars or traces of removed markings will not conflict with new pavement markings, by a method approved by the Engineer.

Before applying pavement markings, remove any material that would adversely affect the bond of the pavement markings by a method approved by the Engineer.

Apply standard paint to dry surfaces only, and when the ambient air and surface temperature is at least 40°F and rising.

Apply durable paint to dry surfaces only. Do not apply durable paint when the ambient air and surface temperature is below 50°F, relative humidity is above 80% or when the dew point is within 5°F of the ambient air temperature.

Do not apply painted pavement markings when winds are sufficient to cause spray dust.

Apply painted pavement markings, having well defined edges, over existing pavement markings such that not more than 2 inches on either end and not more than 1 inch on either side is visible. When stencils are used to apply symbols and messages, the areas covered by the stencil reinforcing will not be required to be painted.

Mix the paint thoroughly prior to pouring into the painting machine. Apply paint to the pavement by spray or other means approved by the Engineer.

Conduct field testing in accordance with FM 5-541. Remove and replace painted pavement markings not meeting the requirements of this Section at no additional cost to the Owner. Apply all pavement markings prior to opening the road to traffic.

710-4.1.1 Painted Pavement Markings (Final Surface): On concrete surfaces or newly constructed asphalt, the painted pavement markings (final surface) will include one application of standard paint and one application of Class B RPMs applied to the final surface.

For center line and edge line rumble strip installations where the pavement marking is placed within the grinding, apply a second application of standard paint within 24 hours of each day's grinding operation.

For center line rumble strip installations where RPMs are in conflict with the grinding, install Class D RPMs with the first application of standard paint. Remove Class D RPMs prior to grinding, then install Class B RPMs in an unground area after grinding.

Do not apply final surface paint for bicycle arrows or bicycle messages, 24-inch longitudinal bars in special emphasis crosswalks, or route shields where preformed thermoplastic will be applied.

Install all RPMs in accordance with Standard Plans, Indexes 706-001 and 711-003, prior to opening the road to traffic.

Temporary RPMs must meet the requirements of Section 102.

Permanent RPMs must meet the requirements of Section 706.

710-4.2 Thickness: Apply standard paint to attain a minimum wet film thickness in accordance with the manufacturer's recommendations. Apply durable paint to attain a minimum wet film thickness of 0.025 inches or 25 mils. Measure, record, and certify on a form and submit to the Engineer, the thickness of white and yellow durable paint pavement markings in accordance with FM 5-541.

710-4.3 Retroreflectivity: Apply white and yellow standard paint that will attain an initial retroreflectance of not less than 300 mcd/lx·m^2 and not less than 250 mcd/lx·m^2, respectively. Apply white and yellow durable paint that will attain an initial retroreflectance of not less than 450 mcd/lx·m^2 and not less than 300 mcd/lx·m^2, respectively.

Measure, record and certify on a form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with FM 5-541.

The Owner reserves the right to test the markings within three days of receipt of the Contractor's certification. Failure to afford the Owner opportunity to test the markings will result in non-payment. The test readings should be representative of the Contractor's pavement marking performance. If the retroreflectivity values measure below values shown above, reapply the pavement marking at no additional cost to the Owner.

For standard paint, ensure that the minimum retroreflectance of white and yellow pavement markings are not less than 150 mcd/lx m2. If the retroreflectivity values for standard paint fall below the 150 mcd/lx m2 value within 180 days of initial application, the pavement marking will be reapplied at the Contractor's expense. If the retroreflectivity values for durable paint fall below the initial values of 450 mcd/lx m2 value for white and 300 mcd/lx m2 for yellow within 180 days of initial application, the pavement marking will be reapplied at the Contractor's expense.

710-4.4 Color: Use paint material that meets the requirements of 971-1.

710-4.5 Glass Spheres: Apply glass spheres on all pavement markings immediately and uniformly following the paint application. The rate of application shall be based on the manufacturer's recommendation.

For longitudinal durable paint markings, apply a double drop of Type 1 and Type 3 glass spheres. For transverse durable paint markings, apply a single drop of Type 3 glass spheres.

The rate of application shall be based on the manufacturer's recommendation.

710-5 Tolerances in Dimensions and in Alignment.
Establish tack points at appropriate intervals for use in aligning pavement markings, and set a stringline from such points to achieve accuracy.

710-5.1 Dimensions:

710-5.1.1 Longitudinal Lines: Apply painted skip line segments with no more than plus or minus 12 inches variance, so that over-tolerance and under-tolerance lengths between skip line and the gap will approximately balance. Apply longitudinal lines at least 2 inches from construction joints of portland cement concrete pavement.

710-5.1.2 Transverse Markings, Gore Markings, Arrows, and Messages: Apply paint in multiple passes when the marking cannot be completed in one pass, with an overall line width allowable tolerance of plus or minus 1 inch.

710-5.1.3 Contrast Lines: Use black paint to provide contrast on concrete or light asphalt pavement, when specified by the Engineer. Apply black paint in 10-foot segments following each longitudinal skip line.

710-5.2 Alignment: Apply painted pavement markings that will not deviate more than 1 inch from the stringline on tangents and curves one degree or less. Apply painted pavement markings that will not deviate more than 2 inches from the stringline on curves greater than one degree. Apply painted edge markings uniformly, not less than 2 inches or more than 4 inches from the edge of pavement, without noticeable breaks or deviations in alignment or width.

Remove and replace at no additional cost to the Owner, pavement markings that deviate more than the above stated requirements.

710-5.3 Correction Rates: Make corrections of variations in width at a maximum rate of 10 feet for each 0.5 inch of correction. Make corrections of variations in alignment at a maximum rate of 25 feet for each 1 inch of correction, to return to the stringline.

710-6 Contractor's Responsibility for Notification.
Notify the Engineer prior to the placement of the materials. At the time of notification, submit a certification to the Engineer with the APL number and the batch or Lot numbers of the paint and glass spheres to be used.

710-7 Protection of Newly Applied Pavement Markings.
Do not allow traffic onto or permit vehicles to cross newly applied pavement markings until they are sufficiently dry. Remove and replace any portion of the pavement markings damaged by passing traffic or from any other cause, at no additional cost to the Owner.

710-8 Corrections for Deficiencies to Applied Painted Pavement Markings.
Reapply a 1.0 mile section, centered around any deficiency, at no additional cost to the Owner.

710-9 Submittals.

710-9.1 Submittal Instructions: Prepare a certification of quantities for each project in the Contract. Submit the certification of quantities and daily worksheets to the Engineer. For Lump Sum pay item 710-90, document the quantity as an estimated percentage (in decimal form) of the total lump sum amount on the daily worksheet. The Owner will not pay for any disputed items until the Engineer approves the certification of quantities.

710-9.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities no later than Twelve O'clock noon Monday after the estimate cut-off date or as directed by the Engineer, based on the amount of work done or completed. Ensure the certification of quantities consists of the following:

1. Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

2. The basis for arriving at the amount of the progress certification, less payments previously made and less any amount previously retained or withheld. The basis will include a detailed breakdown provided on the certification of items of payment.

710-10 Method of Measurement.
The quantities, authorized and acceptably applied, under this Section will be paid as follows:

1. The length, in gross miles, of solid, 10'-30' skip, 3'-9' dotted, 6'-10' dotted, 2'2' dotted, and 2'-4' dotted lines.

2. The length, in linear feet, of transverse lines, diagonal lines, chevrons, and parking spaces.

3. The number of pavement messages, symbols, and arrows. Each arrow is paid as a complete marking, regardless of the number of "points" or directions.

4. Lump Sum, as specified in 710-4.1.1 (final surface) and 710-9.1.

5. The area, in square feet, for removal of existing markings acceptably removed. Payment for removal of conflicting markings will be in accordance with 102-5.8. Payment for removal of non-conflicting markings will be paid separately.

The gross mile measurement will be taken as the distance from the beginning of the painted line to the end of the painted line and will include the unmarked gaps for skip and dotted lines. The gross mile measurement will not include designated unmarked lengths at intersections, turn lanes, etc. Final measurement will be determined by plan dimensions or stations, subject to 9-1.3.1.

710-11 Basis of Payment.

710-11.1 General: Price and payment will be full compensation for all work specified in this Section, including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

710-11.2 Painted Pavement Markings (Final Surface): Price and payment for painted pavement markings (final surface) will be full compensation for all applications of painted pavement markings, and all applications and removal of RPMs in accordance with 710-4.1.1 and 710-9.1.

710-11.3 Basis of Payment: Price and payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item 710-1	Vehicular Pavement Markings, (White) – Field Office	-per Square Foot (SF)
Item 710-2	Vehicular Pavement Markings, (Blue) – Field Office	-per Square Foot (SF)
Item 710-3	Vehicular Pavement Markings, (Yellow) – Field Office	-per Square Foot (SF)
Item 710-4	Vehicular Pavement Markings, (White) – Maint. Bldg.	-per Square Foot (SF)
Item 710-5	Vehicular Pavement Markings, (Blue) – Maint. Bldg.	-per Square Foot (SF)

END OF SECTION 710

SECTION 711

THERMOPLASTIC PAVEMENT MARKINGS

711-1 Description.
Apply new thermoplastic pavement markings, or refurbish existing thermoplastic pavement markings, in accordance with the Contract Documents.

711-2 Materials.
Use only materials meeting the following requirements.

Standard and Refurbishment Thermoplastic ..... 971-1 and 971-5
Preformed Thermoplastic..... 971-1 and 971-6
High Friction Thermoplastic ..... 971-1 and 971-10
Glass Spheres..... 971-1 and 971-2

Use sand materials meeting the requirements of 971-5.4.

The Engineer will take random samples of all material.

711-3 Equipment.
Use equipment capable of providing continuous, uniform heating of the pavement marking material to temperatures exceeding 390ºF, mixing and agitation of the material in the reservoir to provide a homogeneous mixture without segregation. Use equipment that will maintain the pavement marking material in a plastic state, in all mixing and conveying parts, including the line dispensing device until applied. Use equipment which can produce varying width lines and which meets the following requirements:

1. Capable of traveling at a uniform, predetermined rate of speed, both uphill and downhill, to produce a uniform application of pavement marking material and capable of following straight lines and making normal curves in a true arc.

2. Capable of applying glass spheres to the surface of the completed pavement marking by a double drop application for standard thermoplastic pavement markings and a single drop application for recapping and refurbishment thermoplastic pavement markings. The bead dispenser for the first bead drop shall be attached to the pavement marking machine in such a manner that the beads are dispensed closely behind the installed line. The second bead dispenser bead shall be attached to the pavement marking machine in such a manner that the beads are dispensed immediately after the first bead drop application. Use glass spheres dispensers equipped with an automatic cut-off control that is synchronized with the cut-off of the thermoplastic material and applies the glass spheres uniformly on the entire pavement markings surface with 50 to 60% embedment.

3. Equipped with a special kettle for uniformly heating and melting the pavement marking material. The kettle must be equipped with an automatic temperature control device and material thermometer for positive temperature control and to prevent overheating or scorching of the thermoplastic material.

4. Meet the requirements of the National Fire Protection Association, state, and local authorities.

711-4 Application.

711-4.1 General: Remove existing pavement markings such that scars or traces of removed markings will not conflict with new pavement markings by a method approved by the Engineer. Cost for removing conflicting pavement markings during maintenance of traffic operations to be included in Maintenance of Traffic, Lump Sum.

Before applying pavement markings, remove any material that would adversely affect the bond of the pavement markings by a method approved by the Engineer.

Before applying pavement markings to any portland cement concrete surface, apply a primer, sealer, or surface preparation adhesive of the type recommended by the manufacturer. Offset longitudinal lines at least 2 inches from any longitudinal joints of portland cement concrete pavement.

Apply pavement markings to dry surfaces only, and when the ambient air and surface temperature is at least 50ºF and rising for asphalt surfaces and 60 degrees and rising for concrete surfaces.

Apply pavement markings to the same tolerances in dimensions and in alignment specified in 710-5. When applying pavement markings over existing markings, ensure that no more than 2 inches on either end and not more than 1-inch on either side of the existing line is visible.

Apply thermoplastic material to the pavement by extrusion or other means approved by the Engineer.

Conduct field tests in accordance with FM 5-541.Take test readings representative of the pavement marking performance. Remove and replace pavement markings not meeting the requirements of this Section at no additional cost to the Owner.

With the exception of short-term raised rumble strips, wait at least 14 days after constructing the final asphalt surface course to place thermoplastic pavement markings. Installation of thermoplastic on concrete requires a clean, dry surface. Follow the manufacturer's recommendations for surface preparation for thermoplastic on concrete. Provide temporary pavement markings during the interim period prior to opening the road to traffic.

711-4.1.1 Preformed Thermoplastic: Apply markings to dry surfaces only and when ambient air temperature is at least 32°F. Prior to installation, follow the manufacturer's recommendations for pre-heating.

711-4.1.2 High Friction Thermoplastic: High friction thermoplastic may be used as an alternative to preformed thermoplastic for special emphasis crosswalk markings. Apply markings only by gravity or air pressure thermoplastic hand liners set-up with double drop bead attachments. Install markings in accordance with the manufacturer's recommendations.

711-4.2 Thickness:

711-4.2.1 Standard Thermoplastic Markings: Apply or recap standard thermoplastic pavement markings for longitudinal lines to attain a minimum thickness of 0.10 inch or 100 mils and a maximum thickness 0.15 inch or 150 mils when measured above the pavement surface.

All chevrons, diagonal and transverse lines, messages, symbols, and arrows, wherever located, will have a thickness of 0.09 inch or 90 mils to 0.12 inch or 120 mils when measured above the pavement surface.

Measure, record and certify on a form and submit to the Engineer, the thickness of white and yellow pavement markings in accordance with FM 5541.

The Engineer will verify the thickness of the pavement markings in accordance with FM 5-541 within 30 days of receipt of the Contractor's certification.

711-4.2.2 Refurbishment Thermoplastic Markings: Apply a minimum of 0.06 inch or 60 mils of thermoplastic material. Ensure that the combination of the existing marking and the overlay after application of glass spheres does not exceed the maximum thickness of 0.150 inch or 150 mils for all lines.

Measure, record and certify on a form and submit to the Engineer, the thickness of white and yellow pavement markings in accordance with FM 5541.

The Engineer will verify the thickness of the pavement markings in accordance with FM 5-541 within 30 days of receipt of the Contractor's certification.

711-4.2.3 Preformed Thermoplastic: Apply 0.125 inch or 125 mils of preformed thermoplastic material. Use preformed thermoplastic for bicycle markings, shared use path markings, 24 inch markings of the special emphasis crosswalks, route shields, ramp exit numbers, roundabout informational markings, white dotted lines (2'-4') with trailing black contrast, and black contrast arrows, messages, and symbols.

Measure, record and certify on a form and submit to the Engineer, the thickness of the pavement markings in accordance with FM 5-541.

711-4.2.4 High Friction Thermoplastic: Apply lines to attain a minimum thickness of 0.09 inch or 90 mils and a maximum thickness of 0.12 inch or 120 mils, when measured above the pavement surface. Measure, record and certify on a form and submit to the Engineer, the thickness of the pavement markings in accordance with FM 5-541.

711-4.3 Retroreflectivity: Apply white and yellow pavement markings that will attain an initial retroreflectivity of not less than 450 mcd/lx·m2 and not less than 350 mcd/lx·m2, respectively for all longitudinal lines. All chevrons, diagonal lines, stop lines, messages, symbols, and arrows will attain an initial retroreflectivity of not less than 300 mcd/lx·m2 and 250 mcd/lx·m2 for white and yellow respectively. All crosswalks and bicycle markings shall attain an initial retroreflectivity of not less than 275 mcd/lx·m2. Black pavement markings must have a retroreflectance of less than 5 mcd/lx m2.

Measure, record and certify on a form and submit to the Engineer, the retroreflectivity of white and yellow pavement markings in accordance with FM 5541.

711-4.4 Glass Spheres:

711-4.4.1 Longitudinal Lines: For standard thermoplastic markings, apply the first drop of Type 4 or larger glass spheres immediately followed by the second drop of Type 1 glass spheres. For refurbishment thermoplastic markings, apply a single drop of Type 3 glass spheres. Apply reflective glass spheres to all markings at the rates determined by the manufacturer's recommendations.

711-4.4.2 Chevrons, Diagonal and Transverse Lines, Messages, Symbols, and Arrows: For standard or refurbishment thermoplastic markings, apply a single drop of Type 1 glass spheres. Apply retroreflective glass spheres to all markings at the rates determined by the manufacturer's recommendations.

Apply a mixture consisting of 50% glass spheres and 50% sharp silica sand to all standard thermoplastic crosswalk lines at the rates determined by the manufacturer's recommendations.

711-4.4.3 Preformed Markings: These markings are factory supplied with glass spheres and skid resistant material. No additional glass spheres or skid resistant material should be applied during installation.

711-5 Contractor's Responsibility for Notification.
Notify the Engineer prior to the placement of the materials. At the time of notification, submit a certification to the Engineer with the APL number and the batch or Lot numbers of the thermoplastic and glass spheres to be used. Packaging labels that contain the information required by 971-1.1 will be accepted in place of a certification.

711-6 Protection of Newly Applied Thermoplastic Pavement Markings.
Do not allow traffic onto or permit vehicles to cross newly applied pavement markings until they are sufficiently dry. Remove and replace any portion of the pavement markings damaged by passing traffic or from any other cause, at no additional cost to the Owner.

711-7 Observation Period.
Longitudinal pavement markings are subject to a 180-day observation period under normal traffic. The observation period shall begin with the satisfactory completion and acceptance of the work.

The longitudinal pavement markings shall show no signs of failure due to blistering, excessive cracking, chipping, discoloration, poor adhesion to the pavement, loss of retroreflectivity or vehicular damage. The retroreflectivity shall meet the initial requirements of 711-4.3. The Owner reserves the right to check the retroreflectivity any time prior to the end of the observation period.

Replace, at no additional expense to the Owner, any longitudinal pavement markings that do not perform satisfactorily under traffic during the 180-day observation period.

711-8 Corrections for Deficiencies.
Recapping applies to conditions where additional pavement marking material is applied to new or refurbished pavement markings to correct a thickness deficiency. Correct deficiencies by recapping or removal and reapplication of a 1-mile section centered around the deficiency, as determined by the Engineer, at no additional cost to the Owner.

711-9 Submittals.

711-9.1 Submittal Instructions: Prepare a certification of quantities for each project in the Contract. Submit the certification of quantities and daily worksheets to the Engineer. The Owner will not pay for any disputed items until the Engineer approves the certification of quantities.

711-9.2 Contractor's Certification of Quantities: Request payment by submitting a certification of quantities no later than Twelve O clock noon Monday after the estimate cut-off date or as directed

by the Engineer, based on the amount of work done or completed. Ensure the certification of quantities consists of the following:

1. Contract Number, FPID Number, Certification Number, Certification Date and the period that the certification represents.

2. The basis for arriving at the amount of the progress certification, less payments previously made and less any amount previously retained or withheld. The basis will include a detailed breakdown provided on the certification of items of payment.

711-10 Method of Measurement.
The quantities, authorized and acceptably applied, under this Section will be paid as follows:

1. The length, in gross miles, of solid, 10'-30' skip, 3'-9' dotted, 6'-10' dotted, 2'2' dotted, and 2'-4' dotted lines.

2. The length, in linear feet, of transverse lines, diagonal lines, chevrons, and parking spaces.

3. The number of pavement messages, symbols, and arrows. Each arrow is paid as a complete marking, regardless of the number of "points" or directions.

4. The area, in square feet, for removal of existing markings acceptably removed. Payment for removal of conflicting markings will be in accordance with 102-5.8. Payment for removal of non-conflicting markings will be paid separately.

The gross mile measurement will be taken as the distance from the beginning of the thermoplastic line to the end of the thermoplastic line and will include the unmarked gaps for skip and dotted lines. The gross mile measurement will not include designated unmarked lengths at intersections, turn lanes, etc. Final measurement will be determined by plan dimensions or stations, subject to 9-1.3.1.

711-11 Basis of Payment.
Prices and payments will be full compensation for all work specified in this Section, including, all cleaning and preparing of surfaces, furnishing of all materials, application, curing and protection of all items, protection of traffic, furnishing of all tools, machines and equipment, and all incidentals necessary to complete the work. Final payment will be withheld until all deficiencies are corrected.

Payment will be made under:

Item 711-1	Thermoplastic, Standard, White, Solid, 24"- Field Office	-per Linear Foot (LF)
Item 711-2	Thermoplastic, Standard, Yellow, Solid, 6"- Field Office	-per Linear Foot (LF)
Item 711-3	Thermoplastic, Preformed, White, Arrow- Field Office	-per Each (EA)
Item 711-4	Handicap Parking Symbol- Field Office	-per Each (EA)
Item 711-5	Thermoplastic, Standard, White, Solid, 24"- Maint. Bldg.	-per Linear Foot (LF)
Item 711-6	Thermoplastic, Standard, Yellow, Solid, 6"- Maint. Bldg.	-per Linear Foot (LF)
Item 711-7	Handicap Parking Symbol- Maint. Bldg.	-per Each (EA)

END OF SECTION 711

SECTION 971

PAVEMENT MARKING MATERIALS

971-1 General Requirements.

971-1.1 Packaging and Labeling: The name and address of the manufacturer shall be shown on the label. The label must also show the color, date of manufacturer, lot number and APL number. The label shall warn the user of any special handling or precautions of the material, as recommended by the manufacturer. Any packaging and labeling not so marked will not be accepted.

971-1.2 Storage: All materials must have a container storage life of one year from date of manufacture. Any pavement marking materials, which although inspected and approved at the point of manufacture, hardens or livers in the containers will be rejected even though it conforms to these Specifications in all other respects.

971-1.3 Mixing: All paints shall be delivered to the project completely mixed, and ready to be used without additional oil or thinner. Thinners shall not be used under any circumstances.

971-1.4 Approved Product List (APL): All pavement marking materials shall be one of the products listed on the FDOT's Approved Product List (APL).

971-1.5 Samples: Field samples will be obtained in accordance with the FDOT's Sampling, Testing and Reporting Guide Schedule.

971-1.6 Color: Materials other than white and yellow shall meet the color requirements as identified in 23 CFR 665 Table 5 Appendix to Part 655, Subpart F. White colored materials will only be required to meet the initial daytime chromaticity requirements.

Yellow materials for pavement markings shall meet the following performance requirements. The initial daytime chromaticity for yellow materials shall fall within the box created by the following coordinates:

Initial Daytime Chromaticity Coordinates (Corner Points)				
	1	2	3	4
x	0.530	0.510	0.455	0.472
y	0.456	0.485	0.444	0.400

The nighttime chromaticity for yellow materials shall fall within the box created by the following coordinates:

Nighttime Chromaticity Coordinates (Corner Points)				
	1	2	3	4
x	0.575	0.508	0.473	0.510
y	0.425	0.415	0.453	0.490

971-1.7 Additional Requirements: Pavement marking materials shall be characterized as non-hazardous as defined by Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Provide supporting independent analytical data or product material safety data sheets (SDS) identifying any components listed in Table 1 of 40 CFR 261.24.

Additionally, retroreflective elements shall contain no more that 200 ppm by weight of lead or arsenic when tested in accordance with the Environmental Protection Agency (EPA) Testing Methods 3052, 6010B, and 6010C.

971-2 Glass Spheres.

971-2.1 General Requirements: Glass spheres shall be of a composition designed to be highly resistant to traffic wear and to the effects of weathering for the production of a reflective surface, without altering day visibility of the marking. The general requirements of 971-1 apply to glass spheres.

971-2.2 Specific Properties: The large (Type 3 or larger) glass spheres used for drop-on beads shall have an adhesion coating. Type 1 glass spheres used for drop-on beads shall have a dual coating. Beads used in the intermix of materials are not required to be coated.

The following physical requirements apply:

Property	Test Method	Specification
Roundness*	AASHTO PP 74	Min: 70% by weight
Roundness**	AASHTO PP 74	Min: 80% by weight
Refractive Index*	Becke Line Method (25+/-5C)	1.5 minimum
Refractive Index**	Becke Line Method (25+/-5C)	1.9 minimum
* Type 1, 3, 4 and 5 beads ** High Index beads		

Sieve Size	Percent by Mass Passing Designated Sieve (AASHTO PP 74)				
	Grading Designation				
	Type 1 (AASHTO)	Type 3 (FP 96)	Type 4 (FP 96)	Type 5 (FP 96)	High Index
No. 8				100	
No. 10			100	95-100	
No. 12		100	95-100	80-95	
No. 14		95-100	80-95	10-40	
No. 16	100	80-95	10-40	0-5	100
No. 18		10-40	0-5	0-2	
No. 20	95-100	0-5	0-2		95-100
No. 25		0-2			
No. 30	75-95				55-85
No. 40					15-45
No. 50	15-35				0-5
No. 80					
No. 100	0-5				

971-2.3 Sampling: A random 50-pound sample of glass spheres shall be obtained for each 50,000-pound shipped. Send each 50-pound sample to the State Materials Office.

971-2.4 Containers: The spheres shall be furnished in new 50-pound moisture-proof bags or 2000 pound triwall boxes. All containers shall meet Interstate Commerce Commission requirements for strength and type.

971-3 Standard Paint.

971-3.1 General: Standard paints shall include water reducible products that are single packaged and ready mixed. The paint shall have the capability of being cleaned and flushed from the pavement marking machines using regular tap water and any required rust inhibitors. The manufacturer shall have the option of formulating the paint according to his own specifications. However, the requirements delineated in this Specification and Section 710 shall apply regardless of the type of formulation used. The paint shall be free from all skins, dirt and foreign objects.

971-3.2 Composition: Component Test Method Criteria Total Solids, by weight ASTM D2369 minimum 75% Pigments, by weight ASTM D3723 minimum 57% Vehicle Solids % of Vehicle* minimum 40% TiO2, Type II Rutile (white paint only) ASTM D476 minimum 1.0 lb/gal Volatile Organic Content, (VOC) ASTM D3960 maximum 150 g/L *Vehicle Solids % of Vehicle = (% total solids - % pigment) (100 - % pigment)

971-3.3 Physical Requirements: Test laboratory samples in accordance with ASTM E811 and E1349 and also meet the following criteria:

Property	Test Method	Minimum	Maximum
Density	ASTM D1475	13.5 ± 1.4 lb/gal	-
Viscosity at 77°F	ASTM D562	80 KU	100 KU
Fineness of Grind	ASTM D1210	3 (HS)	-
Dry Opacity at 5 mils WFT	ASTM D2805	0.92	-
Bleed Ratio	ASTM D969	0.95	-
Flexibility	ASTM D522 Method B	Pass	-
Abrasion Resistance	ASTM D4060	Pass	-

971-3.3.1 Set To Bear Traffic Time: The paint shall set to bear traffic in not more than two minutes.

971-3.3.2 Abrasion Resistance: Test four samples using a Taber Abrader. The paint shall be applied to specimen plates using a drawdown blade having a clearance of 20 mils. Clean with a soft brush and weigh each sample. Abrade samples for 1,000 cycles with a combined load of 500 g (arm plus auxiliary weight) on each arm and CS-10 wheels. Clean the samples with a soft brush and weigh again. The average weight loss for the four plates shall not exceed 75 mg per plate.

971-3.3.3 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 300 mcd/lx·m2 and 250 mcd/lx·m2, respectively. The retroreflectance of the white and yellow pavement markings at the end of the six month period shall not be less than 150 mcd/lx·m2.

971-3.4 Application Properties: Meet the requirements of Section 710 for application properties.

971-3.5 Packaging and Labeling: The paint shall be placed in 55-gallon open-end steel drums with a re-usable multi-seal sponge gasket or 275 gallon Intermediate Bulk Container (IBC). No more than 50 gallons of paint shall be placed in any drum or 250 gallons in any IBC to allow for expansion during transport and storage. Clearly mark the containers with the weight in pounds per gallon, the volume of materials in units of gallons.

971-4 Durable Paint.

971-4.1 General: Durable paints shall include water reducible products that are single packaged and ready mixed. The paint shall have the capability of being cleaned and flushed from the pavement marking machines using regular tap water and any required rust inhibitors. The manufacturer shall have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification and Section 710 shall apply regardless of the type of formulation used. The paint shall be free from all skins, dirt and foreign objects. The manufacturer shall provide the recommended thickness prior to installation.

971-4.2 Composition:

Component	Test Method	Criteria
Total Solids, by weight	ASTM D2369	75% minimum
Pigments, by weight	ASTM D3723	57% minimum
Vehicle Solids, % on Vehicle*		40% minimum
TiO_2, Type II Rutile (white paint only)	ASTM D475	1.0 lb/gal minimum
Volatile Organic Content, (VOC)	ASTM D3960	150 g/L maximum
* Vehicle Solids % of Vehicle= $\frac{\%\text{total solids}-\%\text{pigment}}{100-\%\text{pigment}}$		
Vehicle solids shall be 100% acrylic emulsion polymer.		

971-4.3 Physical Requirements: Test laboratory samples in accordance with ASTM E811 and E1349. Samples shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Density	ASTM D1475	13.5 ± 1.4 lb/gal	N/A
Viscosity at 77°F	ASTM D562	80 KU	100 KU
Fineness of Grind	ASTM D1210	3(HS)	-
Dry Opacity at 5 mils WFT	ASTM D2805	0.92	-
Bleed Ratio	ASTM D969	0.95	-
Flexibility	ASTM D522 Method B	Pass	-
Abrasion Resistance	ASTM D4060	Pass	-

971-4.3.1 Set To Bear Traffic Time: The paint shall set to bear traffic in not more than ten minutes.

971-4.3.2 Abrasion Resistance: Test four samples using a Taber Abrader. The paint shall be applied to specimen plates using a drawdown blade having a clearance of 20 mils. Air dry each sample until fully cured based on the manufacturer's product recommendation. Clean with a soft brush and weigh each sample. Abrade samples for 1,000 cycles with a combined load of 500 g (arm plus auxiliary weight) on each arm and CS-10 wheels. Clean the samples with a soft brush and weigh again. The average weight loss for the four plates shall not exceed 75 mg per plate.

971-4.3.3 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 450 mcd/lx·m2 and 300 mcd/lx·m2, respectively. The retroreflectance of the white and yellow pavement markings at the end of the 18-month period shall not be less than 150 mcd/lx·m2.

971-4.4 Application Properties: Application properties shall meet the requirements of Section 710.

971-4.5 Packaging and Labeling: The paint shall be placed in 55-gallon open-end steel drums with a re-usable multi-seal sponge gasket or 275-gallon Intermediate Bulk Container (IBC). No more than 50 gallons of paint shall be placed in any drum or 250 gallons in any IBC to allow for expansion during transport and storage. Clearly mark the containers with the weight in pounds per gallon, the volume of materials in units of gallons.

971-5 Standard Thermoplastic Material.

971-5.1 General: The manufacturer shall utilize alkyd-based materials only and shall have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification and Section 711 shall apply regardless of the type of formulation used. The pigment, glass spheres, and filler shall be well dispersed in the resin.

971-5.2 Composition:

Component	Test Method	White	Yellow
Binder	ASTM D4797	20% minimum	20% minimum
TiO_2, Type II Rutile	ASTM D476	10% minimum	-
Glass Spheres	ASTM D4797	40% minimum	40% minimum
Yellow Pigment		-	% minimum per manufacturer
Calcium Carbonate and Inert Filler (-200 mesh sieve)		30% maximum	37% maximum
Percentages are by weight			

The alkyd/maleic binder must consist of a mixture of synthetic resins (at least one synthetic resin must be solid at room temperature) and high boiling point plasticizers. At least one-half of the binder composition must be 100% maleic-modified glycerol of rosin and be no less than 15% by weight of the entire material formulation.

971-5.3 Glass Spheres: The glass spheres in the intermix shall consist of 50% Type 1 and 50% Type 3 and meeting the requirements of this Section.

971-5.4 Sharp Silica Sand: Sharp silica sand used for bicycle markings and pedestrian crosswalk lines shall meet the following gradation requirements:

Sieve Size	Percent by Mass Passing Designated Sieve (ASTM D1214)
20	100
50	0 to 10

971-5.5 Physical Requirements: Laboratory samples shall be tested in accordance with ASTM D4960 and shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Water Absorption	ASTM D570	-	0.5%
Softening Point	ASTM D36	195°F	-
Low Temperature Stress Resistance	AASHTO T250	Pass	-
Specific Gravity	Water displacement	1.9	2.3
Indentation Resistance	ASTM D7735* Type A Durometer	40	75
Impact Resistance	ASTM D256, Method A	1.0 N*m	-
Flash Point	ASTM D92	475°F	-
* The durometer and panel shall be 115°F with a 1000 g load applied. Instrument measurement shall be taken after 15 seconds			

971-5.5.1 Set To Bear Traffic Time: The thermoplastic shall set to bear traffic in not more than two minutes.

971-5.5.2 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 450 mcd/lx·m2 and not less than 350 mcd/lx·m2, respectively. The retroreflectance of the white and yellow pavement markings at the end of the three-year APL testing period shall not be less than 250 mcd/lx·m2. 971-5.6

971-5.6 Application Properties: Application properties shall meet the requirements of Section 711.

971-5.7 Packing and Labeling: The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 pounds. The label shall also warn the user that the material shall be heated in the range as recommended by the manufacturer.

971-6 Preformed Thermoplastic Material.

971-6.1 General: The manufacturer shall have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification and Section 711 shall apply regardless of the type of formulation used. The pigment, glass spheres, and filler shall be well dispersed in the resin.

971-6.2 Composition: The preformed thermoplastic shall consist of high quality materials, pigments and glass spheres or other reflective material uniformly distributed throughout their cross-sectional area, with a reflective layer of spheres or other reflective material embedded in the top surface.

971-6.3 Glass Spheres: Material shall contain no less than 30% glass spheres by weight.

971-6.4 Color: Materials shall meet the performance requirements specified in 971-1.6 and the following additional requirements. The initial luminance factor, Cap Y, shall not be less than 55.

971-6.5 Physical Requirements: Laboratory samples shall be tested in accordance with ASTM D4960 and shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Softening Point	ASTM D36	195°F	-
Low Temperature Stress Resistance	AASHTO T250	Pass	-
Indentation Resistance	ASTM D7735* Type A Durometer	40	75
Impact Resistance	ASTM D256, Method A **	1.0 N*m	-
* The durometer and panel shall be at 115° with a 1000 g load applied. Instrument measurement shall be taken after 15 seconds ** The test specimen for ASTM D256 shall be 1 in. x 1 in. x 6 in. and shall not be notched.			

971-6.5.1 Retroreflectivity: The white pavement markings other than crosswalks and bicycle markings shall attain an initial retroreflectance of not less than 300 mcd/lx·m2. Crosswalks and bicycle markings shall attain initial retroreflectivity of not less than 275 mcd/lx·m2. Black pavement markings shall have a retroreflectance of less than 5 mcd/lx m2. The retroreflectance of the white pavement markings at the end of the three-year period shall not be less than 150 mcd/lx·m2.

971-6.5.2 Skid Resistance: The surface of the pavement markings shall provide a minimum skid resistance value of 35 BPN (British Pendulum Number) when tested according to ASTM E303. Bicycle markings and pedestrian crosswalks shall provide a minimum skid resistance value of 55 BPN.

971-6.6 Application Properties: Application properties shall meet the requirements of Section 711.

971-6.7 Packing and Labeling: The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. Clearly mark each container with the thickness of the preformed material in units of inches.

971-7 Permanent Tape Materials.

971-7.1 General: The materials for permanent tape pavement markings shall consist of white or yellow weather-resistant reflective film as specified herein. The pigment, glass spheres, and filler shall be well dispersed in the resin. However, the requirements delineated in this Specification and Section 713 shall apply.

971-7.2 Composition: Permanent tape pavement markings shall consist of high-quality plastic materials, pigments, and glass spheres uniformly distributed throughout their cross-sectional area, with a reflective layer of spheres embedded in the top surface.

971-7.3 Skid Resistance: The surface of the pavement markings shall provide a minimum skid resistance value of 35 BPN when tested according to ASTM E303. Bicycle markings and pedestrian crosswalks shall provide a minimum skid resistance value of 55 BPN.

971-7.4 Thickness: The APL will list the specified thickness of each approved product.

971-7.5 Durability and Wear Resistance: The film shall be weather resistant and, through normal wear, shall show no significant tearing, rollback or other signs of poor adhesion.

971-7.6 Conformability and Resealing: The pavement markings shall be capable of conforming to pavement contours, breaks and faults under traffic at pavement temperatures recommended by the manufacturer. The film shall be capable of use for patching worn areas of the same types of film in accordance with the manufacturer's recommendations.

971-7.7 Tensile Strength: The pavement markings shall have a minimum tensile strength of 40 psi when tested according to ASTM D638. A rectangular test specimen 6 inches by 1 inch by 0.05 inches minimum thickness shall be tested at a temperature range of 40 to 80ºF using a jaw speed of 0.25 inch/min.

971-7.8 Pigmentation: The pigment shall be selected and blended to provide a material which is white or yellow conforming to standard highway colors through the expected life of the pavement markings. Test laboratory samples in accordance with ASTM E811 and E1349.

971-7.9 Glass Spheres: The pavement markings shall have glass retention qualities such that, when at room temperature a 2 inches by 6 inches specimen is bent over a 0.5 inch diameter mandrel axis, a microscopic examination of the area on the mandrel shall show no more than 10% of the spheres with entrapment by the material of less than 40%. The bead adhesion shall be such that spheres are not easily removed when the film surface is scratched firmly with a thumbnail.

971-7.10 Retroreflectivity: The materials shall attain an initial retroreflectance of not less than 450 mcd/lx·m2 for white markings and not less than 350 mcd/lx·m2 for yellow markings. The pavement markings shall retain a minimum retroreflectance for two years of not less than 300 mcd/lx·m2 for white markings and not less than 250 mcd/lx·m2 for yellow markings. The retroreflectance of the white, yellow and contrast pavement markings at the end of the five-year APL testing period shall not be less than 150 mcd/lx·m2.

971-7.11 Packaging and Labeling: Ship all permanent tape materials in containers which will not adhere to the product during shipment and storage. Clearly mark each container with the thickness of the preformed material in units of inches.

971-8 Two Reactive Component Material.

971-8.1 General: Two reactive component materials intended for use under this Specification shall include, but not be limited to, epoxies, polyesters and urethanes. The manufacturer shall have the option of formulating the material according to his own specifications. However, the criteria outlined in this Specification and Section 709 shall apply regardless of the type of formulation used. The material shall be free from all skins, dirt and foreign objects.

971-8.2 Composition:

Component	Test Method	Criteria
TiO_2, Type II Rutile (white material only)	ASTM D476	Minimum 10% by weight
Volatile Organic Content, (VOC)	ASTM D3960	Maximum 150 g/L

971-8.3 Physical Requirements: Test laboratory samples in accordance with ASTM and also meet the following criteria:

Property	Test Method	Minimum	Maximum
Adhesion to Concrete	ASTM D4541, ASTM D7234 or ACI 503	Concrete Failure	-
Hardness	ASTM D7735, Type D	75	-
Abrasion Resistance	ASTM D4060	Pass	-

971-8.3.1 Set To Bear Traffic Time: The material shall set to bear traffic in not more than two minutes.

971-8.3.2 Abrasion Resistance: Test four samples using a Taber Abrader. The material shall be applied to specimen plates using a drawdown blade having a clearance of 15 mils. Clean with a soft brush and weigh each sample. Abrade samples for 1,000 cycles with a combined load of 500 g (arm plus auxiliary weight) on each arm and CS-10 wheels. Clean the samples with a soft brush and weigh again. The average weight loss for the four plates shall not exceed 60 mg per plate.

971-8.3.3 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 450 mcd/lx·m2 and not less than 350 mcd/lx·m2, respectively. The retroreflectance of the white and yellow pavement markings at the end of the three year period shall not be less than 150 mcd/lx·m2.

971-8.4 Application Properties: Application properties shall meet the requirements of Section 709.

971-8.5 Packaging and Labeling: The two reactive component material shall be placed in 55-gallon open-end steel drums with a re-usable multi-seal sponge gasket or 275-gallon Intermediate Bulk Container (IBC). No more than 50 gallons of material shall be placed in any drum or 250 gallons in any IBC to allow for expansion during transport and storage. Clearly mark the containers with the volume of materials in units of gallons and the product name.

971-9 Profiled Thermoplastic Material.

971-9.1 General: The manufacturer shall utilize alkyd-based materials only and shall have the option of formulating the material according to his own specifications. However, the requirements delineated in this Specification shall apply regardless of the type of formulation used. The pigment, reflective elements, and filler shall be well dispersed in the resin.

971-9.2 Composition:

Component	Test Method	White	Yellow
Binder	ASTM D4797	20% minimum	20% minimum
TiO_2, Type II Rutile	ASTM D476	10% minimum	-
Reflective Elements	ASTM D4797	% minimum per manufacturer	% minimum per manufacturer
Yellow Pigment		-	% minimum per manufacturer
Calcium Carbonate and Inert Filler (-200 mesh sieve)		% minimum per manufacturer	% minimum per manufacturer
Note: Percentages are by weight			

971-9.3 Retroreflective Elements: The reflective elements in the intermix shall be determined by the manufacturer and identified for the APL.

971-9.4 Physical Requirements: Laboratory samples shall be tested in accordance with ASTM D4960 and shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Water Absorption	ASTM D570	-	0.5%
Softening Point	ASTM D36	210°F	-
Low Temperature Stress Resistance	AASHTO T250	Pass	-
Specific Gravity	Water displacement	1.9	2.3
Indentation Resistance	ASTM D7735* Type A Durometer	65	-
Impact Resistance	ASTM D256, Method A	1.0 N*m	-
Flash Point	ASTM D92	475°F	-
* The durometer and panel shall be at 80°F, with a 1000 g load applied. Instrument measurement shall be taken after 15 seconds			

971-9.4.1 Set To Bear Traffic Time: When applied at the temperatures and thickness specified by Section 701, the baseline material shall set to bear traffic in not more than two minutes. The bumps shall set to bear traffic in not more than 10 minutes at ambient air temperatures of 80ºF or less and in not more than 15 minutes for ambient air temperatures exceeding 80ºF.

971-9.4.2 Retroreflectivity: The white and yellow pavement markings shall attain an initial retroreflectance of not less than 300 mcd/lx·m2 and not less than 250 mcd/lx·m2, respectively. The retroreflectance of the white and yellow pavement markings at the end of the three-year period shall not be less than 150 mcd/lx·m2.

971-9.4.3 Durability: Durability shall include flattening of the profile or raised portions of the line. The flattening of the profile or raised portion of the line shall not exceed 25% at the end of the three-year period.

971-9.5 Application Properties: Application properties shall meet the requirements of Section 701.

971-9.6 Packing and Labeling: The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 pounds. The label shall warn the user that the material shall be heated in the range as recommended by the manufacturer.

971-10 High Friction Thermoplastic Material.

971-10.1 General: The manufacturer shall utilize alkyd-based materials only and have the option of formulating the material according to his own specifications. However, the requirements of this Specification shall apply regardless of the formulation used. The pigment, reflective elements, and filler shall be well dispersed in the resin.

971-10.2 Composition:

Component	Test Method	White
Binder	ASTM D4797	18% minimum
TiO_2, Type II Rutile	ASTM D476	10% minimum
Reflective Elements	ASTM D4797	30% minimum per manufacturer
Skid Resistant Element		10% minimum per manufacturer
Note: Percentages are by weight.		

The alkyd/maleic binder shall consist of a mixture of synthetic resins (at least one synthetic resin must be solid at room temperature) and high boiling point plasticizers. At least one-half of the binder composition must be 100% maleic-modified glycerol of rosin and be no less than 15% by weight of the entire material formulation.

971-10.3 Retroreflective Elements: The reflective elements in the intermix shall be determined by the manufacturer and identified on the APL.

971-10.4 Physical Requirements: Laboratory samples shall be tested in accordance with ASTM D4960 and shall meet the following criteria:

Property	Test Method	Minimum	Maximum
Softening Point	ASTM D36	195°F	-
Hardness of Skid Resistance Elements	Moh's Scale	9	-
Indentation Resistance	ASTM D7735* Type A Durometer	55	85
Impact Resistance	ASTM D256, Method A	2.0 N*m	-
Flash Point	ASTM D92	475°F	
* The durometer and panel shall be at 115°F, with a 1000 g load applied. Instrument measurement whall be taken after 15 seconds			

971-10.4.1 Set To Bear Traffic Time: When applied at the temperatures and thicknesses specified by Section 711, the material shall set to bear traffic in not more than two minutes.

971-10.4.2 Retroreflectivity: The white pavement markings shall attain an initial retroreflectance of not less than 275 mcd/lx·m2. The retroreflectance of the white pavement markings at the end of the three-year period shall not be less than 150 mcd/lx·m2.

971-10.4.3 Skid Resistance: The surface of the pavement markings shall provide a minimum initial skid resistance value of 55 BPN when tested in accordance to ASTM E303.

971-10.5 Application Properties: Application properties shall meet the requirements of Section 711.

971-10.6 Packaging and Labeling: The thermoplastic material shall be packaged in suitable biodegradable or thermo-degradable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 pounds. The label shall warn the user that the material is to be heated in the range as recommended by the manufacturer.

END OF SECTION 971

SECTION 981

TURF MATERIALS

981-1 General.
The types of seed and sod will be specified in the Contract Documents. All seed and sod shall meet the requirements of the Florida Department of Agriculture and Consumer Services and all applicable state laws, and shall be approved by the Engineer before installation.

All seed, sod and mulch shall be free of noxious weeds and exotic pest plants, plant parts or seed listed in the current Category I "List of Invasive Species" from the Florida Exotic Pest Plant Council (FLEPPC, https://www.fleppc.org). Any plant officially listed as being noxious or undesirable by any Federal Agency, any agency of the State of Florida or any local jurisdiction in which the project is being constructed shall not be used. Any such noxious or invasive plant or plant part found to be delivered in seed, sod or mulch will be removed by the Contractor at his expense and in accordance with the law.

All materials shall meet plant quarantine and certification entry requirements of Florida Department of Agriculture & Consumer Services, Division of Plant Industry Rules.

981-2 Seed.
The seed shall have been harvested from the previous year's crop. All seed bags shall have a label attached stating the date of harvest, LOT number, percent purity, percent germination, noxious weed certification and date of test.

Each of the species or varieties of seed shall be furnished and delivered in separate labeled bags. During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents and other causes.

All permanent and temporary turf seed shall have been tested within a period of six months of the date of planting.

All permanent and temporary turf seed shall have a minimum percent of purity and germination as follows:

1. All Bahia seed shall have a minimum pure live seed content of 95% with a minimum germination of 80%.

2. Bermuda seed shall be of common variety with a minimum pure live seed content of 95% with a minimum germination of 85%.

3. Annual Type Ryegrass seed shall have a minimum pure live seed content of 95% with a minimum germination of 90%.

981-3 Sod.

981-3.1 Types: Unless a particular type of sod is called for in the Contract Documents, sod may be either centipede, bahia, or bermuda at the Contractor's option. It shall be well matted with roots. Where sodding will adjoin, or be in sufficiently close proximity to, private lawns, other types of sod may be used if desired by the affected property owners and approved by the Engineer.

981-3.2 Dimensions: The sod shall be taken up in commercial-size rectangles, or rolls, preferably 12 inches by 24 inches or larger, except where 6 inch strip sodding is called for, or as rolled sod at least 12 inches in width and length consistent with the equipment and methods used to handle the rolls and place the sod. Sod shall be a minimum of 1-1/4 inches thick including a ¾-inch thick layer of roots and topsoil. Reducing the width of rolled sod is not permitted after the sod has been taken up from the initial growing location. Any netting contained within the sod shall be certified by the manufacturer to be degradable within three years.

981-3.3 Condition: The sod shall be sufficiently thick to secure a dense stand of live turf. The sod shall be live, fresh and uninjured, at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be planted within 48 hours after being cut and kept moist from the time it is cut until it is planted. No sod which has been cut for more than 48 hours may be used unless specifically authorized by the Engineer. A letter of certification from the turf Contractor as to when the sod was cut, and what type, shall be provided to the Engineer upon delivery of the sod to the job site. The source of the sod may be inspected and approved by the Engineer prior to being cut for use in the work.

981-4 Mulch.
The mulch material shall be compost meeting the requirements of Section 987, hardwood barks, shavings or chips; or inorganic mulch materials as approved by the Engineer; or hydraulically applied wood fiber mulch or bonded fiber matrix (BFM) for the establishment of turf material.

981-5 Basis of Payment:

Item 981-1	Centipede Sod- Field Office	-per Square Yard (SY)
Item 981-2	Landscaping- Field Office	-per Lump Sum (LS)
Item 981-3	Centipede Sod- Maint. Bldg.	-per Square Yard (SY)
Item 981-4	Landscaping- Maint. Bldg.	-per Lump Sum (LS)

END OF SECTION 981

SECTION 983

WATER FOR GRASSING

The water used in the grassing operations may be obtained from any approved source. The water shall be free of any substance which might be harmful to plant growth. Effluent water shall meet all Federal, State and local requirements.

END OF SECTION 983

SECTION 02660

WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

A. This item consists of furnishing all labor, materials, equipment and incidentals required for the installation of new waterline as required by the Contract Documents, including all piping, fittings, and appurtenances for water distribution.

B. The work generally includes on-site underground potable water mains (with or without fire hydrants), below grade mechanical piping and other miscellaneous work as depicted on the drawings or specified herein.

C. General Design. The equipment and materials specified herein is intended to be standard types of pipe, fittings and appurtenances for use in transporting water.

D. The below listed standards are applicable and are adopted by reference:

1. ANSI/AWWA C104/A21.4	Cement-Motor Lining for Ductile-Iron Pipe and fittings for Water
2. ANSI/AWWA C110/A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids.
3. ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
4. ANSI/AWWA C115/A21.15	Flanged Ductile-Iron Pipe with Threaded Flanges.
5. ANSI/AWWA C150/A21.50	Thickness Design of Ductile-Iron Pipe.
6. ANSI/AWWA C151/A21.51	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or Other Liquids.
7. ANSI/AWWA C153/A21.53	Ductile-Iron Compact Fittings, 3 in. Through 16 in, for Water and Other Liquids.
8. ANSI/AWWA C503	Wet-Barrel Fire Hydrants.
9. ANSI/AWWA C506	Back flow Prevention Devices – Reduced Pressure Principal and Double Check Valve Types
10. ANSI/AWWA C508	Swing-Check Valves for Water Works Service – 2 inches through 24 inches.
11. ANSI/AWWA C509	Resilient- Seated Gate Valves for Water Supply Service.
12. ANSI/AWWA C511	Reduced-Pressure Principal Backflow- Prevention Assembly
13. ANSI/AWWA C600	Installation of Ductile Iron Water Mains and their Appurtenances.
14. ANSI/AWWA C605	Underground Installation of Poly Vinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
15. ANSI/AWWA C651	Disinfecting Water Mains
16. ANSI/AWWA	C702 Cold - Water Meters - Compound Type

17. ANSI/AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 inches through 12 inches.
18. ANSI/AWWA C905	Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 inches through 36 inches.
19. ASTM D2241	*Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR)
20. ASTM F477	*Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.02 QUALITY ASSURANCE

A. Qualifications. All of the pipe, fittings and appurtenances shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe, fittings and appurtenances shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with the adapted references and these specifications as applicable.

B. Manufacturers of Ductile Iron Pipe and Fitting will be the American Cast Iron Pipe Company, U.S. Pipe and Foundry Company, McWane Cast Iron Pipe Company or Owner approved equal.

C. Factory Tests for DIP and DI Fittings: The manufacturer shall perform the factory tests described in ANSI/AWWA C151/A-21.51 and shall submit sworn certifications of the factory tests and their results.

D. PVC pipe shall be manufactured by Certain Teed, Diamond Plastics, Eslon, J-M Pipe, North American Pipe Corp., or equal.

E. PVC compounds shall be Class 12454A or 12454B in accordance with ASTM D1784. The manufacturer(s) of pipe supplied for this project shall provide a compliance statement for the following and for all other qualifications required by this specification as applicable.

1. Cell Classification Tests (ASTM D1784)
2. Hydrostatic Design Stress Testing (ASTM D2837)
3. Quick Burst Testing (ASTM D1599)
4. Pipe Impact Testing (ASTM D2444)
5. Pipe Stiffness Testing and Flattening Testing (ASTM D2412)
6. Sustained Pressure Testing (ASTM D1598 and ASTM D2241)
7. Hydrostatic Proof Testing (ANSI/AWWA C900)

F. Quality Control. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards and shall provide written warranty for their products.

G. All new and relocated project components that will come into contact with drinking water or drinking water treatment chemicals (except components that will come into contact with raw water prior to its treatment by reverse osmosis) will be in conformance with American National Standards Institute/NSF International (ANSI/NSF) Standard 61. Also, all drinking water treatment chemicals supplied under this project except fluoridation chemicals will be

in conformance with ANSI/NSF Standard 60 and all fluoridation chemicals supplied under this project will be in conformance with ANSI and American Water Works Association Standard B701, B702, or B703 as applicable.

1.03 SUBMITTALS

A. Within seven (7) days after execution of the Contract, submit a list of materials, names of manufacturers and dates of delivery of materials to the project site.

B. Shop and Layout Drawings.

1. Submit complete shop drawings detailing all of the technical and dimensional data of material to be furnished including weights.

2. Submit layout drawings including restrained joint layouts, fitting and joint layouts, and mechanical piping layouts with support locations. Layout drawings shall be prepared to an appropriate scale with dimensioning.

C. Submit Manufacturer Certifications as required by these specifications.

D. Submit Florida Licensed Surveyor Certified As-built drawings of water mains and piping with verified vertical and horizontal data as required by these specifications.

E. Submit documentation for all tests required by these specifications.

PART 2 - PRODUCTS

2.01 MECHANICAL JOINT & PUSH-ON JOINT DUCTILE IRON PIPE AND FITTINGS

A. Pipe shall conform to the requirements of ANSI/AWWA C151/A21.51 with thickness design in accordance with ANSI/AWWA C150/A21-50, latest editions. All pipes shall be tested and marked in accordance with these standards. Pipe diameters equal to or less than 12 inches shall be minimum pressure Class 350 psi.

B. Pipe for installation below ground shall be supplied in lengths not in excess of a nominal 20 feet. The pipe shall have either mechanical joint or push-on joints with rubber gaskets in accordance with ANSI/AWWA C111/A21.11.

C. Fittings shall be ductile iron or cast iron mechanical joint in accordance with ANSI/AWWA C110/A21.10 with a minimum pressure rating as follows: 350 psi for pipe diameters through 24 inches.

D. In lieu of the above requirement compact ductile iron mechanical joint fittings in accordance with ANSI/AWWA C153/A21.53 may be used for pipe diameters 12 inches and smaller; minimum pressure Class 350 psi.

E. Rubber gaskets for joints and fittings shall be made of vulcanized styrene butadiene rubber (SBR) in accordance with ANSI/AWWA C111/A21.11. Tee head nuts and bolts for

mechanical joints shall also comply with this standard.

F. Push-on joint pipe joints shall be in accordance with the applicable parts of ANSI/AWWA C111/A21.11 and shall be American Standard, Fastite type or equal.

2.02 FLANGED JOINT DUCTILE IRON PIPE AND FITTINGS

A. All above grade pipe and pipe inside pits, tanks, and pump station structures shall be flanged ductile iron pipe conforming to ANSI/AWWA C115/A21.15, latest edition with a minimum special thickness class of 53.

1. Minimum dimension for flanged pipe shall be as shown in **Table 2.1**.

2. Ductile iron pipe barrels for threaded flanged pipe shall conform to the requirements of ANSI/AWWA C151/A21.51 with taper pipe threads for flanges in accordance with ASME/ANSI B1.20.1.

Table 2.1
Ductile Iron Pipe for Use with Threaded Flanges

Nominal Pipe Size (in)	Maximum Working Pressure (psi)	Pipe Nominal Thickness* (in)	Pipe OD (in)	Maximum Nominal Length
3	250	0.31	3.96	19’-6”
4	250	0.32	4.80	19’-6”
6	250	0.34	6.90	19’-6”
8	250	0.36	9.05	19’-6”
10	250	0.38	11.10	19’-6”
12	250	0.40	13.20	19’-6”
14	250	0.42	15.30	19’-6”
16	250	0.43	17.40	19’-6”
18	250	0.44	19.50	19’-6”
20	250	0.45	21.60	19’-6”
24	250	0.47	25.80	19’-6”
30	250	0.51	32.00	19’-6”
36	250	0.58	38.30	19’-6”

3. Flanges shall be ductile-iron or gray-iron solid type with an internal taper pipe

thread in accordance with ASME/ANSI B1.20.1. They shall be flat-faced with dimensions and bolthole patterns for a water service rating of 250 psi working pressure in accordance with ASME/ANSI B.16.1, Class 125 flanges. Flanges may be back- or spot-faced to conform with flange thickness tolerances. Hollowback flanges are not acceptable.

4. All flanged pipes shall meet the fabrication tolerances specified in ANSI/AWWA C151/A21.51 and shall be inspected, tested and so marked by the manufacturer.

5. Fittings shall be ductile iron or cast iron flanged joint in accordance with ANSI/AWWA C110/A21.10 with a minimum rating of 250 psi working pressure.

6. Nuts, bolts, and gaskets for flanged joints shall be provided by the. Gaskets shall be full face, minimum 1/8-inch thick synthetic rubber manufacturer adequate for the type of service and pressure rating of the joint with molded annular rings.

2.03 JOINT RESTRAINT FOR DUCTILE IRON PIPE

A. Pipe joint restraint for standard mechanical joints shall be incorporated into the design of the follower gland and shall include a restraining mechanism which, when activated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536. Restraining devices shall be of ductile iron heat treated to minimum harness of 370 BHN. Dimensions of the gland shall be such that it can be used with a standard mechanical joint bell and tee-head bolts conforming to ANSI A21.11 and ANSI/AWWA C153/A21.53. Twist-off nuts shall be used on the restraining devices to ensure proper actuating of the restraining devices. The mechanical joint restraint system shall be designed for a working pressure of 250 psi with a minimum factor of safety of 2. Restrained joint devices shall be Meg-a-Lug as manufactured by Ebba Iron or equal. Standard mechanical joint retainer glands are not acceptable.

B. For 4” to 12” pipes, pipe joint restraint for push on joint pipe shall be American Standard Fastite joint with Fast-Grip gasket, American Flex-Ring joint or equal.

C. Pipe joint restraint across flange adapters and couplings shall be by threaded rods as depicted on the Drawings. Threaded rods shall clear the periphery of adapter and coupling flanges and shall span across to the adjacent flange by flange joints. Gusset plates shall be provided as necessary and fabricated out of 3/4-inch thick ASTM A-36 steel plate, dimensions and number as required.

2.04 LININGS FOR DUCTILE IRON PIPE

A. Ductile iron pipe and fittings for potable water mains, shall have standard thickness cement mortar lining and asphaltic material seal coat in accordance with ANSI/AWWA C104/A21.4.

2.05 COATINGS & FINISHES FOR DUCTILE IRON PIPE

A. All buried or submerged ductile iron pipe and fittings shall receive an exterior asphaltic

coating approximately 1 mil thick in accordance with ANSI/AWWA C151A/A21.51.

B. All above grade pipe and fittings, exposed to view in the finished work or in non-submerged concrete pits or structures, shall not receive the asphaltic coating but shall be shop primed and field painted. The pipe shall be color coded, labeled as to type of service and marked for flow direction. Asphaltic coating on pipe penetrating the ground or inadvertently applied to above grade pipe shall receive a non-bleeding sealer prior to being painted.

2.06 PVC PRESSURE PIPE 3-INCHES IN DIAMETER AND SMALLER

A. Pipe shall have the following properties at 73°F

1.	Tensile Strength	7,000 psi
2.	Modules of Elasticity in Tension	400,000 psi
3.	Compressive Strength	96,000 psi
4.	Flexural Strength	12,700 psi
5.	Izod Impact Strength	0.65
6.	Relative Hardness (Durometer/Rockwell)	80± 3/110-120
7.	Cell Designation	12454-B

B. Pipe shall be Schedule 80 PVC with solvent weld or threaded fittings meeting ASTM and NSF industry standards. Physical dimensions and tolerances shall be in accordance with ASTM D-1785 with the pipe appropriately marked.

C. Schedule 80 solvent weld socket fittings shall be in accordance with ASTM D-2467. Solvent welding shall be in strict accordance with manufacturer's instructions with Schedule 80 solvent weld cement and related products only. Schedule 80 threaded fittings shall be in accordance with ASTM D-2464, all threaded connections shall be taped with teflon tape. All PVC to metal pipe connections shall be flanged. All PVC unions shall have O-rings seats.

2.07 PVC PRESSURE PIPE 4-INCHES IN DIAMETER AND LARGER

A. Pipe shall have the following properties at 73 ^{0}F:

1.	Tensile Strength	7,000 psi
2.	Modules of Elasticity in Tension	400,000 psi
3.	Izod Impact Strength	0.65
4.	Cell Designation	12454A or 12454B
5.	Hydrostatic Design Basis(HDB)	4,000 psi

B. Pipe shall be cast iron (CI) equivalent outside diameter with Elastomeric rubber gasket push-on joints in accordance with ASTM F477.

1. Pipe 4-inches through 12-inches in diameter shall be AWWA C900 DR 18, Pressure Class 150 psi rated at 73.4^{0}F. Dimensions, tolerances, inspection, testing, and pipe marking shall be in accordance with AWWA C900, latest edition.

2. Pipe greater than 12-inches in diameter shall be AWWA C905 DR25, Pressure Rating 165 psi at 73.4^{0}F. Dimensions, tolerances, inspection, testing, and pipe markings shall be in accordance with AWWA C905, latest edition.

C. Fittings shall be of ductile iron in accordance with paragraph 2.01 of this section.

D. Pipe shall be supplied in lengths not exceeding a nominal 20 feet.

2.08 JOINT RESTRAINT FOR PVC PRESSURE PIPE 4-IN. THROUGH 12-IN.

A. Where pipe restraint is required, it shall be provided by restraining sufficient length of pipe with mechanical type devices. Mechanical restraint devices for PVC pipe shall meet the following requirements.

1. Push-on joint pipe restraint: Mechanical devices shall be full circumferential contact compression type consisting of two rings connected across the pipe joint with restraining rods and associated hardware. The pipe bell ring shall be a single piece ductile iron retainer ring that slides over the pipe plain end up to the pipe bell. The pipe plain end ring shall be a two-piece ductile iron restrainer with a serrated-face to contact the pipe. The restrainer shall be assembled on the pipe with side clamping bolts and nuts. The design tolerances to which the restrainer is machined will prevent over-tightening which could weaken or damage the pipe. Ductile iron rings shall be ASTM A536, Grade 65-45-12. Connecting bolts shall be in accordance with ANSI/AWWA C111/A21.11. The restraining devices shall be rated for a working pressure equivalent to the pressure rating of the pipe and shall meet or exceed the requirements of UNI-B-13-94, Recommended Performance Specification for Joint Restraint Devices for Use with PVC Pipe. The devices shall be Uni-Flange Block Buster Series 1350 or Owner approved equal.

2. Mechanical Joint Fitting Restraint: Mechanical restraining devices shall have a full circumferential contact compression 2-piece split ring restrainer which is assembled on the PVC pipe with slide clamping bolts and nuts. The restrainer shall be designed to attach to Standard mechanical joints with extra long T-bolt studs in 4-inch through 12-inch sizes and with threaded restraining rods in 14-inch through 36-inch sizes. The device shall be of ductile iron ASTM A536, Grade 65-45-12. Connection bolts and hardware shall be in accordance with ANSI/AWWA C111/A21.11. The restraining devices shall be rated for a working pressure equivalent to the pressure rating of the pipe and shall meet or exceed the requirements of UNI-B-13-94, Recommended Performance Specification for Joint Restraint Devices for Use with PVC Pipe. The devices shall be Uni-Flange Block Buster Series 1300 or Owner approved equal.

2.09 GATE VALVES

A. When full open, gate valves shall have a clear waterway equal to the nominal diameter of the pipe. Operating nut or wheel shall have an arrow cast in the metal indicating the

direction of opening. Each valve shall have the manufacturer's distinctive marking, pressure rating and year of manufacture cast on the body. Prior to shipment from the factory, each valve shall be tested by applying it to a hydrostatic pressure equal to twice the specified working pressure. Exercise care in transporting and handling valves to avoid damage. Inside valves shall be kept free of dirt and debris. All gate valves shall have mechanical joint ends or flanged ends to fit the pipe run in which they are to be used. Gate valves shall open left or counter-clockwise when viewed from the stem. Buried gate valves shall be furnished with 2-inch square AWWA standard nut operators with a valve box and cover. Gate valves located above ground or inside structures shall be furnished with hand wheel operators and shall have a suitable indicator arrow to give valve position from fully open to fully closed. Unless shown or specified otherwise, manually operated valves shall be equipped with a mechanism which will allow the valve to be opened or closed with a force of not more than 40 lb. applied to the nut, crank, or hand wheel. Hydrostatic and leakage tests shall be conducted in strict accordance with ANSI/AWWA C500, latest revision or ANSI/AWWA C509, latest revision, whichever is applicable.

B. Double Disc Gate Valves 2 to 2 ½ Inch: Valves shall conform to ANSI/AWWA C500, latest revision and shall be designed for a minimum working pressure of 200 psi. Valves shall be iron body, bronze mounted, parallel seat, non-rising stem type with O-ring stem seals. Interior ferrous surfaces of valve, except for finished for wearing, shall be coated with a two-part thermosetting epoxy coating in accordance with AWWA C550, latest revision. Surfaces shall be clean, dry, and free from rust and grease before coating. Exterior surfaces of valve shall be coated as specified hereinafter. Gate valves for this size range shall be as manufactured by Mueller Company, M&H Valve Company or Owner approved equal.

C. Resilient Seat Gate Valves 3 to 24 Inch: Resilient Seat Gate Valves shall be used on all potable water lines. Valves shall conform to ANSI/AWWA C509, latest revision and shall be designed for a minimum working pressure of 150 psi. Valves shall be iron body with non-rising stem and O-ring stem seals. The valve stem, stem nut, glands and bushings shall be bronze. Valve disc shall be constructed to assure uniform seating pressure between disc seating and body seating surface. Body seating surface shall be resilient seat ring seals made from internally reinforced molded rubber which are attached to the disc ring with stainless steel screws, or by a special corrosion resistant, synthetic elastomer which is permanently bonded to and completely encapsulates a cast iron valve disc. Interior of valve body and valve disc shall be coated with a two-part thermosetting epoxy-coating in accordance with AWWA C550, latest revision. Surfaces shall be clean, dry and free from rust and grease before coating. Exterior surfaces of valve shall be coated as specified hereinafter. Gate valves for this size range shall be as manufactured by Mueller Company, American-Darling Company, US. Pipe, Kennedy Valve Company, or approved equal.

2.10 CHECK VALVES

A. Check valves for potable water service shall be cast iron bodied per AWWA C508, latest revision, with integral ANSI Class 125 flanges. Valves shall have a field replaceable centrifugally cast bronze body seat located in place with stainless steel screws. The valve shaft shall be a one-piece shaft of Type 17-4PH steel, which shall extend through both sides of the valve body. An outside lever and weight shall be attached to one side of the shaft; an oil filled control dampening device shall be attached to the other side of the shaft. The

valve disc shall be of ASTM A126 Grade B cast iron and the disc seat shall be of BUNA-N. The control device shall consist of a side-mounted, oil-filled cylinder, which provides (3) closing speed stages. All control stages shall be fully adjustable. Check valves shall be GA Industries, Flomatic, Apco Series 6100, or an approved equal.

2.11 VALVE BOXES

A. All buried valves shall have cast iron three-piece valve boxes. Valve boxes shall be provided with suitable heavy bonnets and extend to such elevation at or slightly above the finished grade surface as directed by the Owner. The barrel shall have two-piece, sliding type, having 5-1/4- inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with cast iron covers. Covers shall have "WATER" cast into the top as applicable to service. All valves shall have actuating nuts extended to top of valve boxes. Valve boxes shall be provided with concrete base and valve nameplate engraved with lettering 1/8-inch deep as shown on the Drawings.

2.12 FLEXIBLE COUPLINGS

A. Flexible couplings shall be of the sleeve type as shown on the Drawings and as follows:

1. Sleeve type couplings shall be used with all buried piping and where shown on the Drawings. The couplings shall be of steel and shall be Dresser Style 38, Rockwell Model 413, Baker Allsteel, or equal. The couplings shall be provided with hot dipped galvanized steel bolts and nuts unless indicated otherwise.

2. Flanged adapters shall be Dresser Type 128, Rockwell Model 913, or equal.

3. All couplings shall be furnished with the pipe stop removed.

4. Couplings shall be provided with gaskets of a composition suitable for contact with potable water.

2.13 HARNESSING SYSTEMS

A. All expansion joints specified in Paragraph 2.06 and flexible couplings specified in Paragraph 2.07 shall be restrained with threaded tie rods and lugs. Tie rods shall be threaded rods manufactured of ASTM A36 steel and shall be hot dip galvanized. All bolts and washers shall be hot dip galvanized. Lugs for tie rods shall connect to flange bolts and provide a device, which allows installation of tie rods outside the periphery of the pipe flanges. Lugs shall be manufactured of ASTM A36 steel, ASTM A283 Grade B, C, or D steel, or ASTM A255 Grade C steel. Lug dimensions shall conform to AWWA Manual M11, Table 19.7. Washers shall be provided for all lugs; washers shall have a minimum thickness of 1/8 inch. Tie rods for restraint of the above coupling and joints shall be furnished as shown below.

PIPE SIZE	NUMBER OF TIE RODS	ROD SIZE (INCHES)
3	4	5/8
4	4	5/8

6	4	¾
8	4	¾
10	4	7/8
12	4	7/8

2.14 PRESSURE GAUGES

A. Each pressure gauge shall be a flange-mounted water sensor conforming to ANSI 125-lb. flange drilling specifications. Pressure sensor shall provide a full 360-degree circumferential reading of line fluids, while isolating them from the gauge with a flexible rubber sleeve. Line pressure shall be transferred from the flexible rubber sleeve to the gauge through a captive fluid with a maximum error rate of 2%. Captive sensing fluid shall be ethylene glycol/glycerin. An alternate pressure sensor shall be diagram seals with a ball valve for easy removal of pressure gauge.

B. Water body and end flanges shall be carbon steel. All wetted steel parts of the sensor shall be Teflon coated. Sleeve material shall be BUNA N.

C. Gauge shall have a 4" minimum diameter. Pressure gauge shall have an operating range of 0 – 100 psig or as indicated in specification or drawings.

D. Pressure gauges shall be Series 40, in-line water sensor, as manufactured by Red Valve, Carnegie, Pennsylvania, Wika, or an approved equal. Diaphragm seals shall be manufactured by HYET Instrument Co., Bridge City, Texas.

2.15 BALL VALVES

A. Ball valves for copper, black steel, and galvanized steel pipe and for below grade PVC pipe shall be Type 1000 as manufactured by Jamesbury, American Valve Milano Series figure M200, Crane Figure 9303-B,or Owner approved equal. Ball valves shall have threaded ends, bronze body, TFE seats and seals and ¼ turn to open lever handles. Below grade service ball valves shall be supplied with and installed in precast concrete access boxes.

2.16 TAPPING SADDLES FOR PVC WATER MAINS

A. Tapping saddles shall be double-strap type saddles suitable for wet-tapping water mains. Each saddle shall be rated for a 200 psi working pressure and shall have a threaded outlet compatible with the tapping valve and other appurtenances furnished. Tapping saddles shall have epoxy coated steel bodies and stainless steel straps and hardware. Tapping saddles shall be Smith-Blair Model 313, Ford Model F-202, JCM Model 402, Mueller Series 10500, Baker Shur Seal-O or an approved equal.

2.17 CORPORATION STOPS

A. Corporation stops for connections to cast-iron, ductile iron or steel piping shall be Ford Model F-1000 or FB-1000, McDonald Model 4701-T, Mueller Model H-15008 or H-15013, Hays Model 5200 DF or 4400 DF or an approved equal.

2.18 BACKFLOW PREVENTERS

A. Backflow preventers shall be reduced pressure type backflow preventers meeting all applicable AWWA requirements and the Owner's code requirement. Backflow preventers shall be manufactured by Febco, Watts, Zurn/Wilkins or an approved equal.

B. Backflow Preventers from 2 ½" through 10" shall meet all applicable requirements of AWWA C511 and the USC manual for Cross Connection Control. They shall have fused epoxy coated cast iron bodies, replaceable bronze seats, and OSY resilient seated gate valves. Maximum pressure drop across an 8-inch valve at 1250 gpm shall not exceed 11 ½ psi.

C. Backflow preventers from ¾" through 2" shall meet all applicable requirements of AWWA C506 and the USC Manual for Cross Connection Control. They shall have threaded end bronze bodies with a rated working pressure of 175 psi. Valves must be supplied with resilient seated ball valve shut-offs and test cocks. Maximum pressure drop across a 1-inch valve at 30 gpm shall not exceed 11 psi.

2.19 DRY BARREL FIRE HYDRANT

A. Fire hydrants shall be Traffic Dry Barrel Type and shall meet or exceed all applicable requirements and tests of ANSI and the latest revisions of AWWA Standard C502. Fire hydrants shall meet all test requirements and shall be listed by Underwriters Laboratories Inc. Fire Hydrants shall be rated for a working pressure of 250 PSIG. (1725 kPa). Manufacturers shall provide sufficient documentation to assure that their hydrant will successfully meet section 24.1 of UL 246 Standard.

1. Fire hydrant shall be of ample length for 3' – 6" depth of bury with a 4-foot square by 8-inch thick concrete thrust collar at 14-inches below finish grade.

2. Fire hydrants shall be of the true compression type, opening against the pressure and closing with the pressure. Fire hydrants shall have a 5-1/4" main valve opening, and have a minimum inside barrel diameter of 7 inches to assure maximum flow.

3. Fire hydrants shall be three-way in design, having one 4-1/2" NST pumper nozzle and two 2-1/2" NST hose nozzles. Nozzles shall thread counter-clockwise into the hydrant barrel utilizing O-ring pressure seals. A suitable nozzle lock shall be in place to prevent inadvertent nozzle removal.

4. The bonnet assembly shall provide an oil reservoir and lubrication system that automatically circulates to all stem threads and bearing surfaces each time the hydrant is operated. This lubrication system shall be sealed from the waterway and any external contaminants by use of O-ring pressure seals. An anti-friction washer shall be in place above the thrust collar to further minimize operating torque. The oil reservoir shall be factory filled with a low viscosity, FDA approved non-toxic oil lubricant which will remain fluid through a temperature range of -60 degrees F. to +150 degrees F.

5. The operating nut shall be a one-piece design, manufactured of ASTM B-584 bronze. It shall be pentagon in shape, measuring 1-1/2" from point to flat. The operating nut shall be affixed to the bonnet by means of an ASTM B-584 bronze hold down nut. The hold down nut shall be threaded into the bonnet in such a manner as to prevent accidental disengagement during the opening cycle of the hydrant. The use of Allen head set screws as a means of retention is unacceptable. A resilient weather seal shall be incorporated into the hold down nut, for the purpose of protecting the operating mechanism from the elements.

6. The direction of the opening shall be left. An arrow shall be cast on the bonnet flange to indicate the operating direction.

7. The hydrant bonnet shall be attached to the upper barrel by not less than eight bolts and nuts, and sealed by means of the O-ring pressure seal.

8. Hydrants shall be "traffic-model" having upper and lower barrels joined at the groundline by a separate and breakable "swivel" flange providing 360 rotation of upper barrel for proper nozzle facing. This flange shall employ not less than eight

bolts. The pressure seal between the barrels shall be an O-ring. The proper groundline shall be cast clearly on the lower barrel and shall provide not less than 18" of clearance from the centerline of the lowest nozzle to the ground.

9. The operating stem shall be two pieces, not less than 1-1/4" diameter (excluding threaded or machined areas) and shall be connected by a torque diverting stem coupling near the groundline flange which shall be manufactured of stainless steel to minimize galvanic action at this point. Screws, pins, or fasteners used in conjunction with the stem coupling shall also be stainless steel. The top of the lower stem shall be recessed 2" below the face of the safety flange to prevent water hammer in the event of a "drive over" where a vehicle tire might accidentally depress the main valve.

10. Hydrant shoe and barrel castings shall be cast of ASTM A-126, class B gray iron or ductile iron ASTM A-536, but no combination thereof, assuring uniform strength of all cast components and minimizing the possibility of shoe breakage upon traffic impact. The lower barrel shall be an integrally cast unit. The use of threaded on or mechanically attached flanges is deemed unacceptable. The inside diameter of the hydrant barrels shall not be less than seven inches (7").

11. Main valves shall be "compression type", closing with the pressure and shall not be less than 5-1/4" in diameter. Composition of the main valve shall be a molded rubber having a durometer hardness of 95+/-5 and shall be reversible in design. The main valve shall not be less then 1" thick.

12. Hydrants shall be equipped with (2) two drain valves which drain the barrel when the hydrant is closed and seal shut when the hydrant is opened. These drain valves shall be an integral part of the one-piece bronze upper valve plate. They shall operate without the use of springs, toggles, tubes, levers or other intricate synchronizing mechanisms.

13. The upper valve plate, seat ring and drain ring (shoe bushing) must be ASTM B-584 bronze and work in conjunction to form an all bronze drainway. A minimum of two (2) internal and two (2) external drain openings are required. Drains ported through the cast iron shoe must be bronze lined.

14. The bronze seat ring shall thread into a bronze drain ring (or shoe bushing) providing a bronze-to-bronze connection. Seat rings shall be O-ring pressure sealed.

15. The 6" shoe connection shall be as specified (flanged, A/C, M.J., etc.) having ample blocking pads for sturdy setting and two strapping lugs to secure the hydrant to piping. A minimum of six bolts and nuts is required to fasten the shoe to the lower barrel.

16. The interior of the shoe including the lower valve plate and stem cap nut shall have a protective coating of a two-part thermosetting epoxy to a minimum thickness of

4 mils. If a stem cap nut is utilized, it must be locked in place by a stainless steel lock washer or similar non-corrosive device.

17. Hydrants shall be warranted by the manufacturer against defects in materials or workmanship for a period of ten (10) years from the date of manufacture.

18. Hydrants shall be Mueller Super Centurion 250 or approved equal.

B. Existing fire hydrants to be relocated shall be thoroughly reconditioned to a serviceable condition satisfactory to the Engineer and the Owner. The outside of the hydrant above the finished ground line shall be thoroughly cleaned and thereafter painted with one coat of paint of a durable composition plus one additional coat of finish paint.

C. Fire hydrant assemblies including all pipe, fittings, valves and appurtenances shall have restrained joints from the hydrant to the limits shown on the drawings.

PART 3 - EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING OF DUCTILE IRON PIPE & FITTINGS

A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with manufacturer recommendations and ANSI/AWWA C600.B.

B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage to the pipe or fittings and their respective linings and coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Unloading shall be done by lifting with a forklift or crane. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective.

C. If any defective pipe is discovered after it has been laid it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

3.02 INSTALLATION (DUCTILE IRON PIPE AND FITTINGS)

A. Below grade ductile iron pipe and fittings shall be installed in accordance with requirements of ANSI/AWWA C-600 and manufacturer recommendations. Pipes shall be laid to the lines and grades shown on the Drawings with a minimum of 3 feet of cover from proposed finished grades. Pipes shall be laid at a constant slope between elevations specified. Pipe joints may be deflected to a maximum of 75% of manufacturer recommendations to establish alignment, slope, and grade.

B. Above grade flanged ductile iron pipe and fittings shall be installed true to alignment and adequately supported. All valves, fittings, equipment, and appurtenances needed upon the pipelines shall be set and jointed as indicated on the Drawings or as required. All pipe and appurtenances connected to equipment shall be supported in such manner as to prevent any strain being imposed on the equipment. Supports shall be provided at each

fitting/valve/appurtenance or combination thereof and at a maximum spacing of 6 feet.

C. All field cutting of pipe shall be performed in accordance with the requirements of ANSI/AWWA C600 and manufacturer recommendations. Field touch-up of linings shall be per manufacturer recommendations.

3.03 DELIVERY, STORAGE, AND HANDLING OF PVC PIPE

A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with manufacturer recommendations and ANSI/AWWA C605.

B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage to the pipe. Pipe shall not be rolled off the carrier or dropped. Unloading shall be done by lifting with a forklift or crane. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective.

C. If any defective pipe is discovered after it has been laid it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

3.04 INSTALLATION (PVC PIPE)

A. Below grade PVC pipe shall be installed in accordance with requirements of ANSI/ AWWA C605, manufacturer recommendations and ASTM D2321. Pipes shall be laid to the lines and grades shown on the drawings with a minimum of 3 feet of cover from proposed finished grades. Pipes shall be laid at a constant slope between elevations specified. Pipe joints may be deflected to a maximum of 75% of manufacturer recommendations to establish alignment, slope, and grade.

B. All field cutting of pipe shall be performed in accordance with the requirements of ANSI/AWWA C605 and manufacturer's recommendations. Installation of valves and fittings shall be strictly in accordance with manufacturer's instructions. Particular care shall be taken not to over-stress threaded connections. Except for ductile iron mechanical joint fittings, all plastic pipe to metal pipe connections shall be made using flanged connections. Metal piping shall not be threaded into plastic fittings, valves, or couplings, nor shall plastic piping be threaded into metal valves, fittings, or couplings.

3.05 INSTALLATION OF VALVES AND APPURTENANCES

A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Owner before they are installed.

B. Pipe for use with flexible couplings shall have plain ends.

C. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8 inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint. The other pipe end shall be inserted into the middle rung and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares. After the bolts have been inserted and all nuts have been made up finger-tight diametrically opposite nuts shall

be progressively and uniformly tightened all around the joint by use of a torque wrench of the appropriate size and torque for the bolts.

D. Pressure gauges shall not be installed until after the substantial completion date unless otherwise requested by the Owner.

E. Valve boxes with concrete bases shall be installed as shown on the drawings. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Place cast iron box over each stem with base bearing on compacted fill or bedding rock and the top shall be set flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on cover shall be parallel to pipe. Remove any sand or undesirable fill from valve box.

3.06 BEDDING AND BACKFILLING

A. Pipe bedding and backfilling shall be in accordance with the requirements in the plans.

B. Bedding: Bedding material shall consist of pearock, drainfield limerock or similar material approved by the Engineer in wet trenches, and limerock screenings, sand or other fine inorganic material approved by the Engineer in dry trenches.

After pipe trenches have been excavated to the proper depths, backfill the resulting excavation with approved pipe bedding material, up to the level of the lower one-third of the proposed pipe barrel. Tamp, compact and shape this material to provide a proper bedding for the pipe. Provide bedding under the branch of all fittings to furnish adequate support and bearing under the fitting.

Backfill any excess excavation below the levels required for installation of the pipe bedding, with approved bedding material, tamped, compacted and shaped to provide proper support for the proposed pipe.

C. Backfill Material: Suitable fill material as specified elsewhere in the contract documents shall contain no stones or rocks larger than 6-inches in diameter, and, when placed within 1-foot of piping and appurtenances, shall contain no stones or rocks larger than 2-inches in diameter (1-inch for PVC pipe).

Backfilling of utility trenches will not be allowed until installation of pipe and appurtenances has been approved and pressure tested if required. Uncover or expose for inspection at no cost to the Owner any work which is covered or concealed without the knowledge and consent of the Engineer. Partial backfill may be placed to restrain the pipe during pressure testing.

If a sufficient quantity of suitable backfill material is not available from the trench or other excavations within the site of the work, provide and install additional material suitable for this purpose.

Place backfill material in 6-inch layers and compact per the densities specified in the embankment specification, but not less than 90% of the maximum density of the material.

After the backfill has been placed to a level 12-inches over the pipe, place the remainder of the backfill in layers not to exceed 9-inches, and compact with mechanical vibrators or other suitable equipment to obtain a density of the backfilled material as specified in the embankment specification. Exercise particular attention and care in obtaining thorough support for the branch of all service connection fittings and to preserve the alignment and gradient of the installed pipe.

Within paved areas of trench excavation, reconstruct the base and surfacing as specified under the appropriate specification section. Partially backfill no more than 800-feet of trench with pipe in place at any time unless otherwise approved by the Engineer.

3.07 CLEANING.

At the conclusion of the work, the Contractor shall thoroughly clean the new pipe lines by flushing with water or other means to remove all dirt, stones or other material which may have entered the line during the construction period. The Contractor shall pay for and provide all water, pumps, piping, and related equipment required for cleaning at no additional cost to the owner.

Flushing will be accomplished using a temporary jumper connection.

3.08 HYDROSTATIC PRESSURE AND LEAKAGE TESTING

A. Hydrostatic tests shall consist of a pressure test and a leakage test. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints, and valves including all service lines. Air testing of pressure pipes will not be permitted under any circumstance. Tests shall be made on sections not exceeding 2,000 ft. The Contractor shall furnish all closure pieces in the pipe as required. Equipment to be furnished by the Contractor shall include, but not be limited to, graduated containers, pressure gauges, hydraulic force pumps, suitable hoses and piping, and temporary jumper connection with reduced pressure backflow prevention device as shown on the Drawings. The Owner will monitor and approve a satisfactory test. The Contractor shall pay for, provide, and dispose of all flushing and test water at no additional cost to the Owner.

B. The Contractor may conduct hydrostatic tests after the trench has been partially backfilled with the joints left exposed for inspection for his informational purposes only. The hydrostatic tests for acceptance shall only be conducted after the trenches have been completely backfilled and compacted as specified. Where any section of pipe is provided with concrete thrust blocking, tests will not be made until at least five (5) days have elapsed after the thrust blocking is installed. If high early strength cement is used for the concrete thrust blocking, the time may be reduced to 24 hours.

C. All pressure pipe sections to be tested shall be subjected to hydrostatic pressure and leakage tests. Test pressures for potable water mains shall be 150 psi.

D. The duration of pressure and leakage tests shall be for periods of 2 hours each. If during the tests, the integrity of the tested line is in question, the Owner may require 6-hour tests. The basic provisions of AWWA C-600 shall be applicable.

E. Pressure Test:

Each section of pipe to be tested, as determined by the Owner, shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings, valves, or hydrants are discovered in consequence of the pressure test, all such items shall be removed and replaced by the Contractor with sound material and tests shall be repeated until satisfactory results are obtained. Provisions of AWWA C-600, where applicable, shall apply.

F. Leakage Test:

1. After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure. Applicable provisions of AWWA C-600 shall apply.

2. Allowable leakage in gallons per hour for the pipeline shall not be greater than that determined by the formula:

$$L = \frac{SD(P)^{0.5}}{133{,}200}$$

where:
- L = Allowable leakage in gallons per hour.
- S = Length of pipe tested, in feet.
- D = Nominal diameter of pipe in inches.
- P = Average test pressure during leakage test in pounds per square inch gauge.

3. Leakage is defined as the quantity of water to be supplied in the newly laid pipe or any valved section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. Should any test of pipe laid disclose leakage greater than that allowed, the Contractor shall locate and replace or repair the defective joints, pipe or valves until the leakage from subsequent testing is within the specified allowance.

3.09 DISINFECTION OF WATER MAINS

A. Before being placed in service, all new water mains shall be chlorinated in accordance in the specifications below and the procedures outlined in ANSI/AWWA C-651 Disinfecting Water Mains. A temporary jumper connection shall be provided by the Contractor as shown on the Drawings.

B. Sections of pipe to be disinfected shall first be flushed (*full diameter) to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a blow-off valve shall be provided large enough to develop a velocity of at least 2.5 feet per second in the main. The Contractor shall pay for all flushing and disinfecting water at no additional cost to the Owner.

C. All taps required for chlorination or flushing purposes, or for temporary or permanent release of air shall be provided for by the Contractor as a part of the construction of water mains. After the disinfection, all such taps shall be sealed to the satisfaction of the Owner.

D. Before being placed into service, all new mains and repaired portions of, or extensions to existing mains shall be chlorinated so that the initial chlorine residual is not less than 50 mg/l and that a chlorine residual of not less than 25 mg/l remains in the water after standing 24 hours in the pipe.

E. Chlorine may be applied as a liquid chlorine (gas-water mixture), or a mixture of water and high-test calcium hypochlorite. The Contractor shall assume responsibility for safe handling of chlorine and shall meet requirements of OSHA and other regulatory agencies for safe handling of chlorine.

F. The preferred point of application of the chlorinating agent is at the beginning of the pipeline extension or any valved section of it, and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipe line extension.

G. Valves shall be manipulated by the Owner's personnel so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water.

H. Treated water shall be retained in the pipe at lest 24 hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 25 mg/l.

I. In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operable while the pipe line is filled with the chlorinating agent and under normal operating pressure.

J. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows upon test, a free chlorine residual not in excess of that normally carried in the system.

K. After flushing, water samples collected on 2 successive days from the treated piping system, as directed by the Owner, shall show acceptable bacteriological results. All bacteriological sampling and testing shall be provided by the Contractor. All such bacteriological analyses must be performed by a laboratory certified by the State of Florida.

L. Proper chain of custody procedures must be followed and samples shall only be collected by certified laboratory personnel in the presence of the Owner's personnel.

M. Copies of testing results and all related correspondence with the Florida Department of Environmental Protection (FDEP) shall be submitted to the Owner.

N. Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are

obtained.

3.10 CORRECTION OF NON-CONFORMING WORK.

All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the Owner. Non-conforming work shall be defined as failure to adhere to any specific or implied directive of these specifications and/or the Drawings, including but not limited to pipe not laid straight, true to the lines and grades as shown on the drawings, damaged or unacceptable materials, excessive misalignment or diameter ring deflection in pipe due to bedding, backfilling or installation, visible or detectable leakage and failure to pass any specified test or inspection.

4.0 METHOD OF MEASUREMENT.

The length of waterline to be paid for shall be the number of linear feet of waterline in place, completed, and approved. It shall be measured along the centerline of the pipe from end to end and shall included bends, line stops, wet taps, jumper connections with RPZ backflow preventers, blow-off assemblies, and plugs. Fittings (other than those previously listed) shall be paid for separately under the respective contract unit price for which they are a part; however, price does include all materials, preparation, excavation, installation, labor, equipment, tools, supplies and incidentals to complete this work.

Waterline valves, fire hydrants, and other fittings shall be measured by each unit in place, completed, and approved.

5.0 BASIS OF PAYMENT.

Payment shall be made at the contract unit price per linear foot for waterline. This price shall be full compensation to the Contractor for furnishing all materials, preparation, excavation, installation, labor, equipment, tools, supplies and incidentals to complete this work.

The accepted quantities of tees, gate valves (with box), and fire hydrant assemblies will be paid for at the contract unit price per each, complete and in place. Bends, line stops, wet taps, jumper connections with RPZ backflow preventers, blow-off assemblies, and plugs shall be incidental to the associated waterline installation. This price shall be full compensation to the Contractor for furnishing all materials and for preparation, excavation, installation and backfilling of these materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the items as shown in the plans; and for all labor, equipment, tools, supplies, and incidentals to complete this work.

Payment shall be made under: No basis of payment for this item. Okaloosa County Water & Sewer to self-perform work.

END OF SECTION 02660

SECTION 02730

SANITARY SEWAGE SYSTEM

PART 1 GENERAL

1.1 SCOPE OF WORK.

A. This item consists of the furnishing of all labor, materials, equipment and incidentals required for the installation of construction at the locations depicted on the Drawings, or as required by the Contract Documents, all Piping, Fittings, Structures and appurtenances.

B. The work generally includes designated on-site force mains, sanitary gravity mains, and services, manholes, appurtenances and other miscellaneous work as depicted on the Drawings or specified herein.

C. General Design. The equipment and materials specified herein is intended to be standard types of pipe, fittings and appurtenances for use in transporting water and wastewater.

1.2 RELATED REQUIREMENTS

A. P-152 Excavation and Embankment

B. Section 02660 Water Distribution System

C. Section 02221 Trenching and Backfilling for Utility Systems

D. FDOT Section 400 Concrete Structures

E. FDOT Section 425 Pre-Cast Concrete Structures

1.3 QUALITY ASSURANCE.

A. The below listed standards are applicable and are adopted by reference:

1. ANSI/AWWA C110/A21.10 Ductile Iron and Gray Iron Fittings 3 in through 48-inch for Water and other liquids.
2. ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.
3. ANSI/AWWA C115/A21.15 Flanged Ductile-Iron Pipe with Threaded Flanges.
4. ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe.
5. ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or Other Liquids.
6. ANSI/AWWA C153/A21.53 Ductile-Iron Compact Fittings, 3 in. Through 16 in., for Water and Other Liquids.
7. ANSI/AWWA C508 Swing Check Values for Water Works Service-2 in through 24 in.
8. ANSI/AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances.
9. ANSI/AWWA C605 Underground Installation of Poly Vinyl Chloride (PVC)

Pressure Pipe and Fittings for Water.

10. ANSI/AWWA C651 Disinfecting Water Mains
11. ANSI/AWWA C900 Poly Vinyl Chloride (PVC) Pressure Pipe, 4-in through 12-in., for Water (ANSI/AWWA C900)
12. ANSI/AWWA C905 Poly Vinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14–in. through 36-in.
13. ASTM D1598 *Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
14. ASTM D1599 *Short-Time Rupture Strength of Plastic Pipe, Tubing and Fittings
15. ASTM D1784 *Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Ply (Vinyl Chloride)(CVPC) Compounds
16. ASTM D1785 *Poly (Vinyl Chloride)(CPVC) Compounds
17. ASTM D2241 *Poly (Vinyl Chloride)(PVC) Plastic Pipe, Schedule 40, 80, and 120
18. ASTM D2321 *Underground Installation of Flexible Thermoplastic Sewer Pipe
19. ASTM D2412 *External Loading Properties of Plastic Pipe Parallel-Plate Loading
20. ASTM D2444 *Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
21. ASTM D2466 *Poly (Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40
22. ASTM D2467 *Socket-Type Poly (Vinyl Chloride)(PVC) Plastic Pipe Fittings Schedule 80
23. ASTM D2564 *Solvent Cements for Poly (Vinyl Chloride)(PVC) Plastic Pipe and Fittings
24. ASTM D2774 *Underground Installation of Thermoplastic Pressure Piping
25. ASTM D2855 *Making Solvent-Cemented Joints with Poly (Vinyl Chloride)(PVC) Pipe and Fittings
26. ASTM D3034 *Type PSM Poly (Vinyl Chloride)(PVC) Sewer Pipe and Fittings
27. ASTM D3139 *Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
28. ASTM D3212 *Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals
29. ASTM F477 *Elastomeric Seals (Gaskets) for Joining Plastic Pipe
30. UNI-B-6 For Low-Pressure Air Testing of Installed Sewer Pipe

B. Qualifications: All of the pipe, fittings and appurtenances shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe, fittings and appurtenances shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with the adopted references and these specifications as applicable.

C. Manufacturers of Ductile Iron Pipe and Fitting will be the American Cast Iron Pipe Company, U.S. Pipe and Foundry Company, McWane Cast Iron Pipe Company or Owner approved equal.

D. Factory Tests for D.I.P. and D.I. Fittings: The manufacturer shall perform the factory tests described in ANSI/AWWA C151/A-21.51 and shall submit sworn certifications of the factory tests and their results.

E. PVC pipe shall be manufactured by Certain Teed, Diamond Plastics, Elson, J-M Pipe, North American Pipe Corp., or equal.

F. PVC compounds shall be Class 12454A or 12454B in accordance with ASTM D1784. The manufacturer(s) of pipe supplied for this project shall provide a compliance statement for this and for all other qualifications required by this specification as applicable.

1. Cell Classification Tests (ASTM D1784)
2. Hydrostatic Design Stress Testing (ASTM D2837)
3. Quick Burst Testing (ASTM D1599)
4. Pipe Impact Testing (ASTM D2444)
5. Pipe Stiffness Testing and Flattening Testing (ASTM D2412)
6. Sustained Pressure Testing (ASTM D1598 & ASTM D2241)
7. Hydrostatic Proof Testing (ANSI/AWWA C900)

G. Quality Control

1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards and shall provide written warranty for their products.

1.4 SUBMITTALS

A. Within seven (7) days after execution of the Contract, submit a list of materials, names of manufacturers and dates of delivery of materials to the project site.

B. Shop and Layout Drawings

1. Submit complete shop drawings detailing all of the technical and dimensional data of material to be furnished including weights.
2. Submit layout drawings including restrained joint layouts, fitting and joint layouts, and mechanical piping layouts with support locations. Layout drawings shall be prepared to an appropriate scale with dimensioning.

B. Submit Manufacturer Certifications as required by these specifications.

C. Submit Florida Licensed Surveyor Certified As-built drawings of force mains and piping with verified vertical and horizontal data as required by these specifications.

D. Submit documentation for all tests required by these specifications.

1.5 PERMITS

A. Contractor shall comply with all conditions of Florida Department of Environmental Protection (FDEP) wastewater permit.

B. Contractor shall maintain copies of permits on-site and available all times for inspection by regulatory agencies throughout the course of the work.

1.6 JOB CONDITIONS

A. Water in Excavation. Water shall not be allowed in the trenches while the pipes are being laid and/or tested. The Contractor shall not open more trench than the available pluming facilities are able to dewater to the satisfaction of the Owner. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall the pipelines being installed be used as drains for such water, and the ends of the pipe shall be kept properly and adequately blocked during construction by the use of approved stoppers and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand or other obstructing matter into the pipelines. If on completion of the work any such materials have entered the pipelines, it must be cleared as directed by the owner so that the entire system will be left clean and unobstructed.

PART 2 PRODUCTS

2.1 MANHOLES AND INSPECTION HOLES

A. The brick shall conform to the requirements of ASTM C 32, Grade SM.

B. Mortar shall consist of one-part portland cement and two parts sand. The portland cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144.

C. Mortar shall consist of one-part portland cement and two parts sand. The portland cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144.

D. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of specification P-610 Structural Portland Cement Concrete and Section 03410.

E. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C 478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches (90 cm) nor more than 48 inches (120 cm).

F. Corrugated metal shall conform to the requirements of AASHTO M 36.

G. Frames, covers, and grates. The castings shall conform to one of the following requirements:

1. Gray iron castings shall meet the requirements of ASTM A 48, Class 30B and 35B.

2. Malleable iron castings shall meet the requirements of ASTM A 47.

3. Steel castings shall meet the requirements of ASTM A 27.

4. Structural steel for grates and frames shall conform to the requirements of ASTM A 283, Grade D.

5. Ductile iron castings shall conform to the requirements of ASTM A 536.

6. Austempered ductile iron castings shall conform to the requirements of ASTM A 897.

   All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified. Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure. All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A 123.

H. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of bituminous paint, when directed.

2.2 MECHANICAL JOINT AND PUSH-ON JOINT DUCTILE IRON PIPE AND FITTINGS

A. Pipe shall conform to the requirements of ANSI/AWWA C151/A21.51 with thickness design in accordance with ANSI/AWWA C150/A21-50, Latest Editions. All pipe shall be tested and marked in accordance with these standards.

   1. Pipe diameters equal to or less than 12 inches shall be minimum pressure Class 350 psi.

B. Pipe for installation below ground shall be supplied in lengths not in excess of a nominal 20 feet. The pipe shall have either mechanical joint or push-on joints with rubber gaskets in accordance with ANSI/AWWA C111/A21.11.

C. Fittings shall be ductile iron or cast iron mechanical joint in accordance with ANSI/AWWA C110/A21.10 with a minimum pressure rating as follows:

   350 psi for pipe diameters through 24 inches.

D. In lieu of the above requirement compact ductile iron mechanical joint fittings in accordance with ANSI/AWWA C153/A21.53 may be used for pipe diameters 12 inches and smaller; minimum pressure Class 350 psi.

E. Rubber gaskets for joints and fittings shall be made of vulcanized styrene butadiene rubber

(SBR) in accordance with ANSI/AWWA C111/A21.11. Tee head nuts and bolt for mechanical joints shall also comply with this standard.

F. Push-on joint pipe joints shall be in accordance with the applicable parts of ANSI/AWWA C111/A21.11 and shall be American Standard, Fastite type or equal.

2.3 FLANGED JOINT DUCTILE IRON PIPE AND FITTINGS.

A. All above grade pipe and pipe inside pits, tanks, and pump station structures shall be flanged ductile iron pipe conforming to ANSI/AWWA C115/A21.15, latest edition with a minimum special thickness class of 53.

B. Minimum dimension for flanged pipe shall be as shown in Table 2.1.

Table 2.1
Ductile Iron Pipe for Use with Threaded Flanges

Nominal Pipe Size (in)	Maximum Working Pressure (psi)	Pipe Nominal Thickness* (in)	Pipe OD (in)	Maximum Nominal Length
3	250	0.31	3.96	19'-6"
4	250	0.32	4.80	19'-6"
6	250	0.34	6.90	19'-6"
8	250	0.36	9.05	19'-6"
10	250	0.38	11.10	19'-6"
12	250	0.40	13.20	19'-6"
14	250	0.42	15.30	19'-6"
16	250	0.43	17.40	19'-6"
18	250	0.44	19.50	19'-6"
20	250	0.45	21.60	19'-6"
24	250	0.47	25.80	19'-6"
30	250	0.51	32.00	19'-6"
36	250	0.58	38.30	19'-6"

1. Ductile iron pipe barrels for threaded flanged pipe shall conform to the requirements of ANSI/AWWA C151/A21.51 with taper pipe threads for flanges in accordance with ASME/ANSI B1.20.1.

2. Flanges shall be ductile-iron or gray-iron solid type with an internal taper pipe thread in accordance with ASME/ANSI B1.20.1. They shall be flat-faced with dimensions and bolthole patterns for a water service rating of 250 psi working pressure in accordance with ASME/ANSI B.16.1, Class 125 flanges. Flanges may be back- or spot-faced to conform with flange thickness tolerances. Hollowback flanges are not acceptable.

3. All flanged pipes shall meet the fabrication tolerances specified in ANSI/AWWA C151/A21.51 and shall be inspected, tested and so marked by the manufacturer.

4. Fittings shall be ductile iron or cast iron flanged joint in accordance with ANSI/AWWA C110/A21.10 with a minimum rating of 250 psi working pressure.

5. Nuts, bolts, and gaskets for flanged joints shall be provided by the manufacturer adequate for the type of service and pressure rating of the joint. Gaskets shall be full face, minimum 1/8-inch thick synthetic rubber with molded annular rings.

2.4 JOINT RESTRAINT FOR DUCTILE IRON PIPE

A. Pipe joint restraint for standard mechanical joints shall be incorporated into the design of the follower gland and shall include a restraining mechanism which, when activated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536. Restraining devices shall be of ductile iron heat treated to minimum harness of 370 BHN. Dimensions of the gland shall be such that it can be used with a standard mechanical joint bell and tee-head bolts conforming to ANSI A21.11 and ANSI/AWWA C153/A21.53. Twist-off nuts shall be used on the restraining devices to ensure proper actuating of the restraining devices. The mechanical joint restraint system shall be designed for a working pressure of 250 psi with a minimum factor of safety of 2. Restrained joint devices shall be Meg-a-Lug as manufactured by Ebba Iron or equal. Standard mechanical joint retainer glands are not acceptable.

B. Pipe joint restraint for push on joint pipe shall be as follows:

4" - 12": American Standard Fastite joint with Fast-Grip gasket, American Flex-Ring joint or equal.

C. Pipe joint restraint across flange adapters and couplings shall be by threaded rods as depicted on the Drawings. Threaded rods shall clear the periphery of adapter and coupling flanges and shall span across to the adjacent flange by flange joints. Gusset plates shall be provided as necessary and fabricated out of 3/4-inch thick ASTM A-36 steel plate, dimensions and number as required.

2.5 LININGS FOR DUCTILE IRON PIPE

A. Ductile iron pipe and fittings for wastewater and sanitary sewage shall be lined by a two-component ceramic epoxy with a total thickness of 40 mils minimum meeting the following requirements.

1. A permeability rating of 0.0 perms when measured by ASTM E96-66, Procedure A. Duration of test shall be 6 weeks.

2. A direct impact resistance of 125 inches-pounds with no cracking when measured by ASTM D-2794.

3. The ability to build at least 50 mils dry in one coat.

4. The material shall be re-coatable with itself for at least seven days with no additional surface preparation when exposed to direct summer sun and a temperature of 90 degrees F.

5. The material shall contain at least 20% by volume of ceramic quartz pigment.

6. A test and service history demonstrating the ability of the material to withstand the service expected.

7. No detrimental blistering, pinholing or porosity of the lining will be allowed. Dry film thickness shall be measured by Steel Structures Painting Council Paint Application Specification No. 2 (SSPC-PA2, November 1, 1982). Conformance verification shall be by Inspection:

   (a) All pipe shall be checked for thickness using a magnetic film thickness gauge;

   (b) All pipe shall be pinhole detected with a non-destructive 2,500 volt test;

   (c) Each pipe joint shall be marked to indicate the date that the lining was applied and the numerical sequence of application on that date.

B. The lining shall be Protecto 401 Ceramic Epoxy manufactured by Vulcan Painters, Inc. or Owner approved equal. Surface preparation, lining application, inspection and testing shall be performed by the pipe manufacturer who shall provide certificates of compliance with these specifications.

2.6 COATINGS AND FINISHES FOR DUCTILE IRON PIPE

A. All buried or submerged ductile iron pipe and fittings shall receive an exterior asphaltic coating approximately 1 mil thick in accordance with ANSI/AWWA C151A/A21.51.

B. All above grade pipe and fittings, exposed to view in the finished work or in non-submerged concrete pits or structures, shall not receive the asphaltic coating but shall be shop primed and field painted in accordance with manufacturer's specifications. The pipe shall be color

coded green, labeled as to type of service and marked for flow direction. Asphaltic coating on pipe penetrating the ground or inadvertently applied to above grade pipe shall receive a non-bleeding sealer prior to being painted.

2.7 PVC PRESSURE PIPE 4-INCHES IN DIAMETER AND LARGER

A. Pipe shall have the following properties at 73° F:

1.	Tensile Strength	7,000 psi
2.	Modules of Elasticity in Tension	400,000 psi
3.	Izod Impact Strength	0.65
4.	Cell Designation	12454-A or 12454-B
5.	Hydrostatic Design Basis (HDB)	4,000 psi

B. Pipe shall be cast iron (CI) equivalent outside diameter with Elastomeric rubber gasket push-on joints in accordance with ASTM F477.

Pipe 4-inches through 12-inches in diameter shall be AWWA C900 DR18, Pressure Class 150 psi rated at 73.4° F. Dimensions, tolerances, inspection, testing and pipe marking shall be in accordance with AWWA C900, latest edition.

C. Fittings for AWWA C900 DR18 PVC Pressure Pipe shall be of ductile iron in accordance with Part 2 of these specifications.

D. Where pipe restraint is required, it shall be provided by restraining sufficient length of pipe with mechanical type devices. Mechanical restraint for PVC pipe shall meet the following requirements.

1. Push-on Joint pipe restraint: Mechanical devices shall be full circumferential contact compression type consisting of two rings connected across the pipe joint with restraining rods and associated hardware. The pipe bell ring shall be a single piece ductile iron retainer ring that slides over the pipe plain end up to the pipe bell. The pipe plain end ring shall be a two-piece ductile iron restrainer with a serrated-face to contact the pipe. The restrainer shall be assembled on the pipe with side clamping bolts and nuts. The design tolerances to which the restrainer is machined will prevent over-tightening which could weaken or damage the pipe. Ductile iron rings shall be ASTM A536, Grade 65-45-12. Connecting Bolts shall be in accordance with ANSI/AWWA C111/A21.11. The restraining devices shall be rated for a working pressure equivalent to the pressure rating of the pipe and shall meet or exceed the requirements of UNI-B-13-94, Recommended Performance Specification for Joint Restraint Devices for Use with PVC Pipe. The devices shall be Uni-Flange Block Buster Series 1350 or Owner approved equal.

2. Mechanical Joint Pipe Restraint: Devices shall have a full circumferential contact compression 2-piece split ring restrainer which is assembled on the PVC pipe with

side clamping bolts and nuts. The restrainer shall be designed to attach to Standard Mechanical Joints with extra long T-bolt studs in 4-inch through 12-inch sizes. The device shall be of ductile iron ASTM A536, Grade 65-45-12. Connection bolts and hardware shall be in accordance with ANSI/AWWA C111/A21.11. The restraining devices shall be rated for a working pressure equivalent to the pressure rating of the pipe and shall meet or exceed the requirements of UNI-B-13-94, Recommended Performance Specification for Joint Restraint Devices for Use with PVC Pipe. The devices shall be Uni-Flange Block Buster Series 1300 or Owner approved equal.

2.8 PVC SANITARY GRAVITY SEWER PIPE

A. Pipe shall have the following properties at 73^{o} F:

1.	Tensile Strength	7,000 psi
2.	Modules of Elasticity in Tension	400,000 psi
3.	Izod Impact Strength	0.65
4.	Cell Designation	12454-A or 12454-B

B. Pipe shall be PVC sewer pipe with integral bell and spigot joints and locked-in elastomeric rubber gaskets in accordance with ASTM D-3212 and ASTM F477.

C. Pipe 4-inches through 15-inches shall be SDR-35, pipe stiffness PS-46 psi in accordance with ASTM D-3034.

D. Pipe shall be supplied in lengths not exceeding a nominal 20 feet.

2.9 CHECK VALVES

A. Check valves for wastewater service shall be cast iron bodied per AWWA C508, latest revision, with integral ANSI Class 125 flanges. Valves shall have a field replaceable centrifugally cast bronze body seat located in place with stainless steel screws. The valve shaft shall be a one-piece shaft of Type 17-4PH steel, which shall extend through both sides of the valve body. An outside lever and weight shall be attached to one side of the shaft: oil filled control-dampening device shall be attached to the other side of the shaft. The valve disc shall be of ASTM A126 Grade B cast iron and the disc seat shall be of BUNA-N. The control device shall consist of a side-mounted, oil-filled cylinder, which provides three (3) closing speed stages. All control stages shall be fully adjustable. Check valves shall be, GA Industries, Flomatic, Apco Series 6100 or Owner approved equal.

2.10 PLUG VALVES

A. All plug valves shall be eccentric plug valves. Valves shall be as manufactured by DeZurik or Owner approved equal.

B. Plug valves shall be tested in accordance with AWWA C504-80 Section 5. Each valve shall be performance tested in accordance with Paragraph 5.2 and shall be given a leakage test and hydrostatic test as described in Paragraphs 5.3 and 5.4. The leakage test shall be applied to

the face of the plug tending to unseat the valve. The manufacturer shall furnish certified copies of reports covering proof of design testing as described in Section 5.5 of AWWA C504.

C. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall be to the AWWA Standard C-111.

D. Valve bodies shall be of ASTM A126 Class B semi-steel, 31,000-psi tensile strength minimum in compliance with AWWA Standard C507. Port areas for valves 4-inch through 20-inch shall have a minimum area of 80 percent of the nominal pipe diameter area. All exposed nuts, bolts, springs, washers, etc. shall be zinc or cadmium plated. Resilient Plug facings shall be Hycar or Neoprene.

E. Valves shall be furnished with permanently lubricated stainless steel or oil-impregnated bronze upper and lower plug stem bushings. These bearings shall comply with the AWWA Standard C507, Section B, Paragraphs 8.1, 8.3 and 8.5, and with AWWA Standard C504, Section 10.

F. Seats in valves 4-inch and larger shall have a welded-in overlay of a high nickel content on all surfaces contacting the plug face and comply with AWWA Standard C507, and with Standard C504.

G. Valve shaft seals shall be adjustable and comply with AWWA Standard C507 Section 10 and with AWWA C507.

H. Valve pressure ratings shall be 175 psi for valves through 12-inch and shall be established by hydrostatic tests as specified by ANSI Standard B16.1. Valves shall be capable of providing drip-tight shut-off to the full valve rating with the pressure applied in either direction.

I. All valves shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. All actuator shafts shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. Valve packing adjustment shall be accessible without disassembly of the actuator.

2.11 VALVE BOXES

All buried valves shall have cast iron three-piece valve boxes. Valve boxes shall be provided with suitable heavy bonnets and extend to such elevation at or slightly above the finished grade surface, as directed by the Owner. The barrel shall be two-piece, sliding type, having 5 ¼-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with cast iron cover. Covers shall have “Sewer” cast into the top.

2.12 FLEXIBLE COUPLINGS

Flexible couplings for wastewater service shall be in accordance with Section 02660.

2.13 HARNESSING SYSTEMS

Harnessing systems for wastewater service shall be in accordance with Item Section 02660.

2.14 AIR/VACUUM AND AIR RELEASE VALVES –NOT USED

PART 3 -EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with manufacturer recommendations, ANSI/AWWA C600, and ANSI/AWWA C605.

B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage to the pipe or fittings and their respective linings and coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Unloading shall be done by lifting by hand or with a forklift or crane. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective.

C. If any defective pipe is discovered after it has been laid it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

3.2 MANHOLES AND INSPECTION HOLES

A. The Contractor shall do all excavation for structures and structure footings to the lines and grades or elevations, shown on the plans, or as staked by the Engineer. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the Engineer may order, in writing, changes in dimensions or elevations of footings necessary to secure a satisfactory foundation.

B. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the Engineer. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation, and excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

C. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to

governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

D. Unless otherwise provided, bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner which will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

E. After each excavation is completed, the Contractor shall notify the Engineer to that effect; and concrete or reinforcing steel shall be placed after the Engineer has approved the depth of the excavation and the character of the foundation material.

F. Brick Structures

1. Foundations. A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

2. Laying Brick. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it, which can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross-joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

3. Joints. All joints shall be slushed with mortar at every course, but slushing alone will not be considered adequate for making an acceptable joint. Exterior faces shall be laid up in advance of backing. Exterior faces shall be back plastered or pargeted with a coat of mortar not less than 3/8-inch (9 mm) thick before the backing is laid up. Prior to pargeting, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4-inch (6 mm) nor more than 1/2-inch (12 mm) wide and whatever width is adopted shall be maintained uniform throughout the work.

4. Pointing. Face joints shall be neatly struck, using the weather joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

5. Cleaning. Upon completion of the work all exterior surfaces shall be thoroughly cleaned by scrubbing and washing down with water and, if necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of clean fresh water.

6. Curing and Cold Weather Protection. In hot or dry weather, or when directed by the Engineer, the brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost in the brick or when the air temperature is below 50 F (10 C) unless the Contractor has on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60 F (15 C) for the duration of the curing period.

G. Concrete Structures: Concrete structures shall be built on prepared foundations, conforming to the dimensions and form indicated on the plans. The construction shall conform to the requirements specified in P-610 Structural Portland Cement Concrete. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the Engineer before the concrete is poured.

All invert channels shall be constructed and shaped accurately so as to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped downward toward the outlet.

H. Precast Pipe Structures: Precast concrete pipe structures shall be constructed on prepared or previously placed slab foundations and shall conform to the dimensions and locations shown on the plans. All precast concrete pipe sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily, and all jointing and connections shall be cemented with mortar. The top of the upper precast concrete pipe member shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal steps which are embedded or built into the side walls shall be aligned and placed at vertical intervals of 12 inches (300 mm). When a metal ladder replaces the steps, it shall be securely fastened into position.

I. Corrugated Metal Structures: Corrugated metal structures shall be constructed on prepared foundations, conforming to the dimensions and locations as shown on the plans. The structures shall be prefabricated. standard or special fittings shall be furnished to provide pipe connections or branches of correct dimensions. The connections or branches shall be of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. When indicated, the structures shall be placed on a reinforced concrete base. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to which can be fastened a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans.

J. Inlet and Outlet Pipes: Inlet and outlet pipes shall extend through the walls of the structures for a sufficient distance beyond the outside surface to allow for connections but shall be cut off flush with the wall on the inside surface, unless otherwise directed. For concrete or brick structures, the mortar shall be placed around these pipes so as to form a tight, neat connection.

K. Placement and Treatment of Castings, Frames, and Fittings: All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the Engineer, and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are to be placed upon previously constructed masonry, the bearing surface or masonry shall be brought true to line and grade and shall present an even bearing surface in order that the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed and approved by the Engineer. All units shall set firm and secure.

After the frames or fittings have been set in final position and the concrete or mortar has been allowed to harden for 7 days, then the grates or covers shall be placed and fastened down.

L. Installation of Steps: The steps shall be installed as indicated on the plans or as directed by the Engineer. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is poured. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least 7 days. After this period has elapsed, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete pipe structures, they shall be cast into the sides of the pipe at the time the pipe sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches (300 mm).

In lieu of steps, prefabricated ladders may be installed. In the case of brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. In the case of metal structures, the ladder shall be secured by welding the top support and grouting the bottom support into drilled holes in the foundation or as directed.

M. After a structure has been completed, the area around it shall be filled with approved material, in horizontal layers not to exceed 8 inches (200 mm) in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the Engineer.

N. Backfilling shall not be placed against any structure until permission is given by the Engineer. In the case of concrete, such permission shall not be given until the concrete has been in place 7 days, or until tests made by the laboratory under supervision of the Engineer establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

3.3 PIPE INSTALLATION

A. Below grade ductile iron pipe and fittings shall be installed in accordance with requirements of ANSI/AWWA C-600 and manufacturer recommendations. Pipes shall be laid to the lines and grades shown on the Drawings with a minimum of 3 feet of cover from proposed finished grades. Pipes shall be laid at a constant slope between elevations specified. Pipe joints may be deflected to a maximum of 75% of manufacturer recommendations to establish alignment, slope and grade. Pipe trenching bedding and backfill shall be in accordance with Section 02221 and the Drawings.

B. Flanged ductile iron pipe and fittings shall be installed true to alignment and adequately supported. All valves, fittings, equipment, and appurtenances needed upon the pipelines shall be set and jointed as indicated on the Drawings or as required. All pipe and appurtenances connected to equipment shall be supported in such manner as to prevent any strain being imposed on the equipment. Supports shall be provided at each fitting/valve/appurtenance or combination thereof and at a maximum spacing of 6 feet.

C. All field cutting of pipe shall be performed in accordance with the requirements of ANSI/AWWA C600 and manufacturer recommendations. Field touch-up of linings shall be per manufacturer recommendations.

D. Below-grade PVC pipe shall be installed in accordance with requirements of ANSI/AWWA C-605, manufacturer recommendations and ASTM D2321. Pipes shall be laid to the lines and grades shown on the Drawings with a minimum of 3 feet of cover from proposed finished grades. Pipes shall be laid at a constant slope between elevations specified. Pipe joints may be deflected to a maximum of 75% of manufacturer recommendations to establish alignment, slope and grade, except for gravity sewers which shall be surveyed in straight to required grade. Pipe trenching, bedding and backfill shall be in accordance with these Specifications, Section 02221 and the Drawings.

3.4 CLEANING

A. At the conclusion of the work, the Contractor shall thoroughly clean the new pipe lines by flushing with water or other means to remove all dirt, stones or other material which may have entered the line during the construction period. The Contractor shall pay for and provide all water, pumps, piping, and related equipment required for cleaning at no additional cost to the owner. Wastewater may not be used for cleaning.

After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as

ordered by the Engineer. The Contractor shall restore all disturbed areas to their original condition.

After all work is completed, the Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

3.5 CONNECTIONS TO EXISTING STRUCTURES AND SEWERS

A. Make connections to existing manholes as required. Provisions have been made in some of the existing structures for future connections and may require only the removal of a plug and the connection of the proposed line, while other connections will require cutting into the existing structure. Exercise care in cutting into the existing structure, using only core drilling, and repair any damage done to the structure as required by the Engineer and at no cost to the Owner. Install drop connections, if required, as detailed on the Drawings.

3.6 HYDROSTATIC PRESSURE AND LEAKAGE TESTING

A. Hydrostatic tests shall consist of a pressure test and a leakage test. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints, and valves including all service lines. Air testing of pressure pipes will not be permitted under any circumstance. Tests shall be made on sections not exceeding 2,000 feet. The Contractor shall furnish all closure pieces in the pipe as required. Equipment to be furnished by the Contractor shall include, but not be limited to, graduated containers, pressure gauges, hydraulic force pumps, and suitable hoses and piping. The Engineer will monitor and approve a satisfactory test. The Contractor shall pay for, provide, and dispose of all flushing and test water at no additional cost to the Owner. Wastewater may not be used for testing.

B. The Contractor may conduct hydrostatic tests after the trench has been partially backfilled with the joints left exposed for inspection for his informational purposes only. The hydrostatic tests for acceptance shall only be conducted after the trenches have been completely backfilled and compacted as specified Where any section of pipe is provided with concrete thrust blocking, tests will not be made until at least five (5) days have elapsed after the thrust blocking is installed. If high early strength cement is used for the concrete thrust blocking, the time may be reduced to 24 hours.

C. All pressure pipe sections to be tested shall be subjected to hydrostatic pressure and leakage tests. Test pressures for the various applications shall be as follows:

Pumped pressure force mains: 100 psi

D. The duration of pressure and leakage tests shall be for periods of 2 hours each. If during the tests, the integrity of the tested line is in question, the Engineer may require 6-hour tests. The basic provisions of AWWA C-600 shall be applicable.

E. Pressure Test:

Each section of pipe to be tested, as determined by the Engineer, shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the

pipe in a satisfactory manner. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings, valves, or hydrants are discovered in consequence of the pressure test, all such items shall be removed and replaced by the Contractor with sound material and tests shall be repeated until satisfactory results are obtained. Provisions of AWWA C-600, where applicable, shall apply.

F. Leakage Test:

1. After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure. Applicable provisions of AWWA C-600 shall apply.

2. Allowable leakage in gallons per hour for the pipeline shall not be greater than that determined by the formula:

$$L = \frac{SD(P)^{0.5}}{133{,}200}$$

Where: L = Allowable leakage in gallons per hour.
S = Length of pipe tested, in feet.
D = Nominal diameter of pipe in inches.
P = Average test pressure during leakage test in pounds per square inch gauge.

3. Leakage is defined as the quantity of water to be supplied in the newly laid pipe or any valved section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. Should any test of pipe laid disclose leakage greater than that allowed, the Contractor shall locate and replace or repair the defective joints, pipe or valves until the leakage from subsequent testing is within the specified allowance.

3.7 LOW PRESSURE AIR TESTING

A. Low-pressure air test shall be performed on all sanitary gravity sewer piping in accordance with UNI-B-6-79 “Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe.”

B. Test sections between adjacent manholes with a test pressure of 4.0 psig greater than the average back pressure of any groundwater head above the pipe invert, but in no case shall it be greater than 9.0 psig. If no groundwater over the pipe invert is present the minimum test pressure shall be 4.0 psig.

C. Before testing the Contractor shall flush all gravity lines to obtain free flow through each line, and determine groundwater levels to adjust the test pressure accordingly.

D. Procedure:

1. Low-pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches the specified test pressure. When temperatures have been equalized and pressure stabilized at the specified test pressure, the air supply shall be shut off.

2. If the time shown in Table 3.1 elapses before the air pressure drops 1.0 psig, the section undergoing the test shall have passed. Times shall be interpolated for lengths other than those shown. Times for 100-foot lengths are minimum.

3. Should the section fail to meet test requirements, the Contractor shall determine the sources of leakage, make necessary repairs and repeat the test until the section passes.

Table 3.1
Specification Time Required for a 1.0 psig Pressure Drop
for Size and Length of Pipe Indicated for Q=0.0015

Pipe Dia. (in.)	Minimum Time (min:sec)	Length for Min. Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown (Min:Sec)						
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36

4. Inspection of gravity sewers by the Owner may be a condition of acceptance. Internal video inspection shall be performed by the Owner to check for alignment and deflection. The television inspection shall also be used to check for cracked, broken or otherwise defective pipe, and overall pipe integrity. Five percent deflection mandrel tests may also be performed.

3.7 CORRECTION OF NON-CONFORMING WORK

All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the Owner. Non-conforming work shall be defined as failure to adhere to any specific or implied directive of these specifications and/or the Drawings, including but not limited to pipe not laid straight, true to the lines and grades as shown on the drawings, damaged or unacceptable materials, excessive misalignment or diameter ring deflection in pipe due to bedding, backfilling or installation, visible or detectible leakage and failure to pass any specified test or inspection.

METHOD OF MEASUREMENT

A. The length of waterline to be paid for shall be the number of linear feet of waterline in place, completed, and approved. It shall be measured along the centerline of the pipe from end to end. Fittings shall be paid for separately under the respective contract unit price for which they are a part; however, price does include all materials, preparation, excavation, installation, labor, equipment, tools, supplies and incidentals to complete this work.

B. Service laterals, oil-water separators, manholes, and other fittings shall be measured by each unit in place, completed, and approved.

BASIS OF PAYMENT

A. Payment shall be made at the contract unit price per linear foot for waterline. This price shall be full compensation to the Contractor for furnishing all materials, preparation, excavation, installation, labor, equipment, tools, supplies and incidentals to complete this work.

B. The accepted quantities of service laterals, oil-water separators, manholes, and other fittings will be paid for at the contract unit price per each, complete and in place. This price shall be full compensation to the Contractor for furnishing all materials and for preparation, excavation, installation and backfilling of these materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the items as shown in the plans; and for all labor, equipment, tools, supplies, and incidentals to complete this work.

C. Modification to existing stormwater inlets shall be incidental to the cost of Pay Item 02730-5 or 02730-6.

Payment shall be made under:

Item 02730-1	Sanitary Sewer Infrastructure- Field Office	-per Lump Sum (LS)
Item 02730-2	Sanitary Sewer Infrastructure- Maint. Bldg.	-per Lump Sum (LS)

END OF SECTION 02730

SECTION 06100

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes the following, at locations indicated on the Drawings or otherwise required by project conditions:

1. Framing with dimension lumber.
2. Framing with engineered wood products (if any).
3. Wood grounds, nailers, and blocking; Preservative pressure treated when in association with roofing and any other exterior work.
4. Sheathing (plywood; if any).
5. Framing anchors and miscellaneous accessories.

1.3 DEFINITIONS:

A. Rough carpentry includes carpentry work not specified as part of other Sections and generally not exposed, unless otherwise specified.

1.4 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product data for the following products, as applicable to the work of this project:

1. Metal framing anchors.
2. Plywood sheathing (if any).
3. Construction adhesives.
4. Engineered wood products (if any).

C. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.

D. Wood treatment data as follows including chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material:

1. For each type of preservative treated wood product include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
2. For water-borne treated products include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.
3. Warranty of chemical treatment manufacturer for each type of treatment.

E. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction evidencing compliance of the following wood products with specified requirements and building code in effect for Project.

1. Engineered wood products (if any).
2. Metal framing anchors (if any).

F. Additional information as needed to clarify materials, installation requirements, etc., upon request by the Architect or Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

B. Refer to Division 1 Sections “Summary of Work” and “Special Conditions” for additional information and requirements regarding stored materials.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL:

A. Lumber Standards: Furnish lumber manufactured to comply with PS 20 “American Softwood Lumber Standard” and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee’s (ALSC) Board of Review.

B. Inspection Agencies and Standards: Inspection agencies and standards and the abbreviations used to reference them with lumber grades and species include the following:

1. AFPA - American Forest and Paper Association (formerly NFPA)
2. AITC - American Institute of Timber Construction
3. AWPA - American Wood Preservers Association
4. AWPB - American Wood Preservers Bureau

5. NLGA - National Lumber Grades Authority (Canadian).
6. SPIB - Southern Pine Inspection Bureau.
7. WCLIB - West Coast Lumber Inspection Bureau.
8. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber furnish pieces with grade stamps applied to ends or back of each piece; or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.2 DIMENSION LUMBER:

A. For light framing provide “Stud,” or “Standard” grade lumber for stud framing (2 to 4 inches thick, 2 to 4 inches wide, 10 feet and shorter) and “Standard” grade for other light framing (2 to 4 inches thick, 2 to 6 inches wide), and as follows:

1. Southern Yellow Pine graded under SPIB rules, No 2 or better.

B. For structural light framing (2 to 4 inches thick, 2 to 4 inches wide), provide the following grade and species:

1. “No. 2” grade, Stress Rated, with the following minimum properties:

a. Fb = 1,150 psi.
b. E = 1,500,000 psi.

2. Species: Southern yellow pine or approved equivalent.

C. For structural framing (2 to 4 inches thick, 5 inches and wider), provide the following grade and species:

1. Same as indicated above for structural light framing.

2.3 BOARDS:

A. Concealed Boards: Where boards will be concealed by other work, provide lumber of 19 percent maximum moisture content (S-DRY or KD-19) and of following species and grade:

1. Southern Pine No. 2 boards per SPIB rules, or any species graded construction boards per WCLIB, or WWPA rules.

2.4 MISCELLANEOUS LUMBER:

A. General: Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: "Standard" grade light-framing-size lumber of any species or board-size lumber as required. "No. 3 Common" or "Standard" grade boards per WCLIB or WWPA rules or "No. 2 Boards" per SPIB rules.

2.5 CONSTRUCTION PANELS, GENERAL:

A. Construction Panel Standards: Comply with DOC PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP-108.

1. Oriented Strand Board: Comply with DOC PS 2.

B. Trademark: Furnish construction panels that are each factory- marked with APA trademark evidencing compliance with grade requirements.

2.6 CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS:

A. General: Where construction panels are indicated for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.

B. Wall Sheathing (if any): APA RATED SHEATHING, Veneer Core Plywood.

1. Exposure Durability Classification: EXTERIOR.
2. Span Rating: As required to suit stud spacing indicated.
3. Thickness: 5/8 inch (nominal), unless otherwise indicated, or as required to match thickness of any contiguous gypsum or other sheathing.

C. Subflooring/Horizontal Sheathing (if any; on joists or rafters): APA RATED SHEATHING, Veneer Core Plywood; Tongue-and-Groove Edges.

1. Exposure Durability Classification: EXPOSURE 1.
2. Grade:

a. Below Carpet and at Attics: B-C, minimum.
b. Below Vinyl Floor Coverings: A-C, minimum.

3. Span Rating: As required to suit rafter/joist spacing indicated.

a. 40/20 minimum, unless otherwise indicated.

4. Thickness: 3/4 inch, unless greater thickness is otherwise indicated.

2.7 CONSTRUCTION PANELS FOR BACKING:

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D PLUGGED EXPOSURE 1, in thickness indicated, or, if not otherwise indicated, not less than 3/4 inch.

2.8 AIR INFILTRATION BARRIER (IF ANY):

A. Asphalt-saturated organic felt complying with ASTM D 226, Type I (No. 15 asphalt felt), unperforated.

2.9 FASTENERS:

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, and in area of high relative humidity provide fasteners with a hot-dip zinc coating per ASTM A 153, or in contact with preservative pressure treated (P.T.) wood or fire-retardant treated wood, of AISI Type 304 or 316 stainless steel.

B. Nails, Wire, and Brads: FS FF-N-105.

C. Power Driven Fasteners (screws): National Evaluation Report NER-272.

D. Wood Screws: ANSI B18.6.1.

E. Lag Bolts: ANSI B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.10 METAL FRAMING ANCHORS:

A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:

1. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

B. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G90 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.

1. Use galvanized steel framing anchors for rough carpentry exposed to weather, in ground contact, or in area of high relative humidity, and all other locations, and at every point of bearing.
2. Minimum Thickness: 18-gauge.

2.11 MISCELLANEOUS MATERIALS:

A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturer.

2.12 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS:

A. General: Where lumber is indicated as preservative- treated wood or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.

B. Pressure-treat above-ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing members less than 18 inches above grade.

a. Exception: Not required above treated bottom plate for framing which is bearing on concrete floor slab on grade.

4. Wood floor plates installed on concrete slabs or directly in contact with earth.

C. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.13 ENGINEERED WOOD PRODUCTS (IF ANY):

A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL:

A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

E. Countersink nail heads on exposed carpentry work and fill holes.

F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS:

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

C. Install permanent grounds of dressed, preservative treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

3.3 WOOD FRAMING, GENERAL:

A. Framing Standard: Comply with A.F.P.A. "Manual for Wood Frame Construction", unless otherwise indicated.

B. Install framing members of size and spacing indicated, or if not indicated, to comply with referenced standard.

C. Anchor and nail as shown, and to comply with the following:

1. Published requirements of manufacturer of metal framing anchors.
2. "Fastening Schedule," of the International Building Code.

D. Fire stop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where fire stops are not automatically provided by the framing system used, use closely fitted wood blocks of nominal 2-inch-thick lumber of the same width as framing members.

3.4 STUD FRAMING (IF ANY):

A. General: Arrange studs so that wide face of stud is perpendicular to direction of wall or partition and narrow face is parallel. Install single bottom plate and double top plates using 2-inch thick members whose widths equal that of studs. Nail or anchor plates to supporting construction, as indicated and as required by applicable codes and standards, authorities having jurisdiction, and project conditions.

1. Anchor bottom plats to concrete slabs with at least 2-inch diameter galvanized anchor bolts with nuts and washers at 4'-0" o.c. (minimum) and otherwise as required by code and project conditions.
2. For exterior walls install 2-inch by 6-inch wood studs spaced 24 inches o.c., unless otherwise indicated.
3. For interior partitions and walls install 2-inch by 4-inch wood studs spaced 16 inches o.c., unless otherwise indicated.
4. The extent of wood stud framing, if any, is indicated on the Drawings.

B. Construct corners and intersections with not less than 3 studs. Install miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items, and trim.

1. Install continuous horizontal blocking row at mid-height of single-story partitions over 8 feet high and at midpoint of multi-story partitions, using 2-inch thick members of same width as wall or partitions.

C. Frame openings with multiple studs and headers. Install nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

1. For nonbearing partitions, install double-jamb studs and headers not less than 4 inches deep for openings 3 feet and less in width, and not less than 6 inches deep for wider openings.
2. For load-bearing partitions, install double-jamb studs for openings 6 feet and less in width, and triple-jamb studs for wider openings. Install headers of depth shown, or if not shown, as recommended by A.F.P.A. "Manual for Wood Frame Construction".

D. Install diagonal bracing in stud framing of exterior walls, except as otherwise indicated. Brace both walls at each external and internal corner, full story height, at a 45 degree angle, using either a let-in 1 by 4 or 2 by 4 blocking or metal diagonal bracing. Omit bracing where following types of sheathing are indicated (if any):

1. Plywood sheathing or corner bracing, 8-feet-wide panels, vertically, at each face of any wall framing at corners.

3.5 INSTALLATION OF CONSTRUCTION PANELS:

A. General: Comply with applicable recommendations contained in Form No. E30, "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Roof Sheathing and Wall Sheathing (if any): Nail to wood framing and screw to metal framing.
2. Subfloor Sheathing: Glue and screw to supports.
3. Plywood Backing Panels, if any: Nail to wood supports; toggle-bolt or expansion bolt anchors to masonry back-up, and screw to metal framing.

3.8 AIR INFILTRATION BARRIER (IF ANY):

A. Cover exterior sheathing with air infiltration barrier as follows:

1. Apply asphalt-saturated organic felt horizontally with 2-inch overlap and 6-inch endlap; fasten to sheathing with corrosion-resistant staples, or round-head corrosion-resistant nails installed through 1 inch minimum diameter discs row with 1 inch diameter heads.
2. Apply air infiltration barrier to cover upstanding flashing with 4-inch overlap.
3. Refer to Division 7 Section "Flashing and Sheet Metal" for locations where waterproofing underlayment is required, as replacement for temporary felts and/or in addition to felts specified in this Section 06100, whether or not indicated on the Drawings.

    a. Note that waterproofing underlayments / "special flashing" is to be adhered to deck and covered with air infiltration barrier / felt.

END OF SECTION 06100

SECTION 06200

FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Related work specified elsewhere includes:

1. Section 05500 – "Metal Fabrications"
2. Section 06100 – "Rough Carpentry"
3. Section 06400 – "Architectural Woodwork"
4. Section 07900 – "Joint Sealers"
5. Section 08710 – "Finish Hardware"
6. Section 09900 – "Painting"

1.2 DESCRIPTION OF WORK:

A. Definition: Finish carpentry includes carpentry work which is exposed to view, is non-structural, and which is not specified as part of other sections.

B. Types of finish carpentry work in this section include:

1. Interior and exterior running and standing trim, and sills with opaque finish, to match existing unless specifically indicated otherwise.

C. Refer to Section 06100 - "Rough Carpentry", Section 05500 - "Metal Fabrications" and Structural Drawings for framing anchors.

D. Finish carpentry is intended to be finish painted on site, under section 09900.

1. All standing and running trim and all exposed lumber and wood products shall be back-primed prior to installation.

1.3 QUALITY ASSURANCE:

A. Factory-mark each piece of lumber with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each item of factory-fabricated products, siding, paneling, trim, etc. Include color samples for items requiring color selection.

B. Samples: Submit the following samples for each species and cut or pattern of finish carpentry.

1. Interior Standing and Running Trim: 2'-0" long x full board or molding width, unfinished.

C. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storage, installation and finishing treated materials, if required.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.6 JOB CONDITIONS:

A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas. Do not install finish carpentry until required temperature and relative humidity conditions have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity conditions.

PART 2 - PRODUCTS

2.1 WOOD PRODUCT QUALITY STANDARDS:

A. In lieu of softwood or hardwood lumber trim, pre-moulded medium density "plastic trim may be used for door and window casings.

PART 3 - EXECUTION

3.1 PREPARATION: NOT USED

3.2 INSTALLATION: NOT USED

3.3 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:

A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

B. Clean finish carpentry work on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.

C. Refer to Section 09900 - "Painting", for final finishing of installed finish carpentry work, not the work of this Section 06200.

D. Protection: Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 06200

SECTION 06400

ARCHITECTURAL WOODWORK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Related work specified elsewhere includes:

.. Section 06100 – "Rough Carpentry"
.. Section 06200 – "Finish Carpentry"
.. Section 07900 – "Joint Sealers"
.. Section 09900 – "Painting"

1.2 DESCRIPTION OF WORK:

A. Extent of each type of architectural woodwork is indicated on drawings and in schedules.

B. Types of architectural woodwork include the following, and related work and trim:

1. Wood cabinets and countertops.

2. Wood frames, sidelights, panels, base, window sills, and miscellaneous trim (paint on site, under Section 09900), stained (transparent finish), or painted (opaque) where indicated.

3. Hardware for architectural woodwork.

C. Architectural woodwork and components are intended to be finish painted on-site, under Section 09900.

1.3 QUALITY ASSURANCE:

A. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI), except as otherwise indicated.

B. Fabricator Qualifications: Fabricators shall be experienced firms specializing in the types of architectural woodwork required for this project for at least 5 verifiable years and on at least 5 verifiable projects of similar size, scope, complexity, and quality of this project.

C. Installer Qualifications: Arrange for installation of architectural woodwork by a firm which can demonstrate at least 5 verifiable years successful experience in installing architectural woodwork items on at least 5 verifiable projects, similar in type and quality to those required for this project.

D. Refer to Section 01015 – "Special Conditions," for additional information and minimum experience requirements.

1.4 SUBMITTALS:

A. Shop Drawings: Submit shop drawings showing location of each item, dimensioned plans and elevations, large scale details, attachment devices and other components.

1. Manufacturer's current and complete product data, for manufactured units of work including color selection data and samples; and design load capacities for wood columns, and their plinths and anchorage systems.

B. Samples: Submit the following samples:

1. Lumber and panel products with or for transparent finish; 6-inches x ¾-inch x 18-inches, for each species and cut, finished on 1 side and 1 edge.

2. Lumber and panel products with factory-applied opaque finish, 8-inches x 10-inches, for each finish system and color.

3. Exposed Cabinet Hardware Support Hardware: One unit of each type and finish, which will be returned for use on the project, upon request by the Contractor.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Protect woodwork during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver woodwork, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforeseen circumstances, woodwork must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.6 PROJECT CONDITIONS:

A. Conditioning: Woodwork Manufacturer and Installer shall advise Contractor of temperature and humidity requirements for woodwork installation and storage areas. Do not install woodwork until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed woodwork within a 1.0% tolerance of optimum moisture content, from date of installation through remainder of construction period. Require Woodwork Manufacturer to establish optimum moisture content and required temperature and humidity conditions.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Cabinet Manufacturers: Subject to compliance with requirements, provide premium grade custom made cabinets and woodwork from a millwork shop complying with requirements of "Quality Assurance" article above.

B. Plastic Laminate Manufacturer: Subject to compliance with requirements, provide solid, stippled, textured, and/or patterned high pressure decorate laminates of one of the following:

1. Formica Corp. (color to be determined) – Laminate Countertops
2. Cosentino (color to be determined) – Solid Surface Counter Tops

2.2 FABRICATION, GENERAL:

A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber at time of fabrication and for relative humidity conditions in the installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated with dowel, dado, glue and screw construction, with openings and mortises precut, where possible, to receive hardware and other items and work.

1. Ease edges to a 1/16-inch radius, for corners of cabinets and edges of solid wood (lumber) members less than 1-inch in nominal thickness, 1/8-inch radius for edges of rails and similar members over 1-inch in nominal thickness.

C. Complete fabrication, assembly, hardware application, and other work before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Pre-Cut Openings: Fabricate architectural woodwork with pre-cut openings, where possible, to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or roughing-in diagrams for proper size and shape. Smooth edges of cutoffs and, where located in countertops and similar exposures seal edges of cutouts with a water-resistant coating.

E. Measurements: Before proceeding with fabrication of woodwork required to be fitted to other construction, obtain field measurements and verify dimensions and shop drawing details as required for accurate fit. A tight fit of less than 1/8-inch is expected.

2.3 FIRE-RETARDANT MATERIALS:

A. Where fire-retardant treated lumber is indicated, provide materials which are pressure impregnated with fire-retardant chemicals and comply with the following requirements:

1. As required to comply with referenced standards and finish classifications necessary as per the Standard Building Code, NFPA 101 – Life Safety Code, authorities having jurisdiction, and acceptable in all respects for indoor use and finish requirements.

2. Fire-Retardant Chemicals: Use chemicals of type and for applications indicated which do not bleed-through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated lumber from untreated lumber.

B. Fire Performance Characteristics: Provide materials which are identical to those tested per ASTM methods and time periods indicated, are marked and listed for fire performance characteristics by Underwriters Laboratories, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction, and comply with the following requirements:

1. Mill lumber after treatment, within limits set for wood removal which does not affect listed fire performance characteristics, using a woodworking plant certified by testing and inspecting agency.

C. Marking: Identify treated lumber with separable paper classification marking of inspecting and testing agency, unless otherwise indicated.

D. Surface Burning Characteristics: Not exceeding values required by latest edition of the "Standard Building Code" and "NFPA 101" (with amendments), tested per ASTM E 84 for standard time period.

1. Flame Spread: Per Code.

2. Smoke Developed: Per Code.

E. Kiln-dry woodwork after treatment to levels required for non-fire-retardant treated woodwork materials. Maintain moisture content required by kiln drying, before and after treatment.

1. Discard treated lumber which does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber.

2.4 <u>STANDING AND RUNNING TRIM, AND SILLS</u>:

A. Quality Standard: Comply with AWI Section 300.

B. Rout or groove backs of flat trim members, kerf backs of other wide flat members, except for members with ends exposed in finished work.

C. Assemble Casings in plant except where limitations of access to place of installation require field assembly.

D. Interior Trim and Sills for Transparent Finish (only where specifically indicated, if any). Comply with the following requirements:

1. Grade: Premium.

2. Lumber Species: White or Yellow Poplar.

3. Locations: Provide stained transparent finish within rooms which have new woodwork with transparent finish, and all other exposed locations, unless indicated otherwise.

E. Interior Trim and Sills for Opaque Finish (typical finish unless specifically indicated otherwise). Comply with the following requirements.

1. Grade: Premium.

2. Lumber Species: Any closed-grain hardwood listed in referenced woodworking standard.

3. Locations: Provide opaque finish within rooms which have new woodwork with opaque finish, unless indicated otherwise.

2.5 ARCHITECTURAL CABINET TOPS:

A. Quality Standard: Comply with applicable 400 and its Divisions 400B and 400C.

B. Type of Top – Laminate Clad:

1. Grade: Premium; Grade I.

2. Edge Treatment: HPDL to match exposed face. Back and end splash pieces similar.

3. Core: Minimum 47-lb. Density particle board, except at least ¾-inch A-B plywood with exterior glue (approved for interior use), at tops with sinks and/or plumbing fixtures.

4. Minimum Thickness: 1-1/4-inches at tops and ¾-inch at splashes, unless indicated otherwise on the Drawings.
5. Color: As selected by Owner.

6. Finish: Selection to be determined.

C. Type of Top – Solid Surface:

A. Solid polymer components

1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.

2. Superficial damage to a depth of 0.010 inch (.25 mm) shall be repairable by sanding and/or polishing.

3. Thickness: 1/2 inch

4. Edge treatment: Beveled

5. Color: To be determined

2.6 CABINET HARDWARE AND ACCESSORY MATERIALS:

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items which are specified in Division-8 Section 08700 – "Finish Hardware."

B. Cabinet Hardware Schedule: Refer to schedule at end of this Section for cabinet hardware required for architectural cabinets.

C. Hardware Standard: Comply with ANSI/BHMA A156.9 "American National Standard for Cabinet Hardware" for items indicated by reference to BHMA numbers or referenced to this standard.

D. Hardware Finishes: Comply with BHMA 1301 for finishes indicated by BHMA Code Numbers or it not otherwise indicated, provide finishes complying with requirements indicated.

1. For exposed hardware comply with requirements indicated for finish and base indicated at the end of this Section 06400.

2. For concealed hardware provide manufacturer's standard brushed chrome or brass finish with complies with product class requirements of ANSI/BHMA A156.9, and to match exposed hardware on same cabinet unit.

2.7 FASTENERS AND ANCHORS:

A. Screws: Select material, type, size and finish required for each use. Comply with FS FF-S-11 for applicable requirements.

B. Nails: Select material, type, size and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size and finish required by each substrate for secure anchorage. Provide non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion-resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.

2.8 FINISHING OF INTERIOR ARCHITECTURAL WOODWORK:

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing of concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.

2.9 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH (if any):

A. Quality Standard: Comply with AWI Section 900.

1. Grade: Premium.

B. Wood Species: Any closed-grain hardwood listed in referenced woodworking standard.

PART 3 – EXECUTION

3.1 PREPARATION:

A. Condition woodwork to average prevailing humidity conditions in installation areas prior to installing.

B. Pre-Installation Meeting: Meet at project site prior to delivery of architectural woodwork and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Include in meeting the Contractor; Architect and other Owner Representatives (if any);; Installers of architectural woodwork, we work such as plastering, other finishes, painting, mechanical work and electrical work; and firms or persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions. Proceed with woodwork installation only when everyone concerned agrees that required ambient conditions can be maintained.

C. Deliver concrete inserts and similar anchoring devices to be built into substrates, well in advance of time substrates are to be built.

1. Coordinate location and placement of concealed treated blocking (by others) prior to finish materials installations.

D. Prior to installation of architectural woodwork, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION:

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8-inch in 8’-0” for plumb and level (including tops); and with no variations in flushness of adjoining surfaces.

C. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

1. Seal all hardware cuts, routed slots, etc., before installation of hardware.

D. Anchor woodwork to anchors or blocking built-in directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.

E. Standing and Running Trim, and Sills: Install with maximum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners and comply with referenced Quality Standards for joinery.

F. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated. Maintain veneer sequence matching (if any) of cabinets with transparent finish.

1. Install cabinets with no more than 1/8-inch in 96-inches sag, bow, or other variation from a straight line.

G. Wood Storage Shelving: Complete the assembly of units and install in the areas indicated, including hardware and accessories as indicated.

H. Tops: Anchor securely to base units and other support systems indicated. Caulk space between backsplash and wall with specified sealant.

1. Install countertops with no more than 1/8-inch in 96-inches sag, bow, or other variation from a straight line.

I. Wood Panels: Anchor panels to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated.

1. Install flush panels with no more than 1/16-inch in 96-inches vertical cup or bow and 1/8-inch in 96-inches horizontal variation from a true plane.

J. Refer to Section 09900 – “Painting,” for final finishing of installed architectural woodwork.

3.3 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:

A. Repair damaged and defective woodwork where possible to eliminate defects functionally and visually; where not possible to repair replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch-up shop-applied finishes to restore damaged or soiled areas.

D. Complete the finishing work specified as work of this Section, to whatever extent not completed at shop or prior to installation of woodwork.

E. Provide final protection and maintain conditions, in a manner acceptable to Fabricator and Installer, which ensures architectural woodwork being without damage or deterioration at time of substantial completion.

3.4 CABINET HARDWARE SCHEDULE:

A. General: Subject to requirements and finishes stated above, furnish the following items in quantities and at locations indicated, by named manufacturers or equivalent products acceptable to Architect.

1. Cabinet Hinges: 170º adjustable "CLIP System" concealed self-closing hinges as manufactured by Julius Blum, Inc., or equivalent by Grass or Stanley.

B. Cabinet Door and Drawer Pulls:

1. Wire pulls, equivalent to Stanley No. 4484, solid brass (ANSI B12012), 4-inches long, with 1-inch clearance. Finish to match Section 08710 – "Finish Hardware" finish in room(s) where occurs.

C. Cabinet Door Catches: Manufacturer's standard 2-screw sill mounted unit made of molded nylon, lipped over sill to form bumper and hold in place, with 2-screw mounted heavy door mounted unit with nylon roller; provide spring-mounted units where required.

1. Acceptable Manufacturers: Any of manufacturer's listed for other cabinet hardware.

D. Drawer Slides: Heavy Duty, non-corrosive (galvanized) full extension ball bearing slides rated at 100-pounds, with positive stop, and self-closing and lift-out disconnect features; Model NO. 1429, as manufactured by Knape & Vogt, or equivalent by Blum or Grant.

1. At legal size drawers, use K&V No. 1483 or equivalent, rated at 150-pounds, with same features as noted above.

E. Shelf Standards: Manufacturer's standard steel units with anchors and supports 5/8-inch wide x 3/16-inch high, adjustable on ½-inch centers; Series 255, as manufactured by K&V, or equivalent by Grant or Stanley.

1. Wood Cabinets: Model No. 255 BRN with No. 256 BRN supports and matching fasteners.

2. Omit standards where fixed shelves are indicated.

3. All standards to be recess mounted (flush in routed dados), unless specifically indicated otherwise.

F. Locks: Where indicated on the Drawings, provide cabinet manufacturer's standard 5-disc tumbler, cam type, keyed differently at each room and at each room and at each teller station, and master keyed.

1. Furnish 2 keys for each lock.

2. Furnish 5 master keys.

3. Finish to match Section 08710 – "Finish Hardware" finish in room(s) where occurs.

END OF SECTION 06400

SECTION 07160

WATERPROOFING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Furnishing of all labor, materials, services and equipment necessary for the supply and installation of cementitious crystalline waterproofing to concrete substrates, above-grade or below-grade, on either dry or wet side of substrates, as indicated on drawings and as specified herein.

B. Related Sections:

1. Section 03100 - Concrete Work
2. Section 07900 - Joint Sealers
3. Section 09900 - Paints and Coatings

1.02 REFERENCES

A. Applicable Standards: The following standards are referenced herein.

1. American Society for Testing and Materials (ASTM)

1.03 SYSTEM DESCRIPTION

A. Cementitious Crystalline Waterproofing (where required): Blend of portland cement, fine treated silica sand and active proprietary chemicals. When mixed with water and applied as a cementitious coating, the active chemicals cause a catalytic reaction which generates a non-soluble crystalline formation of dendritic fibers within the pores and capillary tracts of concrete. This process causes concrete to become permanently sealed against the penetration of liquids from any direction.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

A. Testing Requirements: Crystalline waterproofing system shall be tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.

B. Independent Laboratory: Testing shall be performed by an independent laboratory meeting the requirements of ASTM E 329-95 and certified by the United States Bureau of Standards. Testing laboratory shall obtain all concrete samples and waterproofing product samples

1. Concrete samples (treated and untreated) to have design strength of 2000 psi and thickness of 2 inches. No admixtures permitted.

2. Coatings to have maximum thickness of 0.05 inches per coat with up to two coats permitted.

C. Potable Water Approval: Independent testing shall be performed according to NSF Standard 61 and approval for use of waterproofing material on structures holding potable water shall be evidenced by NSF certification.

1.05 SUBMITTALS

A. General: Submit listed submittals in accordance with conditions of the Contract and with Division 1 Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer's specifications, installation instructions, and general recommendations for waterproofing applications. Also include manufacturer's certification or other data substantiating that products comply with requirements of Contract Documents.

C. Test Reports: Submit for acceptance, complete test reports from approved independent testing laboratories certifying that waterproofing system conforms to performance characteristics and testing requirements specified herein.

D. Manufacturer's Certification: Provide certificates signed by manufacturer or manufacturer's representative certifying that the materials to be installed comply in all respects with the requirements of this specification, and that the applicator is qualified and approved to install the materials in accordance with manufacturer's product data.

E. Manufacturer's Field Report: Provide copy of report from manufacturer's representative confirming that the surfaces to which waterproofing material is to be applied are in a condition suitable to receive same.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be ISO 9001 registered, and shall have no less than 10 years of experience in manufacturing the cementitious crystalline waterproofing materials for the required work. Manufacturers that cannot provide the performance test data specified herein will not be considered for the project.

B. Applicator: Waterproofing applicator shall be experienced in the installation of cementitious crystalline waterproofing materials as demonstrated by previous successful installations, and shall be approved by the manufacturer in writing.

C. Pre-Installation Conference: Prior to installation of waterproofing, conduct meeting with waterproofing applicator, installers of work adjacent to or which penetrates waterproofing,

Architect/Engineer, owner's representative, and waterproofing manufacturer's representative to verify and review the following:

1. Project requirements for waterproofing as set out in Contract Document.
2. Manufacturer's product data including application instructions.
3. Substrate conditions, and procedures for substrate preparation and waterproofing installation.

D. Technical Consultation: The waterproofing manufacturer's representative shall provide technical consultation on waterproofing application.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's labels and seals intact.

1.08 PROJECT CONDITIONS

A. Compliance: Comply with manufacturer's product data regarding condition of substrate to receive waterproofing, weather conditions before and during installation, and protection of the installed waterproofing system.

1.09 WARRANTY

A. Manufacturer's Warranty: Manufacturer shall provide standard product warranty executed by authorized company official.

B. Applicator's Warranty: The warranty will cover the surfaces treated and will bind the applicator to repair, at his expense, any and all leaks through the treated surfaces which are not due to structural weaknesses or other causes beyond applicator's control such as fire, earthquake, tornado and hurricane.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Acceptable Manufacturer:
1. Xypex Chemical Corporation
2. or approved equal

2.02 MIXES

A. General: Mix waterproofing material by volume with clean water which is free from salt and deleterious materials. Mix waterproofing material in quantities that can be applied within 20 to 30 minutes from time of mixing. As mixture thickens, stir frequently, but do not add additional water. Do not mix bonding agents or admixtures with crystalline waterproofing materials.

B. Brush Application Mix: Measure dry powder and place in mixing container. Measure water and mix into the dry powder with a paddle on a slow speed electric drill (250 RPM) or other type mixer which is acceptable to manufacturer. Mixing proportions shall be as follows:

C. Spray Application Mix: Mixing shall be same as specified for brush application except that mixture shall be thinner. Use following proportions as a guide only.

D. Dry-Pac Mix: Using a trowel, mix 1 part clean water with 6 parts concentrate powder for 10 to 15 seconds. It is acceptable that lumps may be present in mixture. Mix only as much as can be applied in 15 minutes.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Site Visit: Prior to waterproofing installation, arrange visit to project site with water-proofing manufacturer's representative. Representative shall inspect and certify that concrete surfaces are in acceptable condition to receive waterproofing treatment.

B. Verification of Substrates: Verify that concrete surfaces are sound and clean, and that form release agents and materials used to cure the concrete are compatible with waterproofing treatment.

C. Examination for Defects: Examine surfaces to be waterproofed for form tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints and cracks. Such defects to be repaired in accordance to manufacturer's product data and 3.02 below.

3.02 PREPARATION

A. Concrete Finish: Concrete surfaces to receive waterproofing treatment shall have an open capillary system to provide tooth and suction, and shall be free from scale, excess form oil, laitance, curing compounds and foreign matter. Horizontal surfaces shall have a rough wood float or broom finish. Where a smooth trowel finish is required on horizontal surface, crystalline waterproofing material shall be applied by dry shake method at time of concrete finishing in accordance with manufacturer's product data.

B. Surface Preparation: Smooth surfaces (e.g. where steel forms are used) or surfaces covered with excess form oil or other contaminants shall be washed, lightly sand-blasted, water-blasted, or acid etched with muriatic acid as necessary to provide a clean absorbent surface. Surfaces to be acid-etched shall be saturated with water prior to application of acid.

C. Repair of Defects: Surface defects shall be repaired in accordance with manufacturer's instructions as follows:

D. Wetting Concrete: Prior to application of waterproofing treatment, thoroughly saturate concrete surfaces with clean water as required to ensure migration of crystalline chemicals into voids and capillary tracts of the concrete. Remove free surface water before application.

3.03 APPLICATION

A. Surface Application: After repairs, surface preparation, treatment of construction joints and sealing strip placement have been completed in accordance with manufacturer's product data and as specified herein, apply treatment uniformly to concrete surfaces with semi-stiff bristle brush or broom, or suitable spray equipment. Application rates and locations shall be as indicated in the drawings and in accordance with manufacturer's product data. When brushing, work slurry well into surface of the concrete, filling surface pores and hairline cracks. When spraying, hold nozzle close enough to ensure that slurry is forced into pores and hairline cracks.

1. First Coat (of one or two coat application): Apply slurry coat to locations indicated on drawings in accordance with manufacturer's product data.

2. Second Coat (of two coat application): Where indicated on drawings or as required by manufacturer's product data, apply slurry coat while first coat of concentrate is still "green" but after it has reached an initial set. Use light prewatering between coats when rapid drying conditions exist.

3.04 CURING

A. General: Begin curing as soon as coating has hardened sufficiently so as not to be damaged by a fine spray. Cure treatment with a mist fog spray of clean water three times a day for 2 to 3 days, or cover treated surfaces with damp burlap for the prescribed period. In warm climates, more than three sprayings per day may be necessary to prevent excessive drying of coating.

B. Air Circulation: Do not lay plastic sheeting directly on the waterproofing coating as air contact is required for proper curing. If poor circulation exists in treated areas, it may be necessary to provide fans or blown air to aid in curing of waterproofing treatment.

C. Holding Structures: For concrete holding structures such as swimming pools, reservoirs, water treatment tanks and wet wells, cure treatment for three days and then allow treatment to set for 12 days before filling structure with liquid. For structures holding hot or corrosive liquids, cure waterproofing treatment for three days and allow to set for 18 days before filling.

D. Protection: During the curing period, protect treated surfaces from damage by wind, sun, rain and temperatures below 36oF. If plastic sheeting is used for protection, it must be raised off of waterproofing coating to allow sufficient air circulation.

E. Curing Agent: If moist curing is not possible, use a chemical curing agent that is specifically designed for or compatible with the approved crystalline waterproofing treatment. Curing agent shall

have at least two years of successful field use and shall be approved by waterproofing manufacturer in writing.

3.05 INTERFACE WITH OTHER MATERIALS

A. Backfilling: Do not backfill for 36 hours after application. If backfill takes place within seven days after application, then backfill material shall be moist so as not to draw moisture from waterproof coating.

B. Paint, Epoxy or Similar Coatings: Do not apply paint or other coatings until waterproofing treatment has cured and set for a minimum of 21 days. Before applying paint or coating, neutralize treated surface by dampening with water and then washing waterproofed surface with 15% muriatic acid, diluted in a ratio of one part acid to four parts water by volume. Flush acid off treated concrete surfaces.

C. Grout, Cement Parge Coat, Plaster or Stucco: Because the waterproof coating forms a relatively smooth surface and the resulting crystalline formation fills the concrete pores thereby reducing suction characteristics of the concrete, it may be necessary to use a suitable bonding agent for proper bonding of cementitious systems.

D. Responsibility to Ensure Compatibility: It shall be the responsibility of the installer of the surface-applied material that is to be applied over the waterproofing treatment, to take whatever measures are necessary, including testing, to ensure acceptance by or adhesion to the waterproofing treatment.

3.06 FIELD QUALITY CONTROL

A. Observation: Do not conceal installed waterproofing system before it has been observed by Architect/Engineer, waterproofing manufacturer's representative and other designated entities.

B. Flood Testing:

1. Perform flood test on completed waterproofing installation before placement of other construction.
2. Plug or dam drains and fill area with water to a depth of two inches or to within 0.5 inch of top of waterproofing treatment.
3. Let water stand for 24 hours.
4. If leaks are discovered, make repairs and repeat test until no leaks are observed.

3.07 CLEANING AND PROTECTION

A. Cleaning: Clean spillage and soiling from adjacent surfaces using appropriate cleaning agents and procedures.

B. Protection: Take measures to protect completed coating from damage after application. Do not permit traffic on unprotected coating.

END OF SECTION 07160

SECTION 07260

BUILDING WRAP
(AIR BARRIER/WEATHER RESISTANT BARRIER)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 05400 - "Cold Formed Metal Framing"
2. Section 06100 - "Rough Carpentry"
3. Section 07241 - "Exterior Insulation and Finish System - Class PB"
4. Section 09250 - "Gypsum Drywall"

1.2 SUMMARY:

A. This Section includes the following:

1. Furnish and install air barrier/weather resistant barrier over exterior of wall sheathing and over perimeter flashing at openings through wall sheathing, at all locations regardless of whether or not indicated on drawings, to protect exterior sheathing and interior walls. Substrates include in part, over vertical and sloped gypsum and plywood sheathing; at locations behind EIFS systems; and over base flashing ("Nervastral") at these materials' locations where they occur at perimeters of wall openings in framed construction.

1.3 REFERENCES:

A. American Society for Testing and Materials

B. Technical Association of the Pulp and Paper Industry

C. American Association of Textile Chemists and Colorists

1.4 SUBMITTALS:

A. General: Submit each item in this Article according to the conditions of the Contract and Division I Specifications Sections.

B. Product Data: Submit product specifications, technical data and installation instructions of manufacturer equivalent to or exceeding those specified.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications:

1. Installer with at least 5 verifiable years successful experience in the installation of air barrier/secondary weather resistant barriers for projects of similar size, scope and complexity.

2. Refer to Division 1 Section "Special Conditions" for additional information and minimum experience requirements.

B. Install job mock-up using specified air barrier/secondary weather resistant barrier with system of fastening and taping seams as per manufacturer's instructions. Obtain architect's approval of system for appearance and workmanship standard.

1. Refer to Division 4 Section "Unit Masonry" for additional information and requirements regarding mock-up walls required.

PART 2 – PRODUCTS

2.1 MATERIALS:

A. Product / Manufacturer: Provide Tyvek "Commercial Wrap", as manufactured by DuPont Weatherization Systems; Wilmington, Delaware; Phone: 1-800-448-9835; or preapproved equivalent properly submitted at least ten days prior to bid date and subsequently accepted by Architect in writing or by addendum.

B. Materials - Air Barrier/Weather Resistant Barrier: A flash spunbonded olefin, non-woven, non-perforated secondary weather resistant barrier.

C. Performance Characteristics:

1. AATCC–127, Water Penetration Resistance, exceeded at 280

2. TAPPI T–460, Gurley Hill (sec/100cc) Air infiltration at >1500 seconds

3. ASTM E 96 Method B(g/m2–24hr.)Water vapor transmission of 200

4. TAPPI T-41D, Basis weight of 2.7oz/yd

5. ASTM E96 Method B, Water Vapor Transmission, 28 perms

6. ASTM E1677, Air Retarder Material Standard Specification, Type I air barrier

D. Sealing Tape/Fasteners:

1. DuPont™ Tyvek® Tape, DuPont Weatherization Systems.

2. For Steel Framed Construction: DuPont™ Tyvek® Wrap Cap Screws, DuPont Weatherization Systems; 1-5/8-inch rust resistant screws with 2-inches diameter plastic cap.

3. For Wood Framed Construction: DuPont™ Tyvek® Wrap Caps, DuPont Weatherization Systems. Nails with large heads or plastic washers.

4. Sealants: Polyurethane or other elastomeric sealants.

   a. Available Products:

      1) OSI® Quad Pro-Series®, solvent release butyl rubber sealant

      2) DAP® Dynaflex 230™

      3) Other products as approved and recommended by air barrier/weather resistant barrier manufacturer.

   b. Refer to Division 7 Section "Joint Sealers" for additional information and requirements regarding sealants and their installation.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates, areas, and conditions under which air barrier/weather resistant barrier will be applied, with Installer present, for compliance with requirements.

B. Verify that joints in sheathing substrate have been sealed and taped.

C. Where plywood substrate occurs, verify that required building felt has been properly installed over entire substrate and lapped in shingled manner, and that internal and external corners have been covered with additional layer of building felt.

D. Verify that all flashings are in place, including in part, that required "elastic flashing" has been installed at perimeter of windows, doors, louvers and similar openings, and turned up at least 4-inches at sills to form a pan.

E. Where metal siding occurs over solid substrate, verify that "special flashing" (waterproofing underlayment) has been properly installed over entire substrate, lapped in shingled manner, perimeter of wall openings have been similarly flashed, and that internal and external corners have been covered with additional layer of special flashing.

3.2 INSTALLATION:

A. Install Air Barrier/Weather Resistant Barrier over exterior side of all exterior wall sheathing.

1. Install Air Barrier after sheathing is installed, after required elastic flashing and/or waterproofing underlayment has been installed as indicated above and in other Sections, and before windows, doors, louvers and similar items are installed. Install lower level barrier prior to upper layers to ensure proper shingling of layers.

2. Overlap Air Barrier at interior and exterior corners of building by a minimum of 12 inches.

3. Overlap Air Barrier vertical seams by a minimum of 6 inches.

4. Ensure barrier is plumb and level with foundation, and unroll extending Air Barrier over openings for windows, doors, louvers and similar openings.

5. Attach Air Barrier to wood, plywood, insulated sheathing board and exterior gypsum with plastic cap nails every 12” to 18” on vertical stud line with wood stud framing, and screws with washers to metal stud framing.

6. Prepare window and door rough openings as follows:

   a. Prepare each window, louver and similar rough opening by cutting a modified “I” pattern in the Air Barrier.

   b. Horizontally cut Air Barrier along bottom of header.

   c. Vertically cut Air Barrier down the center of window openings from the top of the window opening down to 2/3 of the way to the bottom of the window openings.

   d. Diagonally cut Air Barrier from the bottom of the vertical cut to the left and right corners of opening.

   e. Fold side and bottom flaps into window opening and fasten every 6 inches. Trim off excess.

7. Prepare each rough door opening by cutting a standard “I” pattern in the Air Barrier.

   a. Horizontally cut Air Barrier along bottom of door frame header and along top of sill.

   b. Vertically cut Air Barrier down the center of door openings from the top of the door opening (header) down to the bottom of the door opening (sill).

c. Fold side flaps inside around door openings and fasten every 6 inches. Trim off excess.

8. Tape all horizontal and vertical seam of Air Barrier with DuPont™ Tyvek® Tape.

9. Completely seal all tears and cuts in Air Barrier with DuPont™ Tyvek® Tape.

END OF SECTION 07260

SECTION 07900

JOINT SEALERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Division 8 - "Doors and Windows"
2. Section 09250 - "Gypsum Drywall"
3. Section 09900 - "Painting"
4. Divisions 15 and 16 - (Joint sealers for mechanical and electrical work)

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes joint sealer systems.

1.3 SYSTEM PERFORMANCES:

A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.

1.4 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an Installer who has successfully completed within the last three years at least 3 joint sealer applications similar in type and size to that of this project and who will assign mechanics from these earlier applications to this project, of which one will serve as lead mechanic.

B. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.

C. Refer to Division 1 Section "Special Conditions", for additional information and minimum experience requirements.

1.5 SUBMITTALS:

A. Product Data: Submit manufacturer's complete product specifications, handling/installation/curing instructions, color charts and performance tested data sheets for each product required.

1.6 DELIVER, STORAGE AND HANDLING:

A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.

B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.7 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with installation of joint sealers under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40^{o} F.
2. When joint substrates are wet due to rain, frost, condensation or other causes.

B. Joint Width Conditions: Do not proceed with installation of joint sealers when joint widths are less than allowed by joint sealer manufacturer for application indicated.

C. Asbestos Prohibited: Refer to Section 01015 - "Special Conditions".

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

A. Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.

B. Colors: Provide color of exposed joint sealers indicated, or if not indicated, as selected by Architect from manufacturer's standard colors.

2.2 ELASTOMERIC JOINT SEALANTS:

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

B. Multi-Part Nonsag Urethane Sealant: Type M, Grade NS, Class 25, Uses NR, M, A and, as applicable to joint substrates indicated, O.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Dynatrol 11" Pecora Corp.
b. "Sonolastic NP-2"; Sonneborn; BASF Building Systems.
c. "Dymeric 511"; Tremco, Inc.
d. "Vulkem 922"; Tremco, Inc.

2. Locations for Use: Exterior joints and penetrations in vertical surfaces of concrete, and between metal and concrete, mortar of stone; overhead or ceiling joints; perimeters of metal frames in exterior walls; vertical expansion and control joints in masonry and concrete; and at all miscellaneous locations requiring a joint sealant.
3. Equivalent 1-part sealants will be acceptable <u>for interior surfaces only</u>, by one of the above named manufacturers.

C. Two-Part Pourable Urethane Sealant: Type M, Grade P, Class 25; Uses T, M, A and, as applicable to joint substrates indicated, O.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Chem-Calk 550"; Bostik Construction Product Div.
b. "Vulkem 245"; Tremco, Inc.
c. "Pourthane"; W. R. Meadows, Inc.
d. "NR-200 Urexpan"; Pecora Corp.
e. "Sonolastic Paving Joint Sealant"; Sonneborn Div.; BASF Building Systems
f. "THC-900/901"; Tremco, Inc.

2. Locations for Use: Exterior and interior expansion, control and construction joints in horizontal surfaces; and joints subject to pedestrian and light vehicular traffic.

D. One-Part Mildew-Resistant Silicone Sealant: Type S, Grade NS; Class 25, Uses NT, G, A and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide for sealing interior joints with nonporous substrates around ceramic tile, showers, sinks and plumbing fixtures.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "Dow-Corning 786"; Dow Corning Corp.
b. "SCS 1702"; General Electric.
c. "863 #345 White"; Pecora Corp.
d. "Tremsil 200"; White, Clear; Tremco, Inc.

2. Locations for Use: Interior joints in vertical surfaces and terminal edges of tile; and joints At damp areas, such as around sinks and plumbing fixtures and pipe penetrations; and exposed terminal edges of vinyl flooring, such as around door frames and terminations at concrete.

2.3 <u>LATEX JOINT SEALERS</u>:

A. Acrylic-Emulsion Sealant: Manufacturer's standard, one part nonsag, acrylic, mildew resistant, acrylic emulsion sealant complying with ASTM C 834, formulated to be paintable and recommended for exposed applications on interior and on protected exterior exposures involving joint movement of not more than ± 7.5%.

1. Products: Subject to compliance with requirements, provide with one of the following:

   a. "Chem-Calk 600"; Bostik Construction Products Div.
   b. "AC-20"; Pecora Corp.
   c. "Sonolac"; Sonneborn Building Products Div; BASF Building Systems.
   d. "Tremflex 834"; Tremco Inc.

2. Locations for Use: Interior joints in field-painted vertical and overhead surfaces at perimeter of metal door frames, gypsum drywall, plaster and concrete or concrete masonry; and all other interior locations not indicated otherwise.

2.4 FIRE-RESISTANT JOINT SEALERS:

A. Refer to Section 07270 - "Firestopping," for additional information and detailed requirements.

2.5 JOINT SEALANT BACKING:

A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint-Fillers:

1. Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
2. Backer Rod: Premium grade, closed cell polyethylene foam rod; Sealtight Backer Rod, as manufactured by W.R. Meadows, Inc., or approved equivalent.
3. Joint Filler: "Ceramar" flexible foam expansion joint filler, as manufactured by W.R. Meadows, Inc., or approved equivalent.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS:

A. Primer: Provide type recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated.

B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.

C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surface adjacent to joints.

D. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork in preformed strips.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Require Installer to inspect joints indicated to receive joint sealers for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Obtain Installer's written report listing any conditions detrimental to performance of joint sealer work. Do not allow joint sealer work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove latence and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means which re not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations.

Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALERS:

A. General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions indicated.

C. Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.

D. Installation of Sealant Backings:

1. Install sealant backings to comply with the following requirements:
2. Install joint-fillers of type indicated or recommended by sealant manufacturer to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

    a. Do not leave gaps between ends of joint-fillers.
    b. Do not stretch, twist, puncture or tear joint-fillers.
    c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.

3. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants:

1. Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to

eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

2. Concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 PROTECTION AND CLEANING:

A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

END OF SECTION 07900

SECTION 08111

HOLLOW METAL DOORS AND FRAMES

PART - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 06100 - "Rough Carpentry"
2. Section 08710 - "Finish Hardware"
3. Section 09250 - "Gypsum Drywall"
4. Section 09900 - "Painting"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes steel doors and steel frames.

1. All frames shall be equally rabbetted.

1.3 QUALITY ASSURANCE:

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and as herein specified.

B. Fire-Rated Door Assemblies:

1. Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with NFPA 80 "Standard for Fire Doors and Windows," and have been tested, listed and labeled in accordance with ASTM E 152 "Standard Methods of Fire Tests of Door Assemblies" by a nationally recognized independent testing and inspection agency acceptable to authorities having jurisdiction.

2. Labels mounted on doors and door frames must indicate the time rating of the door/frame assembly.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements.

B. Shop Drawings:

1. Submit for fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

2. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.

3. Coordinate glazing frames and stops with glass and glazing requirements.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.

B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided finish items are equivalent in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch-high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide steel doors and frames by one of the following:

1. Steel Doors and Frames, (General):

a. Amweld Div, American Welding & Mfg. Co.,
b. Builder's Manufacturing Company
c. BYMOCO Metal Fabricators, Inc.
d. Ceco Corp.
e. Curries Manufacturing, Inc.
f. Dittco Products Inc.
g. Fenestra Corp.
h. Habersham Metal Products Company
i. Mesker Industries, Inc.
j. Overly Manufacturing Company
k. Pioneer Bldrs. Products Corp./Div. CORE Industries, Inc.

l. Republic Builders Products Corp./Subs. Republic Steel.
m. SteelCraft/Div. American Standard Co.

2. Thermal Rated Steel Door and Frame Assemblies:

a. Subject to compliance with requirements, any above named manufacturer.
b. Ceco Corp.
c. Copco Door Co.
d. Curries Mfg., Inc.
e. Fenestra Corp.
f. Mesker Industries, Inc.
g. Pioneer Bldrs, Products Corp./Div. CORE Industries, Inc.

2.2 MATERIALS:

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM SA 568.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized.

D. Supports and Anchors: Fabricate of not less than 18-gage galvanized sheet steel.

E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.

F. Galvanizing Repair Paint: High zinc dust content paint for repair of galvanized surfaces damaged by fabrication or welding, complying with M.I. Specification MIL-P-21035.

G. Shop Applied Primer: Rust-inhibitive enamel or paint, either air drying or baking, suitable as a base for specified finish paints.

2.3 FABRICATION:

A. Fabricate steel door and frame units to be rigid, neat in appearance and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at project site.

B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel.

C. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).

D. Fabricate exterior doors, panels and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gauge inverted steel channels.

1. Use galvanizing repair paint for surfaces damaged by fabrication or welding.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

F. Thermal-Rated (Insulating) Assemblies:

1. At exterior locations and elsewhere as shown or scheduled, provide doors which have been fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236.

2. Unless otherwise indicated, provide urethane insulated thermal-rated assemblies with U factor of 0.12 Btu, (hr./ft2./F Degrees) or better.

G. Finish Hardware Preparation:

1. Prepare doors and frames to receive mortise and concealed finish hardware in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware.

2. Reinforce doors and frames to receive surface applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.

3. Locate finish hardware as indicated on final shop drawings, or if not indicated, in accordance with "Recommended Locations for Builders' Hardware," published by Door and Hardware Institute.

H. Shop Painting:

1. Clean, treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

2. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.

3. Use galvanizing repair paint for surfaces damaged by fabrication or welding, prior to prime coat.

4. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

5. Do not paint fire labels on doors or frames.

2.4 STANDARD STEEL DOORS:

A. Provide metal doors of types and styles as indicated on drawings or schedules, of seamless, hollow steel construction with 16-gauge face sheets. Form exterior doors of hot dip galvanized steel.

2.5 STANDARD STEEL FRAMES:

A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricated frames of minimum 16-gauge cold-rolled furniture steel.

1. Frames for doors 7'-10" or more in height and/or over 3'-5" in width: 14 gauge cold-rolled furniture steel, and one additional hinge, whether or not indicated in hardware schedule.

B. Frames shall be formed by press brake with corners sharp and true. Corners shall be mitered and accurately fitted, and shall be fully electrically welded and then ground smooth. Removable spreaders shall be welded to the bottom of the frame. Frames shall be accurately mortise for hardware.

C. A minimum of three wall anchors shall be provided at each jamb, except four at doors 7'-10" high or more, and six at doors 10-foot high or more. Anchors shall be attached to door frames, adjustable, suitable for wall conditions and job requirements, and shall be 16 gauge minimum. Floor anchors shall be provided and welded to foot of each jamb with two 5/16" holes for securing to the floor.

D. Reinforcements of adequate gauge shall be provided for strikes, closers and brackets and other surface applied hardware for field drilling and tapping.

E. Form exterior frames of hot dip galvanized steel.

F. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames. Provide silencers equivalent to "GJ64" silencers as manufactured by Glenn-Johnson Corp., for metal frames, when not provided under the work of Section 08710 - "Finish Hardware."

1. Provide additional door silencers at doors over 3'-0" wide or 7'-0" in height.

G. Plaster Guards: Provide 26-gauge steel plaster guards or mortar boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware operation.

2.6 DOOR LOUVERS:

A. Provide prefinished louvers according to SDI 111C, at locations indicated, with blades or baffles formed of 0.0239-inch (0.6-mm) thick cold-rolled steel sheet set into minimum 0.0359-inch (0.9-mm) thick steel frame; Galvanized at exterior.

1. Sight-Proof Louvers: Stationary louvers constructed with inverted Y-shaped blades. Minimum free air area calculated per AMCA shall be 36-percent.

2. Finish:

a. Surface Preparation: Solvent clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

b. Pretreatment: Immediately after surface preparation, apply conversion coating of type suited to organic coating applied over it.

c. Baked Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard 2-coat baked enamel finish, consisting of prime coat and thermosetting topcoat that complies with ANSI A250.3. Comply with paint manufacturer's current written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.0508 mm).

d. Color and Gloss: As selected by Architect from manufacturer's full range of choices for standard non-metallic colors and gloss.

3. Final finish painting is specified in Section 09900 - "Painting," not the work of this Section 08110.

B. Provide removable bird screens for exterior louvers.

1. Fabricate screen frames of same metal and finish as louver units to which secured, unless otherwise indicated.

2. Provide frames consisting of U-shaped metal for permanently securing screen mesh.

3. Use 1/4-inch x 1/4-inch mesh formed with 0.063-inch diameter aluminum wire.

4. Color: To match louver, or black.

5. Locate screens on inside face of louvers. Secure screens to louver frames with machine screws, spaced at each corner and at 12-inch o.c. between.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install standard steel doors, frames and accessories in accordance with final shop drawings and manufacturer's data, and as herein specified.

B. Placing Frames:

1. Comply with provisions of SDI-1-06 "Recommended Erection Instructions for Steel Frames," unless otherwise indicated.

2. Except for frames located at in-place concrete or masonry, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

3. In masonry construction, locate a minimum of 3 wall anchors per jamb at hinge and strike levels. Add 1 wall anchor per jamb at hinge and strike levels for each whole 1'-10" height increment over 6'-0"; Similar at glazed and cased openings.

4. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.

5. In metal stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. Attach wall anchors to studs with tapping screws. Add additional anchors as indicated in Paragraph 3.1-B3 above.

6. Install fire-rated frames in accordance with NFPA Std. No. 80.

C. Door Installation:

1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.

2. Place fire-rated doors with clearances as specified in NFPA Std. No. 80.

3. Install silencers after all painting of doors and frames has been completed.

3.2 ADJUST AND CLEAN:

A. Prime Coat Touch-up:

1. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

2. Use galvanizing repair paint for galvanized surfaces, prior to prime coat.

B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 08111

SECTION 08211

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 09900 - "Painting"
3. Division 15 - "Mechanical" (Door Louvers and Frames)

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes solid core flush wood doors with veneer faces and metal frames for any light openings.

B. Unless otherwise indicated, all wood doors will receive "transparent" finish specified in Section 09900 - "Painting", or factory finish.

C. **Note**: Any wood doors indicated to have wood frames, shall have hardwood frames with opaque paint finish unless specifically indicated otherwise. Refer to Sections 06200 and 09900 for additional information and requirements.

1.3 SUBMITTALS:

A. Product Data: Submit door manufacturer's technical data for each type of door, including details of core and edge construction, and trim for openings and louvers.

B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, details of metal frames for light openings, location and extent of hardware blocking, fire ratings, and other pertinent data.

1.4 QUALITY ASSURANCE:

A. Quality Standards: Comply with the following standards:

1. NWWDA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).
2. AWI Quality Standard: "Architectural Woodwork Quality Standards", including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.

B. NWWDA Quality Marking:

1. Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S. 1 Series.
2. For manufacturers not participating in NWWDA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

C. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152 and which are labeled and listed for ratings indicated by UL, Warnock Hersey or other testing and inspection agency acceptable to authorities having jurisdiction.

D. Manufacturer:

1. Obtain doors from a single manufacturer, selecting from manufacturers listed herein.
2. Other manufacturers may be considered, however, approval must be requested from the Architect in writing at least ten (10) days prior to original bid date. Architect will issue only written approval, via letter and/or Addendum, and conditionally subject to compliance with specified requirements.

1.5 PRODUCT DELIVER, STORAGE AND HANDLING:

A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet “How to Store, Handle, Finish, Install, and Maintain Wood Doors” as well as with manufacturer’s instructions.

B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

1.6 PROJECT CONDITIONS:

A. Conditioning:

1. Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project’s geographical location:
2. Referenced AWI quality standard including Section 100-S-3 “Moisture Content”.

1.7 WARRANTY:

A. General: Warranties shall run concurrently with, be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents or otherwise.

B. Door Manufacturer’s Warranty:

1. Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist), or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.
2. Warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
3. Warranty shall be in effect during following period to time after date of Substantial Completion.

    a. Solid Core Interior Doors: Life of installation.

C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with requirements, provide doors on one of the following:

1. Solid Core Doors with Wood Veneer Faces:

    a. Algoma Hardwoods, Inc.
    b. Eggers Industries, Architectural Door Division.
    c. Ipik Door Co., Inc.
    d. Marshfield Door Systems, Inc.
    e. Oshkosh Architectural Door Co.

2. Metal Frames for Light Openings in Fire Rated and Other Doors: Manufacturer's standard beveled or square frame of 18-gage cold-rolled steel, factory-primed, and approved for use in door of fire-rating indicated or required, and in other doors where indicated.

2.2 INTERIOR FLUSH WOOD DOORS:

A. Solid Core Doors: Comply with the following requirements.

1. Faces for Transparent Finish: Birch, Plain Sliced; Consistent similar appearance on all doors, with no "green" or "brown" colored wood.

    a. Similar color and appearance at both sides of doors.

2. AWI Grade:

a. Transparent Finish: Premium; Veneer Grade: A or better.

3. Solid Core Construction: PC-7 (Particle board core, 7-ply, hot-pressed method), except at wood doors where 30 percent or more of their area is glass use SLC-7 (Staved lumber core, 7-ply, hot-pressed method).

B. Fire-Rated Solid Core Doors:

1. Comply with the following requirements - Faces and AWI Grade: Provide faces and grade to match non-rated doors in same area of building, unless otherwise indicated.
2. Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.
3. Edge Construction: Provide manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance as compared to edges composed of a single layer of treated lumber.
4. Pairs: Provide fire-rated pairs with fire-retardant stiles which are labeled and listed for
kinds of applications indicated without formed steel edges and astragals.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine installed door frames prior to hanging door:

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
2. Reject doors with defects.

3.2 INSTALLATION:

A. Hardware: For installation see Division 8 Section "Finish Hardware", of these specifications.

B. Manufacturer's Instructions:

1. Install wood doors to comply with manufacturer's current written instructions and recommendations, and to comply with referenced AWI standard, and as indicated.
2. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA 80.
3. Trim light openings with moldings of material and profile indicated.

C. Job-Fit Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors of hardware. Seal cut surfaces after fitting and machining.
2. Fitting Clearances for Non-Rated Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.
3. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
4. Bevel non-rated doors 1/8" in 2" at lock and hinge edges.
5. Bevel fire-rated doors 1/8" in 2" in lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Prefit Doors: Fit to frames for uniform clearance at each edge.

E. Factory-Finished Doors: Refer to Section 09900 - “Painting” for requirements for finishing wood doors.

3.3 ADJUSTING AND PROTECTION:

A. Operation: Rehang or replace doors which do not swing or operate freely.

B. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 08211

SECTION 08331

OVERHEAD COILING DOORS

PART I - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 05120 - "Structural Steel"
2. Section 05500 - "Metal Fabrications"
3. Section 06100 - "Rough Carpentry"
4. Section 09900 - "Painting"

1.2 SUMMARY:

A. This Section includes the following types of overhead coiling doors:

1. Electric motor operated, prefinished factory prime coated, insulated, galvanized steel exterior doors, and all related work.

1.3 DEFINITIONS:

A. Operation Cycle: One complete cycle of a door begins with the door in the closed position. The door is then moved to the open position and back to the closed position.

1.4 PERFORMANCE REQUIREMENTS:

A. Structural Performance: Provide overhead coiling doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

1. Wind Load: Uniform pressure (velocity pressure) required by the Florida Building Code, acting inward and outward.

2. Project Wind Load - Basic Wind Speed: In accordance with applicable building requirements, **160 mph** unless higher wind load speed is indicated on Structural Drawings.

B. Operation-Cycle Requirements: Design and warranty overhead coiling door components and operator to operate for not less than 30,000 cycles and for 10 cycles per day.

1. Include tamperproof cycle counter.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced installer who is an authorized representative of the overhead coiling door manufacturer for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead doors through one source from a single manufacturer, for exterior coiling service doors and for interior high speed roll-up doors.

1. Obtain operators and any controls from the overhead coiling door manufacturer.

C. Refer to Division 1 Section "Special Conditions" for additional information and minimum experience requirements.

D. Fire-Rated Door Assemblies (if any): Provide assemblies complying with NFPA 80 that are identical to door and frame assemblies tested for fire-test-response characteristics per UL 10b, and that are labeled and listed for fire ratings indicated by UL, FM, ITS/Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

E. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

1.6 WARRANTIES AND GUARANTEES:

A. Manufacturer's Warranty: Manufacturer's standard guarantees and warranties for products, components, motor, finishes, labor and materials, and total overhead coiling door assemblies. Signed by an authorized representative of overhead coiling doors manufacturers, on form published with current product literature as of date of Contract Documents.

B. The Guarantees and Warranties shall be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents, and shall not deprive or limit the Owner of any other rights the Owner may have for remedy.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:

1. Coiling Service Doors:

a. Alpine Overhead Doors, Inc.
b. Atlas Door Corp.; Div. of Clopay Building Products Co.
c. The Cookson Company.
d. Cornell Iron Works Inc.
e. Overhead Door Corporation.
f. Raynor Garage Doors.
g. Rite Hite Corporation.
h. Roll-Lite Door Corp.; Div. of Clopay Building Products Co.
i. Wayne-Dalton Corp.
j. Windsor Door; A United Dominion Company.

2.2 SERVICE DOORS - EXTERIOR:

A. Overhead Coiling Door - Product/Manufacturer: Provide as specified, or equivalent by one of the above named manufacturers, complete with all standard features and accessories, and as follows:

1. Flat profile slats of approximately 3-1/4" center to center height, insulated, .028 inch galvanized steel.
2. Finishes - General: Galvanized steel with baked enamel primer paint finish.
3. Galvanized structural steel angles at bottom bar with astragal, with combination bottom weatherseal and pneumatic sensor edge.
4. Roll-formed galvanized steel guides, with weatherstripping, end-locks and wind-locks.
5. Torsion springs counterbalance mechanism.
6. Galvanized steel hood, box-shaped, 24-gauge, with internal weather / wind baffle.
7. Electric motor operation, with slide bolt locking bars equipped to accept padlocks.
8. Designed for face-of-wall mounting, unless between jambs mounting is indicated on the Drawings.
9. Weatherseals: Bottom, exterior guides, interior hood, and interior guides.
10. Push/Pull Handles: For push-up-operated or emergency operated doors, provide galvanized steel lifting handles on each side of door.
    a. Provide pull-down straps or pole hooks for doors more than 84-inches high.
11. Chain Lock Keeper: For emergency operation; suitable for padlock.
12. Provide safety interlock switch to disengage power supply when door is locked.
13. Manufacturer's standard guarantees and warranties for products, components, motor, finishes, labor and materials, and total overhead coiling door assemblies.

2.3 ELECTRIC DOOR OPERATORS:

A. General: Provide heavy duty, 60 to 90 cycles per hour electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operational life specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations,

control devices, integral gearing for locking door, and accessories required for proper operation.

B. Comply with NFPA 70.

C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging sprocket-chain operator and releasing brake for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.

F. Door-Operator Type: Provide wall-mounted, jackshaft, gear-head hoist-type door operator unit consisting of electric motor, enclosed worm-gear running-in-oil primary drive, chain and sprocket secondary drive, and auxiliary chain-hoist and floor level disconnect.

G. Electric Motors: Provide high-starting torque, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps0.2 m/s or more than 1 fps0.3 m/s, without exceeding nameplate ratings or considering service factor.

1. Type: Polyphase, medium-induction type.
2. Service Factor: According to NEMA MG 1, unless otherwise indicated.
3. Coordinate wiring requirements and electric characteristics of motors with building electrical system; If building electrical system is not to be provided with initial construction, Contractor and supplier should assume single-phase power will be available.
4. Provide open drip proof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.

H. Remote-Control Station: Provide momentary-contact, 3-button control station with push-button controls labeled “Open,” “Close,” and “Stop.”

1. Provide interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

I. Obstruction Detection Device: Provide each motorized door with indicated external automatic safety sensor able to protect full width of door opening. Activation of sensor immediately stops and reverses downward door travel.

1. Sensor Edge: Provide each motorized door with an automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

    a. Provide pneumatically actuated automatic bottom bar.

        1) Self-Monitoring Type: Provide self-monitoring, 4-wire configured device.

J. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

1. Provide electric operators with ADA-AG compliant audible alarm and visual indicator lights.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install doors and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to reviewed Shop Drawings, manufacturer's current written instructions, and as specified.

1. Install any fire-rated doors to comply with NFPA 80.

B. Provide complete installation with all standard and listed optional accessories and features, so as to provide complete, properly operating and fully functional installations.

3.2 ADJUSTING:

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, and/or distortion, and fitting weathertight for entire perimeter.

B. Repair damaged components and restore damaged finishes, to original and unnoticeable condition, or replace.

3.3 DEMONSTRATION:

A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train Owner's maintenance personnel as specified below:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

2. Fire-Rated Doors (if any):

a. Test door closing when activated by detector or alarm connected fire-release system. Reset door-closing mechanism after successful test.

b. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance, and procedures for testing and resetting release devices.

3. Review data in the maintenance manuals. Refer to Division 1 Section "Project Closeout."

4. Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION 08331

SECTION 08410

ALUMINUM ENTRANCES AND STOREFRONT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Section Includes: Aluminum Entrances, glass and glazing, and door hardware and components.

1. Types of Aluminum Hurricane Resistant Entrances include:

a. Entrances; Medium stile, 3-1/2" vertical face dimension, 1-3/4" depth, Interior structural silicone glazed, High traffic/impact resistant applications.

b. Framing System: 2-1/2” x 5”, non-thermal, center glazed for 1-5/16” impact resistant glazing interior structural silicone glazed, screw spline fabrication.

B.Related Sections:

.. SECTION 07900 – “Joint Sealers”
.. SECTION 08410 – “Aluminum Entrances and Storefronts”
.. SECTION 08710 – “Door Hardware”
.. SECTION 08800 – “Glass and Glazing”

1.2 SYSTEM DESCRIPTION:

A. Entrance Performance Requirements:

1. Windloads: Provide immediate door framing for swing doors, including anchorage, capable of withstanding windload design pressures. These design pressures are based upon Florida Building Code, 2010 Edition.

2. Air Infiltration: For single acting offset pivot, butt hung or continuous geared hinge entrances in the closed and locked position, the test specimen shall be tested in accordance with DCBCCO Protocol PA 202 and ASTM E 283 at a pressure differential of 1.57 psf for pairs of doors. A pair of 6'0" x 8'0" entrance doors and frame shall not exceed 1.2 cfm\ft2.

3. Structural: Corner strength shall be tested per manufacturer’s dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity.

4. Uniform Load: A static air design load of 85 psf (65 psf for 9/16" laminated infill) shall be applied in the positive and negative direction in accordance with DCBCCO Protocol PA 202 and ASTM E 330. There shall be no deflection in excess of l/180 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage shall occur.

5. Impact Resistance: Large Missile, tested in accordance with DCBCCO Protocols PA 201, PA 203, SBCCI SSTD-12 and ASTM E 1886 at a door opening of 6'0" x 8'0".

6. Forced Entry: Tested in accordance with SFBC 3603.2 (b) (5).

1.3 SUBMITTALS:

A. General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Division 1 Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in "Conditions of the Contract."

B. Quality Assurance/Control Submittals:

1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics.

1.4 WARRANTY:

A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.

B. Manufacturer's Product Warranty: Submit, for Owner's acceptance, manufacturer's warranty for entrance system as follows:

1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer. In addition, welded door corner construction shall be supported with a limited lifetime warranty for the life of the door under normal use.

1.5 QUALITY ASSURANCE:

A. Qualifications:

1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.

2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.7 DELIVERY, STORAGE AND HANDLING:

A. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

B. Packing, Shipping, Handling and Unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities, and other hazards before, during and after storefront installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Acceptable Manufacturers:

1. Kawneer Company, Inc.
2. YKK AP America, Inc
3. Approved Equal

B.Substitutions:

1. Approved Equal Documentation

a. Product Literature and Drawings: Submit product literature and drawings modified to suit specific project requirements and job conditions.

b. Certificates: Submit certificate(s) certifying substitute manufacturer (1) attesting to adherence to specification requirements for entrance system

performance criteria, and (2) has been engaged in the design, manufacturer and fabrication of aluminum entrances for a period of not less than ten (10) years. (Company Name)

c. Test Reports: Submit test reports verifying compliance with each test requirement required by the project.

d. Product Sample and Finish: Submit product sample, with specified finish and color.

2. Approved Equal Acceptance: Acceptance will be in written form, either as an addendum or modification, and documented by a formal change order signed by the Owner and Contractor.

2.2 MATERIALS:

A. Aluminum (Entrances and Components):

1. Material Standard: ASTM B 221; 6063-T6 alloy and temper

2. The door stile and rail face dimensions of Entrance doors will be as follows:

Vertical Stile	Top Rail	Bottom Rail
3-1/2"	3-1/2"	10"

3. Major portions of the door members to be 0.125" nominal in thickness and glazing molding to be 0.050" thick.

4. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by The Aluminum Association.

B. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.

C. Structural silicone sealant to be Dow Corning 983 or 995.

2.3 HARDWARE:

A. Fasteners: Where exposed, shall be stainless steel.

B. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

C. Standard Entrance Hardware

1. Weather stripping:

    a. Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.
    b. The door weathering on a single acting offset pivot or butt hung door and frame (single or pairs) is comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.

2. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners. (Necessary to meet specified performance tests.)

3. Threshold: Extruded aluminum, one piece per door opening, with ribbed surface, meeting ADA requirements.

4. Offset Pivots: Manufacturer's standard top and bottom pivots with one intermediate offset pivot.

5. Butt Hinge: 1-1/2 pair manufacturer standard 4-1/2" x 4" ball bearing hinges.

6. Continuous Geared Hinge: (tested to +/- 65 psf Uniform Load).

7. Push/Pull: CPN style.

8. Panic Device: Concealed Vertical Rod Exit Device or Concealed Rod Exit Device (tested to +/- 65 psf Uniform Load).

9. Closer: Surface or concealed closer.

10. Security Lock/Dead Lock: MS 1850A lock with 3-point active stile locking and hurricane flushbolts on pairs or MS 1850A lock with 1871 cylinder operated flushbolts.

11. Cylinder(s)/Thumbturn: Manufacturer standard.

12. Cylinder Guard: Manufacturer standard.

2.4 RELATED MATERIALS:

A. Sealants: Refer to Joint Treatment (Sealants) Section.

B. Glass:

1. Entrance Doors: Viracon – HRG-2, 9/16" infil, tinted.

2. Framing System: 1-5/16” insulated laminated infill with 0.090 PVB (solutia saflex), tinted.

2.5 FABRICATION:

A. Entrance System Fabrication:

1. Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8" long fillet welds inside and outside of all four corners. Exterior glazing stop shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord. Interior glazing stop shall be mechanically fastened to the door member and it shall incorporate a silicone compatible spacer used with silicone sealant.

2. Accurately fit and secure joints and corners. Make joints hairline in appearance.

3. Prepare components with internal reinforcement for door hardware.

4. Arrange fasteners and attachments to conceal from view.

2.6 FINISHES:

A. Shop Finishing:

1. Architectural Class II Clear Anodic Coating. Color #17 Clear; Standard.

2.7 SOURCE QUALITY CONTROL:

A. Source Quality: Provide aluminum entrances specified herein from a single source.

1. Building Enclosure System: When aluminum entrances are part of a building enclosure system, including storefront framing, windows, curtain wall system and related products, provide building enclosure system products from a single source manufacturer.

B. Fabrication Tolerances: Fabricate aluminum entrances in accordance with entrance manufacturer’s prescribed tolerances.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions. Verify openings are sized to receive storefront system and sill plate is level in accordance with manufacturer's acceptable tolerances.

1. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

3.2 INSTALLATION:

A. General: Install entrance system in accordance with manufacturer's instructions and AAMA storefront and entrance guide specifications manual.

1. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

2. Provide alignment attachments and shims to permanently fasten system to building structure.

3. Align assembly plumb and level, free of warp and twist. Maintain assembly dimensional tolerances aligning with adjacent work.

4. Set thresholds in bed of mastic and secure.

5. Adjusting: Adjust operating hardware for smooth operation.

B. Related Products Installation Requirements:

1. Sealants (Perimeter): Refer to Section 7 Joint Treatment (Sealants).

2. Glass: Refer to Section 8 Glass and Glazing.

a. Reference: ANSI Z97.1, CPSC 16 CFR 1201 and GANA Glazing Manual.

3.3 PROTECTION AND CLEANING:

A. Protection: Protect installed product's finish surfaces from damage during construction. Protect aluminum storefront system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.

B. Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 08410

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. All items known commercially as Finish or Door Hardware.

B. Thresholds and Weatherstripping/Door Seals.

1.2 RELATED SECTIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes the following:

1. Section 08110 – "Steel Doors and Frames"

1.3 REFERENCES

A. BHMA (Builders Hardware Manufacturers Association) A156 series.

B. DHI (Door and Hardware Institute) A115 series.

C. SDI – 107 – 84 – Hardware on Steel Doors (Reinforcement – Application.)

D. SDI – 109 – 88 – Hardware for Standard Steel Doors & Frames.

E. NFPA – 80 – Fire Doors and Windows.

F. NFPA – 101-2000 - Life Safety Code.

G. ADA-AG – Americans with Disabilities Act - Accessibility Guidelines.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data – Submit two (2) copies of manufacturer's catalog sheets describing each item of hardware to be supplied.

C. Schedules: Submit six (6) copies of hardware schedules for Architect's approval. Schedules are to include quantity, type, location, finish and manufacturer of each item of hardware for each opening. Schedule may be horizontal or vertical format. No material

is to be ordered until the submittal is approved. After approval, no substitutions will be allowed without the written approval of the Architect.

D. Samples: If requested by the Architect, submit a sample of each hardware item in the design and finish to be used on the project. Samples may be used on the project provided they are undamaged during the submittal process.

E. Templates: Furnish template information to the General Contractor for use by other trades in fabricating related materials.

F. Project Closeout: On completion of the project, furnish one (1) copy of the "as furnished" hardware schedule along with one (1) copy each of the keying schedule, manufacturer's maintenance instructions and any special tools which may be required to maintain or adjust the hardware. In addition, furnish copies of all manufacturer's warranties for the owner's records.

1.5 QUALITY ASSURANCE

A. Manufacturers and model numbers listed in the hardware sets portion of this specification are for the purpose of establishing a standard of quality. Similar products by approved manufacturers that are equal in design, function and quality will be acceptable upon prior approval of the Architect provided the required physical samples and data are submitted in accordance with Section 01015.

B. The hardware supplier shall be a firm specializing in finish hardware. The firm shall have been engaged in this business for a period of not less than five (5) years and shall have in its employ a full time, certified Architectural Hardware Consultant (AHC) or person of equivalent experience. This person shall be available to the Architect at reasonable times for consultation regarding this project. This supplier shall be a direct, factory authorized distributor for the manufacturer of the materials being furnished.

C. The hardware manufacturer shall be a recognized firm regularly engaged in the manufacture and sale of finished hardware items.

D. If required, the hardware supplier shall furnish certification and documentation that his materials meet all physical and environmental requirements of the project.

E. As near as possible, obtain each type of hardware (hinges, locks, closers, etc.) from a single manufacturer.

F. Provide hardware for fire rated openings that complies with the requirements of NFPA 80 and authorities having jurisdiction. Provide only items of door hardware that have been tested and listed by UL, FM, Warnock-Hersey or other testing organizations acceptable to the authorities having jurisdiction.

G. Products and installation under the work of this Section shall be in compliance with applicable provisions of published U. S. Justice Department Regulations for the "Americans with Disabilities Act of 1990" (ADA; ADA-AG); ANSI A117.1; and the "Uniform

Federal Accessibility Standards" (UFAS), 1988 Edition; And revisions and amendments thereto.

1. Where this requires any substitution of products specified herein, advise Architect in writing for necessary approvals.

1.6 DELIVERY, STORAGE AND PROTECTION

A. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding transportation, handling and storage of project materials.

B. Package each item individually. Label and clearly identify each package with item nomenclature and door opening. Correlate all making and opening numbers to match the hardware schedule.

C. The General Contractor is to provide a secure, locked storage area for all items delivered to the jobsite.

D. The General Contractor shall inventory all items delivered to the jobsite within forty-eight hours and advise the supplier immediately of any shortages.

1.7 PROJECT CONDITIONS

A. The General Contractor will coordinate the work between this supplier and other related sections such as hollow metal and wood door suppliers to insure proper manufacturer and fabrication of doors to receive the approved hardware.

1.8 WARRANTY

A. Provide manufacturers warranties from hardware supplier as follows:

1. Closers: Ten years
2. Exit Devices & Locksets: Three years
3. Locksets: Three Years.
4. All other Hardware: One year.

B. Warranties shall cover failure due to manufacturing defects or material failure only. They shall not cover abuse, vandalism, improper installation or maintenance. Defective materials are to be replaced at no cost to the owner.

C. The above warranties shall be in addition to, shall be in effect simultaneously with, and shall not alter other project or product warranties or guarantees, nor shall they serve as a limitation to other remedies available to the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable products and their manufacturers are listed below. Specific information regarding functions, sizes, mounting and types is found in the hardware sets at the end of the section.

1. Hinges:

	MFG'R	FINISH	TYPE/SERIES
a.	Yale	US26D/SC	3500 Series

2. Exit Devices:

	MFG'R	FINISH	SERIES/DESIGN
a.	Yale	32D	7000 Series

Note: All exit devices for exterior openings to meet hurricane codes.

3. Mortise Lock w/ Deadbolt:

	MFG'R	FINISH	TYPE/SERIES
a.	Yale	626/SC	3500 Series

4. Locks, Latches and Dummy Trim:

	MFG'R	FINISH	SERIES/DESIGN
a.	Yale	626/SC	3500 Series

5. Closers:

	MFG'R	FINISH	SERIES/DESIGN
a.	Yale	626/SC	3500 Series

6. Push/Pulls/Kickplates:

	MFG'R	FINISH	TYPE/SERIES
a.	Hager	US26D/SC	30S, 33G

7. Bolts/DP Strikes/Misc.:

	MFG'R	FINISH	TYPE/SERIES
a.	Hager	US26D/SC	282D

8. Floor Stops:

MFG'R	FINISH	TYPE/SERIES

Hager	US26D/SC	242F

9. Thresholds and Weatherstripping:

	MFG'R	FINISH	TYPE/ITEM
a.	Hager	AL	Equal

10. Silencers:

	MFG'R	FINISH	TYPE/SERIES
	Hager	Grey	307D

B. Substitutions: Substitutions from the listed manufacturers and products without prior approval of the architect are not permitted. Suppliers desiring to bid products not listed must make written application to the architect no less than seven (7) working days prior to the bid date. Applications must be accompanied by manufacturer's complete literature and/or samples to allow the Architect to make an informed decision. Verbal requests will not be considered. Approval of alternate manufacturer's products will only be in writing or by addendum to insure an equitable competitive situation for all bidders.

2.2 MATERIALS AND FABRICATION

A. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.

B. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

C. Furnish stainless steel screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Furnish exposed (exposed under any condition) screws to match hardware finish or if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

D. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt heads or nuts are exposed on opposite face unless their use is the only means of adequately securing the hardware or where required on labeled doors. In no case are thru-bolts to be used as a substitute for proper reinforcement of doors or frames.

2.3 FINISHES

A. Finishes for all items are as listed in the hardware schedule at the end of this section.

B. Finish designations are as listed in ANSI/BHMA A156.18 "American Standards for Materials and Finishes: and are the industry recognized standard commercial finishes.

2.4 KEYING

A. Key all cylinders into the existing system or a new MK system as required. Furnish the following:

1. 6 Master Keys per new group.
2. 3 Change Keys per cylinder.
3. Temporary cores for all cylinders

B. Meet with owner's representative to determine exact keying requirements. Ship permanent cores and keys direct from factory to owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by architect.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the DOOR AND HARDWARE INSTITUTE.

2 WDMA Industry Standard I.S. 1.A-97, "Hardware Locations for Wood Flush Doors."

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Section "Painting". Do not install surface-mounted items until finishes have been completed on the substrates involved.

C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Set thresholds in sealant complying with requirements specified in Division 7 Section "Joint Sealers".

F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

3.2 ADJUSTING AND CLEANING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper functions and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Clean adjacent surfaces soiled by hardware applications.

3.3 HARDWARE SCHEDULE

A. Hardware Sets – As noted on drawings.

NOTES:
1. Mount all closers inside; away from exterior, lobbies, corridors etc.
2. Furnish 3 silencers for each hollow metal frame and 2 for each double.

END OF SECTION 08710

SECTION 08800

GLASS AND GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Related work specified elsewhere includes:

1. Section 07900 - "Joint Sealers"

1.2 SUMMARY:

A. Extent of glass and glazing work is indicated on drawings and schedules.

B. Types of work in this section include glass and glazing (impact resistant) for:

1. Aluminum frames and view windows.
2. Glazing accessories.

C. General Locations - Glazing Types:

1. Insulating Glass Assemblies shall be used.

a. Provide clear wind and wind-blown "missile" resistant glass and glazing systems. Refer to drawings for locations.

D. Insulating Glass Assemblies - Glass Colors:

1. Typical glass shall be as follows, or equivalent priced products selected after bidding:

a. Exterior Pane: 1/4-inch minimum thickness "clear glass, with pyrolytic coating on second surface; heat strengthened or fully tempered glass (as required by glass size and code), and as specified.

b. Air Space: 1/2-inch.

c. Interior Pane Assembly: 9/16-inch laminated clear transparent glass, heat strengthened or fully tempered glass (as required by glass size and code).

1) 1/4-inch (6-mm) clear transparent outboard pane;
2) 0.100 interlayer of "Saflex HP" by Solutia;

3) 1/4-inch (6-mm) clear transparent inboard pane, and as specified.

1.3 SYSTEM DESCRIPTION:

A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.

1. Normal thermal movement is defined as that resulting from an ambient temperature range of 120^{O}F (67^{O}C) and from a consequent temperature range within glass and glass framing members of 180^{O}F (100^{O}C), minimum. Modify as required for more extreme conditions.

2. Deterioration of insulating glass is defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

3. Deterioration of coated glass is defined as the development of manufacturing defects including peeling, cracking or other indications of deterioration in metallic or other coating due to normal conditions of use.

1.4 QUALITY ASSURANCE:

A. General: All glass shall comply with FS DD-G-451, except where more stringent standard is indicated or required by authorities having jurisdiction.

1. At locations where glass size cannot be supplied as indicated, provide similar glass in better quality and/or greater thickness; Coordinate with glass framing.

2. Furnish each piece of glass with a label indicating type, quality, thickness, etc., and do not remove until after written approval is received from Architect and Owner's representative.

B. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

C. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

D. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

E. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

F. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FGMA) “Glazing Manual” and “Sealant Manual”, and SIGMA TM-3000, “Vertical Glazing Guidelines”, except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.

G. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

H. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component pane of units with appropriate certification label of the inspecting and testing organization indicated below:

1. Insulating Glass Certification Council (IGCC).

a. Certification: CBA.

I. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

J. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

K. Preinstallation Conference: Notify all parties required to attend at least 10-days prior to the date of the Preinstallation Conference. Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review all coordination issues with the work of other trades, each of whom is to be in attendance.
3. Review temporary protection requirements for glazing during and after installation.
4. Review any issues involved in completing the work, resolve those issues or set a date when they will be resolved.
5. Provide typed minutes of the Preinstallation Conference, and provide copies to the Owner’s Representative, Architect and each Subcontractor and supplier for glass and glazing and contiguous work, each of whom are required to attend the preinstallation conference.

L. Windborne-Debris-Impact Resistance: Provide exterior glazing that passes enhanced-protection testing requirements in ASTM E 1996 for **160 miles per hour Wind Zone** when tested according to ASTM E 1886. Test specimens shall be no smaller in width and length than glazing indicated for use on the Project and shall be installed in same manner as glazing indicated for use on the Project.

1. Large-Missile Test: For all glazing, regardless of height above grade.

M. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

N. Subcontractor Qualifications: Glazing Subcontractors shall comply with experience requirements for work on this project as stated in Section 01015 - "Special Conditions."

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1. Where insulating glass units will be exposed to substantial altitude changes, avoid hermetic seal ruptures by complying with insulating glass fabricator's recommendations for venting and sealing.

1.6 PROJECT CONDITIONS:

A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1.7 WARRANTY:

A. General: Warranties shall run concurrently with other warranties made by the Contractor under requirements of the Contract Documents, and shall be in addition to and not a limitation of other rights the Owner may have under the Contract Documents or otherwise.

1. Manufacturer's Special Project Warranty on Coated Glass Products: Provide written warranty signed by manufacturer of each type of coated glass agreeing to furnish F.O.B. point of manufacture, with freight provided to project site, within specified warranty period indicated below, replacements and all installation costs and expenses for those coated glass units which develop manufacturing defects. Manufacturing defects are defined as peeling, cracking,

wrinkling, discoloring, staining, or deterioration in metallic, or opacifier coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.

a. Warranty Period: Manufacturer's standard but not less than **10-years** after date of project substantial completion.

2. Manufacturer's Special Project Warranty on Insulating Glass: Provide written warranty signed by manufacturer of insulating glass agreeing to furnish F.O.B. point of manufacture, with freight provided to project site, within specified warranty period indicated below, replacements and all installation costs and expenses for those insulating glass units developing manufacturing defects. Manufacturing defects are defined as failure of hermetic seal of air space (beyond that due to glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coatings, if any, and other visual indications of seal failure or performance; provided the manufacturer's instructions for handling, installing, protecting and maintaining units have been complied with during the warranty period.

a. Warranty Period: Manufacturer's standard but not less than **10-years** after date of substantial completion.

3. Manufacturer's Special Project Warranty on Laminated Glass: Provide written warranty signed by manufacturer of laminated glass agreeing to furnish F.O.B. point of manufacturer, with freight provided to project site, within specified warranty period indicated below, replacements and all installation costs and expenses for those laminated glass units which develop manufacturing defects. Manufacturing defects are defined as delamination, discoloring, staining, or deterioration in laminated glass units, due to normal project conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.

a. Warranty Period: Manufacturer's standard but not less than **10-years** after date of entire project's substantial completion.

4. Replacements Under Warranties: Glass units replaced under Warranty provisions shall be required to carry the same warranty as original glass and glazing, beginning from the date of replacement completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Manufacturers of Fire-Rated and Impact Resistant Glass:

a. AFG Industries, Inc.
b. Blue Ridge.
c. Guardian Industries Corp.
d. Hordis Brothers, Inc.
e. Pilkington Sales (North American) Limited.

2.2 GLASS PRODUCTS, GENERAL:

A. Primary Glass Standard: Provide primary glass which complies with FS DD-G-451 and ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and, if applicable, form, finish, mesh and pattern.

B. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements, including those indicated by reference to kind, condition, type, quality, class, and, if applicable, form, finish, and pattern.

C. Sizes: Fabricate glass to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer. Provide thicknesses indicated or, if not otherwise indicated, as recommended by glass manufacturer for application indicated.

D. Windborne-Debris-Impact Resistance: Refer to "Quality Assurance" Paragraph above.

2.3 PRIMARY GLASS PRODUCTS:

A. Windborne-Debris-Impact Resistant Glass - General: 9/16-inch minimum, laminated clear transparent glass, heat strengthened or fully tempered glass (as required by glass size and code).

1. 1/4-inch (6-mm) clear transparent outboard pane; tinted grey.
2. 0.100 interlayer of "Saflex HP" by Solutia;
3. 1/4-inch (6-mm) clear transparent inboard pane, and as specified.

B. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of tinted and clear transparent glass, relative to visible light transmittance, U-values, shading coefficient and visible reflectance.

2.4 HEAT-TREATED GLASS PRODUCTS:

A. Manufacturing Process: Manufacture heat-treated glass as follows:

1. By horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed, unless otherwise indicated.

B. Coated and Uncoated Clear Heat-Treated Float Glass: Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below.

1. Types:

    a. Fully Tempered at interior; Heat strengthened or fully tempered glass (as required by glass size and code) at exterior.

2. Thickness: 1/4-inch, unless indicated otherwise.

C. Windborne-Debris-Impact Resistant Glass: As indicated.

2.5 SEALED INSULATING GLASS UNITS:

A. General: All units shall be preassembled consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E 774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant.

1. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section and in Sections where the materials are provided, applicable to types, classes, kinds and conditions of glass products indicated.

2. Provide heat-treated panes of type and at locations indicated or, if not indicated, provide heat-strengthened panes where recommended by manufacturer for application indicated and tempered where indicated or where safety glass is designated or required.

3. Performance characteristics designated for insulating glass are nominal values based on manufacturer's published test data for units with 1/4-inch thick panes of glass and 1/2-inch thick air space.

    a. U-values indicated are expressed in the number of Btu's per hour per square feet per degree F difference.

4. Performance Classification per ASTM E 774: Class A.

    a. Thickness of Each Pane: 1/4-inch minimum at exterior and 9/16-inch at interior, unless indicated otherwise.

    b. Air Space Thickness: 1/2-inch minimum, unless indicated otherwise.

    c. Sealing System: Manufacturer's standard, in compliance with referenced standards.

    d. Spacer Material: Aluminum, in compliance with referenced standards, same color as exposed framing where it occurs.

e. Desiccant: Manufacturer's standard; either molecular sieve or silica gel or blend of both. Comply with requirements of referenced standards.

f. Corner Construction: Manufacturer's standard corner construction.

B. Coated and Uncoated Insulating Glass Units: Manufacturer's standard units complying with the following requirements:

1. Typical Exterior Insulating Glass:

a. Exterior Pane: 1/4-inch minimum thickness "Solargray" (cool gray tinted) glass, with pyrolytic coating on second surface; heat strengthened or fully tempered glass (as required by glass size and code), and as specified;

b. Air Space: 1/2-inch.

c. Interior Pane Assembly: 9/16-inch laminated clear transparent glass, heat strengthened or fully tempered glass (as required by glass size and code).

1) 1/4-inch (6-mm) clear transparent outboard pane, with "Solarban 60" Low E coating sputtered on No. 3 surface;
2) 0.100 interlayer of "Saflex HP" by Solutia;
3) 1/4-inch (6-mm) clear transparent inboard pane, and as specified.

2. Performance Characteristics: As specified herein and as indicated in specification sections where insulated glazing is provided.

2.6 <u>ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES</u>:

A. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.

3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those for Type, Grade, Class and Uses.

4. Colors: Provide color of exposed sealants indicated or, if not indicated, as selected by Architect from manufacturer's standard colors.

5. Asbestos prohibited: Refer to Section 01015 - "Special Conditions," for requirements.

B. Glazing Sealant: Use only the following materials, or pre-approved substitutes:

1. One-Part Non-Acid-Curing Silicone Glazing Sealant: Type S; Grade NS, Class 25; Uses NT, G, A, and, as applicable to uses indicated, O; and complying with the following requirements for modules and additional joint movement capability.

a. Low Modules: Tensile strength of 45 psi or less at 100-percent elongation when tested per ASTM D 412 after 14-days at 77^{O}F (20^{O}C) and 50-percent relative humidity.

b. Additional capability, when tested per ASTM C 719 for adhesion and cohesion under maximum cyclic movement, to withstand the following percentage increase and decrease of joint width, as measured at time of application, and remain in compliance with other requirements of ASTM C 920.

2. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100-percent; complying with AAMA A 804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.

C. Products: Subject to compliance with requirements, provide one of the following:

1. One-Part Non-Acid Curing Low-Modules Silicone Glazing Sealant:

a. "Chem-Calk 1000"; Bostik Construction Products Div.
b. "Dow Corning 790"; Dow Corning Corp.
c. "864"; Pecora Corp.
d. "Omniseal"; Sonneborn Div., BASF Building Systems
e. "Spectrum 1"; Tremco, Inc.

2. Preformed Butyl-Polyisobutylene Glazing Tape Without Spacer Rod:

a. "Chem-Tape 40"; Bostik Construction Products Div.
b. "Extru-Seal"; Pecora Corp.
c. "PTI 303" Glazing Tape; Protective Treatments, Inc.

d. "Tremco 440 Tape"; Tremco Inc.

3. Preformed Butyl-Polyisobutylene Glazing Tape With Spacer Rod:

a. "Chem-Tape 60"; Bostik Construction Products Div.
b. "Shim-Seal"; Pecora Corp.
c. "PTI 303" Shim Tape; Protective Treatments, Inc.
d. "Pre-shimmed Tremco 440 Tape"; Tremco Inc.

2.7 GLAZING GASKETS:

A. Dense Elastomeric Compression Seal Gaskets: Molded or extruded neoprene or EPDM gaskets, complying with ASTM C 864, of profile and hardness required to maintain watertight seal.

B. Cellular Elastomeric Preformed Gaskets: Extruded or molded closed cell, integral-skinned neoprene of profile and hardness required to maintain watertight seal; complying with ASTM C 509, Type II; black.

C. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Manufacturers of Preformed Gaskets:

a. D. S. Brown Co.
b. Maloney Precision Products Co.
c. Tremco.

2.8 MISCELLANEOUS GLAZING MATERIALS:

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.

D. Spacers: Neoprene, EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.

E. Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

F. Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, flexible and resilient, with 5-10 psi compression strength for 25-percent deflection.

2.9 GLAZING ACCESSORIES:

A. General: Provide accessories in quantities and at locations as indicated on the Drawings, including all components, templates, etc., required for complete and proper installation which is fully compatible with glazing at locations where accessories occur.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for presence and functioning of weep system; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.3 GLAZING, GENERAL:

A. Comply with combined current printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.

B. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

C. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Clean and trim excess glazing materials from glass, muntins, frames, etc., promptly after installation.

3.4 GLAZING:

A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6-inches from corner, unless otherwise required. Set blocks in thin course of sealant which is acceptable for heel bead use.

B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50-united-inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are used for glazing. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

D. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

E. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers, to prevent sealant from extruding into glass channel weep systems and from adhering to joints back surface as well as to control depth of sealant for optimum performance, unless otherwise indicated.

F. Force sealants into glazing channels to eliminate voids and to ensure complete “wetting” or bond of sealant to glass and channel surfaces.

G. Tool exposed surfaces of sealants to provide a substantial “wash” away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

H. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not “walk” out when installation is subjected to movement.

I. Miter cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent pull away at corners; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

J. Provide cut-outs, where required, install glazing accessories at locations indicated.

3.5 PROTECTION AND CLEANING:

A. Protect glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.

C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

D. Wash glass on both faces not more than 4-days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glass by method recommended by glass manufacturer.

END OF SECTION 08800

SECTION 09250

GYPSUM DRYWALL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 06100 - "Rough Carpentry" (grounds and concealed P.T. blocking)
2. Section 07600 - "Flashing and Sheet Metal"
3. Section 07900 - "Joint Sealers"
4. Section 09900 - "Painting"

1.2 DESCRIPTION OF WORK:

A. Work described in this section includes the following types of gypsum board construction:

1. Steel framing members to receive gypsum board.
2. Gypsum board screw-attached to steel framing and furring members, and to wood framing, where indicated, at no more than 16" o.c.
3. Grid type suspension systems for sloped and horizontal ceiling applications of interior gypsum board products which are not attached directly to primary framing system (if any).
4. Notes:

   a. Extend framing and gypsum board up at fire-rated walls to bottom of fire-rated enclosures above (where occurs) or to roof or floor deck, and mud top edges.
   b. Extend non-rated walls up to bottom of structure.
   c. Extend only that partition framing specifically indicated as not full-height up to finished ceilings and tie-off every 4th stud to structure above.
   d. Completed work in repair and renovation work shall be flush with and to match finish texture to immediately adjacent materials and work.

5. Refer to Section 07210 - "Building Insulation," for any thermal insulation and typical "sound batts".

1.3 DEFINITIONS:

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA 505 for definitions of terms for gypsum board construction not otherwise defined in this section or other referenced standards.

1.4 SUBMITTALS:

A. Submit the following according to Conditions of the Contract and Division 1 Specifications Sections.

1. Current product data and installation instructions from manufacturers for each type of product specified; Six (6) Sets - minimum.

1.5 QUALITY ASSURANCE:

A. Fire-Resistance Ratings:

1. Where indicated, provide materials and construction which are identical with those of assemblies whose fire resistance rating has been determined per ASTM E 119 by a testing and inspecting organization acceptable to authorities having jurisdiction.
2. Provide fire-resistance rated assemblies identical to those indicated by reference to GA File numbers in GA-600 “Fire Resistance Design Manual” or to design designations in U.L. “Fire Resistance Directory” or in listing of other testing agencies acceptable to authorities having jurisdiction.

B. Single Source Responsibility: Obtain all steel framing and all metal trim, and each type of gypsum board and related joint treatment materials from a single manufacturer.

C. Pre-Construction Conference: Prior to beginning work, the Contractor and appropriate subcontractors shall meet to discuss coordination of the work of the trades associated with the installation of suspended acoustical and gypsum board ceiling, suspended mechanical ductwork, suspended light fixtures, etc. This work shall be planned and coordinated to provide hanger attachments needed by the various trades in a manner that will minimize conflict with installation of each component and system.

1.6 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside, under cover, and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

C. When materials are moved into the building, distribute pallets and loads evenly around work areas so as to avoid overloading structure, causing damage to any materials, interfering with work of other trades, etc.

D. Handle gypsum boards to prevent damage to edges, ends and surfaces. Do not bend or otherwise damage metal corner beads, trim, etc.

E. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.7 PROJECT CONDITIONS:

A. Environmental Requirements, General: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840, with gypsum board manufacturer's recommendations, and with adhesive manufacturer's recommendations, for before, during, and after installation.

B. Minimum Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 degrees F.

C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

1.8 SEQUENCING AND SCHEDULING:

A. Properly sequence installation of gypsum board with installation of other work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Steel Framing and Furring:

a. Aegis Metal Framing, LLC
b. ClarkeWestern Building Systems
c. Dale/Incor
d. Dietrich Metal Framing; Div. of Worthington Industries, Inc.
e. Marino/WARE Industries, Corp.
f. SEMCO, Southeastern Metals, Div. of Gibraltar Industries
g. Southeastern Stud & Components, Inc.
h. Steel-Con; Div. of Steel Construction Systems
i. Telling Industries, LLC

2. Grid or Direct Suspension Systems:

a. Armstrong World Industries, Inc.
b. CertainTeed
c. Chicago Metallic Corp.
d. USG Interiors, Inc.; United States Gypsum Company
e. Worthington Industries, Inc.

3. Gypsum Board and Related Products:

    a. CertainTeed
    b. Georgia-Pacific Corp.
    c. Gold Bond Building Products Div., National Gypsum Company
    d. Lafarge Gypsum
    e. United States Gypsum Company

4. Extruded Moldings and Reveal Moldings:

    a. AMICO
    b. Fry Reglet Corporation
    c. Gordan, Inc.
    d. M&M Systems Corporation

2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS:

A. General: Provide components which comply with ASTM C 754 for materials and sizes, unless otherwise indicated.

B. Wires for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.

C. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Steel Studs for Furring Channels: ASTM C 645, with flange edges bent back 90 deg. and doubled over to form 3/16-inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:

1. Thickness: 20 gauge, unless otherwise indicated.
2. Depth: As indicated.
3. Spacing: As indicated in referenced standard and on drawings, but no less than at all edges and 24-inches o.c.

E. Steel Rigid Furring Channels: ASTM C645, hat-shaped, depth of 7/8-inch, and minimum thickness of base (uncoated) metal as follows:

1. Thickness: 20 gauge at interior and 18-gauge at exterior, unless otherwise indicated.
2. Spacing: As indicated in referenced standard and on drawings, but not less than at all edges and 24-inches o.c.

    a. At ceilings and soffits indicated to receive more than a single layer of gypsum board, spacing shall be not less than at all edges and 16-inches o.c.

3. At locations indicated on the Drawings, provide 25 gauge "resilient channels" at spacing indicated, or if not indicated, horizontally and at all edges at no more than 24" o.c.

F. Grid Suspension System: ASTM C 645, manufacturer's standard grid suspension system composed of main beams and cross furring members which interlock to form a modular supporting network.

1. Locations for Use: Provide grid type suspension systems for sloped and horizontal ceiling applications of interior gypsum board products which are not attached directly to primary framing system; Minimum 4-feet x 4-feet grid and cross tees at 2-feet o. c., with minimum installation requirements as required by manufacturer's current written instructions, referenced standards, and as indicated in this Section 09250 and Section 09511 - "Acoustical Panel Ceilings". Provide and comply with manufacturer's published requirements for accessories, trim, and hanger wire, and as otherwise required to provide flat ceilings without deflection or sag.
2. Product/Manufacturer: Provide suspended modular grid furring system equivalent to standard drywall suspension system for flat ceilings, with 1-1/2-inch grid faces, and as follows:

   a. Equivalent to "Drywall Suspension System", as manufactured by USG Interiors, or one of the other above named manufacturers.

2.3 STEEL FRAMING FOR WALLS AND PARTITIONS:

A. Steel Studs and Runners: Provide deflection track at exterior walls and floor-to-floor walls - typical.

1. ASTM C 645, with flange edges bent back 90 deg. and doubled over to form 3/16-inch minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and minimum depth as follows:
2. Metal studs at interior partitions shall be 3-5/8-inches x 20 gauge (362S162-33), 6-inches x 20 gauge (600S162-33), or 8-inches x 18 gauge (800S162-43), at locations indicated on the Drawings, spaced at 16-inches o.c., unless otherwise indicated below, or otherwise shown on drawings or required by project conditions. Stud width shall be 1-5/8-inches unless otherwise indicated.

   a. Provide triple-metal studs at overhead door jambs;
   b. Provide metal studs at no more than 16" o.c. at any load-bearing walls and at walls supporting ramps or similar construction;
   c. Metal stud gauge at these locations (two paragraphs above) shall be as indicated on the Drawings, but in no case less than 18 gauge (800S162-43).

3. Use double studs or 6-inch studs, as indicated or as otherwise required, for chase walls, piping, conduits, or etc.

4. Metal studs at any shaft wall or similar construction shall be type, thickness, depth and configuration indicted, or if not indicated, not less than the studs used in the tested assembly. Minimum thickness of 3-5/8-inch studs shall be 22 gauge, and of 6-inch studs shall be 20 gauge.
5. Any load-bearing studs, if any, shall be at least 6-inches depth x 18 gauge (600S162-43), or 8-inches x 18 gauge (800S162-43), unless heavier gauge is otherwise indicated on Drawings - galvanized C-studs spaced at 16-inches o.c.

B. Track:

1. Bottom Track: Unless otherwise indicated or required by project conditions, fire-ratings, etc., provide manufacturer's standard Deep Leg Tracks, unpunched unless otherwise indicated, of size, shape and gauge indicated, with 1-5/16-inch flange.

2. Deflection Track - Typical at Stud Walls Up To Slab or Similar Fixed Structure at Top of Walls: Provide for no less than 1" of vertical movement, Equivalent to one of the following:

   a. Dietrich Double Track System
   b. Dietrich Track-Over-Track System
   c. Dietrich SLP-TRK slotted track system
   d. Dietrich TR-Series with Spazzer 9200 Bar (SPZD)

3. Special stud tracks for all curved walls shall be equivalent to "Flex-C Trac" galvanized flexible segmented track with slidable side straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK; Phone: (405) 996-5343.
4. Special stud tracks for all arched walls shall be equivalent to "Flex-C Arch" galvanized flexible segmented track with slidable straps, as manufactured by Flex-Ability Concepts, Inc.; Oklahoma City, OK; Phone: (405) 996-5343.

C. Fasteners: Provide fasteners of type, material, size, corrosion resistance, holding power and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum drywall manufacturers for applications indicated.

D. Continuous Horizontal Bridging / Bracing:

1. 1-1/2-inch cold-rolled channels (galvanized).
2. Spacing: 4'-0" or 4'-6" o.c. vertically, through pre-punched slots in studs.
3. Splice Plates: 16 gauge at all splices.
4. Anchors (bridging channels to studs): 1-1/2-inches x 2-inches x 16 gauge clip angle, 1/4-inch less than stud width, secured with four (4) 5/8-inch S-14 screws. (Anchors required at ends of runs, where snap-in fit to stud slots is not snug or allows stud to move/slide on channels, and at studs on each side of splices in bridging channels).

E. Strap Bracing: 1-1/2-inch x 20-gauge galvanized steel, anchored at ends, splices, and each stud with typical framing screws. Placement at curved walls shall align with radius or curve indicated at each such location.

F. Extruded Moldings and Reveal Moldings: Provide manufacturer's standard alloy 6063-T5 extruded units with 70% resin 2-coat "Kynar 500" baked enamel finish, and as follows:

1. Design: Provide shapes and configurations as indicated on the Drawings.

a. Form reveal moldings to cover at least two sides and rear of reveal.
b. At drywall (or plaster) edge, provide continuous expanded metal edge, designed for mudding-in.
c. At ceiling grid edge, provide continuous edge designed for compatibility with lay-in ceiling grid.

2. Color: To match ceiling grid in same room where occurs, unless indicated otherwise, and color as selected by Architect at any exterior locations.

2.4 GYPSUM BOARD:

A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end joints.

B. Gypsum Wallboard: ASTM C 36, and as follows:

1. Type: High-impact abuse resistant; Type X at all locations.
2. Edges: Tapered and featured (rounded or beveled) for prefilling.
3. Thickness: 5/8-inch for general use, except where 1/4-inch layers (at least two layers) may be indicated or required for curved wall or ceiling assemblies.

C. Gypsum Backing Board for Multi-Layer Applications: ASTM C 442 or, where backing board is not available from manufacturer, gypsum wallboard, ASTM C 36, and as follows:

1. Type: High-impact abuse resistant; Type X at all locations.
2. Edges: Manufacturer's standard.
3. Thickness: 5/8-inch.

D. Moisture- and Mold- Resistant Gypsum Board: ASTM C 36, and as follows:

1. Type: Type X, high-impact abuse resistant at all locations; Moisture- and mold-resistant core and facings/surfaces.
2. Edges: Manufacturer's standard.
3. Thickness: 5/8-inch.
4. Locations: At rooms with toilet fixtures and/or service sinks, entire wall behind sinks, and elsewhere only as indicated.
5. Use equivalent to 5/8-inch thick Georgia-Pacific "Dens-Shield" tile backer board with sealed and facing-taped joints, at ceramic and hard tile; ASTM C 1177 or ASTM C 1178.

6. Use “exterior gypsum board” where exposed at any exterior locations; ASTM C 931 or ASTM C 1396.
7. Old style “Green Board” WILL NOT BE ACCEPTABLE FOR ANY USE.

E. Gypsum Sheathing Board with Water-Resistant Core: Gypsum sheathing board consisting of noncombustible gypsum core incorporating a water-resistant material, surfaced on face, back and long edges with water-repellent surface; complying with ASTM C 1177, and requirements indicated below:

1. Type: Type X at all locations.
2. Edge and End Configuration: Square.
3. Thickness: 5/8-inch, unless indicated otherwise on the Drawings.
4. Size: 4’-0” x 8’-0” or 9’-0” as required for coordination with framing.
5. **Note:** Use equivalent to 5/8-inch thick CertainTeed “GlasRoc Sheathing” or Georgia-Pacific “Dens-Glass Gold”, with **sealed and facing-taped joints** at any exterior EIFS systems, stucco systems, and metal siding systems, **only** where plywood or other wood sheathing is not indicated.
6. Cover ALL SHEATHING with air infiltration barrier.

2.5 TRIM ACCESSORIES:

A. Cornerbead and Edge Trim for Interior Installation: Provide corner beads, edge trim and control joints which comply with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal, plastic, or metal combined with paper, with metal complying with the following requirement.

   a. Sheet steel coated with zinc by hot-dip or electrolytic processes, or with aluminum.

2. Edge trim shapes indicated below by reference to designations of Fig. 1 in ASTM C 1047:

   a. “LC” Bead, unless otherwise indicated.
   b. “L” Bead where indicated or required.
   c. “U” Bead where indicated.

3. One-Piece Control Joint: Formed with vee-shaped slot per Fig. 1 in ASTM C 1047, with slot opening covered with removable strip.

2.6 GYPSUM BOARD JOINT TREATMENT MATERIALS:

A. General: Provide materials complying with ASTM C 475, ASTM C 840, and recommendations of manufacturer of both gypsum board and joint treatment materials for the application indicated.

B. Joint Tape: Paper reinforcing tape.

C. Drying-Type Joint Compounds:

1. Factory-prepackaged vinyl-based products complying with the following requirements for formulation and intended use.
2. Ready-Mix Formulation: Factory-premixed product.
3. Taping compound formulated for embedding tape and for first coat over fasteners and flanges of corner beads and edge trim.
4. Topping compound formulated for fill (second) and finish (third) coats.
5. All-purpose compound for use as both taping and topping compound.

D. Setting-Type Joint Compound:

1. Factory-prepackaged, job-mixed, chemical-hardening powder products formulated for uses indicated.
2. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer for this purpose.

2.7 MISCELLANEOUS MATERIALS:

A. General: Provide auxiliary materials for gypsum drywall construction which comply with referenced standards and the recommendations of the manufacturer of the gypsum board.

B. Spot Grout: ASTM C 475, setting-type joint compound of type recommended for spot grouting hollow metal door frames.

C. Fasteners: Type S steel drill screws, 1-inch long unless otherwise required for any shaft wall or any multi-layer application, with corrosion-resistant finish in form of cadmium plating or proprietary coating, and as follows:

1. For attachment of gypsum board panels to light gauge steel framing of less than 0.033 of an inch in thickness (20 gauge), provide steel drill screws complying with ASTM C 1002.
2. For attachment of gypsum board panels, to steel framing from 0.033 (20 gauge) to 0.112 of an inch in thickness, provide steel drill screws complying with ASTM C 954.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance

of drywall. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION FOR METAL SUPPORT SYSTEMS:

A. Ceiling Anchorages:

1. Coordinate installation of ceiling suspension system with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

3.3 INSTALLATION OF STEEL FRAMING, GENERAL:

A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking and bracing at terminations in the work and for support of fixtures, equipment services, heavy trim, cabinets, countertops, shelving, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated and with recommendations of gypsum board manufacturer, or if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

1. Refer to Section 06100 - "Rough Carpentry" for additional information and requirements.
2. Provide additional horizontal framing (flat studs or tracks) at 24-inches o.c. minimum in walls at cabinets and at ends of countertops, and as otherwise required, to assure square corners and flat walls without bowing, warping, etc.

C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations indicated below to comply with details shown on Drawings:

1. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetration of structural elements.
2. Where partition and wall framing abuts overhead structure:

a. Provide slip or cushioned type joints as detailed to attain lateral support and avoid axial loading.
b. Unless framing is specifically indicated to terminate below ceilings, all framing and gypsum board shall extend up to bottom of structure above.

D. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members or as indicated.

3.4 INSTALLATION OF STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS:

A. Suspend ceiling hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
5. Secure hangers to structural support by connecting directly to structure where possible; otherwise, connect to anchorage devices or fasteners as indicated or required.
6. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to steel deck tabs.
8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
9. Do not connect or suspend steel framing from ducts, pipes or conduit.
10. Keep hangers and braces 2-inches clear of ducts, pipes and conduits.
11. Sway-brace suspended steel framing with hangers used for support.
12. Install suspended steel framing components in sizes and at spacing indicated but not less than that required by referenced steel framing installation standard.
13. Installation Tolerances: Install steel framing components for suspended ceilings so that cross furring members or grid suspension members are level to within 1/8-inch in 12 ft. as measured both lengthwise on each member and transversely between parallel members.
14. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross furring members to each other and butt-cut to fit into wall track.
15. Suspension Systems:

    a. Suspend ceiling hangers from building structural members and as follows below, with system leveling tolerance of 1/8 inch in 12'-0".
    b. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss

obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

c. Wire Hangers: 0.1620-inch diameter (8 gauge), 4-feet on center. Install supplementary hangers as necessary at ceiling fixtures to provide a hanger at each corner of each fixture, diffuser, grille, and other ceiling-mounted equipment.

d. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits indicated and as established by referenced standards.

e. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

f. Secure, angle, and rod hangers, (if any) to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for structure to which hangers are attached as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

g. Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.

h. Provide additional hangers as necessary, so that one hanger occurs on each side of lay-in and surface-mounted light fixtures, and at other grid supported equipment, devices, etc.

3.5 INSTALLATION OF STEEL FRAMING FOR WALLS AND PARTITIONS:

A. Install runners (tracks) at floors, ceilings and structural walls and columns, where gypsum drywall stud system abuts other construction.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surface does not vary more than 1/8-inch from plane of faces of adjacent framing.

C. Extend wall and partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. Provide studs up to tie to structure at 4'-0" o.c. minimum, from partitions terminating below ceilings.

D. Install steel studs and furring in sizes and at spacings, indicated but not less than that required by referenced steel framing installation standard.

E. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flange.

F. Install horizontal steel bridging/bracing in all walls, and the additional strap bracing at curved walls as steel framing progresses (refer to Paragraph 2.3 C and D above). Install in compliance with stud manufacturer's recommendations, at spacing indicated.

1. Galvanized steel strap bracing shall be provided continuous at top and bottom runner tracks and at bridging locations at all curved stud walls.

G. Frame door openings to comply with details indicated, with GA-219 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Extend vertical jamb studs (double studs-typical) through suspended ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.

H. Frame openings other than door openings to comply with details indicated, or if none indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required for door heads.

3.6 APPLICATION AND FINISHING OF GYPSUM BOARD, GENERAL:

A. Gypsum Board Application and Finishing Standard: Install and finish gypsum board to comply with ASTM C 840 and GA-216.

B. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 24-inches in alternate courses of board.

C. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which avoids end joints in the central area of each ceiling. Stagger end joints at least 24- inches.

D. Install wall/partitions boards in manner which minimizes the number of end-butt joints or avoids them entirely where possible. At high walls, install boards horizontally with end joints staggered over studs.

E. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16-inch open space between boards. Do not force into place.

F. Locate either edge or end joints over supports, except in horizontal applications where intermediate supports or gypsum board back-blocking is provided behind end joints.

Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

G. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.

H. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cutouts.

I. Spot grout hollow metal door frames for solid core wood doors, hollow metal doors and doors over 32-inches wide. Apply spot grout at each jamb anchor clip just before inserting board into frame.

J. Form control joints and expansion joints at locations indicated, with space between edges of boards, prepared to receive trim accessories.

1. Provide control joints in long partitions and walls at a maximum spacing of 30 feet on center, unless a closer spacing is indicated. Provide control joints in large ceiling areas at a maximum spacing of 50 feet on center in each direction, unless a closer spacing is indicated. Consult with Architect on locations of all control joints prior to beginning work.

K. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except inside double or chase walls which are required to be braced internally.

1. Except where concealed application is required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. area, and may be limited to not less than 75% of full coverage.
2. Fit gypsum board around ducts, pipes, and conduits.
3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4-to-1/2-inch-wide joints to install sealant.
4. Fire-stop around penetrations as required by Codes and authorities having jurisdiction. Refer to Section 07270 for additional information and requirements.

L. Where interior partitions are indicated to extend to the structure above, the drywall shall also extend to the structure with the same number of layers as required below the ceiling.

M. Isolate perimeter of non-load-bearing drywall partitions at structural abutments. Provide 1/4-inch to 1/2-inch space and trim edge with “U” bead edge trim. Seal joints with acoustical sealant.

N. At all interior walls, seal construction at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C 919 and manufacturer’s

recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.

O. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.7 METHODS OF GYPSUM BOARD APPLICATION:

A. Single-layer Application: Install gypsum wallboard as follows:

1. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.
2. On partitions/walls apply gypsum board vertically (parallel to framing), unless otherwise indicated or required for fire or smoke resistive rated assemblies. Provide maximum length panels, to minimize end joints.
3. On partitions/walls 8'-1" or less in height apply gypsum board horizontally (perpendicular to framing); use maximum length sheets possible to minimize end joints.

B. Multi-Layer Application:

1. Install gypsum backing board for base layer and gypsum wallboard for face layer.
2. On ceilings apply base layer(s) prior to base layer application on walls/partitions; apply face layers in same sequence. Offset joints between layers at least 10-inches. Apply base layers at right angles to supports unless otherwise indicated.
3. On partitions/walls apply base layer(s) and face layers vertically (parallel to framing) with joints of base layers over supports and face layer joints offset at least one stud or furring member space from base layer joints.

C. Single-Layer Fastening Methods: Apply gypsum boards to supports as follows:

1. Fasten with screws.

D. Multi-Layer Fastening Methods:

1. Apply base layer(s) of gypsum board and face layer to base layer(s) as follows:
2. Fasten both base layer(s) and face layer separately to supports with screws.

E. Shaft Wall Construction (if any): Install in accordance with gypsum manufacturer's current published tested assembly, utilizing standard or special shaft wall framing in accordance with the assembly tested.

3.8 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Install corner beads at external corners.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.

1. Install "LC" bead where drywall construction is tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install "L" bead where edge trim can only be installed after gypsum board is installed.
3. Install U-type trim where edge is exposed, revealed, gasketed, or sealant-filled (including expansion joints).

D. Install edge trim where indicated on wall panels at juncture with ceilings.

E. Install control joints at locations indicated, or if not indicated, at spacings and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

3.9 FINISHING OF DRYWALL:

A. General: Apply treatment at gypsum board joints (both directions); flanges of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects and elsewhere as required to prepare work for decoration.

B. Prefill open joints and rounded or beveled edges, if any, using setting-type joint compound.

C. Apply joint tape at joints between gypsum boards, except where trim accessories are indicated.

D. Finish interior gypsum wallboard by applying the following joint compounds in 3 coats (not including prefill of openings in base), and sand between coats and after last coat:

1. Embedding and First Coat: Ready-mix drying-type all-purpose or taping compound.
2. Fill (Second) Coat: Ready-mix drying-type all-purpose or topping compound.
3. Finish (Third) Coat: Ready-mix drying-type all-purpose or topping compound.

E. Water-Resistant Gypsum Board and Exterior Gypsum Board: Finish joints between water-resistant backing board with tape and setting-type joint compound to comply with gypsum board manufacturer's written recommendations and installation standards referenced in related sections.

F. Partial Finishing: Omit third coat and sanding on concealed drywall construction which is indicated for drywall finishing, except where finishing is required to achieve fire-resistance rating, sound rating or to act as air or smoke barrier.

3.10 CLEANING AND PROTECTION OF WORK:

A. Promptly remove any joint compound and adhesives and similar residue from adjacent surfaces, as it may occur.

B. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall construction remain without damage or deterioration at time of Substantial Completion.

END OF SECTION 09250

SECTION 09300

TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

B. Related work specified elsewhere includes:

1. Section 03310 - "Concrete"
2. Section 07900 - "Joint Sealers" (sealing expansion joints in tile work)

1.2 DESCRIPTION OF WORK:

A. Definition: Tile includes ceramic surfacing units made from clay or other ceramic materials.

B. Extent of tile work is indicated on drawings and schedules. Provide grout setting bed sloped to floor drains at locations where recessed slabs are indicated.

C. Types of tile work in this section include the following:

1. Porcelain ceramic tile flooring, and glazed wall tile, coved base and trim.

a. Patterns as indicated by the Architect.

3. Stone thresholds, where indicated.

4. Colored grouts.

5. Waterproofing membrane below all tile work in rooms with toilet fixtures, sinks and lavatories, and below tile work at control and expansion joints in width indicated.

D. Chemical Resistant Epoxy grout installation system is required at entire are within Toilet and Shower Rooms, at Janitor's Rooms, at Kitchens, and rooms where food is stored, prepared, cooked, served, and dining areas, where tile is scheduled to occur, and at any exterior tile work.

E. Note that all tile flooring, base, and wall tile specified herein shall be installed with grouted joints, also as specified.

1.3 QUALITY ASSURANCE:

A. Source of Materials: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

B. Installer Qualifications: Engage an experienced installer who has successfully completed tile installations similar in material, design, and extent to that indicated for this Project.

1. Refer to Division 1 Section "Special Conditions", for additional information and minimum experience requirements.

C. Flooring Products: Installation surfaces' co-efficient of friction (slip-resistance), etc., shall be as designed by the manufacturer to comply with published U.S. Justice Department Regulations for the "Americans with Disabilities Act of 1990" (ADA, ADA-AG), ANSI A 117.1, and the "Uniform Federal Accessibility Standards" (UFAS), 1988 Edition; And revisions and amendments thereto.

1. Where this requires any substitution of products specified herein, advise Architect in writing prior to Bid Date, for necessary approvals.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.

B. Shop Drawings: Submit shop drawings indicating tile patterns and locations and widths of control, isolation, contraction and expansion joints in tile surfaces.

C. Samples for Initial Selection Purposes: Submit manufacturer's color charts consisting of actual stone and tiles or sections of tile showing full range of colors, textures and patterns available for each type of tile indicated. Include samples of grout and accessories involving color selection.

D. Samples for Verification Purposes, submit the following upon request by Architect:

1. Samples for each type of tile and for each color and texture required, not less than 12-inches square, on plywood or hardboard backing and grouted.

2. Full size samples for each type of trim, accessory and for each color.

3. 6-inch long samples of stone thresholds.

E. Certification: Furnish Master Grade Certificates for each shipment and type of tile, signed by manufacturer and Installer.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

1. Comply with requirements of ANSI A137.1 for labeling sealed tile packages.

B. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements regarding stored materials.

1.6 PROJECT CONDITIONS:

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at not less than 50 degrees F (10 degrees C) in tiled areas during installation and for 7-days after completion, unless higher temperatures are required by referenced installation standard and/or tile and grout manufacturers' current written instructions and recommendations.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following manufacturers:

1. Manufacturers of Porcelain Ceramic Tile:

a. American Olean Tile Co., Inc.
b. Aztec Ceramics Corp.
c. Cerdisa
d. Crossville Ceramics
e. Dal-Tile Corp.
f. Flor Gres Porcelain Stoneware
g. Mid-State Tile
h. Quamagra Tile, Inc.
i. Summitville Tiles, Inc.
j. Smov
k. United States Ceramic Tile Co.
l. Wenczel Tile Co.
m. Winburn Tile Manufacturing Co.

2. Manufacturers of Latex-Portland Cement Mortars:

    a. American Olean Tile Co., Inc.
    b. Boiardi Products Corp.
    c. Cambridge Tile Mfg. Co.
    d. Custom Building Products.
    e. C-Cure Chemical Co., Inc.
    f. H. B. Fuller Co.
    g. Jamo, Inc.
    h. L & M Surco Mfg., Inc.
    i. Laticrete International, Inc.
    j. Southern Grouts & Mortars, Inc.
    k. Summitville Tiles, Inc.
    l. Syracuse Adhesives Co.
    m. Upco Co. Div., Emhart Corp.
    n. W. R. Bonsal Co.

3. Manufacturers of Organic Adhesives, Type I:

    a. Boiardi Products Corp.
    b. Cambridge Tile Mfg. Co.
    c. Custom Building Products.
    d. C-Cure Chemical Co., Inc.
    e. H. B. Fuller Co.
    f. Jamo, Inc.
    g. L & M Surco Mfg., Inc.
    h. Southern Grouts & Mortars, Inc.
    i. Syracuse Adhesives Co.
    j. Upco Co. Div., Emhart Corp.

4. Manufacturers of Latex-Portland Cement Grouts:

    a. Boiardi Products Corp.
    b. Cambridge Tile Mfg. Co.
    c. Custom Building Products.
    d. C-Cure Chemical Co., Inc.
    e. H. B. Fuller Co.
    f. Jamo, Inc.
    g. L & M Surco Mfg., Inc.
    h. Southern Grouts & Mortars, Inc.
    i. Syracuse Adhesives Co.
    j. Upco Co. Div., Emhart Corp.
    k. W. R. Bonsal Co.

5. Manufacturers of Chemical Resistant Epoxy Grouts:

    a. Atlas Minerals & Chemicals, Inc.
    b. Boiardi Products Corp.
    c. Cambridge Tile Mfg. Co.
    d. C-Cure Chemical Co., Inc.
    e. H. B. Fuller Co.
    f. L & M Surco Mfg., Inc.
    g. Laticrete International, Inc.
    h. Southern Grouts & Mortars, Inc.
    i. Summitville Tiles, Inc.
    j. Syracuse Adhesives Co.
    k. Upco Co. Div., Emhart Corp.

6. Manufacturers of Chemical-Resistant Joint Sealants:

    a. Atlas Minerals and Chemical Co.
    b. Pennwalt Corporation.

7. Manufacturers of Tile Cleaners:

    a. Hillyard Chemical Co.
    b. L & M Surco Mfg. Co., Inc.

2.2 PRODUCTS - GENERAL:

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 “American National Standard Specifications for Ceramic Tile” for types and grades of tile indicated.

    1. Furnish tile complying with “Standard Grade” requirements unless otherwise indicated.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with products and materials indicated for setting and grouting.

C. Colors, Textures and Patterns: For tile, grout and other products requiring selection of colors, surface textures or other appearance characteristics, provide products to match characteristics indicated or, if not otherwise indicated, as selected by Architect from manufacturer’s standards.

    1. Provide tile trim and accessories which match color and finish of adjoining flat tile.

D. Mounting: Where factory-mounted tile is required provide back or edge-mounted tile assemblies as standard with manufacturer unless another mounting method is indicated.

1. Where tile is indicated for installation, on exteriors or in wet areas, do not use back or edge-mounted tile assemblies unless tile manufacturer specifies that this type of mounting is suitable for these kinds of use and has been successfully used on other projects.

2.3 CERAMIC TILE PRODUCTS:

A. Unglazed Quarry Tile (if any): Provide square-edged flat tile complying with the following requirements;

1. Wearing Surface: Abrasive embedded in surface where slip-resistant tile is indicated or required by Code or referenced standards; Non-abrasive elsewhere.

2. Nominal Facial Dimensions: 12-inches x 12-inches, unless indicated otherwise on Drawings.

3. Nominal Thickness: 1/2-inches.

4. Face: Plain.

5. Base Trim: 6-inches high x 12-inches wide x 1/2-inches thick, coved, and to align with joints in adjoining flat tile unless not practical or approved otherwise.

6. Provide with removable coating, to remain until grouting is complete and to be removed prior to application of filler/sealer.

B. Trim Units: Provide tile trim units, if indicated, to match characteristics of adjoining flat tile and to comply with following requirements; to match existing:

1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile, where applicable.

2. Shapes (if any): As follows, selected from manufacturer's standard shapes:

a. Base for Portland Cement Mortar and thinset Mortar Installations: Coved.

b. Wainscot Cap for Portland Cement Mortar Installations: Bullnose cap.

c. Wainscot Cap for Thinset Mortar Installations: Surface bullnose.

d. External Corners for Portland Cement Mortar Installations: Bullnose shape with a radius of not less than 3/4-inch unless otherwise indicated.

e. External Corners for Thinset Installations: Surface bullnose.

3. Colors: Colors will be selected by Architect from manufacturer's full line of standard colors, after Bid Date.

2.4 STONE THRESHOLDS:

A. General: Provide stone which is uniform in color and finish, fabricated to sizes and profiles indicated or required to provide transition between tile surfaces and adjoining finished floor surfaces.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and abrasion resistance for uses subject to heavy foot traffic.

1. Color shall be white, if not indicated on drawings.

2. Provide white, honed marble complying with MIA Group "A" requirements for soundness, where indicated to be white.

3. Size: 2-inches wide x 1-inch thick (nominal) with beveled exposed edges, unless otherwise indicated or required.

a. Provide heavy duty wide thresholds at interior doors and wall openings leading into kitchen and serving areas and related/contiguous offices, storage rooms, utility rooms, etc., and where mobile equipment and hand trucks may pass over. Size: 5-inches wide x 1-1/4-inch thick (nominal), with beveled exposed edges.

2.5 SETTING MATERIALS:

A. Portland Cement Mortar Installation Materials: Provide materials to comply with ANSI A108.1 as required for installation method designated, unless otherwise indicated.

B. Latex-Portland Cement Mortar: Provide product complying with ANSI A118.4 and the following requirement for composition:

1. Latex additive (water emulsion) of type described below, serving as a replacement for part or all of gauging water, added at job site to prepackaged dry mortar mix supplied or specified by latex manufacturer.

a. Latex Type: Acrylic resin.

C. Organic Adhesive: Provide product complying with ANSI A136.1 for Type I.

2.6 GROUTING MATERIALS:

A. Latex-Portland Cement Grout: Provide product complying with ANSI A118.6 for the following composition and of color indicated:

1. Latex additive (water emulsion) serving as a replacement for part or all of gauging water, added at job site to prepackaged dry grout mix, with type of latex and dry grout mix complying with requirements indicated below:

    a. Latex Type: Acrylic resin.

    b. Grout Type: Commercial portland cement grout specified or supplied by latex manufacturer.

B. Chemical Resistant Epoxy Grout: Provide product complying with ANSI A118.3 of color indicated.

1. Provide product with resistance to temperatures up to 300 degrees F (149 degrees C), certified by grout manufacturer for intended use.

2. Locations: All floor, base, and wall tile work within Toilet Rooms, at Janitor's Rooms, at rooms where food is stored, prepared and/or cooked, and at exterior tile work.

2.7 MISCELLANEOUS MATERIALS:

A. Filler/Sealer for Quarry Tile: Proprietary product designed for filling quarry tile to prevent staining.

B. Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation, 112 North Alfred Street, Alexandria, VA 22134 or Ceramic Tile Institute, 700 North Virgil Avenue, Los Angeles, CA 90029.

C. Waterproofing Membrane: Equivalent to "ECB Anti-Fracture Membrane", as manufactured by NAC Products, Inc.; Cuyahoga Falls, Ohio (Phone: 1-800-633-4622).

1. Provide complete system, including substrate primer/sealer, 40-mil, two component, self-adhering membrane, and appropriate top-coat primer for the material(s) to be placed over the ECB system.

2. Locations for Use:

    a. Below all tile flooring in rooms with toilet fixtures, sinks, and lavatories, turned up 1-inch at all edges and concealed by base material, and turned down at least 2-inches into floor drains.
    b. Below tile flooring and centered over control and expansion joints, in rooms other than above, 12-inches wide and wall to wall.

3. Completed membrane system is intended for waterproofing, and to bridge substrate joints within the limitations stated in manufacturer's current written product data.

2.8 MIXING MORTARS AND GROUT:

A. Mix mortars and grouts to comply with requirements of referenced standards and manufacturers for accurately proportioning of materials, water or additive content, mixing equipment and mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

1. Verify that substrates for setting tile are firm, dry, clean, and free from oil or waxy films and curing or cleaning compounds.

2. Verify that installation of all required grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

B. Do not proceed with installation until unsatisfactory conditions and incomplete work have been corrected.

3.2 INSTALLATION, GENERAL:

A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile."

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.

C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.

1. For tile mounted in sheets make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

F. Expansion Joints: Locate expansion joints and other sealant filled joints, including control, contraction and isolation joints, where indicated, or if not indicated, at spacings and locations recommended in TCA "Handbook for Ceramic Tile Installation," and approved by Architect. Do not saw cut joints.

1. Sealing of joints is specified in Section 07900 - "Joint Sealers."

2. Provide expansion joints in tile and setting beds directly above all unsealed and unbridged expansion joints, control joints, construction joints, cold joints and saw-cut control joints in the building structure; and where tile work abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes, ceilings, and where changes occur in backing materials. Expansion joints shall be provided as follows:

a. Floor Tile: Minimum 1/4-inch joint width; joints 36-feet o.c. maximum.

3. Joints in tile and setting materials directly over any unsealed and unbridged structural joints shall never be narrower than the width of the structural joint. Joints over saw-cut control joints shall never be less than the width of the saw-cut joint width. Preparation and installation shall be as required for expansion joints.

4. To insure that locations of any unsealed and unbridged joints in tile work align with existing joints in substrates, joints in tile work shall be constructed during installation of mortar beds and/or tile, rather than saw-cutting joints after installation.

5. Keep expansion joint cavities open and free of dirt, debris, grout, mortar and setting materials.

6. Set compressible back-up strip when mortar is placed or utilize removable wood strip to provide space for back-up after mortar has cured.

7. Install sealant after tile work and grout are dry.

G. Grout tile to comply with the requirements of the following installation standards:

1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts) comply with ANSI A108.10.

2. For chemical resistant epoxy grouts comply with ANSI A108.6.

3.3 FLOOR INSTALLATION METHODS:

A. Quarry Tile: Install tile to comply with requirements indicated below for setting bed method, TCA installation method related to type of subfloor construction, and grout type:

1. Portland Cement Mortar: ANSI A108.1.

2. Bond Coat: Portland cement paste on plastic bed or the following thin-set mortar on cured bed, ANSI A108.5, at Contractor's option:

a. Latex-portland cement mortar.

3. Concrete Subfloor, Interior: TCA F111 or F121.

4. Concrete Subfloor, Interior: TCA F112 (bonded).

5. Concrete Subfloor, Interior: TCA F114 (with epoxy chemical resistant resin grout).

6. Grout:

a. Latex-portland cement (ANSI 108.10).

b. Chemical resistant epoxy (ANSI 108.6).

7. Grout - Locations for Use:

a. Latex-portland cement, (interior).

b. Epoxy (exterior, and where indicated at interior).

B. Ceramic Tile: Install tile to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction, and grout types:

1. Portland Cement Mortar: ANSI A108.1.

2. Bond Coat: Portland cement paste on plastic bed or the following thin-set mortar on cured bed or concrete slabs, ANSI A108.5, at Contractors option:

a. Latex-portland cement mortar.

3. Concrete Subfloors, Interior: TCA F112 (bonded).

4. Concrete Subfloors, Interior: TCA F114 (with chemical resistant epoxy grout).

5. Grout:

a. Latex-portland cement (interior).

b. Chemical Resistant Epoxy: ANSI 108.6.

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent non-tile floor finish.

3.4 WALL TILE AND TRIM INSTALLATION METHODS:

A. Install types of tile designated for wall application to comply with requirements indicated below for setting bed methods, TCA installation methods related to subsurface wall conditions, and grout types:

1. Portland Cement Mortar: ANSI A108.1.

a. Masonry or Concrete, Interior: TCA W211 (bonded).

b. Grout: Sand-portland cement (ANSI 108.10), except chemical resistant epoxy (ANSI 118.3) at toilet rooms.

c. Location: Quarry tile bases at locations indicated on Drawings, and otherwise as applicable at conditions required by actual project conditions.

2. Organic Adhesive: ANSI A108.4.

a. Solid Backing, Interior: TCA W223.

b. Grout: Latex-portland cement, (ANSI 108.10), except chemical resistant epoxy (ANSI 118.3) at toilet rooms.

3.5 CLEANING AND PROTECTION - TILE WORK:

A. Cleaning: Upon completion of placement and grouting, clean all new and adjacent existing tile surfaces so they are free of foreign matter.

1. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but no sooner than 14-days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

2. Remove temporary protective wax coating from quarry tile, using methods recommended by manufacturers of tile and grout.

    a. Apply quarry tile filler to clean, dry quarry tile in compliance with filler manufacturer's directions. Repeat application as necessary to obtain uniform color in appearance of both tile and grout.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.

C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage and wear.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with draft paper or other heavy covering during construction period to prevent staining, damage, and wear.

2. Prohibit foot and wheel traffic from using tiled floors for at least 7-days after grouting is completed.

3. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09300

SECTION 09511

ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 07900 - "Joint Sealers"
2. Division 15 - (Mechanical items, etc., mounted in ceilings).
3. Division 16 - (Electrical items, light fixtures, etc., mounted in ceilings).

1.2 SUMMARY:

A. This Section includes acoustical and non-acoustical panel ceilings installed with exposed grid suspension systems - where any new lay-in ceilings are indicated.

1. Type 1 (ACT-1): Angled tegular acoustical panel system in Standard Finish Grid (Acoustical panels), 2x4

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of product specified.
2. Samples for verification purposes of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.

a. 6-inch-square samples of each acoustical panel type, pattern, and color.
b. Set of 12-inch-long samples of exposed suspension system members, including grid, moldings, trim, etc., for each color and system type required.

1.4 QUALITY ASSURANCE:

A. Installer Qualifications: Engage an experienced Installer who has successfully completed acoustical ceilings similar in material, design, and extent to those indicated for Project, and which is acceptable to manufacturer of acoustical products herein, as indicated by written statement by their manufacturer(s).

1. Refer to Section 01015 - "Special Conditions", for additional experience requirements and information.

B. Fire-Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.

1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.

a. Flame Spread: 25 or less.
b. Smoke Developed: 50 or less.

C. Acoustical Performance Characteristics: Provide acoustical ceiling systems which have been tested by UL or other acceptable independent testing organization, to certify compliance with STC and CAC minimum requirements indicated herein.

D. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

E. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, and wall and partition systems.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS:

A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.7 EXTRA MATERIAL:

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.

1. Acoustical and Non-Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed, in whole unused cartons.

PART 2 - PRODUCTS

2.1 ACOUSTICAL CEILING UNITS, GENERAL:

A. Standard for Acoustical Ceiling Units: Provide manufacturer's standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches [400 mm] away from the test surface) per ASTM E 795.

B. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type, or if not indicated, as selected by Architect from manufacturer's standard colors, surface textures, and patterns available for ceiling panels and exposed metal suspension systems of quality indicated herein.

2.2 ACOUSTICAL UNITS:

A. Type 1 (ACT-1): Manufacturer's standard lay-in non-directional random pattern, lightly fissured, heavily perforated panels, and as follows, unless indicated otherwise:

1. Manufacturer/Product: Armstrong #1729
2. Size: 24 inches x 48 inches x 5/8 inch.
3. Edge: Angled Tegular.
4. NRC Range: .55.
5. CAC Range: 35.
7. Color: White
8. Light Reflectance: No less than 0.85
9. Grid: Standard hot-dipped galvanized steel in white color to match ceiling tile; 15/16-inch exposed tee grid."

2.3 METAL SUSPENSION SYSTEMS, GENERAL:

A. Standard for Metal Suspension Systems: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated, unless otherwise required.

1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

a. Product/Manufacturer: Galvanized, aluminum capped grid.

1) "Environmental ZXLA Grid System," as manufactured by USG Interiors or Donn.
2) "Prelude Plus" Environmental Tee System, as manufactured by Armstrong World Industries, Inc.
3) "Protectone" Series, as manufactured by CertainTeed.

C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper, pre-stretched.

1. Gauge: Provide wire sized to that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct-Hung), will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12 gauge).

E. Hanger Rods - (as required): Mild steel, zinc coated, or protected with rust-inhibitive paint.

F. Angle Hangers - (as required): Angles with legs not less than 7/8 inch wide, formed with 0.0365-inch-thick galvanized steel sheet complying with ASTM A 446, Coating Designation G90, with bolted connections and 5/16-inch-diameter bolts.

G. Edge Moldings and Trim: Metal or extruded aluminum of types and profiles indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit type of edge detail and suspension system indicated.

H. Subject to compliance with requirements, provide suspension systems of one of the following:

1. Manufacturers of Steel Exposed Suspension Systems:

a. Same as ceiling panel unit manufacturer.
b. Armstrong World Industries, Inc.
c. CertainTeed.
d. Chicago Metallic Corporation.
e. Donn Corporation.

2. Manufacturers of Moldings and Trim:

a. Construction Specialties.
b. Fry Reglet Corporation.
c. Gordon, Inc.
d. MM Systems.
e. Technical Ceiling Systems, Inc.
f. Same as Suspension system manufacturer.

2.4 NON-FIRE-RESISTANCE-RATED DIRECT-HUNG SUSPENSION SYSTEMS:

A. Wide-Face Capped Double-Web Steel Suspension System: Main and cross-runners roll-formed from prepainted or electrolytic zinc-coated cold-rolled steel sheet, with prefinished 15/16-inch-wide metal caps on flanges; other characteristics as follows:

1. Structural Classification: Intermediate-Duty System.
2. End Condition of Cross-Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
3. Cap Material and Finish:

a. Steel sheet, painted (typical).
b. Aluminum sheet with painted finish, (at "Environmental Grid Systems").

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors, or supports, whose installation is specified in other sections.

1. Furnish galvanized inserts and similar devices as required for wood structure (if required), to other trades for installation well in advance of time needed for coordination of other work.

B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half-width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION:

A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's current written instructions and CISCA "Ceiling Systems Handbook."

1. Standard for Installation of Ceiling Suspension Systems: Comply with ASTM C 636.

B. Arrange acoustical units and orient directionally patterned units, (if any) in a manner shown by reflected ceiling plans.

1. Install panels with pattern running in one direction, as indicated, or if not indicated, as requested from and directed by Architect.

C. Suspend ceiling hangers from building structural members and as follows, with system leveling tolerance of 1/8 inch in 12'-0":

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
4. Secure, angle, and rod hangers, (if any) to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices that are secure and appropriate for structure to which hangers are attached as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
5. Space hangers not more than 4'-0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.

    a. Provide additional hangers as necessary, so that one hanger occurs on each side of lay-in and surface-mounted light fixtures, and at other grid supported equipment, devices, etc.

6. Install "high humidity finish" systems at all areas indicated to receive lay-in vinyl-faced gypsum "non-acoustical" ceiling panels.

D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical units.

1. Screw-attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.

3.4 CLEANING:

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.5 EXTRA MATERIALS:

A. Deliver extra materials stock as indicated above, to Owner.

END OF SSECTION 09511

SECTION 09650

RESILIENT FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. Related work specified elsewhere includes:

.. Section 01045 - "Cutting and Patching"
.. Section 03310 - "Concrete"
.. Section 07900 - "Joint Sealers"

1.2 DESCRIPTION OF WORK:

A. Extent of resilient flooring and accessories is shown on drawings and in schedules, including in part, the following:

1. Vinyl Composition Floor Tile.

2. Rubber Base.

3. Preparation at areas to receive resilient flooring, including any necessary cleaning, and leveling and/or patching.

1.3 QUALITY ASSURANCE:

A. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

B. Fire Test Performance: Provide resilient flooring which complies with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1. Critical Radiant Flux (CRF): Not less than the following rating per ASTM E 648.

a. 0.45 watts per sq. cm.

2. Flame Spread: Not more than 75 per ASTM E 84.

3. Smoke Developed: Not more than 450 per ASTM E 84.

C. Flooring/Walkway Products: Installation, surfaces' co-efficient of friction (slip-resistance), etc., shall be as designed by the manufacturer to comply with published U.S. Justice Department Regulations for the "Americans with Disabilities Act of 1990" (ADA; ADA-AG), ANSI A117.1, and the "Uniform Federal Accessibility Standards" (UFAS), 1988 Edition; And revisions and amendments thereto.

1. Where this requires any substitution of products specified herein, advise Architect in writing prior to Bid Date, for necessary approvals.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data and color selections for each type of resilient flooring and accessory.

B. Maintenance Instructions: Submit 3 copies of manufacturer's recommended maintenance practices for each type of resilient flooring and accessory required.

1.5 PROJECT CONDITIONS:

A. Maintain minimum temperature of 65^{O}F (18^{O}C) in spaces to receive resilient flooring for at least 48-hours prior to installation, during installation, and for not less than 48-hours after installation. Store resilient flooring materials in spaces where they will be installed for at least 48-hours before beginning installation. Subsequently, maintain minimum temperature of 55^{O}F (13^{O}C) in areas where work is completed.

B. Install resilient flooring and accessories after other finishing operations, including painting, have been completed. Do not install resilient flooring over concrete slabs until the latter have been cured and are sufficiently dry to achieve bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture test.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Manufacturers of Vinyl Composition Tile:

a. Armstrong World Industries, Inc.

2. Manufacturers of Rubber Wall Base:

a. Johnsonite, Inc.

2.2 RESILIENT FLOORING COLORS AND PATTERNS:

A. Provide color and patterns as indicated, or if not otherwise indicated, as selected by Architect from manufacturer's standards.

B. Vinyl Composition Tile - (VCT): 12x12 unless otherwise indicated, and as follows:

1. Composition 1 - asbestos-free.

2. Gauge/Thickness: 5/32-inch.

3. Product Description: Standard thru-color products from named acceptable manufacturers' full line of solid and patterned products will be selected, equivalent to and not to exceed the following standard product/designs available from Armstrong World Industries, Inc.:

a. Type 1 (VCT-1): Color to be selected by Architect.

2.3 ACCESSORIES:

A. Rubber Wall Base: Provide rubber base complying with FS SS-W-40, with matching end stops and preformed or molded corner units, and as follows:

1. Wall Base: ASTM F 1861.

2. Type (Material Requirement): TS (rubber, vulcanized thermoset) or TP (rubber, thermoplastic).

3. Group (Manufacturing Method): I (solid).

4. Style: Cove (with top-set toe).

5. Minimum Thickness: 0.125 inch (3.2 mm).

6. Height: Height: 6", unless indicated otherwise on the Drawings.

7. Lengths: Cut lengths 48 inches (1219 mm) long, or coils in manufacturer's standard length.

8. Outside Corners: Premolded.

9. Inside Corners: Premolded.

10. Surface: Smooth.

11. Color: As indicated on the Drawings, or if not indicated, as selected by Architect from manufacturer's full line of products available.

B. Resilient Edge Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, as selected for condition at adjoining other floor surface material and a flush or "tapered" transition, color to match flooring, or as selected by Architect from standard colors available; not less than 1" wide.

1. Locate below door (if in closed position) and similarly at cased openings, at continuous VCT and at every edge of VCT, except as indicated below.

2. Omit accent strip at doorways where carpet strip, marble threshold, aluminum or other threshold is scheduled, indicated, or otherwise required.

C. Adhesives (Cements): Waterproof, stabilized type as recommended by flooring manufacturer to suit material and substrate conditions.

D. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

E. Leveling and Patching Compounds: Latex type as recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Require Installer to inspect subfloor surfaces to determine that they are satisfactory. A satisfactory subfloor surface is defined as one that is smooth and free from cracks, holes, ridges, coatings preventing adhesive bond, and other defects impairing performance or appearance.

B. Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing compounds.

C. Do not allow resilient flooring work to proceed until subfloor surfaces are satisfactory.

3.2 PREPARATION:

A. Prepare subfloor surfaces as follows:

1. Use leveling and patching compounds as recommended by resilient flooring manufacturer for filling small cracks, holes and depressions in subfloors.

2. Broom clean or vacuum surfaces to be covered, and inspect subfloor.

B. Apply concrete slab primer, if recommended by flooring manufacturer, prior to application of adhesive. Apply in compliance with manufacturer's directions.

3.3 INSTALLATION - GENERAL:

A. Install resilient flooring using method indicated in strict compliance with manufacturer's current printed instructions and recommendations. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.

1. Install resilient edge strips as resilient flooring work progresses.

B. Scribe, cut, and fit resilient flooring to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

C. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.

D. Install resilient flooring on covers for telephone and electrical ducts, and similar items occurring within finished floor areas, if any. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly cement edges to perimeter of floor around covers and to covers.

E. Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections. Hand roll resilient flooring at perimeter of each covered area to assure adhesion.

3.4 INSTALLATION OF TILE FLOORS:

A. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room area of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

B. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.

1. Lay tile with grain, if any, running in one direction, as indicated, or if not indicated, as requested by Contractor from and then as directed by Architect.

C. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.

D. When requested by Architect, provide borders and patterns using patterned tile selected from the tile specified herein.

3.5 CLEANING AND PROTECTION:

A. Perform following operations immediately upon completion of resilient flooring:

1. Sweep or vacuum floor thoroughly.

2. Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well-sealed in adhesive.

3. Damp-mop floor being careful to remove black marks and excessive soil.

4. Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturers.

B. Advise Contractor on appropriate protection of flooring against damage during construction period and to comply with resilient flooring manufacturer's current written directions and recommendations.

1. Apply protective floor polish to resilient flooring surfaces free from soil, excess adhesive or surface blemishes. Use commercially available, metal, cross-linked acrylic product acceptable to resilient flooring manufacturer.

a. Coordinate selection of floor polish with Owner and/or their maintenance service.

2. Protect resilient flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishings across floors.

3. Cover resilient flooring with undyed, untreated building paper until inspection for substantial completion.

3.6 EXTRA STOCK:

A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

1. Tile Flooring: Furnish not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern and size installed.

END OF SECTION 09650

SECTION 09680

CARPET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the contract including General and Supplementary conditions and Division 1 Specifications sections, apply to work of this section.

B. Rubber base to be provided under the work of this Section 09680 for use with carpet, where scheduled, shall be same as specified in Section 09650 – "Resilient Flooring."

1.2 DESCRIPTION OF WORK:

A. The extent of each type of carpeting is indicated on the drawings, finish schedule, and by specifications and is defined to include carpet, and accessories.

B. Each type of required carpet and carpet tile is specified on the Drawings.

C. The work of this Section shall include cleaning and preparation of substrates to comply with current written instructions and recommendations of carpet manufacturer and warranty requirements.

1.3 QUALITY ASSURANCE:

A. Installer: Firm with not less than **five (5) verifiable years** of carpeting experience, similar to work of this section.

1. All installation shall be performed by or under direct full-time supervision of the Installer's foreman or superintendent.
2. Refer to Section 01015 – "Special Conditions" for additional information and minimum experience requirements.

B. Manufacturer: Firm (Carpet Mill) with not less than five (5) years of production experience with carpet similar to types specified in this section, and whose published product literature clearly indicates compliance of products with requirements of this section.

C. General Standard: "Carpet Specifier's Handbook" by the Carpet and Rug Institute; comply with recommendations which can be reasonably applied to types of carpeting work required.

D. Maintenance Materials: Deliver specified overrun and usable scraps of carpet to Owner's designated storage space, properly packaged (paper wrapped) and identified.

E. Flame/Smoke Resistance Standards: Carpet must comply with the following minimum test standards:

1. Floor Radiant Panel Test: ASTM E 648; Class I; FRPT Rating 0.45 watts/sq. cm. or greater.
2. Smoke Density Test: ASTM E 662; Smoke developed: 450 or less.

F. Flooring/Walkway Products: Products and installation, surfaces' co-efficient of friction (slip-resistance), etc., under the work of this Section shall be in compliance with the more stringent of applicable provisions of the following; And revisions and amendments thereto:

1. Americans With Disabilities Act of 1990 (ADA) "Accessibility Guidelines" (ADA-AG).
2. "2010 ADA Standards for Accessible Design", Published in the Federal Register September 15, 2010.
3. American National Standards Institute (ANSI), ANSI A 117.1, 2003.
4. "Uniform Federal Accessibility Standards" (UFAS);
5. International Building Code, either the latest edition or latest adopted edition of the locality as applicable at the project locale.
6. Where this requires any substitution of products specified herein, advise Architect in writing prior to Bid Date, for necessary approvals.

1.4 APPROVAL OF PRODUCT SUBSTITUTIONS:

A. Submit 18" x 18" samples and complete product data to Architect a minimum of ten (10) days prior to original bid date, and subsequently accepted in writing or by addendum. Samples being submitted shall meet all specifications for the products as indicated on the Drawings, including pattern, color, yarn type, construction, texture, appearance, etc., as judged solely by the Architect.

1. Refer to Section 01015 – "Special Conditions" for additional information and requirements regarding submittals and substitutions.
2. Carpet and/or carpet tile specified is available through numerous suppliers, and approval of substitutions is not anticipated.

1.5 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Product Data: For each type of carpet material and installation accessory required. Submit written data on physical characteristics, durability, resistance to fading, and flame resistance characteristics.

C. Shop Drawings: Show layout and seaming diagrams. Indicate pile or pattern direction and locations and types of edge strips. Indicate columns, doorways, enclosing walls or

partitions, built-in cabinets, and locations where cutouts are required in carpet. Show installation details at special conditions.

D. Samples For Verification Purposes: Manufacturer's standard size, showing full range of color, texture, and pattern variations expected. Prepare samples from same material to be used for the Work. Submit the following:

1. 12-inch square samples of each type of carpet.
2. 12-inch long samples of each type of exposed edge stripping, rubber base, and each type accessory intended for use.

E. Sample Warranties for each product.

1.6 WARRANTY:

A. Provide special joint and severable project warranty, signed by the Contractor, Installer and Manufacturer (Carpet Mill), agreeing to repair or replace defective materials and workmanship of carpeting work during a **1 year** warranty period following project Substantial Completion. Attach copies of product warranties.

1. Provide manufacturers standard commercial warranties on all carpet and/or carpet tile;. Lifetime warranties where available, or where not available at least manufacturer's standard **10-year** commercial carpet, delamination, edge ravel and wear warranties.

B. Warranties under this Section 09680 are in addition to and shall run concurrently with any other warranties required by this project's Contract Documents, and shall not serve as any limitations of the rights of the Owner within the provisions of the Contract Documents or otherwise.

1.7 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.

B. Store materials in original undamaged packages and containers, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, blocked off ground. Maintain minimum temperature of 68 deg F (20 deg C) at least three days prior to and during installation in area where materials are stored.

C. Refer to Division 1 Sections "Summary of Work" and "Special Conditions" for additional information and requirements for stored materials.

1.8 PROJECT CONDITIONS:

A. Substrate Moisture Conditions: No condensation within 48 hours on underside of 4-foot by 4-foot polyethylene sheet, fully taped at perimeter to substrate.

B. Substrate Conditions: pH of 9 or less when substrate wetted with potable water and pHydrion paper applied.

C. Number of tests as required by carpet manufacturer and for warranty, but no less than one of each test above per 1,000 square feet or fraction thereof of floor area to be carpeted, with at least one test per room.

D. Do not begin preparation or leveling of substrate or install carpet until substrate conditions comply with requirements indicated, and as otherwise required by carpet manufacturer and for warranty.

PART 2 - PRODUCTS

2.1 CARPET:

A. Manufacturer: Shaw Contract Group
Style: to be determined
Color: to be determined

B. Provide all carpet with anti-soil, anti-microbial and anti-static treatments.

C. Maintenance Stock: Deliver 5% of each type and color of carpet tile, increased as necessary so as to provide stock in whole cartons of each tile, to Owner's designated storage area.

2.2 CARPET ACCESSORIES:

A. Carpet Edge Guard, Non-metallic: Extruded or molded heavy duty vinyl or rubber carpet edge guard of size and profile indicated. Colors selected by Architect from among standard colors available within the industry (any manufacturer).

1. Minimum 2-inch wide anchorage flange.

B. Installation Adhesive (releasable adhesive): As indicated on attached Drawings, or if not indicated, water-resistant type as recommended by carpet manufacturer, and which complies with flammability requirements for installed carpet. Adhesive shall be 100% non-toxic.

C. Seaming Cement: Special seaming sealer is to be used to seal each seam of the carpeting together to form properly aligned secure seams, and to prevent pile loss at seams. Seam sealer manufactured and/or recommended by the carpet manufacturer is to be used.

1. Provide special seaming tape as required per manufacturer's instructions.

D. Miscellaneous Materials: As recommended by manufacturer of carpet and other carpeting products; and selected by Installer to meet project circumstances and requirements.

E. Cementitious Topping: ARDEX K-15, and ARDEX P-51 Primer, or ARDEX Feather Edge System, as manufactured by Ardex, Inc.; Corapolis, PA. (Phone: 412-264-4240), or pre-approved equivalent.

2.3 EXTRA STOCK:

A. Deliver stock of maintenance materials to Owner. Furnish maintenance materials from same manufactured lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

1. Carpet Tile Flooring: Furnish not less than 5% for each type, color, pattern and size installed, in whole unused boxes/cartons.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS:

A. Installer must examine substrates for moisture content and other conditions under which carpeting is to be installed, including the temperature of the area that the carpet is to be installed in, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Sequence carpeting with other work so far as to minimize the possibility of damage and soiling of carpet during remainder of construction period.

C. Rope off areas where floor covering is being installed to restrict from pedestrian traffic and to prevent heavy items from being moved across or stored on areas where floor covering is being installed or has been installed. Clearly mark with signs (i.e.: police crime ribbon, “Keep Out,” etc.).

D. If heavy machinery, equipment, or dollies loaded with materials are to be rolled across where floor covering is installed, 1/2-inch plywood must be used to form a road or path to roll or move items across floor covering, so as not to cause delamination or wrinkles in floor covering.

E. Install cementitious topping on cured primer, both in accordance with manufacturer’s written recommendations, at the edges of other floor surfaces adjacent to carpet, at least 18 inches wide from “zero” feathered edge sloped up to adjacent flooring material to raise top of installed carpet 1/8-inch above other flooring surface.

3.2 INSTALLATION:

A. All Areas - Direct Glue Down Installation:

1. Installation is to be special direct glue down for all areas (or "peel-and-stick" if indicated for any carpet tile).

   a. Comply with manufacturers' current written instructions and recommendations for seam locations and directions of carpet; maintain uniformity of direction and lay of pile.
   b. Center seams under doors, with doors in closed position. Do not place seams in traffic direction at doorways.
   c. Do not bridge building expansion joints with continuous carpet.

2. Extend carpet under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.

3. Provide cutouts where required and seal edges. Also, bind cut edges which are not concealed by protective edge guards or overlapping flanges.

4. Install carpet edge guard where edge of carpet is exposed. Securely anchor guards to substrate.

5. Fit sections of carpet into each space prior to application of adhesive. Trim edges and butt cuts with seaming cement, and use special seaming tape as recommended by carpet manufacturer and/or sewing seams, at all seams, so as to provide sufficient strength for stretching and continued stresses during life of carpet.

6. Apply adhesive uniformly to substrate in accordance with manufacturers' instructions. Butt carpet edges tightly together to form seams without gaps. Roll lightly to eliminate air pockets and ensure uniform bond. Remove adhesive promptly from face of carpet and any adjacent surfaces.

7. Restrict from traffic for at least twenty-four (24) hours after installation.

3.3 CLEANING AND PROTECTION:

A. Remove debris daily, after sorting pieces to be saved from scraps to be disposed of, and legally dispose of off site.

B. Remove any excess or exposed adhesive from carpet surface with manufacturer's recommended cleaning agent.

C. Remove soil and spots and replace carpet where cannot be removed.

D. Remove protruding face yarn, where no visible damage or pile loss will occur as a result, and replace carpet where visible damage or pile loss occurs.

E. Vacuum carpet using commercial machine with facebeater element.

3.4 PROTECTION:

A. Advise General Contractor of final protection and how to maintain conditions, in a manner acceptable to manufacturer and installer, to ensure carpet is not damaged or deteriorated at time of Substantial Completion.

B. Advise General Contractor not to allow any construction trades to apply any adhesive, tape or make markings on carpet.

3.5 CARPET TYPES:

A. Refer to the Drawings.

END OF SECTION 09680

SECTION 09900

PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to this section.

1.2 SUMMARY:

A. This Section includes surface preparation, painting, and finishing of exposed interior items and surfaces, except where noted otherwise.

1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.

B. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.

1. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
2. Pipe identification tags end markers or bands, direction of flow arrows, voltage identification, etc., if any, are provided under Division 15 - "Mechanical", and Division 16 - "Electrical."

C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1. Examples of prefinished items not to be painted include, in part, the following factory-finished components:

a. Metal and plastic laminate toilet enclosures and partitions.
b. Acoustic materials.
c. Plastic laminate casework.
d. Finished mechanical and electrical equipment.
e. Light fixtures.
f. Switchgear.
g. Distribution cabinets.
h. Signage, Plaques, Directories, and Bulletin Boards.
i. Storefront.
j. Finish Hardware.

2. Examples of concealed surfaces not to be painted include, in part, wall or ceiling surfaces in the following generally inaccessible areas:

    a. Foundation spaces.
    b. Furred areas.
    c. Utility tunnels.
    d. Pipe spaces or chases.
    e. Duct shafts.

3. Examples of Finished metal surfaces not to be painted include, in part, the following:

    a. Anodized aluminum.
    b. Stainless steel.
    c. Chromium plate.
    d. Copper.
    e. Bronze.
    f. Brass.
    g. Prefinished aluminum windows and trim.

4. Examples of operating parts not to be painted include, in part, moving parts of operating equipment such as the following:

    a. Valve and damper operators.
    b. Linkages.
    c. Sensing devices.
    d. Motor and fan shafts.

5. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections: The following sections contain requirements that relate to this section:

1. Divisions 5 Sections, for shop priming metal work.
2. Division 6 Sections, for shop priming woodwork.

1.3 SUBMITTALS:

A. Product Data: Manufacturer's most current technical information, label analysis, and application instructions for each material proposed for use.

1. List each material and cross-reference to scheduled paint types, and including each specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.

B. Samples for initial color selection in the form of manufacturer's color charts from paint manufacturer intended for use.

C. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate. Define each separate coat, including fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.

1. Submit samples on the following substrates for the Architect's review of color and texture only: Stained or Natural Wood: Provide two 4- by 8-inch samples of natural and stained wood finish on actual wood surfaces.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by paint manufacturer, and use only within the recommended limits.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of any problems anticipated using the materials specified, prior to proceeding with work.

C. Material Quality: Provide the manufacturer's best quality grade paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude approved equivalent products of other manufacturers.

D. Color Pigments: Pure, non-fading, applicable types to suite substrates and service indicated.

E. Lead content in pigments or other painting materials and components is not allowed.

F. Solvents and V.O.C. Compliance: At the time of this writing, sufficient product data and information is not available from paint manufacturers to specify new products to replace solvent based products specified. If new regulations are in effect restricting use of solvents and/or they are not available at the time painting is required for this project, submit and provide the equivalent water-borne products to those specified, at no additional cost to the Owner.

1.5 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's name, stock number, and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store materials not in use in tightly covered containers in a well- ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers, others present or passing through or inspecting work areas (painting or any other work), and the work areas themselves are protected from fire and health hazards resulting from handling, mixing, and application of materials.

1.6 JOB CONDITIONS:

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F and 90 deg F, unless otherwise permitted by paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F and 95 deg F, unless otherwise permitted by paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog, or mist, or when the relative humidity exceeds 85 percent, or at temperatures less than 5 deg F above the dew point, or to damp or wet surfaces, unless otherwise permitted by paint manufacturer's printed instructions.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer, during application, drying and curing periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. ICI Paints World Group (ICI); Div. of Glidden.

2. Devoe and Raynolds Co. (Devoe).
3. The Glidden Company (Glidden).
4. Benjamin Moore and Co. (Moore).
5. PPG Industries, Pittsburgh Paints (Pittsburgh).
6. Pratt and Lambert (P & L).
7. The Sherwin-Williams Company (S-W).
8. TNEMEC Company, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION:

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.
2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.

b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

   a. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Fill cracks in wood or plywood floors with a latex filler and prime filled areas after sanding, except where otherwise recommended by paint manufacturer. Sand smooth when dried.
   b. Prime, stain, or seal unfinished wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
   c. When transparent finish is required, backprime with spar varnish.
   d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
   e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.

4. Ferrous Metals: Clean nongalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.

   a. Treat bare, sandblasted, or pickled clean metal with a metal treatment wash coat before priming.
   b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with non- petroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.

1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

D. Tinting: Tint each primer and undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat(s), but provide sufficient differences in shade of undercoats to distinguish each separate coat.

1. Finish coats as scheduled, shall be same color for each coat required.

3.3 APPLICATION:

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied. Use of spray equipment at the site is not allowed, except where specifically indicated.

1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
2. Paint surface treatments and finishes are indicated on the Drawings and in Specifications.
3. Finish colors will be selected after Bidding, unless indicated otherwise.
4. Provide finish coats that are compatible with primers used.
5. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.
6. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
7. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, connector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.
8. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
9. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
10. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

B. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.

C. Finish doors on tops, bottoms, and side edges same as faces.

1. Sand lightly between each succeeding enamel or varnish coat.

D. Primers:

1. Omit primer on metal surfaces that have been shop-primed and touch-up painted, only after verifying full compatibility of shop primers with materials specified for the next coat and finish coats.
2. Primer may be omitted at previously painted existing surfaces in good condition, except at interior concrete, plaster and drywall surfaces, after repairs to any existing damaged substrates and after spot priming of existing damaged paint finish, followed by cleaning and preparation recommended in writing by paint manufacturer.

E. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

F. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

G. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.

1. Mechanical items to be painted include but are not limited to:

a. Piping, pipe hangers, and supports.
b. Tanks.
c. Ductwork.
d. Insulation.
e. Supports.
f. Accessory items.

2. Electrical items to be painted include but are not limited to:

a. Conduit and fittings.
b. Switchgear.

H. Block Fillers: Apply block fillers to new or previously unpainted concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before application of finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.4 CLEANING:

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION:

A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide “wet paint” signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

C. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINT SCHEDULE:

A. General: Provide the following paint systems for the various substrates indicated.

P-1: IRON AND STEEL SURFACES:

1. ICI:

a. Primer: 4100, Alkyd Metal Primer.

b. Finish: 2516-XXXX, Exterior Alkyd Semi-Gloss Finish; 2 Coats.

P-2: GALVANIZED STEEL AND ALUMINUM SURFACES:

1. ICI:

a. Primer: 4160, Alkyd Multi-Purpose Primer.

b. Finish: 2516-XXXX, Exterior Alkyd Semi-Gloss Finish; 2 Coats.

P-3: CMU AND MASONRY SURFACES: IF REQUIRED.

1. ICI:

a. Primer: 4000, Acrylic Latex Block Filler; **Brush and Roller application only.**
b. Finish: 2516-XXXX, Exterior Alkyd Semi-Gloss Enamel; 2 Coats; **Brush and Roller application only.**
c. All block pores shall be completely filled.

3.7 INTERIOR PAINT SCHEDULE:

A. General: Provide the following paint systems for the various substrates, as indicated.

P-1: IRON AND STEEL SURFACES:

1. ICI:

a. Primer: 4100, Alkyd Metal Primer.
b. Finish: 1507-XXXX, Interior Alkyd Semi-Gloss Wall and Trim Enamel; 2 Coats.
c. **Where "Exposed" is indicated on Finish Schedule for Ceilings, paint all exposed structure, walls, etc., above other ceiling levels flat black.**

P-2: GALVANIZED STEEL AND ALUMINUM SURFACES:

1. ICI:

a. Primer: 4120, Metal and Galvanized Primer.

b. Finish: 1507-XXXX, Interior Alkyd Semi-Gloss Wall and Trim Enamel; 2 Coats.
c. **Where "Exposed" is indicated on Finish Schedule for Ceilings, paint all exposed structure, walls, etc., above other ceiling levels flat black.**

P-3: WOOD SURFACES TO RECEIVE NATURAL FINISH (AS NOTED-STAINED):

1. ICI:

a. First Coat: Alkyd Interior Paste Wood Filler, fully compatible with other finish system products below.
b. Second Coat: 1700, Interior Alkyd Stain; Wiped.
c. Third Coat (Sealer): 1908-0000, thinned with 1-pint of mineral spirits per gallon.
d. Fourth Coat: 1902-0000, Interior Polyurethane Satin Varnish.
e. Fifth Coat: 1902-0000, Interior Polyurethane Satin Varnish.

2. Natural finish (stained) shall be typical finish, unless indicated otherwise, for:

a. New woodwork (maple), unless specifically indicated otherwise.
b. Elsewhere as indicated on the Drawings.

P-4: DRYWALL SURFACES - (Dry Areas):

1. ICI/Devoe:

a. Primer: **<This primer only, spray-applied>**

1) Devoe 45XXX, Spra-Max-40, Interior High Build Latex Coating; Approximately 20-mil dry thickness; **OR**
2) ICI 1472-XXXX, High Build Latex Eggshell Interior Primer; Approximately 20-mil dry thickness.

Number of coats as required to conceal minor wall irregularities, imperfections, differing textures, joint taping and mudding, etc., prior to finish coats.

b. Finish: ICI 1512-XXXX, Interior Alkyd Eggshell Enamel; 2 Coats.
c. **NOTE - Special Ceiling Finish: Flat finish.**
d. **Where "Exposed" is indicated on Finish Schedule for Ceilings, paint all exposed structure, walls, etc., above other ceiling levels flat black.**

P-5: DRYWALL SURFACES - (Wet Areas: Toilet, Locker, Shower & Janitors Rooms, Kitchen Areas, any room with a plumbing fixture, and areas where food is stored, prepared, cooked and/or served):

1. ICI/Devoe:

   a. Initial Primer: **<This primer only, spray-applied>**

      1) Devoe 45XXX, Spra-Max-40, Interior High Build Latex Coating; Approximately 20-mil dry thickness; OR
      2) ICI 1472-XXXX, High Build Latex Eggshell Interior Primer; Approximately 20-mil dry thickness.

      Number of coats as required to conceal minor wall irregularities, imperfections, differing textures, joint taping and mudding, etc., prior to Second Primer and finish coats.

   b. Second Primer: ICI 3210, Ultra-Hide Aquacrylic Gripper, Stain Killer Primer-Sealer; 1 Coat.
   c. Finish: ICI 4406-XXXX, Waterborne Epoxy Semi-Gloss Coating; 2 Coats.
   d. **NOTE - Special Ceiling Finish: Flat finish.**
   e. **Where "Exposed" is indicated on Finish Schedule for Ceilings, paint all exposed structure, walls, etc., above other ceiling levels flat black.**

END OF SECTION 09900

SECTION 10522

FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1. Section 01500 - "Temporary Facilities"
2. Section 06100 - "Rough Carpentry" (concealed blocking)
3. Section 09250 - "Gypsum Drywall"
4. Section 09900 - "Painting"

1.2 SUMMARY:

A. This Section includes the following:

1. Fire extinguishers.
2. Fire extinguisher cabinets, factory finished.
3. Mounting brackets.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of product specified. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
2. Where color selections by Architect are required, include color charts showing full range of manufacturer's standard colors and designs available.

1.4 QUALITY ASSURANCE:

A. Single-Source Responsibility: Obtain fire extinguishers, cabinets, and brackets from one source from a single manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amerex Corp.
2. J.L. Industries.
3. Larsen's Manufacturing Co.
4. Modern Metal Products by Muckle.
5. Potter-Roemer, Inc.

2.2 FIRE EXTINGUISHERS:

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, which comply with requirements of governing authorities.

1. Abbreviations indicated below identify extinguisher types related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

B. Extinguishers: Provide equivalent to the following, from one of the above manufacturers.

1. Public and Service Areas:

a. Multi-purpose Dry Chemical Type: Larsen's Model No. MP10, UL-rated 4-A:80-B:C, 10-pound nominal capacity, in enameled steel container.
b. Mounted in cabinet in public areas and on wall bracket in private and service areas, unless otherwise indicated on the Drawings.

2. Kitchen / Food Service Areas:

a. Regular Wet Chemical Type (Type "K"): Larsen's Model No. WC-2 1/2, UL-rated 2A:K, 2-1/2 gallon nominal capacity, in enameled steel container.
b. Mounted on wall bracket in Kitchen areas, unless otherwise indicated on the Drawings.

C. Provide tag for each fire extinguisher, which identifies the unit, indicates date charged, and other pertinent data required by authorities having jurisdiction.

2.3 MOUNTING BRACKETS:

A. Provide brackets designed to prevent accidental dislodgement of extinguisher, of sizes required for type and capacity of extinguisher indicated, in manufacturer's standard plated finish: Provide brackets for extinguishers not located in cabinets.

2.4 FIRE EXTINGUISHER CABINETS:

A. General: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated.

B. Product/Manufacturer: Architectural Series, Model No. 2409-6R, semi-recessed design, as manufactured by Larsen's Manufacturing Company; Ft. Lauderdale, Fl.; Phone: (305) 486-3325; or approved equal by another manufacturer named above.

1. All steel with factory pre-finished white baked acrylic enamel paint and flush Vertical Duo style door glazed with colorless transparent tempered glass.

a. Identify fire extinguisher in cabinet with vertical die-cut red lettering reading "Fire Extinguisher," applied to door. Letter style, size, spacing, and location shall be as selected by Architect from manufacturer's standard arrangements provided with submittals.

2. Verify semi-recessed design with Owner prior to ordering. Provide equivalent surface-mounted cabinet when requested by Owner.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

B. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

C. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions, and mounting heights as follows:

1. Fire Extinguisher Cabinets: 4'-0" A.F.F. to horizontal centerline of door handle.
2. Fire Extinguisher Mounting Brackets: 4'-0" A.F.F. to horizontal centerline of bracket release mechanism.

D. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

E. Install one fire extinguisher in each fire extinguisher cabinet and bracket.

END OF SECTION 10522

SECTION 10800

TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Related work specified elsewhere includes:

1.Section 06100 - "Rough Carpentry" (concealed P.T. 2 x 10 wood blocking at stud wall anchorages)
2.Section 09250 - "Gypsum Drywall"

1.2 SUMMARY:

A. The extent of toilet and other accessory items is indicated on the Drawings, in this Section 10800, and as follows:

See Schedule on Drawings.

1.3 SUBMITTALS:

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Sections.

1. Product Data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gauges, profiles, method of mounting, specified options, and finishes.
2. Setting Drawings: Where cutouts are required in other work, provide templates, substrate preparation instructions, and directions for preparing cutouts and for installation of anchorage devices.

1.4 QUALITY ASSURANCE:

A. Inserts and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.

1.5 PROJECT CONDITIONS:

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference and to assure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, provide toilet accessories by one of the following and which are equivalent to the units specified:

1. Bobrick Washroom Equipment, Inc.

2.2 MATERIALS, GENERAL:

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22-gauge (.034-inch) minimum thickness, unless otherwise indicated.

B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16, Castings, ASTM B-30.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gauge (.040-inch) minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 527, G60.

E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

F. Baked Enamel Finish: Factory-applied, gloss white, baked acrylic enamel coating.

G. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.

H. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

2.3 MOP HOLDER WITH SHELF:

A. Manufacturer/Model No:

1. Bobrick No. B-224 x 30-inches long.

B. Mounting Height: 60-inches A.F.F. to top of shelf.

C. Location: 1-each at Janitors Room (1-EACH BUILDING) over mop sink, on opposite wall from plumbing.

2.4 GRAB BAR:

A. Manufacturer/Model No:

1. Bobrick Series B-6806.99.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
4. Finish: Smooth, No.4, satin finish on ends and slip-resistant texture in grip area.
5. Outside Diameter: 1-1/2 inches.
6. Configuration and Length: As indicated on Drawings.

2.5 MIRROR UNITS:

A. Stainless Steel Framed Mirror Units: Fabricate frame with angle shapes of not less than 18-gauge, with square welded corners mitered and ground smooth. Provide with bright polished finish.

B. Locations: At each lavatory in each Toilet Room, and as otherwise indicated. Provide tilt mirror with fully enclosed back at one lavatory in each toilet room, for use by the disabled and handicapped.

C. Mountings: Concealed type, manufacturer's standard.

D. Manufacturer/Model No.: Model Size:

1. Bobrick Series: B-165 2430 24-inches x 30-inches high.

E. Mounting Height: 40-inches A.F.F. to bottom of mirror.

2.6 SANITARY NAPKIN DISPOSAL: (as indicated on drawing)

A. Stainless Steel Units: Fabricate frame with angle shapes, with square welded corners mitered and ground smooth. Provide with satin finish.

B. Locations: At each toilet stall in each Women's Toilet Room, and as otherwise indicated.

C. Mountings: Manufacturer's standard.

D. Manufacturer/Model No.: Model:

1. Bobrick Series: B254

E. Mounting Height: As indicated on drawings.

2.7 SEAT COVER DISPENSER: (as indicated on drawing)

A. Stainless Steel Units: Fabricate frame with angle shapes, with square welded corners mitered and ground smooth. Provide with satin finish.

B. Locations: At each toilet stall in each Men's and Women's Toilet Room, and as otherwise indicated.

C. Mountings: Manufacturer's standard.

D. Manufacturer/Model No.: Standard:

1. Bobrick Series: B221

E. Mounting Height: As indicated on drawings.

2.8 FABRICATION:

A. General: Only a maximum 1-1/2-inch diameter, unobtrusive stamped logo of manufacturer, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Install toilet accessory units in accordance with manufacturers' current written instructions, using fasteners appropriate to substrate and recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

3.2 ADJUSTING AND CLEANING:

A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10800

SECTION 16053

COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electronic safety and security equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electronic safety and security installation requirements.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-dieneter polymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For sleeve seals.

1.5 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 8 Section "Access Doors and Frames."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Plastic. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION 16053

SECTION 16060

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:
   1. Ground rods.

C. Qualification Data: For testing agency and testing agency's field supervisor.

D. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.

4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad sectional type; 3/4 inch by10 feet in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

C. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

D. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.

E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 16060

SECTION 16073

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Division 16 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut; Tyco International, Ltd.
    g. Wesanco, Inc.

3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
6. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. Fabco Plastics Wholesale Limited.
    d. Seasafe, Inc.

3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
4. Fitting and Accessory Materials: Same as channels and anglesRated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Hilti Inc.
      2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 5 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick

or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.

6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 5 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.
   1. g to anchor-bolt manufacturer's written instructions.PAINTING

D. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

E. Touchup: Comply with requirements in Division 9 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

F. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 16073

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Identification for raceway and metal-clad cable.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:

1. Power Circuits: Black letters on an orange field.
2. Legend: Indicate system or service and voltage, if applicable.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.2 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

C. Aluminum Wraparound Marker Labels: Cut from 0.014-inch- thick aluminum sheet, with stamped, embossed, or scribed legend, and fitted with tabs and matching slots for permanently securing around wire or cable jacket or around groups of conductors.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, 0.010-inch-thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.

2.5 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16-inch-thick for signs up to 20 sq. in. and 1/8-inch-thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and ultraviolet-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

1. Minimum Width: 3/16 inch.
2. Tensile Strength: 50 lb., minimum.
3. Temperature Range: Minus 40 to plus 185-degree F.
4. Color: Black, except where used for color-coding.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A: Identify with orange snap-around label.

B. Accessible Raceways and Cables of Auxiliary Systems: Identify the following systems with color-coded, snap-around, color-coding bands:

1. Fire Alarm System: Red.
2. Fire-Suppression Supervisory and Control System: Red and yellow.
3. Combined Fire Alarm and Security System: Red and blue.
4. Security System: Blue and yellow.
5. Mechanical and Electrical Supervisory System: Green and blue.
6. Telecommunication System: Green and yellow.
7. Control Wiring: Green and red.

C. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

E. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply baked-enamel warning signs. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

G. Instruction Signs:

1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Electrical switchgear and switchboards.
d. Transformers.

e. Emergency system boxes and enclosures.
f. Disconnect switches.
g. Enclosed circuit breakers.
h. Motor starters.
i. Push-button stations.
j. Power transfer equipment.
k. Contactors.
l. Remote-controlled switches, dimmer modules, and control devices.
m. Voice and data cable terminal equipment.
n. Intercommunication and call system master and staff stations.
o. Fire-alarm control panel and annunciators.
p. Monitoring and control equipment.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded feeder conductors.

1. Color shall be factory applied

.

2. Colors for 208/120-V Circuits shall match existing color coding system.

3. Colors for 480/277-V Circuits shall match existing color coding system.

H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

I. Painted Identification: Prepare surface and apply paint according to Division 9 painting Sections.

END OF SECTION 16075

SECTION 16120

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

B. Related Sections include the following:

1. Division 16 Section "Voice and Data Communication Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

C. Copper Conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN & XHHW.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.

5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

2.4 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION WIRING METHODS

A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

H. Class 1 Control Circuits: Type THHN-THWN, in raceway.

I. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 16 Section "Electrical Supports and Seismic Restraints."

F. Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 7 Section "Through-Penetration Firestop Systems."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve rectangle perimeter less than 50 inches and no side greater than 16 inches, thickness shall be 0.052 inch.
2. For sleeve rectangle perimeter equal to, or greater than, 50 inches and 1 or more sides equal to, or greater than, 16 inches, thickness shall be 0.138 inch.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both wall surfaces.

G. Extend sleeves installed in floors 2 inches above finished floor level.

H. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and cable unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 7 Section "Joint Sealants."

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 7 Section "Through-Penetration Firestop Systems."

L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 7 Section "Through-Penetration Firestop Systems."

END OF SECTION 16120

SECTION 16410

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers.
4. Enclosures.

1.3 DEFINITIONS

A. GD: General duty.

B. GFCI: Ground-fault circuit interrupter.

C. HD: Heavy duty.

D. RMS: Root mean square.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.
4. UL listing for series rating of installed devices.
5. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Manufacturer Seismic Qualification Certification: Submit certification that enclosed switches and circuit breakers, accessories, and components will withstand seismic forces defined in Division 16 Section "Electrical Supports and Seismic Restraints." Include the following:

1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

    a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For testing agency.

E. Field quality-control test reports including the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

F. Manufacturer's field service report.

G. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current curves, including selectable ranges for each type of circuit breaker.

1.5 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Siemens Energy & Automation, Inc.
4. Square D/Group Schneider.

B. Nonfusible Switch, 600A and Smaller: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
3. Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.3 MOLDED-CASE CIRCUIT BREAKERS AND SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Moeller Electric Corporation.
4. Siemens Energy & Automation, Inc.
5. Square D/Group Schneider.

B. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.

C. Molded-Case Circuit-Breaker Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

2.4 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
3. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated. Anchor floor-mounting switches to concrete base.

C. Comply with mounting and anchoring requirements specified in Division 16 Section "Electrical Supports and Seismic Restraints."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 16 Section "Electrical Identification."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 16 Section "Electrical Identification."

3.4 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 16410

SECTION 16415

TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.
2. Remote annunciation systems.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1. Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

C. Qualification Data: For manufacturer.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify Architect, Construction Manager, and Owner no fewer than 14days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Contactor Transfer Switches:

a. AC Data Systems, Inc.
b. Emerson; ASCO Power Technologies, LP.
c. Generac Power Systems, Inc.
d. GE Zenith Controls.
e. Kohler Power Systems; Generator Division.
f. Onan/Cummins Power Generation; Industrial Business Group.

2. Transfer Switches Using Molded-Case Switches or Circuit Breakers:

a. AC Data Systems, Inc.
b. Eaton Electrical Inc.; Cutler-Hammer.
c. GE Zenith Controls.
d. Hubbell Industrial Controls, Inc.

2.2 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

G. Transfer Switches Based on Molded-Case-Switch Components: Comply with NEMA AB 1, UL 489, and UL 869A.

H. Automatic Closed-Transition Transfer Switches: Include the following functions and characteristics:

1. Fully automatic make-before-break operation.
2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 ms.
3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator.
    b. Controls ensure that closed-transition load transfer closure occurs only when the 2 sources are within plus or minus 5 electrical degrees maximum, and plus or minus 5 percent maximum voltage difference.

4. Failure of power source serving load initiates automatic break-before-make transfer.

I. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

J. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

K. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Pause is adjustable from 0.5 to 30 seconds minimum and factory set for 0.5 second, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

L. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to

30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
b. Push-button programming control with digital display of settings.
c. Integral battery operation of time switches when normal control power is not available.

2.3 REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Switch position.
3. Switch in test mode.
4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.4 REMOTE ANNUNCIATOR AND CONTROL SYSTEM

A. Functional Description: Include the following functions for indicated transfer switches:

1. Indication of sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Indication of switch position.
3. Indication of switch in test mode.
4. Indication of failure of digital communication link.
5. Key-switch or user-code access to control functions of panel.
6. Control of switch-test initiation.
7. Control of switch operation in either direction.
8. Control of time-delay bypass for transfer to normal source.

B. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically reverts to stand-alone, self-contained operation. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation.

C. Remote Annunciation and Control Panel: Solid-state components. Include the following features:

1. Controls and indicating lights grouped together for each transfer switch.
2. Label each indicating light control group. Indicate transfer switch it controls, location of switch, and load it serves.
3. Digital Communication Capability: Matched to that of transfer switches supervised.
4. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 16 Section "Electrical Supports and Seismic Restraints."

B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

C. Identify components according to Division 16 Section "Electrical Identification."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Ground equipment according to Division 16 Section "Grounding and Bonding."

C. Connect wiring according to Division 16 Section "Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.
1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages

and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

a. Check for electrical continuity of circuits and for short circuits.
b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
b. Simulate loss of phase-to-ground voltage for each phase of normal source.
c. Verify time-delay settings.
d. Verify pickup and dropout voltages by data readout or inspection of control settings.
e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connections and locations and ratings of sensors.

C. Testing Agency's Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

a. Check for electrical continuity of circuits and for short circuits.
b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

D. Coordinate tests with tests of generator and run them concurrently.

E. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

F. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 16415

SECTION 16442

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Electronic-grade panelboards.

1.3 DEFINITIONS

A. SVR: Suppressed voltage rating.

B. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.

8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

C. Panelboard Schedules: For installation in panelboards.

D. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards.

1.7 PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush and Surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Finishes:

a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
b. Back Boxes: Same finish as panels and trim.
c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

7. Directory Card: Inside panelboard door, mounted in transparent card holder.

C. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.

2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
5. Split Bus: Vertical buses divided into individual vertical sections.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Circuit breaker or Lugs only as indicated on the drawings.

E. Branch Overcurrent Protective Devices for Circuit-Breaker: Bolt-on circuit breakers.

2.3 ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 90 inches above finished floor unless otherwise indicated.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install filler plates in unused spaces.

E. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.

F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

G. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 16 Section "Electrical Identification."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 16 Section "Electrical Identification."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 16 Section "Electrical Identification."

3.4 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 16442

SECTION 16511

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CRI: Color-rendering index.

C. CU: Coefficient of utilization.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Luminaire: Complete lighting fixture, including ballast housing if provided.

G. RCR: Room cavity ratio.

1.4 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast.

4. Energy-efficiency data.
5. Air and Thermal Performance Data: For air-handling lighting fixtures. Furnish data required in "Submittals" Article in Division 15 Section "Diffusers, Registers, and Grilles."
6. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Division 15 Section "Diffusers, Registers, and Grilles."
7. Life, output, and energy-efficiency data for lamps.
8. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
    b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

    1. Wiring Diagrams: Power wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1.5 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer’s considered equals, as listed on the drawings of the lighting fixture schedule, must submit shop drawings to the engineer.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

G. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

   a. Lens Thickness: At least 0.125 inch minimum unless different thickness is indicated.
   b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2.4 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 16 Section "Electrical Supports and Seismic Restraints" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Connect wiring according to Division 16 Section "Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to emergency generator transfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 16511

SECTION 220513

COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220513

SECTION 220516

EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal-bellows packless expansion joints.
2. Pipe loops and swing connections.
3. Alignment guides and anchors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 PACKLESS EXPANSION JOINTS

A. Metal-Bellows Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Adsco Manufacturing LLC.
    b. American BOA, Inc.
    c. Badger Industries, Inc.
    d. Expansion Joint Systems, Inc.
    e. Flex Pression Ltd.
    f. Flex-Hose Co., Inc.
    g. Flex-Weld, Inc.
    h. Flexicraft Industries.
    i. Flo Fab inc.
    j. Hyspan Precision Products, Inc.
    k. Mason Industries, Inc.
    l. Metraflex Company (The).
    m. Proco Products, Inc.
    n. Senior Flexonics Pathway.
    o. Tozen Corporation.
    p. U.S. Bellows, Inc.
    q. Unaflex.
    r. Unisource Manufacturing, Inc.
    s. Universal Metal Hose.
    t. WahlcoMetroflex.

3. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
4. Type: Circular, corrugated bellows with external tie rods.
5. Minimum Pressure Rating: 150 psig unless otherwise indicated.
6. Configuration: Single joint Single joint with base and double joint with base class(es) unless otherwise indicated.
7. Expansion Joints for Copper Tubing: Single- or multi-ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.

    a. End Connections for Copper Tubing NPS 2 and Smaller: Solder joint or threaded.
    b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4: Solder joint or threaded.
    c. End Connections for Copper Tubing NPS 5 and Larger: Flanged.

2.2 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Stud: Threaded, zinc-coated carbon steel.
    b. Expansion Plug: Zinc-coated steel.
    c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
    b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
    c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Galvanized-Steel Pipe: Attach with pipe hangers. Use MSS SP-69, Type 42, riser clamp welded to anchor.
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 220516

SECTION 220517

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

C. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves.

2. Exterior Concrete Walls below Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

END OF SECTION 220517

SECTION 220518

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
i. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Bronze swing check valves.
4. Bronze gate valves.
5. Bronze globe valves.

B. Related Sections:

1. Section 221116 "Domestic Water Piping" for valves applicable only to this piping.
2. Section 221319 "Sanitary Waste Piping Specialties" for valves applicable only to this piping.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. One-Piece, Reduced-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Kitz Corporation.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig.
c. Body Design: One piece.
d. Body Material: Forged brass.
e. Ends: Threaded.
f. Seats: PTFE or TFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.

c. DynaQuip Controls.
d. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
e. Hammond Valve.
f. Jamesbury; a subsidiary of Metso Automation.
g. Jomar International, LTD.
h. Kitz Corporation.
i. Legend Valve.
j. Marwin Valve; a division of Richards Industries.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Red-White Valve Corporation.
n. RuB Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

C. Two-Piece, Regular-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Hammond Valve.
b. Jamesbury; a subsidiary of Metso Automation.
c. Legend Valve.
d. Marwin Valve; a division of Richards Industries.
e. Milwaukee Valve Company.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.

j. Port: Regular.

2.3 BRONZE BALL VALVES

A. One-Piece, Reduced-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig.
c. Body Design: One piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE or TFE.
g. Stem: Bronze.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Co.; Crane Valve Group; Crane Valves.
d. Hammond Valve.
e. Lance Valves; a division of Advanced Thermal Systems, Inc.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.

e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

C. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. DynaQuip Controls.
f. Hammond Valve.
g. Lance Valves; a division of Advanced Thermal Systems, Inc.
h. Milwaukee Valve Company.
i. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Regular.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.

g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
l. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Red-White Valve Corporation.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE or TFE.

2.5 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.

b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
l. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
k. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.

2.6 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Kitz Corporation.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Powell Valves.
h. Red-White Valve Corporation.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
j. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. NIBCO INC.
d. Red-White Valve Corporation.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Throttling Service: Globe ball, or butterfly valves.
3. Pump-Discharge Check Valves:

    a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
    b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.
    c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2-1/2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: Two piece, full port, brass or bronze with brass trim.
4. Bronze Swing Check Valves: Class 125, bronze disc.
5. Bronze Gate Valves: Class 125, NRS.
6. Bronze Globe Valves: Class 125, bronze disc.

3.5 SANITARY-WASTE VALVE SCHEDULE

A. Pipe NPS 2-1/2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, brass or bronze with brass trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.
4. Bronze Gate Valves: Class 125, NRS.
5. Bronze Globe Valves: Class 125, bronze disc.

END OF SECTION 220523

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic hot-water piping.
2. Domestic recirculating hot-water piping.
3. Sanitary waste piping exposed to freezing conditions.
4. Storm-water piping exposed to freezing conditions.
5. Roof drains and rainwater leaders.
6. Supplies and drains for handicap-accessible lavatories and sinks.

B. Related Sections:

1. Section 220716 "Plumbing Equipment Insulation."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties, equipment connections, and access panels.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pittsburgh Corning Corporation; Foamglas.

2. Special-Shaped Insulation: ASTM C 552, Type III.
3. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.

4. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
5. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Armacell LLC; Tubolit.
b. Nomaco Insulation; IMCOLOCK and NOMALOCK.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    b. Eagle Bridges - Marathon Industries; 405.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    b. Eagle Bridges - Marathon Industries; 405.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
    d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
    b. Vimasco Corporation; Elastafab 894.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
    b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
    c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Tee covers.
    d. Flange and union covers.
    e. End caps.
    f. Beveled collars.
    g. Valve covers.
    h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

D. Underground Direct-Buried Jacket: 125-mil-thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Pittsburgh Corning Corporation; Pittwrap.
b. Polyguard Products, Inc.; Insulrap No Torch 125.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.

6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. ABI, Ideal Tape Division; 370 White PVC tape.
   b. Compac Corporation; 130.
   c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. ABI, Ideal Tape Division; 488 AWF.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   c. Compac Corporation; 120.
   d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. ITW Insulation Systems; Gerrard Strapping and Seals.
   b. RPR Products, Inc.; Insul-Mate Strapping and Seals.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. C & F Wire.

2.11 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers,:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Engineered Brass Company.
b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
c. McGuire Manufacturing.
d. Plumberex.
e. Truebro; a brand of IPS Corporation.
f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures,:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Truebro; a brand of IPS Corporation.
b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe

diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe

insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by

insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 INSTALLATION OF POLYOLEFIN INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of polyolefin sheet insulation of same thickness as pipe insulation.

4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water: Insulation shall be one of the following:

1. Flexible Elastomeric: 3/4 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
3. Polyolefin: 3/4 inch thick.

B. Stormwater and Overflow: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
3. Polyolefin: 1 inch thick.

C. Roof Drain and Overflow Drain Bodies: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
3. Polyolefin: 1 inch thick.

D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be one of the following:

1. Flexible Elastomeric: 1/2 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
3. Polyolefin: 1/2 inch thick.

E. Sanitary Waste Piping Where Heat Tracing Is Installed: Mineral-fiber, preformed pipe insulation, Type I, 1-1/2 inches thick.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water Piping: Insulation shall be one of the following:

1. Cellular Glass: 2 inches thick.
2. Flexible Elastomeric: 2 inches thick.
3. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.
4. Polyolefin: 2 inches thick.

B. Domestic Hot and Recirculated Hot Water: Insulation shall be one of the following:

1. Cellular Glass: 2 inches thick.
2. Flexible Elastomeric: 2 inches thick.
3. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.
4. Polyolefin: 2 inches thick.

C. Sanitary Waste Piping Where Heat Tracing Is Installed: Insulation shall be one of the following:

1. Cellular Glass: 2 inches thick.

2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.15 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Sanitary Waste Piping, All Sizes, Where Heat Tracing Is Installed: Cellular glass, 2 inches thick.

3.16 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.
2. PVC: 30 mils thick.
3. Aluminum, Smooth: 0.016 inch thick.

D. Piping, Exposed:

1. None.
2. PVC: 30 mils thick.
3. Aluminum, Smooth: 0.016 inch thick.

3.17 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.
2. PVC: 30 mils thick.
3. Aluminum, Smooth: 0.016 inch thick.

D. Piping, Exposed:

1. PVC: 30 mils thick.
2. Painted Aluminum, Smooth: 0.016 inch thick.

3.18 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 220719

SECTION 221116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

C. Any reference within the specifications referring to PEX piping shall be construed to describe PEX-a piping as manufactured by Uponor or equal.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

G. Copper Pressure-Seal-Joint Fittings:

1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

H. Copper Push-on-Joint Fittings:

1. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
2. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe:

1. ASTM A 53/A 53M, Type E, Grade B, Standard Weight.
2. Include ends matching joining method.

B. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Standard Weight, seamless steel pipe with threaded ends.

C. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

D. Malleable-Iron Unions:

1. ASME B16.39, Class 150.
2. Hexagonal-stock body.
3. Ball-and-socket, metal-to-metal, bronze seating surface.
4. Threaded ends.

E. Flanges: ASME B16.1, Class 125, cast iron.

2.5 CPVC PIPING

A. CPVC Pipe: ASTM F 441/F 441M, Schedule 40 and Schedule 80.

1. CPVC Socket Fittings: ASTM F 439 for Schedule 80.
2. CPVC Threaded Fittings: ASTM F 437, Schedule 80.

B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.

C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.6 PEX TUBE AND FITTINGS

A. PEX Distribution System: ASTM F 877, SDR 9 tubing.

B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.

C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

2.7 PVC PIPE AND FITTINGS

A. PVC Pipe: ASTM D 1785, Schedule 80.

B. PVC Socket Fittings: ASTM D 2467 for Schedule 80.

C. PVC Schedule 80 Threaded Fittings: ASTM D 2464.

2.8 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.

1. CPVC solvent cement shall have a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.9 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.

2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Charlotte Pipe and Foundry Company.
    b. Harvel Plastics, Inc.
    c. Spears Manufacturing Company.

3. Description:

    a. CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
    b. One end with threaded brass insert and one solvent-cement-socket or threaded end.

D. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Colonial Engineering, Inc.
    b. NIBCO Inc.
    c. Spears Manufacturing Company.

3. Description:

    a. CPVC or PVC four-part union.
    b. Brass or stainless-steel threaded end.
    c. Solvent-cement-joint or threaded plastic end.
    d. Rubber O-ring.
    e. Union nut.

2.10 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
    b. Central Plastics Company.
    c. Hart Industries International, Inc.
    d. Jomar International.
    e. Matco-Norca.
    f. McDonald, A. Y. Mfg. Co.
    g. Watts; a division of Watts Water Technologies, Inc.
    h. Wilkins; a Zurn company.

3. Standard: ASSE 1079.
4. Pressure Rating: 125 psig minimum at 180 deg F.
5. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
    b. Central Plastics Company.
    c. Matco-Norca.
    d. Watts; a division of Watts Water Technologies, Inc.
    e. Wilkins; a Zurn company.

3. Standard: ASSE 1079.
4. Factory-fabricated, bolted, companion-flange assembly.
5. Pressure Rating: 125 psig minimum at 180 deg F.
6. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

3. Nonconducting materials for field assembly of companion flanges.
4. Pressure Rating: 150 psig.
5. Gasket: Neoprene or phenolic.
6. Bolt Sleeves: Phenolic or polyethylene.
7. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Elster Perfection Corporation.
    b. Grinnell Mechanical Products; Tyco Fire Products LP.
    c. Matco-Norca.
    d. Precision Plumbing Products, Inc.
    e. Victaulic Company.

3. Standard: IAPMO PS 66.
4. Electroplated steel nipple complying with ASTM F 1545.
5. Pressure Rating and Temperature: 300 psig at 225 deg F.
6. End Connections: Male threaded or grooved.
7. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."

G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install PEX piping with loop at each change of direction of more than 90 degrees.

R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

T. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

H. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Piping: Join according to ASTM D 2855.

I. Joints for PEX Piping: Join according to ASTM F 1807.

J. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6: 12 feet with 3/4-inch rod.
8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 36 inches with 3/8-inch rod.
2. NPS 1-1/4 to NPS 2: 48 inches with 3/8-inch rod.
3. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
4. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
5. NPS 6: 48 inches with 3/4-inch rod.
6. NPS 8: 48 inches with 7/8-inch rod.

J. Install supports for vertical CPVC piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.

K. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

L. Install hangers for vertical PEX piping every 48 inches.

M. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.
2. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.
5. NPS 8: 48 inches with 7/8-inch rod.

N. Install supports for vertical PVC piping every 48 inches.

O. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Repeat procedures if biological examination shows contamination.
    e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
2. PVC, Schedule 80; socket fittings; and solvent-cemented joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
2. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.
3. PVC, Schedule 80; socket fittings; and solvent-cemented joints.

F. Under-building-slab, combined domestic water, building-service, and fire-service-main piping, NPS 6 to NPS 12, shall be one of the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

G. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard or soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
2. PVC, Schedule 80; socket fittings; and solvent-cemented joints.

H. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.

2. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed joints.
3. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; copper pressure-seal-joint fittings; and pressure-sealed joints.
4. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; copper push-on-joint fittings; and push-on joints.
5. CPVC, Schedule 80; socket fittings; and solvent-cemented joints.
6. CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
7. CPVC Tubing System: CPVC tube; CPVC socket fittings; and solvent-cemented joints. NPS 1-1/2 and NPS 2 CPVC pipe with CPVC socket fittings may be used instead of tubing.
8. PEX tube, NPS 1 and smaller; fittings for PEX tube; and crimped joints.
9. PVC, Schedule 80; socket fittings; and solvent-cemented joints.

I. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed joints.
2. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; grooved-joint, copper-tube appurtenances; and grooved joints.
4. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
5. CPVC, Schedule 80; socket fittings; and solvent-cemented joints.
6. CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
7. PVC, Schedule 80; socket fittings; and solvent-cemented joints.

J. Aboveground domestic water piping, NPS 5 to NPS 8, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed joints.
2. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; grooved-joint, copper-tube appurtenances; and grooved joints.
3. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
4. CPVC, Schedule 80; socket fittings; and solvent-cemented joints.
5. CPVC, Schedule 80 pipe; CPVC, Schedule 80 threaded fittings; and threaded joints.
6. PVC, Schedule 80; socket fittings; and solvent-cemented joints.

K. Aboveground, combined domestic water-service and fire-service-main piping, NPS 6 to NPS 12, shall be one of the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.
2. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.

END OF SECTION 221116

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water-hammer arresters.
11. Trap-seal primer valves.

B. Related Requirements:

1. Section 224716 "Pressure Water Coolers" for water filters for water coolers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 and NSF 14. Mark "NSF-pw" on plastic piping components.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Chrome or nickel plated.

2.4 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers

1. Standard: ASSE 1012.
2. Operation: Continuous-pressure applications.
3. Size: NPS 1/2.
4. Body: Bronze.
5. End Connections: Union, solder joint.
6. Finish: Chrome plated.

B. Reduced-Pressure-Principle Backflow Preventers

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig maximum, through middle third of flow range.

4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
6. Configuration: Designed for horizontal, straight-through flow.
7. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Double-Check, Backflow-Prevention Assemblies

1. Standard: ASSE 1015.
2. Operation: Continuous-pressure applications unless otherwise indicated.
3. Pressure Loss: 5 psig maximum, through middle third of flow range.
4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
6. Configuration: Designed for horizontal, straight-through flow.
7. Accessories:

    a. ValvesNPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. ValvesNPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Cash Acme; a division of Reliance Worldwide Corporation.
    b. Conbraco Industries, Inc.
    c. Honeywell International Inc.
    d. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
    e. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

3. Standard: ASSE 1003.
4. Pressure Rating: Initial working pressure of 150 psig.
5. Body: Bronze with chrome-plated finish for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
6. Valves for Booster Heater Water Supply: Include integral bypass.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Conbraco Industries, Inc.
    b. Crane Co.; Crane Valve Group; Crane Valves.
    c. Crane Co.; Crane Valve Group; Jenkins Valves.
    d. Crane Co.; Crane Valve Group; Stockham Div.
    e. Hammond Valve.
    f. Milwaukee Valve Company.
    g. NIBCO Inc.
    h. Red-White Valve Corp.

3. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
4. Pressure Rating: 400-psig minimum CWP.
5. Size: NPS 2 or smaller.
6. Body: Copper alloy.
7. Port: Standard or full port.
8. Ball: Chrome-plated brass.
9. Seats and Seals: Replaceable.
10. End Connections: Solder joint or threaded.
11. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Armstrong International, Inc.
    b. Cash Acme; a division of Reliance Worldwide Corporation.
    c. Conbraco Industries, Inc.
    d. Honeywell International Inc.
    e. Legend Valve.
    f. Leonard Valve Company.
    g. Powers; a division of Watts Water Technologies, Inc.
    h. Symmons Industries, Inc.
    i. TACO Incorporated.

j. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
k. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

3. Standard: ASSE 1017.
4. Pressure Rating: 125 psig.
5. Type: Thermostatically controlled, water mixing valve.
6. Material: Bronze body with corrosion-resistant interior components.
7. Connections: Threaded union inlets and outlet.
8. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
9. Tempered-Water Setting: 110 deg F.
10. Valve Finish: Chrome plated.

B. Primary, Thermostatic, Water Mixing Valves

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Armstrong International, Inc.
b. Lawler Manufacturing Company, Inc.
c. Leonard Valve Company.
d. Powers; a division of Watts Water Technologies, Inc.
e. Symmons Industries, Inc.

3. Standard: ASSE 1017.
4. Pressure Rating: 125 psigminimum unless otherwise indicated.
5. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
6. Material: Bronze body with corrosion-resistant interior components.
7. Connections: Threaded union inlets and outlet.
8. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
9. Valve Finish: Chrome plated.
10. Piping Finish: Chrome plated.
11. Cabinet: Factory fabricated, stainless steel, for recessed mounting and with hinged, stainless-steel door.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.

5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.020 inch.
    b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
    c. Strainers NPS 5 and Larger: 0.10 inch.

6. Drain: Pipe plug.

2.9 HOSE BIBBS

A. Hose Bibbs

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Wheel handle.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.10 WALL HYDRANTS

A. Nonfreeze Wall Hydrants

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): One with each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Vacuum Breaker:

    a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
    b. Garden-hose thread complying with ASME B1.20.7 on outlet.

10. Operating Keys(s): One with each wall hydrant.

C. Vacuum Breaker Wall Hydrants

1. Standard: ASSE 1019, Type A or Type B.
2. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
3. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
4. Pressure Rating: 125 psig.
5. Operation: Loose key or wheel handle.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 1/2 or NPS 3/4.
8. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. AMTROL, Inc.
    b. Josam Company.
    c. MIFAB, Inc.
    d. Precision Plumbing Products, Inc.
    e. Sioux Chief Manufacturing Company, Inc.
    f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    g. Tyler Pipe; Wade Div.
    h. Watts Drainage Products.
    i. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.

3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: Copper tube with piston.
5. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. MIFAB, Inc.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

3. Standard: ASSE 1018.
4. Pressure Rating: 125 psig minimum.
5. Body: Bronze.
6. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
7. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

3. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
4. Size: NPS 1-1/4 minimum.
5. Material: Chrome-plated, cast brass.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

E. Install Y-pattern strainers for water on supply side of each control valve water pressure-reducing valve solenoid valve and pump.

F. Set nonfreeze, nondraining-type post hydrants in concrete or pavement.

G. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.

H. Install water-hammer arresters in water piping according to PDI-WH 201.

I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

J. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each pressure vacuum breaker reduced-pressure-principle backflow preventer double-check, backflow-prevention assembly and double-check, detector-assembly backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221319

SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backwater valves.
2. Cleanouts.
3. Floor drains.
4. Roof flashing assemblies.
5. Miscellaneous sanitary drainage piping specialties.
6. Flashing materials.
7. Oil/Sand interceptors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.

d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASME A112.14.1.
4. Size: Same as connected piping.
5. Body: Cast iron.
6. Cover: Cast iron with bolted or threaded access check valve.
7. End Connections: Hub and spigot or hubless.
8. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang closed.
9. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

B. Drain-Outlet Backwater Valves

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Josam Company; Josam Div.
b. Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.
c. Watts Drainage Products Inc.
d. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Size: Same as floor drain outlet.
4. Body: Cast iron or bronze made for vertical installation in bottom outlet of floor drain.
5. Check Valve: Removable ball float.
6. Inlet: Threaded.
7. Outlet: Threaded or spigot.

2.2 CLEANOUTS

A. Exposed Cast-Iron Cleanouts

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Josam Company.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe.
e. Watts Drainage Products.

f. Zurn Plumbing Products Group.

3. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
4. Size: Same as connected drainage piping
5. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
6. Closure: Countersunk or raised-head, brass plug.
7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Josam Company; Josam Div.
   b. Oatey.
   c. Sioux Chief Manufacturing Company, Inc.
   d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   e. Tyler Pipe; Wade Div.
   f. Watts Drainage Products Inc.
   g. Zurn Plumbing Products Group; Light Commercial Operation.
   h. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
4. Size: Same as connected branch.
5. Type: Threaded, adjustable housing.
6. Body or Ferrule: Cast iron.
7. Clamping Device: Required.
8. Outlet Connection: Inside calk.
9. Closure: Brass plug with straight threads and gasket.
10. Adjustable Housing Material: Cast iron with set-screws or other device.
11. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
12. Frame and Cover Shape: Round.
13. Top Loading Classification: Extra Heavy Duty.
14. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Josam Company; Josam Div.

b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASME A112.36.2M. Include wall access.
4. Size: Same as connected drainage piping.
5. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
6. Closure: Countersunk or raised-head, drilled-and-threaded brass plug.
7. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
8. Wall Access: Round, deep, chrome-plated bronze cover plate with screw.
9. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.3 FLOOR DRAINS

A. Cast-Iron Floor Drains

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Commercial Enameling Co.
b. Josam Company; Josam Div.
c. MIFAB, Inc.
d. Prier Products, Inc.
e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
f. Tyler Pipe; Wade Div.
g. Watts Drainage Products Inc.
h. Zurn Plumbing Products Group; Light Commercial Operation.
i. Zurn Plumbing Products Group; Specification Drainage Operation.

3. Standard: ASME A112.6.3 with backwater valve.
4. Pattern: Floor Sanitary drain.
5. Body Material: Gray iron.
6. Seepage Flange: Required.
7. Anchor Flange: Required.
8. Clamping Device: Required.
9. Outlet: Bottom.
10. Backwater Valve: Drain-outlet type.
11. Top or Strainer Material: Bronze.
12. Top of Body and Strainer Finish: Nickel bronze.
13. Top Shape: Round.

14. Top Loading Classification: Extra Heavy-Duty.
15. Funnel: Not required.
16. Inlet Fitting: Not required.
17. Trap Material: Bronze.
18. Trap Pattern: Deep-seal P-trap.
19. Trap Features: Trap-seal primer valve drain connection.

2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.

3. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 6 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

    a. Open-Top Vent Cap: Without cap.
    b. Low-Silhouette Vent Cap: With vandal-proof vent cap.
    c. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping.

B. Deep-Seal Traps

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2: 4-inch-minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch-minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings (Funnel Traps)

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.6 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

D. Solder: ASTM B 32, lead-free alloy.

E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.7 OIL/SAND INTERCEPTORS

A. Interceptors:

1. Cast-Iron or Steel Grease Interceptors:

a. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1) Applied Chemical Technology, Incorporated.
2) Josam Company.
3) MIFAB, Inc.
4) Rockford Sanitary Systems, Inc.
5) Schier Products Company.
6) Smith, Jay R. Mfg. Co.
7) Tyler Pipe.
8) Watts Drainage Products.
9) Zurn Plumbing Products Group.

2. Plastic Oil/Sand Interceptors:

a. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1) Ashland Trap Distribution Co.
2) Bio-Microbics, Inc.
3) Canplas LLC.
4) Schier Products Company.
5) Zurn Plumbing Products Group.

3. Plumbing and Drainage Institute Seal: Not required.
4. Body Material: Plastic.
5. Interior Lining: Not required.
6. Exterior Coating: Not required.
7. Cleanout: Integral or field installed on outlet.
8. Flow-Control Fitting: Required.
9. Operation: Manual cleaning.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

G. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

H. Assemble open drain fittings and install with top of hub 1 inch above floor.

I. Install deep-seal traps on floor drains and other waste outlets, if indicated.

J. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

K. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

L. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

M. Install vent caps on each vent pipe passing through roof.

N. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 224716

PRESSURE WATER COOLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pressure water coolers and related components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Pressure Water Coolers: Flush to wall.

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Elkay LNTEM8K, subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Elkay Manufacturing Co.
b. Halsey Taylor.
c. Haws Corporation.
d. Larco Inc.
e. Tri Palm International, LLC; Oasis Brand.

f. Tri Palm International, LLC; Sunroc Brand.

3. Standards:

   a. Comply with NSF 61.
   b. Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.
   c. Comply with ADA requirements.

4. Cabinet: All stainless steel.
5. Bubbler: One, with adjustable stream regulator, located on deck.
6. Control: Push button.
7. Drain: Grid with NPS 1-1/4 tailpiece.
8. Supply: NPS 3/8 with shutoff valve.
9. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.
10. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
11. Cooling System: Electric, with precooler, hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

    a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

12. Capacities and Characteristics:

    a. Cooled Water: 7.5 gph.
    b. Ambient-Air Temperature: 90 deg F.
    c. Inlet-Water Temperature: 80 deg F
    d. Cooled-Water Temperature: 50 deg F.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Set freestanding pressure water coolers on floor.

C. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

D. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

E. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

G. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color.

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball, gate, or globe shutoff valve on water supply to each fixture. Install valve upstream from filter for water cooler. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust pressure water-cooler temperature settings.

3.5 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224716

SECTION 230513

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.
b. Variable-air-volume systems.

2. Balancing Hydronic Piping Systems:

a. Constant-flow hydronic systems.
b. Variable-flow hydronic systems.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 INFORMATIONAL SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC NEBB or TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC NEBB or TABB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC NEBB or TABB as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.

5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.

7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper

operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.9 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.

8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Pipe and valve sizes and locations.
4. Balancing stations.
5. Position of balancing devices.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713

DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.

B. Related Sections:

1. Section 233113 "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type II with factory-applied vinyl jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; Commercial Board.
    b. Fibrex Insulations Inc.; FBX.
    c. Johns Manville; 800 Series Spin-Glas.
    d. Knauf Insulation; Insulation Board.
    e. Manson Insulation Inc.; AK Board.
    f. Owens Corning; Fiberglas 700 Series.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; FlameChek.
    b. Johns Manville; Firetemp Wrap.
    c. Nelson Fire Stop Products; Nelson FSB Flameshield Blanket.
    d. Thermal Ceramics; FireMaster Duct Wrap.
    e. 3M; Fire Barrier Wrap Products.
    f. Unifrax Corporation; FyreWrap.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
    d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
   b. Eagle Bridges - Marathon Industries; 225.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
   d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Dow Corning Corporation; 739, Dow Silicone.
   b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
   c. P.I.C. Plastics, Inc.; Welding Adhesive.
   d. Speedline Corporation; Polyco VP Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
   b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
   b. Eagle Bridges - Marathon Industries; 550.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
   d. Mon-Eco Industries, Inc.; 55-50.
   e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
    b. Vimasco Corporation; Elastafab 894.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; Zeston.
b. P.I.C. Plastics, Inc.; FG Series.
c. Proto Corporation; LoSmoke.
d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.

D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.

E. Self-Adhesive Outdoor Jacket: 60-mil-thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with white aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Polyguard Products, Inc.; Alumaguard 60.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. ABI, Ideal Tape Division; 370 White PVC tape.
b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.

4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. ABI, Ideal Tape Division; 488 AWF.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   c. Compac Corporation; 120.
   d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

   a. ITW Insulation Systems; Gerrard Strapping and Seals.
   b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

      1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
      2) GEMCO; Perforated Base.
      3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

1) GEMCO; Nylon Hangers.
2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
c. Spindle: Nylon, 0.106-inch-diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.
2) GEMCO; Peel & Press.
3) Midwest Fasteners, Inc.; Self Stick.

b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
d. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) GEMCO.
2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. C & F Wire.

2.11 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.6 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.7 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
7. Outdoor, concealed supply and return.
8. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.

2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

C. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

D. Concealed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

E. Concealed, Type I, Commercial, Kitchen Hood Exhaust Duct and Plenum Insulation: Fire-rated blanket or board; thickness as required to achieve 2-hour fire rating.

F. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 1.5-lb/cu. ft. nominal density.

G. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 1.5-lb/cu. ft. nominal density.

H. Exposed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 1.5-lb/cu. ft. nominal density.

I. Exposed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber board, 2 inches thick and 1.5-lb/cu. ft. nominal density.

3.11 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber board, 3 inches thick and 3-lb/cu. ft. nominal density.

C. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber board, 3 inches thick and 3-lb/cu. ft. nominal density.

D. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber board, 3 inches thick and 3-lb/cu. ft. nominal density.

E. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber board, 3 inches thick and 3-lb/cu. ft. nominal density.

F. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber board, 3 inches thick and 3-lb/cu. ft. nominal density.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.
2. PVC: 30 mils thick.
3. Aluminum, Smooth: 0.016 inch thick.

D. Ducts and Plenums, Exposed:

1. None.
2. PVC: 30 mils thick.
3. Aluminum, Smooth: 0.016 inch thick.

3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.
2. PVC: 30 mils thick.
3. Aluminum, Smooth: 0.016 inch thick.

D. Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Aluminum, Smooth: 0.016 inch thick.

E. Ducts and Plenums, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:

1. Painted Aluminum, Smooth with 1-1/4-Inch-Deep Corrugations: 0.040 inch thick.

END OF SECTION 230713

SECTION 230923.12

CONTROL DAMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes control dampers and actuators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal:

1. Schedule and design calculations for control dampers and actuators, including the following.

a. Flow at project design and minimum flow conditions.
b. Face velocity at project design and minimum airflow conditions.
c. Pressure drop across damper at project design and minimum airflow conditions.
d. AMCA 500D damper installation arrangement used to calculate and schedule pressure drop, as applicable to installation.
e. Maximum close-off pressure.
f. Leakage airflow at maximum system pressure differential (fan close-off pressure).
g. Torque required at worst case condition for sizing actuator.
h. Actuator selection indicating torque provided.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to size products where indicated as delegated design.

C. Ground Fault: Products shall not fail due to ground fault condition when suitably grounded.

D. Selection Criteria:

1. Control dampers shall be suitable for operation at following conditions:

a. Supply Air: 1.5”W.G.
b. Return Air: 1.5”W.G..
c. Outdoor Air: 1.5”W.G..
d. Mixed Air: 1.5”W.G..
e. Exhaust Air: 1.5”W.G..

2. Fail positions unless otherwise indicated:

a. Supply Air: Open.
b. Return Air: Open.
c. Outdoor Air: Close.
d. Mixed Air: Close.
e. Exhaust Air: Close.

3. Select modulating dampers for a pressure drop of 2 percent of fan total static pressure unless otherwise indicated.

2.2 RECTANGULAR CONTROL DAMPERS

A. General Requirements:

1. Unless otherwise indicated, use parallel blade configuration for two-position control, equipment isolation service, and when mixing two airstreams. For other applications, use opposed blade configuration.
2. Factory assemble multiple damper sections to provide a single damper assembly of size required by the application.

B. Rectangular Dampers with Aluminum Airfoil Blades:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Greenheck.

2. Performance:

a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure.

b. Pressure Drop: 0.05-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 6000 fpm.
d. Temperature: Minus 40 to plus 185 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

a. Frame:

1) Material: ASTM B 211, Alloy 6063 T5 extruded-aluminum profiles,0.07 inch thick.
2) Hat-shaped channel with integral flange(s). Mating face shall be a minimum of 1 inch.
3) Width not less than 5 inches.

b. Blades:

1) Hollow, airfoil, extruded aluminum.
2) Parallel or opposed blade configuration as required by application.
3) Material: ASTM B 211, Alloy 6063 T5 aluminum, 0.07 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl, or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch-diameter plated or stainless steel, mechanically attached to blades.
e. Bearings:

1) Molded synthetic or stainless-steel sleeve mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of aluminum and plated or stainless steel.
3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.

2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inches for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide anodized finish for aluminum surfaces in contact with airstream. Anodized finish shall be a minimum of 0.0007 inch thick.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

4. Airflow Measurement:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Trane

2) Automated Logic.

b. Where indicated, provide damper assembly with integral airflow monitoring.
c. Accuracy shall be within 5 percent of the actual flow rate between the range of minimum and design airflow. For applications with a large variation in range between the minimum and design airflow, configure the damper sections and flow measurement assembly as required to comply with the stated accuracy over the entire modulating range.
d. Provide a straightening device as part of the flow measurement assembly to achieve the specified accuracy with configuration indicated.
e. Suitable for operation in untreated and unfiltered air.
f. Provide temperature and altitude compensation and correction to maintain accuracy over temperature range encountered at site altitude.
g. Provide automatic zeroing feature.

5. Airflow Control:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Trane.

2) Automated Logic.

b. Where indicated, provide damper assembly with integral airflow measurement and control.

c. A factory-furnished and -calibrated controller shall be programmed, in nonvolatile EPROM, with application-specific airflow set point and range.
d. The controller and actuator shall communicate to control the desired airflow.
e. The controller shall receive a zero- to 10-V dc input signal and report a zero- to 20-mA output signal that is proportional to the airflow.
f. Airflow measurement and control range shall be suitable for operation between 150 to 2000 fpm.
g. Ambient Operating Temperature Range: Minus 40 to plus 140 deg F.
h. Ambient Operating Humidity Range: 5 to 95 percent relative humidity, non-condensing.
i. Provide unit with control transformer rated for not less than 85 VA. Provide transformer with primary and secondary protection and primary disconnecting means. Coordinate requirements with field power connection.
j. Provide screw terminals for interface to field wiring.
k. Factory mount electronics within a NEMA 250, Type 1 painted steel enclosure.

C. Rectangular Dampers with Steel Airfoil Blades:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Greenheck.

b. Ruskin.

2. Performance:

a. Leakage: AMCA 511, Class 1A. Leakage shall not exceed 3 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.06-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 6000 fpm.
d. Temperature: Minus 40 to plus 185 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length.
f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

a. Frame:

1) Material: ASTM A 653/A 653M galvanized-steel profiles, 0.06 inch thick.
2) Hat-shaped channel with integral flanges. Mating face shall be a minimum of 1 inch.
3) Width not less than 5 inches.

b. Blades:

1) Hollow, airfoil, galvanized steel.
2) Parallel or opposed blade configuration as required by application.
3) Material: ASTM A 653/A 653M galvanized steel, 0.05 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl, or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch-diameter plated or stainless steel, mechanically attached to blades.

e. Bearings:

1) Stainless steel mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of aluminum and plated or stainless steel.
3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inches for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide epoxy finish for surfaces in contact with airstream.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

D. Rectangular Dampers with Aluminum Flat Blades:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Greenheck.

b. Ruskin.

2. Performance:

a. Leakage: Leakage shall not exceed 3.2 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.07-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 2000 fpm.
d. Temperature: Minus 50 to plus 250 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length, not to exceed 3-in. wg.
f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

a. Frame:

1) Material: ASTM B 211, Alloy 6063 T5 extruded-aluminum profiles,0.12 inch thick.
2) Hat-shaped channel with integral flanges.
3) Width not less than 5 inches.

b. Blades:

1) Flat blades of extruded aluminum.
2) Parallel or opposed blade configuration as required by application.
3) Material: ASTM B 211, Alloy 6063 T5 extruded-aluminum profiles,0.12 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached extruded silicone, vinyl or plastic composite.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch-diameter plated or stainless steel, mechanically attached to blades.
e. Bearings:

1) Molded-synthetic sleeve, mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of plated or stainless steel.

3) Hardware: Stainless steel.

g. Transition:

1) For round and flat oval duct applications, provide damper assembly with integral transitions to mate to adjoining field connection.
2) Factory mount damper in a sleeve with a close transition to mate to field connection.
3) Damper size and sleeve shall be connection size plus 2 inches.
4) Sleeve length shall be not less than 12 inches for dampers without jackshafts and shall be not less than 16 inches for dampers with jackshafts.
5) Sleeve material shall match adjacent duct.

h. Additional Corrosion Protection for Corrosive Environments:

1) Provide anodized finish for aluminum surfaces in contact with airstream. Anodized finish shall be a minimum of 0.0007 inch thick.
2) Axles, damper linkage, and hardware shall be constructed of Type 316L stainless steel.

E. Rectangular Dampers with Steel Flat Blades:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Greenheck.

b. Ruskin.

2. Performance:

a. Leakage: Leakage shall not exceed 4.8 cfm/sq. ft. against 1-in. wg differential static pressure.
b. Pressure Drop: 0.1-in. wg at 1500 fpm across a 24-by-24-inch damper when tested according to AMCA 500-D, figure 5.3.
c. Velocity: Up to 1500 fpm.
d. Temperature: Minus 25 to plus 180 deg F.
e. Pressure Rating: Damper close-off pressure equal to fan shutoff pressure with a maximum blade deflection of 1/200 of blade length, not to exceed 4-in. wg.
f. Damper shall have AMCA seal for both air leakage and air performance.

3. Construction:

a. Frame:

1) Material: Galvanized or stainless steel,0.06 inch thick.
2) Hat-shaped channel with integral flanges.
3) Width not less than 5 inches.

b. Blades:

1) Flat blades with multiple grooves positioned axially for reinforcement.
2) Parallel or opposed blade configuration as required by application.
3) Material: Galvanized or stainless steel, 0.06 inch thick.
4) Width not to exceed 6 inches.
5) Length as required by close-off pressure, not to exceed 48 inches.

c. Seals:

1) Blades: Replaceable, mechanically attached, PVC-coated polyester.
2) Jambs: Stainless steel, compression type.

d. Axles: 0.5-inch-diameter plated or stainless steel, mechanically attached to blades.

e. Bearings:

1) Molded-synthetic sleeve, mounted in frame.
2) Where blade axles are installed in vertical position, provide thrust bearings.

f. Linkage:

1) Concealed in frame.
2) Constructed of plated or stainless steel.
3) Hardware: Stainless steel.

2.3 GENERAL CONTROL-DAMPER ACTUATORS REQUIREMENTS

A. Actuators shall operate related damper(s) with sufficient reserve power to provide smooth modulating action or two-position action and proper speed of response at velocity and pressure conditions to which the damper is subjected.

B. Actuators shall produce sufficient power and torque to close off against the maximum system pressures encountered. Actuators shall be sized to close off against the fan shutoff pressure as a minimum requirement.

C. The total damper area operated by an actuator shall not exceed 80 percent of manufacturer's maximum area rating.

D. Provide one actuator for each damper assembly where possible. Multiple actuators required to drive a single damper assembly shall operate in unison.

E. Avoid the use of excessively oversized actuators which could overdrive and cause linkage failure when the damper blade has reached either its full open or closed position.

F. Use jackshafts and shaft couplings in lieu of blade-to-blade linkages when driving axially aligned damper sections.

G. Provide mounting hardware and linkages for connecting actuator to damper.

H. Select actuators to fail in desired position in the event of a power failure.

I. Actuator Fail Positions: As indicated below:

1. Exhaust Air: Close.
2. Outdoor Air: Close.
3. Supply Air: Open.
4. Return Air: Open.

2.4 ELECTRIC AND ELECTRONIC ACTUATORS

A. Type: Motor operated, with or without gears, electric and electronic.

B. Voltage:

1. Actuator shall deliver torque required for continuous uniform movement of controlled device from limit to limit when operated at rated voltage.
2. Actuator shall function properly within a range of 85 to 120 percent of nameplate voltage.

C. Construction:

1. Less Than 100 W: Fiber or reinforced nylon gears with steel shaft, copper alloy or nylon bearings, and pressed steel enclosures.
2. 100 up to 400 W: Gears ground steel, oil immersed, shaft-hardened steel running in bronze, copper alloy, or ball bearings. Operator and gear trains shall be totally enclosed in dustproof cast-iron, cast-steel, or cast-aluminum housing.
3. Greater Than 400 W: Totally enclosed reversible induction motors with auxiliary hand crank and permanently lubricated bearings.

D. Field Adjustment:

1. Spring return actuators shall be easily switchable from fail open to fail closed in the field without replacement.
2. Provide gear-type actuators with an external manual adjustment mechanism to allow manual positioning of the damper when the actuator is not powered.

E. Two-Position Actuators: Single direction, spring return or reversing type.

F. Modulating Actuators:

1. Capable of stopping at all points across full range, and starting in either direction from any point in range.
2. Control Input Signal:

a. Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position, and other input drives actuator to close position. No signal of either input remains in last position.
b. Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for zero- to 10- or 2- to 10-V dc and 4- to 20-mA signals.
c. Pulse Width Modulation (PWM): Actuator drives to a specified position according to a pulse duration (length) of signal from a dry-contact closure, triac sink or source controller.
d. Programmable Multi-Function:

1) Control input, position feedback, and running time shall be factory or field programmable.
2) Diagnostic feedback of hunting or oscillation, mechanical overload, mechanical travel, and mechanical load limit.
3) Service data, including at a minimum, number of hours powered and number of hours in motion.

G. Position Feedback:

1. Equip two-position actuators with limits switches or other positive means of a position indication signal for remote monitoring of open and close position.
2. Equip modulating actuators with a position feedback through current or voltage signal for remote monitoring.
3. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.

H. Fail-Safe:

1. Where indicated, provide actuator to fail to an end position.
2. Internal spring return mechanism to drive controlled device to an end position (open or close) on loss of power.
3. Batteries, capacitors, and other non-mechanical forms of fail-safe operation are acceptable only where uniquely indicated.

I. Integral Overload Protection:

1. Provide against overload throughout the entire operating range in both directions.
2. Electronic overload, digital rotation sensing circuitry, mechanical end switches, or magnetic clutches are acceptable methods of protection.

J. Damper Attachment:

1. Unless otherwise required for damper interface, provide actuator designed to be directly coupled to damper shaft without need for connecting linkages.
2. Attach actuator to damper drive shaft in a way that ensures maximum transfer of power and torque without slippage.
3. Bolt and set screw method of attachment is acceptable only if provided with at least two points of attachment.

K. Temperature and Humidity:

1. Temperature: Suitable for operating temperature range encountered by application with minimum operating temperature range of minus 20 to plus 120 deg F.
2. Humidity: Suitable for humidity range encountered by application; minimum operating range shall be from 5 to 95 percent relative humidity, non-condensing.

L. Enclosure:

1. Suitable for ambient conditions encountered by application.
2. NEMA 250, Type 2 for indoor and protected applications.
3. NEMA 250, Type 4 or Type 4X for outdoor and unprotected applications.
4. Provide actuator enclosure with a heater and controller where required by application.

M. Stroke Time:

1. Operate damper from fully closed to fully open within 60 seconds.
2. Operate damper from fully open to fully closed within 60 seconds.
3. Move damper to failed position within 5 seconds.
4. Select operating speed to be compatible with equipment and system operation.
5. Actuators operating in smoke control systems comply with governing code and NFPA requirements.

N. Sound:

1. Spring Return: 62 dBA.
2. Non-Spring Return: 45 dBA.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Furnish and install products required to satisfy most stringent requirements indicated.

B. Properly support dampers and actuators, tubing, wiring, and conduit to comply with requirements indicated. Brace all products to prevent lateral movement and sway or a break in attachment.

C. Provide ceiling, floor, roof, and wall openings and sleeves required by installation. Before proceeding with drilling, punching, or cutting, check location first for concealed products that could potentially be damaged. Patch, flash, grout, seal, and refinish openings to match adjacent condition.

D. Seal penetrations made in fire-rated and acoustically rated assemblies.

E. Fastening Hardware:

1. Stillson wrenches, pliers, or other tools that will cause injury to or mar surfaces of rods, nuts, and other parts are prohibited for assembling and tightening nuts.
2. Tighten bolts and nuts firmly and uniformly. Do not overstress threads by excessive force or by oversized wrenches.
3. Lubricate threads of bolts, nuts, and screws with graphite and oil before assembly.

F. Install products in locations that are accessible and that will permit calibration and maintenance from floor, equipment platforms, or catwalks. Where ladders are required for Owner's access, confirm unrestricted ladder placement is possible under occupied condition.

G. Corrosive Environments:

1. Use products that are suitable for environment to which they will be subjected.
2. If possible, avoid or limit use of materials in corrosive environments, including, but not limited to, the following:

    a. Laboratory exhaust airstreams.
    b. Process exhaust airstreams.

3. Use Type 316 stainless-steel tubing and fittings when in contact with a corrosive environment.
4. When conduit is in contact with a corrosive environment, use Type 316 stainless-steel conduit and fittings or conduit and fittings that are coated with a corrosive-resistant coating that is suitable for environment.
5. Where actuators are located in a corrosive environment and are not corrosive resistant from manufacturer, field install products in a NEMA 250, Type 4X enclosure constructed of Type 316L stainless steel.

3.2 ELECTRIC POWER

A. Furnish and install electrical power to products requiring electrical connections.

B. Furnish and install circuit breakers. Comply with requirements in Section 262816 "Enclosed Switches and Circuit Breakers."

C. Furnish and install power wiring. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

D. Furnish and install raceways. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems."

3.3 CONTROL DAMPERS

A. Install smooth transitions, not exceeding 15 degrees, to dampers smaller than adjacent duct. Install transitions as close to damper as possible but at distance to avoid interference and impact to performance. Consult manufacturer for recommended clearance.

B. Clearance:

1. Locate dampers for easy access and provide separate support of dampers that cannot be handled by service personnel without hoisting mechanism.
2. Install dampers with at least 24 inches of clear space on sides of dampers requiring service access.

C. Service Access:

1. Dampers and actuators shall be accessible for visual inspection and service.
2. Install access door(s) in duct or equipment located upstream of damper to allow service personnel to hand clean any portion of damper, linkage, and actuator. Comply with requirements in Section 233300 "Air Duct Accessories."

D. Install dampers straight and true, level in all planes, and square in all dimensions. Install supplementary structural steel reinforcement for large multiple-section dampers if factory support alone cannot handle loading.

E. Attach actuator(s) to damper drive shaft.

F. For duct-mounted and equipment-mounted dampers installed outside of equipment, install a visible and accessible indication of damper position from outside.

G. Connect electrical devices and components to electrical grounding system. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

H. Identify system components, wiring, cabling, and terminals. Each piece of wire, cable, and tubing shall have the same designation at each end for operators to determine continuity at points of connection. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."Section 16075 "Electrical Identification."

I. Install engraved phenolic nameplate with damper identification on damper and on face of ceiling where damper is concealed above ceiling.

3.4 CHECKOUT PROCEDURES

A. Control-Damper Checkout:

1. Check installed products before continuity tests, leak tests, and calibration.
2. Check dampers for proper location and accessibility.
3. Verify that control dampers are installed correctly for flow direction.
4. Verify that proper blade alignment, either parallel or opposed, has been provided.
5. Verify that damper frame attachment is properly secured and sealed.
6. Verify that damper actuator and linkage attachment are secure.
7. Verify that actuator wiring is complete, enclosed, and connected to correct power source.
8. Verify that damper blade travel is unobstructed.

3.5 ADJUSTMENT, CALIBRATION, AND TESTING:

A. Stroke and adjust control dampers following manufacturer's recommended procedure, from 100 percent open to 100 percent closed back to 100 percent open.

B. Check and document open and close cycle times for applications with a cycle time of less than 30 seconds.

C. For control dampers equipped with positive position indication, check feedback signal at multiple positions to confirm proper position indication.

END OF SECTION 230923.12

SECTION 231123

FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: More than 0.5 psig but not more than 2 psig.

C. Natural-Gas System Pressures within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2 psig, and is reduced to secondary pressure of 0.5 psig or less.

D. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. OmegaFlex, Inc.
b. Parker Hannifin Corporation.
c. Titeflex.
d. Tru-Flex Metal Hose Corp.

2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.

3. Coating: PE with flame retardant.

a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1) Flame-Spread Index: 25 or less.
2) Smoke-Developed Index: 50 or less.

4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
5. Striker Plates: Steel, designed to protect tubing from penetrations.
6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
7. Operating-Pressure Rating: 5 psig.

C. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type K ASTM B 837, Type G.

1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
2. Flare Fittings: Comply with ASME B16.26 and SAE J513.

a. Copper fittings with long nuts.
b. Metal-to-metal compression seal without gasket.
c. Dryseal threads complying with ASME B1.20.3.

3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch thick.

D. PE Pipe: ASTM D 2513, SDR 11.

1. PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
2. PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
3. Anodeless Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet.

b. Casing: Steel pipe complying with ASTM A 53/A 53M, Schedule 40, black steel, Type E or S, Grade B, with corrosion-protective coating covering. Vent casing aboveground.
c. Aboveground Portion: PE transition fitting.
d. Outlet shall be threaded or suitable for welded connection.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

4. Transition Service-Line Risers: Factory fabricated and leak tested.

a. Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
b. Outlet shall be threaded or suitable for welded connection.
c. Bridging sleeve over mechanical coupling.
d. Factory-connected anode.
e. Tracer wire connection.
f. Ultraviolet shield.
g. Stake supports with factory finish to match steel pipe casing or carrier pipe.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor or outdoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.

4. CWP Rating: 125 psig.

D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. A.Y. McDonald Mfg. Co.
   b. BrassCraft Manufacturing Co.; a Masco company.
   c. Conbraco Industries, Inc.
   d. Lyall, R. W. & Company, Inc.
   e. Perfection Corporation.

2. Body: Bronze, complying with ASTM B 584.

3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. A.Y. McDonald Mfg. Co.
    b. BrassCraft Manufacturing Co.; a Masco company.
    c. Conbraco Industries, Inc.
    d. Lyall, R. W. & Company, Inc.
    e. Perfection Corporation.

2. Body: Bronze, complying with ASTM B 584.

3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. A.Y. McDonald Mfg. Co.
    b. BrassCraft Manufacturing Co.; a Masco company.
    c. Conbraco Industries, Inc.
    d. Lyall, R. W. & Company, Inc.
    e. Perfection Corporation.

2. Body: Bronze, complying with ASTM B 584.

3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. A.Y. McDonald Mfg. Co.
    b. Lee Brass Company.

2. Body: Bronze, complying with ASTM B 584.

3. Plug: Bronze.
4. Ends: Threaded, socket, as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. PE Ball Valves: Comply with ASME B16.40.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Kerotest Manufacturing Corp.
    b. Lyall, R. W. & Company, Inc.
    c. Perfection Corporation.

2. Body: PE.

3. Ball: PE.
4. Stem: Acetal.
5. Seats and Seals: Nitrile.
6. Ends: Plain or fusible to match piping.
7. CWP Rating: 80 psig.
8. Operating Temperature: Minus 20 to plus 140 deg F.
9. Operator: Nut or flat head for key operation.

10. Include plastic valve extension.
11. Include tamperproof locking feature for valves where indicated on Drawings.

H. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 MOTORIZED GAS VALVES

A. Electrically Operated Valves: Comply with UL 429.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Dungs, Karl, Inc.
b. Eclipse Innovative Thermal Technologies.
c. Goyen Valve Corp.
d. Magnatrol Valve Corporation.
e. Parker Hannifin Corporation.
f. Watts; a Watts Water Technologies company.

3. Pilot operated.

4. Body: Brass or aluminum.
5. Seats and Disc: Nitrile rubber.
6. Springs and Valve Trim: Stainless steel.
7. 120-V ac, 60 Hz, Class B, continuous-duty molded coil, and replaceable.
8. NEMA ICS 6, Type 4, coil enclosure.
9. Normally closed.
10. Visual position indicator.

2.6 EARTHQUAKE VALVES

A. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Vanguard Valves, Inc.

3. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.

4. Maximum Operating Pressure: 5 psig.
5. Cast-aluminum body with nickel-plated chrome steel internal parts.
6. Nitrile-rubber valve washer.
7. Sight windows for visual indication of valve position.
8. Threaded end connections complying with ASME B1.20.1.
9. Wall mounting bracket with bubble level indicator.

B. Earthquake Valves: Comply with ASCE 25.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Pacific Seismic Products, Inc.

3. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction.

4. Maximum Operating Pressure: 0.5 psig.
5. Cast-aluminum body with stainless-steel internal parts.
6. Nitrile-rubber, reset-stem o-ring seal.
7. Valve position, open or closed, indicator.
8. Composition valve seat with clapper held by spring or magnet locking mechanism.
9. Level indicator.
10. End Connections: Threaded for valves NPS 2 and smaller.

2.7 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Actaris.
    b. American Meter Company.
    c. Eclipse Innovative Thermal Technologies.
    d. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
    e. Invensys.
    f. Itron Gas.
    g. Maxitrol Company.
    h. Richards Industries.

3. Body and Diaphragm Case: Cast iron or die-cast aluminum.

4. Springs: Zinc-plated steel; interchangeable.
5. Diaphragm Plate: Zinc-plated steel.
6. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
7. Orifice: Aluminum; interchangeable.
8. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
9. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
10. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
11. Overpressure Protection Device: Factory mounted on pressure regulator.
12. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
13. Maximum Inlet Pressure: 10 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Canadian Meter Company Inc.
    b. Eaton Corporation.
    c. Harper Wyman Co.
    d. Maxitrol Company.
    e. SCP, Inc.

3. Body and Diaphragm Case: Die-cast aluminum.

4. Springs: Zinc-plated steel; interchangeable.
5. Diaphragm Plate: Zinc-plated steel.
6. Seat Disc: Nitrile rubber.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
9. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
10. Maximum Inlet Pressure: 5 psig.

2.8 DIELECTRIC UNIONS

A. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. A.Y. McDonald Mfg. Co.
   b. Capitol Manufacturing Company.
   c. Central Plastics Company.
   d. HART Industrial Unions, LLC.
   e. Jomar Valve.
   f. Matco-Norca.
   g. Watts; a Watts Water Technologies company.
   h. Wilkins.
   i. Zurn Industries, LLC.

2. Description:

   a. Standard: ASSE 1079.
   b. Pressure Rating: 125 psig minimum at 180 deg F.
   c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.9 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.

C. Install underground, PE, natural-gas piping according to ASTM D 2774.

D. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

E. Copper Tubing with Protective Coating:

1. Apply joint cover kits over tubing to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

F. Install fittings for changes in direction and branch connections.

G. Install pressure gage upstream and downstream from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.2 INDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Q. Connect branch piping from top or side of horizontal piping.

R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment.

S. Do not use natural-gas piping as grounding electrode.

T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

U. Install pressure gage upstream and downstream from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install earthquake valves aboveground outside buildings according to listing.

E. Install anode for metallic valves in underground PE piping.

3.4 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

F. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

G. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.5 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

D. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.6 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.8 FIELD QUALITY CONTROL

A. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.

B. Natural-gas piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be one of the following:

1. PE pipe and fittings joined by heat fusion; service-line risers with tracer wire terminated in an accessible location.
2. Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
3. Annealed-temper copper tube with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.

B. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.
3. Annealed-temper copper tube with wrought-copper fittings and brazed joints.

C. Branch Piping in Cast-in-Place Concrete to Single Appliance: Annealed-temper copper tube with wrought-copper fittings and brazed joints. Install piping embedded in concrete with no joints in concrete.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.10 INDOOR PIPING SCHEDULE

A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:

1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.

2. Annealed-temper copper tube with wrought-copper fittings and brazed joints.
3. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

C. Underground, below building, piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

D. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

E. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.11 UNDERGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Connections to Existing Gas Piping: Use valve and fitting assemblies made for tapping utility's gas mains and listed by an NRTL.

B. Underground: PE valves.

3.12 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

C. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION 231123

SECTION 232300

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-22:

1. Suction Lines for Air-Conditioning Applications: 185 psig.
2. Suction Lines for Heat-Pump Applications: 325 psig.
3. Hot-Gas and Liquid Lines: 325 psig.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.7 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.

6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.
8. Manual operator.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 700 psig.

H. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

I. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

J. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

K. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

L. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

M. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Suction Lines NPS 4 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:

1. NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.
2. NPS 1-1/2 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
3. NPS 2 to NPS 3: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
4. NPS 4: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

F. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

G. Safety-Relief-Valve Discharge Piping:

1. NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.
2. NPS 1-1/2 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.
3. NPS 2 to NPS 3: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.
4. NPS 4: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at strainers if they are not an integral part of strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Q. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

A. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

B. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.

5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113

METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233116 "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
3. Section 233119 "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
4. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"

1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.

e. Access panels.
f. Perimeter moldings.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and

Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction

methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m) and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.6 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Ductmate Industries, Inc.
3. Hilti Corp.
4. Kinetics Noise Control.
5. Loos & Co.; Cableware Division.
6. Mason Industries.
7. TOLCO; a brand of NIBCO INC.
8. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 492, stainless-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.

10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.7 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

B. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 3-inch wg.

b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 1-inch wg.
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 3-inch wg.
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 3-inch wg.
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 1-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 3-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

E. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. PVC-Coated Ducts:

    a. Exposed to Airstream: Match duct material.
    b. Not Exposed to Airstream: Match duct material.

3. Stainless-Steel Ducts:

    a. Exposed to Airstream: Match duct material.
    b. Not Exposed to Airstream: Match duct material.

4. Aluminum Ducts: Aluminumor galvanized sheet steel coated with zinc chromate.

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Velocity 1000 fpm or Lower:

        1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
        2) Mitered Type RE 4 without vanes.

    b. Velocity 1000 to 1500 fpm:

        1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
        2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

    c. Velocity 1500 fpm or Higher:

        1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
        2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
        3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

    a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300

AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Flange connectors.
7. Turning vanes.
8. Duct-mounted access doors.
9. Flexible connectors.
10. Flexible ducts.
11. Duct accessory hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control-damper installations.
d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
e. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and painted finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Lloyd Industries, Inc.
6. Nailor Industries Inc.

7. NCA Manufacturing, Inc.
8. Pottorff.
9. Ruskin Company.
10. Vent Products Company, Inc.

C. Description: Gravity balanced.

D. Maximum Air Velocity: 1250 fpm.

E. Maximum System Pressure: 2-inch wg.

F. Frame: Hat-shaped, 0.05-inch-thick, galvanized sheet steel, with welded corners or mechanically attached and mounting flange.

G. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.025-inch-thick, roll-formed aluminum noncombustible, tear-resistant, neoprene-coated fiberglass with sealed edges.

H. Blade Action: Parallel.

I. Blade Seals: Neoprene, mechanically locked.

J. Blade Axles:

1. Material: Nonferrous metal.
2. Diameter: 0.20 inch.

K. Tie Bars and Brackets: Aluminum.

L. Return Spring: Adjustable tension.

M. Bearings: Steel ball or synthetic pivot bushings.

N. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.

    a. Sleeve Thickness: 20 gage minimum.
    b. Sleeve Length: 6 inches minimum.

6. Screen Mounting: Rear mounted.
7. Screen Material: Aluminum.
8. Screen Type: Insect.
9. 90-degree stops.

2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Air Balance Inc.; a division of Mestek, Inc.
    b. American Warming and Ventilating; a division of Mestek, Inc.
    c. Flexmaster U.S.A., Inc.
    d. McGill AirFlow LLC.
    e. Nailor Industries Inc.
    f. Pottorff.
    g. Ruskin Company.
    h. Trox USA Inc.
    i. Vent Products Company, Inc.

3. Standard leakage rating, with linkage outside airstream.
4. Suitable for horizontal or vertical applications.
5. Frames:

    a. Frame: Hat-shaped, 0.094-inch-thick, galvanized sheet steel.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

6. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized-steel, 0.064 inch thick.

7. Blade Axles: Galvanized steel.
8. Bearings:

    a. Oil-impregnated bronze.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

9. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Air Balance Inc.; a division of Mestek, Inc.
    b. American Warming and Ventilating; a division of Mestek, Inc.
    c. McGill AirFlow LLC.
    d. Nailor Industries Inc.
    e. Pottorff.
    f. Ruskin Company.
    g. Trox USA Inc.
    h. Vent Products Company, Inc.

3. Standard leakage rating, with linkage outside airstream.
4. Suitable for horizontal or vertical applications.
5. Frames: Hat-shaped, 0.10-inch-thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
6. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Roll-Formed Aluminum Blades: 0.10-inch-thick aluminum sheet.
    e. Extruded-Aluminum Blades: 0.050-inch-thick extruded aluminum.

7. Blade Axles: Galvanized steel.
8. Bearings:

    a. Oil-impregnated bronze.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

9. Tie Bars and Brackets: Aluminum.

C. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch-thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Lloyd Industries, Inc.
6. McGill AirFlow LLC.
7. Metal Form Manufacturing, Inc.
8. Nailor Industries Inc.
9. NCA Manufacturing, Inc.
10. Pottorff.
11. Ruskin Company.
12. Vent Products Company, Inc.
13. Young Regulator Company.

C. Frames:

1. Hat shaped.
2. 0.094-inch-thick, galvanized sheet steel.
3. Mitered and welded corners.

D. Blades:

1. Multiple blade with maximum blade width of 6 inches.
2. Opposed-blade design.
3. Galvanized-steel.
4. 0.064 inch thick single skin.
5. Blade Edging: Closed-cell neoprene.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

E. Blade Axles: 1/2-inch-diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

F. Bearings:

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.6 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff.
8. Prefco; Perfect Air Control, Inc.
9. Ruskin Company.
10. Vent Products Company, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.

D. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

E. Fire Rating: 1-1/2 and 3 hours.

F. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.

G. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.138 inch or 0.39 inch thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

H. Mounting Orientation: Vertical or horizontal as indicated.

I. Blades: Roll-formed, interlocking, 0.024-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch-thick, galvanized-steel blade connectors.

J. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

K. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

L. Heat-Responsive Device: , replaceable link and switch package, factory installed, 165 deg F and 212 deg F rated.

2.7 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

D. Material: Galvanized steel.

E. Gage and Shape: Match connecting ductwork.

2.8 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. METALAIRE, Inc.
5. SEMCO Incorporated.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

D. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

E. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

F. Vane Construction: Double wall.

2.9 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Elgen Manufacturing.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. McGill AirFlow LLC.
8. Nailor Industries Inc.
9. Pottorff.
10. Ventfabrics, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

    a. Double wall, rectangular.
    b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    c. Vision panel.
    d. Hinges and Latches: 1-by-1-inchbutt or piano hinge and cam latches.
    e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

    a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    b. Access Doors up to 18 Inches Square: Continuous and two sash locks.

c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches.
d. Access Doors Larger Than 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.

D. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.
2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 3.0- to 8.0-inch wg.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch-thick, fibrous-glass or polystyrene-foam board.

2.10 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

C. Labeled according to UL 1978 by an NRTL.

D. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

E. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

F. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

G. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.11 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. Ventfabrics, Inc.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Materials: Flame-retardant or noncombustible fabrics.

D. Coatings and Adhesives: Comply with UL 181, Class 1.

E. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

F. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

G. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd..
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.12 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Noninsulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.

3. Temperature Range: Minus 10 to plus 160 deg F.

D. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

E. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
2. Non-Clamp Connectors: Adhesive.

2.13 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.

2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Upstream and downstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. Connect terminal units to supply ducts with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

N. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with liquid adhesive plus tape.

P. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233713

DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Louver face diffusers.
3. Linear bar diffusers.
4. Adjustable bar registers and grilles.
5. Fixed face registers and grilles.
6. Linear bar grilles.

B. Related Sections:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. A-J Manufacturing Co., Inc.
b. Anemostat Products; a Mestek company.
c. Carnes.
d. Hart & Cooley Inc.
e. Krueger.
f. METALAIRE, Inc.
g. Nailor Industries Inc.
h. Price Industries.
i. Titus.
j. Tuttle & Bailey.

3. Devices shall be specifically designed for variable-air-volume flows.
4. Material: Aluminum.
5. Finish: Baked enamel, color selected by Architect.
6. Face Size: 24 by 24 inches or 12 by 12 inches.
7. Face Style: Four cone.
8. Mounting: T-bar.
9. Pattern: Adjustable.
10. Dampers: Radial opposed blade.
11. Accessories:

a. Equalizing grid.
b. Plaster ring.
c. Safety chain.
d. Wire guard.
e. Sectorizing baffles.
f. Operating rod extension.

B. Louver Face Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. A-J Manufacturing Co., Inc.
b. Anemostat Products; a Mestek company.
c. Carnes.
d. METALAIRE, Inc.
e. Nailor Industries Inc.
f. Price Industries.
g. Titus.
h. Tuttle & Bailey.

3. Devices shall be specifically designed for variable-air-volume flows.
4. Material: Aluminum.
5. Finish: Baked enamel, color selected by Architect.
6. Mounting: Surface.

7. Pattern: One-way & Adjustable core style.
8. Dampers: Radial opposed blade.
9. Accessories:

    a. Square to round neck adaptor.
    b. Adjustable pattern vanes.
    c. Throw reducing vanes.
    d. Equalizing grid.
    e. Plaster ring.
    f. Safety chain.
    g. Wire guard.
    h. Sectorizing baffles.
    i. Operating rod extension.

2.2 CEILING LINEAR SLOT OUTLETS

A. Linear Bar Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Air Research Diffuser Products, Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. Dayus Register & Grille Inc.
    e. Hart & Cooley Inc.
    f. Krueger.
    g. METALAIRE, Inc.
    h. Nailor Industries Inc.
    i. Price Industries.
    j. Titus.
    k. Tuttle & Bailey.

3. Devices shall be specifically designed for variable-air-volume flows.
4. Material: Aluminum.
5. Finish: Baked enamel, color selected by Architect.
6. Narrow Core Spacing Arrangement: 1/8-inch-thick blades spaced 1/4 inch apart, zero-degree deflection.
7. Wide Core Spacing Arrangement: 1/8-inch-thick blades spaced 1/2 inch apart, zero-degree deflection.
8. Wide Core Spacing Arrangement: 3/16-inch-thick blades spaced 1/2 inch apart, zero-degree deflection.
9. Pencil-Proof Core Spacing Arrangement: 3/16-inch-thick blades spaced 7/16 inch apart, zero-degree deflection.
10. One-Way Deflection Vanes: Extruded construction fixed louvers with removable core.

11. Frame: 1 inch wide.
12. Accessories: Directional vanes.

B. Linear Slot Diffuser:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Air Research Diffuser Products, Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. Hart & Cooley Inc.
    e. Krueger.
    f. METALAIRE, Inc.
    g. Nailor Industries Inc.
    h. Price Industries.
    i. Titus.
    j. Tuttle & Bailey.

3. Devices shall be specifically designed for variable-air-volume flows.
4. Material - Shell: Aluminum, noninsulated.
5. Material - Pattern Controller and Tees: Aluminum.
6. Finish - Face and Shell: Baked enamel, black.
7. Finish - Pattern Controller: Baked enamel, black.
8. Finish - Tees: Baked enamel, color selected by Architect.
9. Slot Width: 1-1/2 inches.
10. Number of Slots: Two.
11. Length: 48 inches.
12. Accessories: T-bar slot.

2.3 REGISTERS AND GRILLES

A. Adjustable Bar Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. A-J Manufacturing Co., Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. Dayus Register & Grille Inc.
    e. Hart & Cooley Inc.
    f. Krueger.
    g. METALAIRE, Inc.

h. Nailor Industries Inc.
i. Price Industries.
j. Titus.
k. Tuttle & Bailey.

3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
6. Core Construction: Removable.
7. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
8. Frame: 1-1/4 inches wide.
9. Mounting: Countersunk screw.
10. Damper Type: Adjustable opposed blade.
11. Accessories:

a. Rear-blade gang operator.
b. Filter.

B. Adjustable Bar Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. A-J Manufacturing Co., Inc.
b. Anemostat Products; a Mestek company.
c. Carnes.
d. Dayus Register & Grille Inc.
e. Hart & Cooley Inc.
f. Krueger.
g. METALAIRE, Inc.
h. Nailor Industries Inc.
i. Price Industries.
j. Titus.
k. Tuttle & Bailey.

3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
6. Core Construction: Removable.
7. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
8. Frame: 1-1/4 inches wide.
9. Mounting: Countersunk screw.

C. Fixed Face Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. A-J Manufacturing Co., Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. Dayus Register & Grille Inc.
    e. Hart & Cooley Inc.
    f. Krueger.
    g. Nailor Industries Inc.
    h. Price Industries.
    i. Titus.
    j. Tuttle & Bailey.

3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
6. Core Construction: Removable.
7. Frame: 1-1/4 inches wide.
8. Mounting: Countersunk screw.
9. Damper Type: Adjustable opposed blade.
10. Accessory: Filter.

D. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. A-J Manufacturing Co., Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. Dayus Register & Grille Inc.
    e. Hart & Cooley Inc.
    f. Krueger.
    g. Nailor Industries Inc.
    h. Price Industries.
    i. Titus.
    j. Tuttle & Bailey.

3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
6. Core Construction: Removable.
7. Frame: 1-1/4 inches wide.
8. Mounting: Lay in.
9. Accessory: Filter.

E. Linear Bar Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. A-J Manufacturing Co., Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. Dayus Register & Grille Inc.
    e. Hart & Cooley Inc.
    f. Krueger.
    g. Nailor Industries Inc.
    h. Price Industries.
    i. Titus.
    j. Tuttle & Bailey.

3. Material: Aluminum.
4. Finish: Baked enamel, color selected by Architect.
5. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
6. Distribution plenum.

    a. Internal insulation.
    b. Inlet damper.

7. Frame: 1-1/4 inches wide.
8. Mounting: Lay in.
9. Damper Type: Adjustable opposed blade.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels,

locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 237416.11

PACKAGED, SMALL-CAPACITY, ROOFTOP AIR-CONDITIONING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes packaged, small-capacity, rooftop air-conditioning units (RTUs) with the following components and accessories:
   1. Casings.
   2. Fans.
   3. Motors.
   4. Rotary heat exchangers.
   5. Coils.
   6. Refrigerant circuit components.
   7. Air filtration.
   8. Dampers.
   9. Electrical power connections.
   10. Controls.
   11. Accessories.
   12. Roof curbs.

1.2 ACTION SUBMITTALS

A. Product Data: For each RTU.

B. Shop Drawings:
   1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Include diagrams for power, signal, and control wiring.

C. Delegated-Design Submittal: For RTU supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and other details, drawn to scale and coordinated with each other, using input from installers of the items involved.

B. Seismic Qualification Certificates: For RTUs, accessories, and components, from manufacturer.

C. Product Certificates: Submit certification that specified equipment will withstand wind forces identified in "Performance Requirements" Article and in Section 230548 "Vibration and Seismic Controls for HVAC."

D. Field quality-control reports.

E. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of RTUs that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. AHRI Compliance:
1. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
3. Comply with AHRI 270 for testing and rating sound performance for RTUs.
4. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.

B. AMCA Compliance:
1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.
2. Damper leakage tested according to AMCA 500-D.
3. Operating Limits: Classify according to AMCA 99.

C. ASHRAE Compliance:
1. Comply with ASHRAE 15 for refrigeration system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

D. ASHRAE/IES Compliance: Comply with applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. NFPA Compliance: Comply with NFPA 90A or NFPA 90B.

F. UL Compliance: Comply with UL 1995.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, [**provide products by the following**] [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:

1. AAON.
2. Addison.
3. Daikin Applied.
4. Valent.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design mounting and restraints for RTUs, including comprehensive engineering analysis.
1. Design RTU supports to comply with wind and seismic performance requirements.

B. Wind-Restraint Performance:
1. Basic Wind Speed: 160 mph.
2. Building Classification Category: IV.
3. Minimum 10 lb/sq. ft. multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

C. Seismic Performance: RTUs, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified."

2.4 CAPACITIES AND CHARACTERISTICS

A. Exterior Casing Thickness: 0.052 inch thick.

B. Supply-Air Fan:
1. Fan Type: Belt driven, double width, forward curved, centrifugal.
2. Fan Type: Double width, forward curved, centrifugal.
3. Airflow: See drawings.
4. External Static Pressure: See drawings.
5. Fan Speed: Variable See drawings.
6. Enclosure Type: Open, dripproof.
7. Enclosure Materials: Rolled steel.
8. Motor Characteristics:

a. Horsepower: See drawings.
b. Motor Speed: ECM.
c. Volts: 460.
d. Phase: Poly.
e. Hertz: 60.
f. Full-Load Amperes: See drawings.
g. Minimum Circuit Ampacity: See drawings.
h. Maximum Overcurrent Protection: See drawings.

C. Outdoor-Air-Intake Relief-Air Fan:
1. Airflow: See drawings.
2. Static Pressure: See drawings.
3. Fan Speed: See drawings.
4. Enclosure Type: Open, dripproof.
5. Enclosure Materials: Rolled steel.

D. Supply-Air Refrigerant Coil:
1. Total Cooling Capacity: See drawings.
2. Sensible Cooling Capacity: See drawings.
3. Entering-Air Dry-Bulb Temperature: See drawings.
4. Entering-Air Wet-Bulb Temperature: See drawings.

E. Outdoor-Air Refrigerant Coil:
1. Ambient-Air Temperature: See drawings.
2. Fan Motor: See drawings.
3. Number of Fans: See drawings.

F. Dampers:
1. Outdoor-Air Damper: Linked damper blades, for zero to 30 percent outdoor air, with motorized damper filter.
2. Outdoor- and Return-Air Mixing Dampers: Parallel-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage or gears and interconnect so dampers operate simultaneously.
3. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IES 90.1.
4. Barometric relief dampers.

G. Recirculating-Air Filters:
1. Minimum Face Area: See drawings.
2. One-wide filter racks.
3. Thickness: 2 inches.
4. Pleated with minimum 90 percent arrestance, and MERV 13.
5. Initial Resistance: See drawings.
6. Final Resistance: See drawings.

H. Outdoor-Air Filters:
1. Minimum Face Area: See drawings.
2. One-wide filter racks.

3. Thickness: 1 inch.
4. Filter Type: Glass fiber with minimum 80 percent arrestance, and MERV 8.

I. RTU Electrical Characteristics for Single-Point Connection: See drawings.

2.5 CASINGS

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Double-Wall Construction: Fill space between walls with 2-inch foam insulation and seal moisture tight for R-13 performance.

C. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
1. Corrosion Protection: 750 hours' salt spray test according to ASTM B 117.

D. Inner Casing Fabrication Requirements:
1. Inside Casing: G-90-coated galvanized steel, 0.034 inch thick, perforated 40 percent free area.

E. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
1. Materials: ASTM C 1071, Type I.
2. Thickness: 1 inch injected foam, R-7, galvanized steel liner.
3. Liner materials shall have airstream surface coated with erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
4. Liner Adhesive: Comply with ASTM C 916, Type I.

F. Plastic Condensate Drain Pans: Fabricated using rigid heavy plastic polymer, a minimum of 2 inches deep, and complying with ASHRAE 62.1 for design and construction of drain pans.

G. Condensate Drain Pans: Fabricated using stainless-steel sheet 0.025 inch thick, a minimum of 2 inches deep, and complying with ASHRAE 62.1 for design and construction of drain pans.
1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
2. Drain Connections: Threaded nipple.

H. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.6 FANS

A. Supply-Air Fans: Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.
1. Direct-Driven Supply-Air Fans: Motor shall be resiliently mounted in the fan inlet.

2. Belt-Driven Supply-Air Fans: Motors shall be installed on an adjustable fan base resiliently mounted in the casing.

B. Condenser-Coil Fan: propeller, mounted on shaft of permanently lubricated ECM motors.

2.7 MOTORS

A. Comply with NEMA MG 1, Design B, medium induction motor, unless otherwise indicated.

B. Comply with IEEE 841 for severe-duty motors.

C. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

D. Duty: Continuous duty at ambient temperature of 104 deg Fand at altitude of 3300 feet above sea level.

E. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

F. Efficiency: Energy efficient, as defined in NEMA MG 1.

G. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements.

H. Multispeed Motors: Variable torque.
1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

I. Multispeed Motors: Separate winding for each speed.

J. Rotor: Random-wound, squirrel cage.

K. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

L. Temperature Rise: Match insulation rating.

M. Insulation: Class F.

N. Code Letter Designation:
1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

O. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

P. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

Q. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
   1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short-time rise pulses produced by pulse-width-modulated inverters.
   2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
   3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
   4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
   5. Retain "Service Factor" Subparagraph below for service factors exceeding NEMA standard for other than open-dripproof motors.
   6. Service Factor: 1.15.
   7. Efficiency: Premium efficient.
   8. NEMA Design: 3R.

2.8 COILS

A. Supply-Air Refrigerant Coil:
   1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
   2. Polymer strip shall prevent all copper coils from contacting steel coil frame or condensate pan.
   3. Coil Split: Interlaced.
   4. Coated.

B. Outdoor-Air Refrigerant Coil:
   1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
   2. Polymer strip shall prevent all copper coils from contacting steel coil frame or condensate pan.

C. Electric-Resistance Heating:
   1. Open Heating Elements: Resistance wire of 80 percent nickel and 20 percent chromium, supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.
   2. Overtemperature Protection: Disk-type, automatically reset, thermal-cutout, safety device; serviceable through terminal box.
   3. Overcurrent Protection: Manual-reset thermal cutouts, factory wired in each heater stage.
   4. Control Panel: Unit mounted with disconnecting means and overcurrent protection. Include the following controls:

a. Magnetic contactors.
b. Step Controller: Pilot lights and override toggle switch for each step.
c. SCR Controller: Pilot lights operate on load ratio, a minimum of five steps.
d. Time-delay relay.
e. Airflow proving switch.

2.9 REFRIGERANT CIRCUIT COMPONENTS

A. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.

B. Refrigeration Specialties:
1. Refrigerant: R-410A.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.

2.10 AIR FILTRATION

A. Minimum arrestance and MERV according to ASHRAE 52.2.

2.11 DAMPERS

A. Leakage Rate: Comply with ASHRAE/IES 90.1.

B. Damper Motor: Modulating with adjustable minimum position.

2.12 ELECTRICAL POWER CONNECTIONS

A. RTU shall have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.13 CONTROLS

A. Control equipment and sequence of operation are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

B. Basic Unit Controls:
1. Control-voltage transformer.
2. Wall-mounted thermostat or sensor with the following features:

a. Heat-cool-off switch.
b. Fan on-auto switch.
c. Fan-speed switch.
d. Automatic changeover.
e. Adjustable deadband.
f. Exposed set point.
g. Exposed indication.
h. Degree F indication.
i. Unoccupied-period-override push button.
j. Data entry and access port to input temperature and humidity set points, occupied and unoccupied periods, and output room temperature and humidity, supply-air temperature, operating mode, and status.

3. Wall-mounted humidistat or sensor with the following features:
   a. Concealed set point.
   b. Concealed indication.
4. Unit-Mounted Annunciator Panel for Each Unit:
   a. Lights to indicate power on, cooling, heating, fan running, filter dirty, and unit alarm or failure.
   b. DDC controller or programmable timer and interface with HVAC instrumentation and control system.
   c. Digital display of outdoor-air temperature, supply-air temperature, return-air temperature, economizer damper position, indoor-air quality, and control parameters.

C. DDC Controller:
1. Controller shall have volatile-memory backup.
2. Safety Control Operation:
   a. Smoke Detectors: Stop fan and close outdoor-air damper if smoke is detected. Provide additional contacts for alarm interface to fire-alarm control panel.
   b. Firestats: Stop fan and close outdoor-air damper if air greater than 130 deg F enters unit. Provide additional contacts for alarm interface to fire-alarm control panel.
   c. Fire-Alarm Control Panel Interface: Provide control interface to coordinate with operating sequence described in Section 283111 "Digital, Addressable Fire-Alarm System" and Section 283112 "Zoned (DC Loop) Fire-Alarm System."
   d. Defrost Control for Condenser Coil: Pressure differential switch to initiate defrost sequence.
3. Scheduled Operation: Occupied and unoccupied periods on 365-day clock with a minimum of four programmable periods per day.
4. Unoccupied Period:
   a. Heating Setback: 10 deg F.
   b. Cooling Setback: System off.
   c. Override Operation: Two hours.
5. Supply Fan Operation:
   a. Occupied Periods: Run fan continuously.
   b. Unoccupied Periods: Cycle fan to maintain setback temperature.
6. Refrigerant Circuit Operation:

a. Occupied Periods: Cycle or stage compressors to match compressor output to cooling load to maintain room temperature and humidity. Cycle condenser fans to maintain maximum hot-gas pressure.
b. Unoccupied Periods: Compressors off.

7. Gas Furnace Operation:
   a. Occupied Periods: Modulate burner to maintain room temperature.
   b. Unoccupied Periods: Cycle burner to maintain setback temperature.
8. Electric-Heating-Coil Operation:
   a. Occupied Periods: Modulate coil to maintain room temperature.
   b. Unoccupied Periods: Energize coil to maintain setback temperature.
9. Fixed Minimum Outdoor-Air Damper Operation:
   a. Occupied Periods: Open to 25 percent.
   b. Unoccupied Periods: Close the outdoor-air damper.
10. Economizer Outdoor-Air Damper Operation:
    a. Morning warm-up cycles.
    b. Occupied Periods: Open to 10 percent fixed minimum intake, and maximum 100 percent of the fan capacity. Controller shall permit air-side economizer operation when outdoor air is less than 60 deg F. Use outdoor-air temperature to adjust mixing dampers. During economizer cycle operation, lock out cooling.
    c. Unoccupied Periods: Close outdoor-air damper and open return-air damper.
11. Terminal-Unit Relays:
    a. Provide heating- and cooling-mode changeover relays compatible with terminal control system required in Section 233600 "Air Terminal Units" and Section 230923 "Direct Digital Control (DDC) System for HVAC."

D. Interface Requirements for HVAC Instrumentation and Control System:
1. Interface relay for scheduled operation.
2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
3. Provide BACnet or LonWorks compatible interface for central HVAC control workstation for the following:
   a. Adjusting set points.
   b. Monitoring supply fan start, stop, and operation.
   c. Inquiring data to include outdoor-air damper position, supply- and room-air temperature and humidity.
   d. Monitoring occupied and unoccupied operations.
   e. Monitoring constant and variable motor loads.
   f. Monitoring variable-frequency drive operation.
   g. Monitoring cooling load.
   h. Monitoring economizer cycles.
   i. Monitoring air-distribution static pressure and ventilation air volume.

2.14 ACCESSORIES

A. Electric heater with integral thermostat maintains minimum 50 deg F temperature in gas burner compartment.

B. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required.

C. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.

D. Remote potentiometer to adjust minimum economizer damper position.

E. Return-air bypass damper.

F. Factory- or field-installed, demand-controlled ventilation.

G. Safeties:
   1. Smoke detector.
   2. Condensate overflow switch.
   3. Phase-loss reversal protection.
   4. High and low pressure control.

H. Coil guards of painted, galvanized-steel wire.

I. Hail guards of galvanized steel, painted to match casing.

J. Concentric diffuser with white louvers and polished aluminum return grilles, insulated diffuser box with mounting flanges, and interior transition.

K. Door switches to disable heating or reset set point when open.

L. Outdoor-air intake weather hood with moisture eliminator.

M. Oil separator.

2.15 ROOF CURBS

A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.
   1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
      a. Materials: ASTM C 1071, Type I or II.
      b. Thickness: 2 inches.
   2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.
      a. Liner Adhesive: Comply with ASTM C 916, Type I.
      b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
      c. Liner materials applied in this location shall have airstream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.

d. Liner Adhesive: Comply with ASTM C 916, Type I.

B. Curb Dimensions: Height of 34 inches mounted on 6” thick concrete pad at ground level.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "NRCA Roofing Manual: Membrane Roof Systems." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing with anchor bolts.

B. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

3.2 CONNECTIONS

A. Comply with duct installation requirements specified in other HVAC Sections. Drawings indicate general arrangement of ducts. The following are specific connection requirements:
1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.
5. Install normal-weight, 3000-psi, compressive strength (28-day) concrete mix inside roof curb, 4 inches thick. Concrete, formwork, and reinforcement are specified with concrete.

B. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

C. Where installing piping adjacent to RTUs, allow space for service and maintenance.
1. Gas Piping: Comply with applicable requirements in Section 231123 "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.

B. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. RTU will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 237416.11

SECTION 238126

SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: One year(s) from date of Substantial Completion.
b. For Parts: One year(s) from date of Substantial Completion.
c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
2. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
3. Mitsubishi Electric Sales Canada Inc.
4. Trane; a business of American Standard companies.
5. YORK; a Johnson Controls company.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.
5. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
6. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.

7. Fan Motors:

    a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

8. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
9. Filters: Permanent, cleanable.
10. Condensate Drain Pans:

    a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

        1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
        2) Depth: A minimum of 2 inches deep.

    b. Single-wall, stainless-steel sheet.
    c. Double-wall, stainless-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
    d. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

        1) Minimum Connection Size: NPS 1.

    e. Pan-Top Surface Coating: Asphaltic waterproofing compound.
    f. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

    a. Compressor Type: Scroll.
    b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.

c. Refrigerant Charge: R-410A.
d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F.
7. Mounting Base: Polyethylene.
8. Coil Guards: Required. Install from factory or field installed.
9. Mount on 6" thick concrete pad and secure for 160 mph wind loading.

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

E. Drain Hose: For condensate.

F. Additional Monitoring:

1. Monitor constant and variable motor loads.
2. Monitor variable-frequency-drive operation.
3. Monitor economizer cycle.
4. Monitor cooling load.
5. Monitor air distribution static pressure and ventilation air volumes.

2.5 CAPACITIES AND CHARACTERISTICS

A. Cooling Capacity: See Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Equipment Mounting:

1. Install ground-mounted, compressor-condenser components on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Install ground-mounted, compressor-condenser components on polyethylene mounting base.
3. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
4. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

B. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 238126.13

MINI-SPLIT SYSTEMS

Part 1 – General

1.1 System Description

The Air Conditioner system shall be a electric split system with Variable Speed Inverter Compressor technology. The system shall consist of a horizontal discharge, single phase outdoor unit, a matched capacity indoor section that shall be equipped with a wired wall mounted, wireless wall mounted and/or wireless hand held remote controller.

Quality Assurance

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.

C. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 210 and bear the ARI Certification label.

D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

E. A dry air holding charge shall be provided in the indoor section.

F. The outdoor unit shall be pre-charged with R-410a refrigerant for 70 feet (20 meters) of refrigerant tubing.

1.3 Delivery, Storage and Handling

A. Unit shall be stored and handled according to the manufacturer's recommendations.

B. The controller shall be shipped separately and shall be able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

Part 2 – Warranty

2.01 The units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation.

If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

2.02 Manufacturer shall have over thirty (30) years of continuous experience in the U.S. market.

Part 3 Outdoor Unit Design:

3.01 The outdoor unit shall be compatible with the four different types of indoor units (ceiling suspending, ducted, wall mounted and four way recessed ceiling cassette). The connected indoor unit shall be of the same capacity as the outdoor unit. *Option: Indoor unit Twinning is allowed as described in 3.02 below.*

3.03 The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.

3.04 The outdoor unit shall be capable of cooling operation down to 0°F (-18°C) ambient temperature without additional low ambient controls.

3.05 The outdoor unit shall be able to operate with a maximum height difference of 100 feet (30 meters) between indoor and outdoor units.

3.06 System shall operate at up to a maximum refrigerant tubing length of 100 feet (30 meters) for the 12,000 and 18,000 and 165 feet (50 meters) for the 24,000, 30,000, 36,000, and 42,000 BTU/h units between indoor and outdoor units without the need for line size changes, traps or additional oil.

3.07 The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.

3.2 Cabinet

3.2.1 The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection.

3.2.2 Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability.

3.2.3 Easy access shall be afforded to all serviceable parts by means of removable panel sections.

3.2.4 The fan grill shall be of ABS plastic.

3.2.5 Cabinet mounting and construction shall be sufficient to withstand 160 MPH wind speed conditions for use in Hurricane condition areas. Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

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3.3 Fan

3.3.1 Shall be furnished with a single DC fan motor.

3.3.2 The fan blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated.

3.3.3 The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts

3.4 Coil

3.4.1 The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard.

3.4.2 Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be controlled by a microprocessor controlled step motor.

3.4.3 All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a - Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.

3.5 Compressor

3.5.1 The compressor shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology.

3.5.2 The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.

3.5.3 To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.

3.5.4 The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

3.6 Electrical

3.6.1 The electrical power of the unit shall be 208volts or 230 volts, single phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts.

3.6.2 Power for the indoor unit shall be supplied from the outdoor unit via Mitsubishi Electric A-Control using three (3) fourteen (14) gauge AWG conductors plus ground wire connecting the units.

3.6.3 The outdoor unit shall be controlled by the microprocessor located in the indoor unit.

The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC.

3.6.4 The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.

3.7 Operating Range:

Operating Range		Indoor Air Intake Temperature	Outdoor Air Intake Temperature
Cooling	Maximum	D.B. 95°F (35°C) W.B. 71°F (21.7°C)	D.B. 115°F (46°C)
	Minimum	D.B. 67°F (19.4°C) W.B. 57°F (13.9°C)	D.B. 0°F (-18°C)*

* Requires wind baffle – without wind baffle: D.B. 23°F (-5°C)

3.7.1 Unit shall be able to provide 100% capacity when operating at 0ºF outdoor air temperature and a wind baffle is used.

Part 4 - Indoor Unit Selection and Specification

4.3 Wall Mounted Type
The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit, in conjunction with the wired wall-mounted controller, wireless wall-mounted controller or wireless handheld controller, shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a

test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from the factory.

4.3.1 Unit Cabinet: The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. Cabinet color shall be white – Munsell 1.0Y 9.2/0.2. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.

4.3.2 Fan: The indoor unit fan shall be high performance, double inlet, forward curve, direct drive sirocco fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds: Low, Mid, and Hi and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

4.3.3 Vane: There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall significantly decrease downward air resistance for lower sound levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement.

4.3.4 Filter: Return air shall be filtered by means of an easily removable washable filter.

4.3.5 Coil: The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil. An optional drain pan level switch (DPLS1), designed to connect to the control board, shall be provided if required, and installed on the condensate pan to prevent condensate from overflowing. [Option: *A condensate mini-pump shall be provided to provide a means of condensate disposal when a gravity drain is not available.*]

4.3.6 Electrical: The electrical power of the unit shall be 208 volts or 230 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts. The power to the indoor unit shall be supplied from the outdoor unit, using the Mitsubishi Electric A-Control system. For A-Control, a three (3) conductor AWG-14 wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units.

4.3.8 System Control: The control system shall consist of a minimum of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from a wireless or wired controller, providing emergency operation and controlling the outdoor unit. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Indoor units shall have the ability to control supplemental heat via connector and a 12 VDC output.

4.3.8.2 Remote Controllers

A. Wireless, wall mounted remote controller kit

The Wireless, wall mounted remote controller kit shall consist of a wireless, wall mounted controller, a wireless receiver and a cable to connect the receiver to the indoor unit. The controller shall be white in color with a light-green LCD display and a backlight feature. It shall consist of four Function buttons below the display, and Increase/Decrease Set Temperature buttons and a Hold button to the right of the display. The controller shall have a built-in temperature sensor and a battery holder, using two AA alkaline batteries.

A. Wireless, hand held remote controller

The wireless had held remote controller shall perform input functions necessary to operate the system. There shall be a wireless receiver built in the indoor unit.

The controller shall have a Power On/Off switch, Mode Selector – Cool, Dry, Heat, Auto, and Powerful Modes - Temperature Setting, Timer Control, Fan Speed Select and Horizontal and Vertical Vane control selector. There shall be an i-See® Sensor Area Selector control. The indoor unit shall perform Self-diagnostic Function and Check Mode switching. Temperature changes shall be in 1ºF (0.5ºC) increments with a setting range of 61 to 88ºF (16 to 31ºC).

END OF SECTION 238126.13

SECTION 220548.13

VIBRATION CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For each vibration isolation device.

1. Include design calculations for selecting vibration isolators.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Isolation Technology, Inc.

d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Isolation.
h. Vibration Mountings & Controls, Inc.

3. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
4. Size: Factory or field cut to match requirements of supported equipment.
5. Pad Material: Oil and water resistant with elastomeric properties.
6. Surface Pattern: Smooth pattern.
7. Infused nonwoven cotton or synthetic fibers.
8. Load-bearing metal plates adhered to pads.

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Isolation.
h. Vibration Mountings & Controls, Inc.

3. Mounting Plates:

a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

4. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.

3. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

    a. Housing: Cast-ductile iron or welded steel.
    b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.

8. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.5 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Top housing with attachment and leveling bolt.

2.6 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.

e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Isolation.
h. Vibration Mountings & Controls, Inc.

3. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Top plate with threaded mounting holes.
c. Internal leveling bolt that acts as blocking during installation.

4. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
5. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
6. Minimum Additional Travel: 50 percent of the required deflection at rated load.
7. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
8. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.7 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Isolation.
h. Vibration Mountings & Controls, Inc.

3. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.

a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psigon isolation material providing equal isolation in all directions.

2.9 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch-thick neoprene

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.10 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Mountings & Controls, Inc.

3. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.

4. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.11 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Ace Mountings Co., Inc.
   b. California Dynamics Corporation.
   c. Kinetics Noise Control, Inc.
   d. Mason Industries, Inc.
   e. Vibration Eliminator Co., Inc.
   f. Vibration Isolation.
   g. Vibration Mountings & Controls, Inc.

3. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
9. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
10. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

PART 3 - EXECUTION

3.1 VIBRATION CONTROL DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 220548.13

SECTION 224213.13

COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets: Floor mounted, bottom outlet, top spud.

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Kohler Wellworth K-4406. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.
b. Briggs Plumbing Products, Inc.
c. Capizzi.
d. Crane Plumbing, L.L.C.
e. Ferguson Enterprises, Inc.; ProFlo Brand.

f. Gerber Plumbing Fixtures LLC.
g. Kohler Co.
h. Mansfield Plumbing Products LLC.
i. Peerless Pottery Sales, Inc.
j. St. Thomas Creations.
k. TOTO USA, INC.
l. Zurn Industries, LLC; Commercial Brass and Fixtures.

3. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Height: Standard.
f. Rim Contour: Elongated.
g. Water Consumption: 1.6 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.
i. Color: White.

4. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.
5. Flushometer Valve: Sloan Royal or Zurn.
6. Toilet Seat: Church.

2.2 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS, ADA COMPLIANT

A. Water Closets: Floor mounted, bottom outlet, top spud.

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Kohler Highline K-4405. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.
b. Briggs Plumbing Products, Inc.
c. Capizzi.
d. Crane Plumbing, L.L.C.
e. Ferguson Enterprises, Inc.; ProFlo Brand.
f. Gerber Plumbing Fixtures LLC.
g. Kohler Co.
h. Mansfield Plumbing Products LLC.
i. Peerless Pottery Sales, Inc.
j. St. Thomas Creations.
k. TOTO USA, INC.
l. Zurn Industries, LLC; Commercial Brass and Fixtures.

3. Bowl:

    a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
    b. Material: Vitreous china.
    c. Type: Siphon jet.
    d. Style: Flushometer valve.
    e. Height: Handicapped/elderly, complying with ICC/ANSI A117.1.
    f. Rim Contour: Elongated.
    g. Water Consumption: 1.6 gal. per flush.
    h. Spud Size and Location: NPS 1-1/2; top.
    i. Color: White.

4. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.
5. Flushometer Valve: Sloan Royal or Zurn.

2.3 FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Sloan Royal 100-1.6. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Coyne & Delany Co.
    b. Gerber Plumbing Fixtures LLC.
    c. Sloan Valve Company.
    d. Zurn Industries, LLC; Commercial Brass and Fixtures.

3. Standard: ASSE 1037.
4. Minimum Pressure Rating: 125 psig.
5. Features: Include integral check stop and backflow-prevention device.
6. Material: Brass body with corrosion-resistant components.
7. Exposed Flushometer-Valve Finish: Chrome plated.
8. Panel Finish: Chrome plated or stainless steel.
9. Style: Exposed.
10. Consumption: 1.6 gal. per flush.
11. Minimum Inlet: NPS 1.
12. Minimum Outlet: NPS 1-1/4.

B. Lever-Handle, Piston Flushometer Valves

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Basis-of-Design Product: Sloan Crown 111-1.6. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Coyne & Delany Co.
    b. Sloan Valve Company.
    c. TOTO USA, INC.

3. Standard: ASSE 1037.
4. Minimum Pressure Rating: 125 psig.
5. Features: Include integral check stop and backflow-prevention device.
6. Material: Brass body with corrosion-resistant components.
7. Exposed Flushometer-Valve Finish: Chrome plated.
8. Panel Finish: Chrome plated or stainless steel.
9. Style: Exposed.
10. Consumption: 1.6 gal. per flush.
11. Minimum Inlet: NPS 1.
12. Minimum Outlet: NPS 1-1/4.

2.4 TOILET SEATS

A. Toilet Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Church 9500CT. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. American Standard America.
    b. Bemis Manufacturing Company.
    c. Centoco Manufacturing Corporation.
    d. Church Seats.
    e. Jones Stephens Corp.; Comfort Seat Brand.
    f. Kohler Co.
    g. Olsonite Seat Co.
    h. Sanderson Plumbing Products, Inc.
    i. Sperzel of Lexington.
    j. TOTO USA, INC.
    k. Zurn Industries, LLC; Commercial Brass and Fixtures.

3. Standard: IAPMO/ANSI Z124.5.
4. Material: Plastic.
5. Type: Commercial (Heavy duty).
6. Shape: Elongated rim, open front.
7. Hinge: Self-sustaining, check.
8. Hinge Material: Noncorroding metal.
9. Seat Cover: Not required.

10. Color: White.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.2 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.3 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.4 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 224213.16

COMMERCIAL URINALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Urinals.
2. Flushometer valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

A. Urinals: Wall hung, back outlet, siphon jet, accessible.

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Kohler Bardon K-4991-ET. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. American Standard America.
b. Briggs Plumbing Products, Inc.
c. Ferguson Enterprises, Inc.; ProFlo Brand.
d. Gerber Plumbing Fixtures LLC.
e. Kohler Co.
f. Mansfield Plumbing Products LLC.
g. Peerless Pottery Sales, Inc.

3. Fixture:

    a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
    b. Material: Vitreous china.
    c. Type: Siphon jet with extended shields.
    d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
    e. Water Consumption: Low.
    f. Spud Size and Location: NPS 3/4; top.
    g. Outlet Size and Location: NPS 2; back.
    h. Color: White.

4. Waste Fitting:

    a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
    b. Size: NPS 2.

5. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.

2.2 URINAL FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Sloan Royal 186-0.5 HEU Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Coyne & Delany Co.
    b. Gerber Plumbing Fixtures LLC.
    c. Sloan Valve Company.
    d. Zurn Industries, LLC; Commercial Brass and Fixtures.

3. Standard: ASSE 1037.
4. Minimum Pressure Rating: 125 psig.
5. Features: Include integral check stop and backflow-prevention device.
6. Material: Brass body with corrosion-resistant components.
7. Exposed Flushometer-Valve Finish: Chrome plated.
8. Style: Exposed.
9. Consumption: 0.5 gal. per flush.
10. Minimum Inlet: NPS 3/4.
11. Minimum Outlet: NPS 1-1/4.

B. Lever-Handle, Piston Flushometer Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Sloan Crown 186-0.5 HEU. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Coyne & Delany Co.
    b. Sloan Valve Company.
    c. TOTO USA, INC.

3. Standard: ASSE 1037.
4. Minimum Pressure Rating: 125 psig.
5. Features: Include integral check stop and backflow-prevention device.
6. Material: Brass body with corrosion-resistant components.
7. Exposed Flushometer-Valve Finish: Chrome plated.
8. Style: Exposed.
9. Consumption: 0.5 gal. per flush.
10. Minimum Inlet: NPS 3/4.
11. Minimum Outlet: NPS 1-1/4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.

B. Examine walls and floors for suitable conditions where urinals will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to roughing-in drawings.
2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.
4. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
5. Install trap-seal liquid in waterless urinals.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.

2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
3. Use carriers without waste fitting for urinals with tubular waste piping.
4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.
4. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

SECTION 224216.13

COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.
3. Supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Servicing and adjustments of automatic faucets.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

A. Lavatory LC & HLC: Oval, vitreous china, undercounter mounted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. American Standard America.
    b. Kohler Co.
    c. TOTO USA, INC.
    d. Zurn Industries, LLC.

2. Fixture:

    a. Standard: ASME A112.19.2/CSA B45.1.
    b. Type: For undercounter mounting.
    c. Nominal Size: Oval, 22 by 14 inches.
    d. Faucet-Hole Punching: No holes.
    e. Faucet-Hole Location: On countertop.
    f. Color: White.
    g. Mounting Material: Sealant and undercounter mounting kit.

3. Faucet: Solid-Brass, Manually Operated Faucets.

2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory HL: Wheelchair, vitreous china, wall mounted.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American Standard America.
    b. Kohler Co.
    c. Sloan Valve Company.
    d. Zurn Industries, LLC.

2. Fixture:

    a. Standard: ASME A112.19.2/CSA B45.1.
    b. Type: Slab or wheelchair.
    c. Nominal Size: Rectangular, 27 by 20 inches.
    d. Faucet-Hole Punching: Three holes, 2-inch centers.
    e. Faucet-Hole Location: Top.
    f. Color: White.
    g. Mounting: For concealed-arm carrier.

3. Faucet: Solid-Brass, Manually Operated Faucets.
4. Support: Type II, concealed-arm lavatory carrier with escutcheons.
5. Lavatory Mounting Height: Handicapped/elderly according to ICC A117.1.

2.3 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Manual-type, single-control mixing, commercial, solid-brass valve.

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Standard America.
b. Bradley Corporation.
c. Chicago Faucets; Geberit Company.
d. Delta Faucet Company.
e. Just Manufacturing.
f. Kohler Co.
g. Speakman Company.
h. T&S Brass and Bronze Works, Inc.

2. Standard: ASME A112.18.1/CSA B125.1.

3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Type: Centerset.
5. Body Material: Commercial, solid brass.
6. Finish: Polished chrome plate.
7. Maximum Flow Rate: 0.5 gpm.
8. Maximum Flow: 0.25 gal. per metering cycle.
9. Mounting Type: Deck, exposed.
10. Valve Handle(s): Single lever.
11. Spout: Rigid, gooseneck type.
12. Spout Outlet: Aerator Spray.
13. Operation: Compression, manual.
14. Drain: grid.

2.4 SUPPORTS

A. Type II Lavatory Carrier:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Jay R. Smith Mfg. Co.
b. Josam Company.
c. MIFAB, Inc.

d. Watts; a Watts Water Technologies company.
e. Zurn Industries, LLC.

2. Standard: ASME A112.6.1M.

2.5 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:

1. NPS 3/8.
2. ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.6 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated, brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories and counters and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

SECTION 224216.16

COMMERCIAL SINKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service basins.
2. Service sinks.
3. Utility sinks.
4. Handwash sinks.
5. Sink faucets.
6. Laminar-flow, faucet-spout outlets.
7. Supply fittings.
8. Waste fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 SERVICE BASINS

A. Service Basins: Floor mounted.

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Crane Plumbing, L.L.C.
    b. Ferguson Enterprises, Inc.; ProFlo Brand.
    c. Florestone Products Co., Inc.
    d. Mustee, E. L., & Sons, Inc.
    e. Swan Corporation (The).
    f. Zurn Industries, LLC; Light Commercial Specialty Plumbing Products.

3. Fixture:

    a. Standard: IAPMO/ANSI Z124.6.
    b. Material: Cast polymer.
    c. Nominal Size: 24 by 36 by 10 inches.
    d. Tiling Flange: On two sides.
    e. Rim Guard: On all top surfaces.
    f. Drain: Grid with NPS 2 outlet.

4. Mounting: On floor and flush to wall.

5. Faucet:

    a. Number Required: One.
    b. Mounting: Wall.
    c. Handles: Two lever.
    d. Hose Connection: Yes.
    e. Pail Hook: Yes.
    f. Vacuum breaker: Yes.
    g. Construction: Commercial solid brass.

2.2 COUNTERTOP SINKS

A. Sinks K**S**: Stainless steel, countertop mounted, double compartment.

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Elkay LR3322PD. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Advance Tabco.
    b. Eagle Group; Foodservice Equipment Division.
    c. Elkay Manufacturing Co.
    d. Griffin Products, Inc.
    e. Just Manufacturing.

3. Fixture:

a. Standard: ASME A112.19.3/CSA B125.2.
b. Type: Countertop Mounted.
c. Number of Compartments: Two.
d. Metal Thickness: 18 gauge, type 304 stainless steel.
e. Compartment: 33”x22”x9-5/8”.

1) Drain: Grid with NPS 1/2 tailpiece and twist drain.
2) Drain Location: Centered in compartment.

4. Faucet(s): .

a. Number Required: One.
b. Mounting: On ledge.

5. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle.
2) Risers: NPS 1/2,ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

6. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: NPS 1/2.
2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
3) Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

c. Continuous Waste:

1) Size: NPS 1/2.
2) Material: Chrome-plated, 0.032-inch-thick brass tube.

7. Mounting: On counter with sealant.

2.3 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: for KS. Manual type, single-lever-handle mixing valve.

1. Commercial, Solid-Brass Faucets:

a. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

b. Basis-of-Design Product: Elkay LK3001. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1) American Standard America.
2) Bradley Corporation.
3) Chicago Faucets.
4) Delta Faucet Company.
5) Elkay Manufacturing Co.
6) GROHE America, Inc.
7) Just Manufacturing.
8) Kohler Co.
9) Moen Incorporated.
10) Speakman Company.
11) T & S Brass and Bronze Works, Inc.
12) Zurn Plumbing Products Group.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Type: Centerset.
5. Body Material: Commercial, solid brass.
6. Finish: Chrome plated.
7. Maximum Flow Rate: 2.2 gpm.
8. Handle(s): Lever.
9. Mounting Type: Sink, exposed.
10. Spout Type: Swing, round tubular.
11. Spout Outlet: Swivel Aerator.

2.4 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange. Option – Stainless steel braided supply hoses.

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Wheel handle.

F. Risers:

1. NPS 1/2
2. ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

2.5 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/2.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch-thick brass tube to wall; and chrome-plated brass or steel wall flange.
3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch-thick stainless-steel tube to wall; and stainless-steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-hung sinks.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."
2. Install stops in locations where they can be easily reached for operation.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

SECTION 230548.13

VIBRATION CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For each vibration isolation device.

1. Include design calculations for selecting vibration isolators.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.

c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Isolation.
h. Vibration Mountings & Controls, Inc.

3. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
4. Size: Factory or field cut to match requirements of supported equipment.
5. Pad Material: Oil and water resistant with elastomeric properties.
6. Surface Pattern: Smooth pattern.
7. Infused nonwoven cotton or synthetic fibers.
8. Load-bearing metal plates adhered to pads.

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Isolation.
h. Vibration Mountings & Controls, Inc.

3. Mounting Plates:

a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

4. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.

3. Description: All-directional isolator with restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

    a. Housing: Cast-ductile iron or welded steel.
    b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

7. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
8. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.5 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Ace Mountings Co., Inc.
    b. California Dynamics Corporation.
    c. Isolation Technology, Inc.
    d. Kinetics Noise Control, Inc.
    e. Mason Industries, Inc.
    f. Vibration Eliminator Co., Inc.
    g. Vibration Isolation.
    h. Vibration Mountings & Controls, Inc.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Top housing with attachment and leveling bolt.

2.6 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.
f. Vibration Eliminator Co., Inc.
g. Vibration Isolation.
h. Vibration Mountings & Controls, Inc.

3. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

   a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
   b. Top plate with threaded mounting holes.
   c. Internal leveling bolt that acts as blocking during installation.

4. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
5. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
6. Minimum Additional Travel: 50 percent of the required deflection at rated load.
7. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
8. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.7 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Ace Mountings Co., Inc.
   b. California Dynamics Corporation.
   c. Isolation Technology, Inc.
   d. Kinetics Noise Control, Inc.
   e. Mason Industries, Inc.
   f. Vibration Eliminator Co., Inc.
   g. Vibration Isolation.
   h. Vibration Mountings & Controls, Inc.

3. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.

a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch-thick neoprene

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psigon isolation material providing equal isolation in all directions.

2.9 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch-thick neoprene

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.10 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Isolation Technology, Inc.
d. Kinetics Noise Control, Inc.
e. Mason Industries, Inc.

f. Vibration Eliminator Co., Inc.
g. Vibration Mountings & Controls, Inc.

3. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
4. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.11 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Ace Mountings Co., Inc.
b. California Dynamics Corporation.
c. Kinetics Noise Control, Inc.
d. Mason Industries, Inc.
e. Vibration Eliminator Co., Inc.
f. Vibration Isolation.
g. Vibration Mountings & Controls, Inc.

3. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
8. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
9. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
10. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

PART 3 - EXECUTION

3.1 VIBRATION CONTROL DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 230548.13

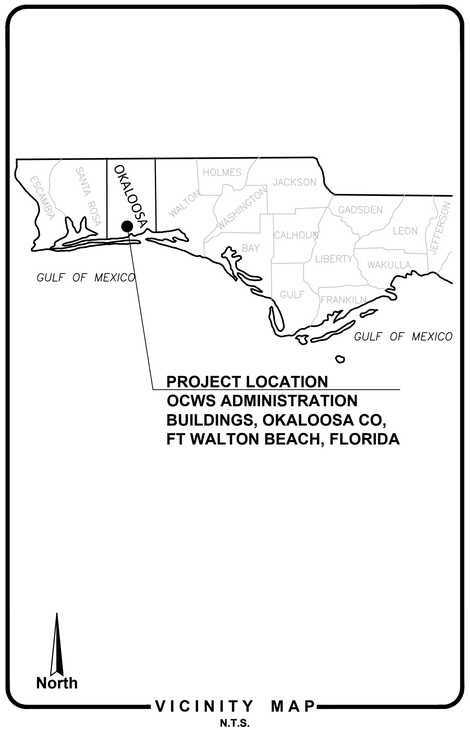
CIVIL DESIGN DRAWINGS FOR:

CONSTRUCT OCWS FIELD OFFICES

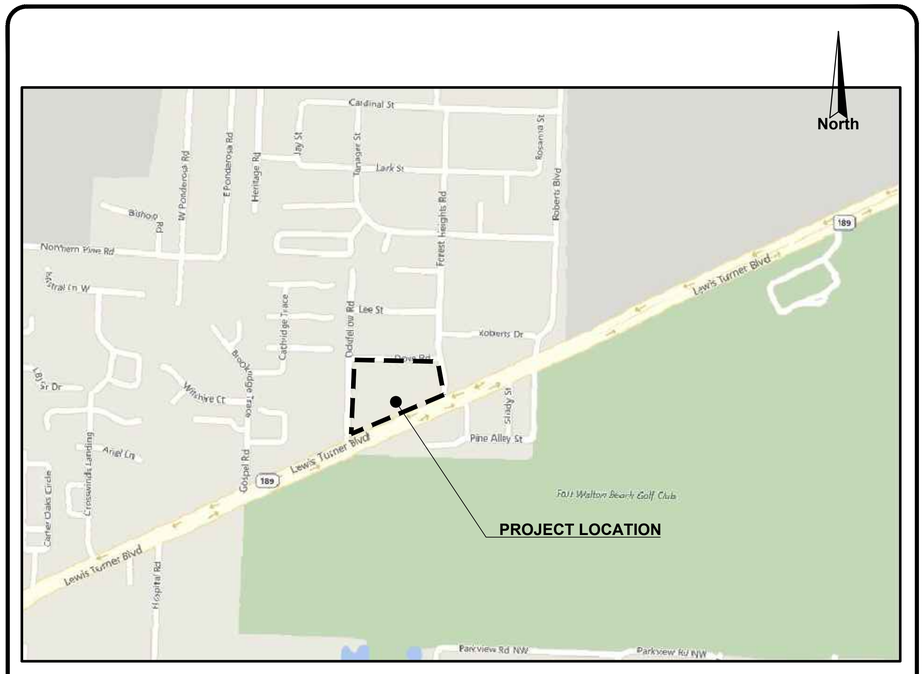
PARCEL ID'S: 35-1S-24-0000-0027-0000, 35-1S-24-0000-0027-0010, 35-1S-24-0000-0027-0020, & 35-1S-24-0000-0031-0000

OKALOOSA COUNTY, FT WALTON BEACH, FL

SECTION 35 TOWNSHIP 1 SOUTH RANGE 24 WEST



VICINITY MAP
N.T.S.



SITE LOCATION MAP
N.T.S.

PREPARED FOR:

OKALOOSA COUNTY WATER & SEWER
CONTACT: JEFF LITTRELL, DIRECTOR
1804 LEWIS TUNER BOULEVARD, SUITE 300
FORT WALTON BEACH, FL 32547
PHONE: (850) 651-7172

LEGAL DESCRIPTION:

PARCEL 1
COMMENCE AT THE NORTHWEST CORNER OF SECTION 35, TOWNSHIP 1 SOUTH, RANGE 24 WEST, OKALOOSA COUNTY, FLORIDA; THENCE S 1°47'49" W 743.95 FEET ALONG THE WEST LINE OF SAID SECTION 35 TO THE NW CORNER OF THE SW ¼ OF THE NW ¼ OF THE NW ¼ OF SAID SECTION 35; THENCE DEPARTING SAID WEST SECTION LINE S 87°32'11" E 130.02 FEET; THENCE S 1°47'49" W 307.49'; THENCE N 87°32'11" W 100.00 FEET; THENCE N 1°47'49" E 307.49 FEET; THENCE S 87°32'11" W 100.00 FEET TO THE POINT OF BEGINNING.
CONTAINS 30,749.0 SQ. FT.
BEARINGS BASED ON NAD 83: ORIGINAL DEED BOOK 2746 PG. 754 OFFICIAL RECORDS, OKALOOSA COUNTY, FL.

PARCEL 3
COMMENCE AT THE NORTHWEST CORNER OF SECTION 35, TOWNSHIP 1 SOUTH, RANGE 24 WEST, OKALOOSA COUNTY, FLORIDA; THENCE S 1°47'49" W 743.95 FEET ALONG WEST LINE OF SAID SECTION 35 TO THE NW CORNER OF THE SW ¼ OF THE NW ¼ OF THE NW ¼ OF SAID SECTION 35; THENCE DEPARTING SAID WEST SECTION LINE S 87°32'11" E 130.02 FEET; THENCE S 1°47'49" W 30.04 FEET TO A CONCRETE MONUMENT; THENCE S 87°32'11" E 265.20 FEET TO THE POINT OF BEGINNING; THENCE CONTINUE S 87°32'11" E 241.86 FEET; THENCE S 2°00'49" W 248.90 FEET TO A POINT ON THE NORTHERLY R/W LINE OF LEWIS TURNER BLVD.; THENCE ALONG SAID R/W S 65°31'42" W 268.65 FEET; THENCE DEPARTING SAID R/W N 1°47'49" E 370.61 FEET TO THE POINT OF BEGINNING.
CONTAINS 74,739.0 SQ. FT.
BEARINGS BASED ON NAD83: ORIGINAL DEED BOOK 2184 PG. 1925 OFFICIAL RECORDS, OKALOOSA COUNTY, FL.

PARCEL 4
COMMENCE AT THE NW CORNER OF THE SW ¼ OF THE NW ¼ OF THE NW ¼ OF SAID SECTION 35, TOWNSHIP 1 SOUTH, RANGE 24 WEST, OKALOOSA COUNTY, FLORIDA; THENCE S 1°47'49" W 337.55 FEET ALONG THE WEST LINE OF SAID SECTION 35; THENCE DEPARTING SAID WEST LINE S 87°33'58" E 30.02 FEET TO THE POINT OF BEGINNING; THENCE S 87°32'11" E 100.00 FEET; THENCE S 1°47'49" W 177.81 FEET; THENCE CONTINUE S 1°47'49" 22.20 FEET TO A POINT ON THE NORTHERLY R/W LINE OF LEWIS TURNER BLVD.; THENCE ALONG SAID R/W S 65°43'22"W 111.32 FEET; TEHNCE DEPARTING SAID R/W N 1°47'49" E 250.10 FEET TO THE POINT OF BEGINNING.
CONTAINS 22,503.0 SQ. FT.
BEARINGS BASED ON NAD83: ORIGINAL DEED BOOK 3255 PG. 4810 OFFICIAL RECORDS, OKALOOSA COUNTY, FL.

ENGINEER:

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A – NICEVILLE, FL 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

MUNICIPALITY: OKALOOSA COUNTY
WATER/WASTE WATER: OKALOOSA WATER & SEWER, INC.
POWER: GULF POWER
GAS: OKALOOSA GAS

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL. 32578-2425
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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

TONIA D. NATION
FL LICENSE NO.: 64631
FBPR CERTIFICATE OF AUTHORIZATION NO. 5057

NO.	DATE	REVISION	BY
1	11/7/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

COVER SHEET

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

G-1

INDEX OF DRAWINGS

SHEET NO.	SHEET TITLE
G–1	COVER SHEET
G–2	INDEX OF DRAWINGS
G–3	SUMMARY OF QUANTITIES
G–4	GENERAL NOTES
C–1	EXISITING CONDITIONS
C–2	DEMOLITION, HAUL ROUTE & EROSION CONTROL PLAN
C–3	OVERALL SITE PLAN
C–4	FIELD OFFICE SITE PLAN
C–5	MAINTENANCE BUILDING SITE PLAN
C–6	DIMENSIONAL CONTROL TABLES
C–7	UTILITY PLAN (SHEET 1 OF 2)
C–8	UTILITY PLAN (SHEET 2 OF 2)
C–9	GRADING & DRAINAGE PLAN (SHEET 1 OF 2)
C–10	GRADING & DRAINAGE PLAN (SHEET 2 OF 2)
C–11	GRADING & DRAINAGE TABLES
C–12	TREE LOCATION PLAN
C–13	TREE PLANTING DETAILS
C–14	MISCELLANEOUS DETAILS (SHEET 1 OF 5)
C–15	MISCELLANEOUS DETAILS (SHEET 2 OF 5)
C–16	MISCELLANEOUS DETAILS (SHEET 3 OF 5)
C–17	MISCELLANEOUS DETAILS (SHEET 4 OF 5)
C–18	MISCELLANEOUS DETAILS (SHEET 5 OF 5)
C–19	PYRAMAT DETAILS
C–20	UTILITY DETAILS (SHEET 1 OF 3)
C–21	UTILITY DETAILS (SHEET 2 OF 3)
C–22	UTILITY DETAILS (SHEET 3 OF 3)

FIELD OFFICE SHEETS

SHEET NO.	SHEET TITLE
SF.0	GENERAL NOTES
SF.1	FOUNDATION PLAN, SECTION & NOTES
AF1.01	LIFE SAFETY PLAN
AF1.11	FLOOR PLAN
AF1.21	REFLECTED CEILING PLAN
AF1.31	FLOOR PLAN
AF1.41	CLEARANCES AND MOUNTING HEIGHTS, WALL TYPES & DETAILS
AF2.01	ELEVATIONS
AF3.01	BUILDING SECTIONS
AF4.01	BUILDING SECTIONS
AF4.11	RAMP DETAILS
AF6.01	DOOR / WINDOW TYPES AND SCHEDULES
AF6.11	DOOR / WINDOW DETAILS
PF1.11	FIELD OFFICE PLUMBING FLOOR PLAN
PF2.11	FIELD OFFICE PLUMBING NOTES, SCHEDULES, RISERS, & LEGEND
PF2.12	FIELD OFFICE PLUMING DETAILS
MF1.11	FIELD OFFICE BUILDING HVAC FLOOR PLAN
MF2.11	FIELD OFFICE HVAC SCHEDULES
MF2.12	FIELD OFFICE HVAC DETAILS
EF0.01	FIELD OFFICE ELECTRICAL LEGEND, NOTES, AND DETAILS
EF0.02	PANEL SCHEDULES AND DETAILS
EF1.00	FIELD OFFICE POWER & SIGNAL PLAN
EF1.01	FIELD OFFICE LIGHTING PLAN

FIELD OFFICE SHEETS

SHEET NO.	SHEET TITLE
SM.1	FOUNDATION PLAN, SECTION & NOTES
AM1.01	LIFE SAFETY PLAN
AM1.11	FLOOR PLAN
AM1.21	REFLECTED CEILING PLAN
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AM2.01	ELEVATIONS
AM3.01	BUILDING SECTIONS
AM4.01	BUILDING SECTIONS
AM6.01	DOOR / WINDOW TYPES AND SCHEDULES
AM6.11	DOOR / WINDOW DETAILS
PM1.11	MAINTENANCE BUILDING PLUMBING FLOOR PLAN
PM2.11	MAINTENANCE BUILDING PLUMBING DETAILS
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MM2.11	MAINTENANCE BUILDING HVAC DETAILS
EM0.01	MAINTENANCE BLDG ELECTRICAL LEGEND, NOTES, AND DETAILS
EM1.00	MAINTENANCE BLDG ELECTRICAL POWER & SIGNAL PLAN
EM1.01	MAINTENANCE BLDG LIGHTING PLAN

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NO.	DATE	REVISION	BY
1	11/7/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

INDEX OF DRAWINGS

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

G-2

FIELD OFFICE SUMMARY OF QUANTITIES

BASE BID

ITEM NUMBER	BID ITEM	ITEM DESCRIPTION	UNIT	QUANTITY
1	101-1	MOBILIZATION	LS	1
2	102-1	MAINTENANCE OF TRAFFIC	LS	1
3	104-1	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	LS	1
4	110-1	COMPLETE ASPHALT AND BASE REMOVAL WITHIN EXISTING PARKING LOT	SY	160
5	110-2	MISCELLANEOUS CURBING/SIDEWALK DEMOLITION (SELECTIVE)	LS	1
6	110-3	UTILITY/STORM/STRUCTURE DEMOLITION- FIELD OFFICE	LS	1
7	120-1	UNCLASSIFIED EXCAVATION AND EMBANKMENT- FIELD OFFICE	LS	1
8	160-1	12" STABILIZED SUBGRADE- FIELD OFFICE	SY	2,464
9	285-1	6" BASE COURSE	SY	2,259
10	334-1	1" BITUMINOUS SURFACE COURSE	TN	30
11	334-2	2" BITUMINOUS SURFACE COURSE	TN	230
12	425-1	FDOT TYPE "5" TOP; FDOT TYPE "J" ALT B BOTTOM	EA	1
13	425-2	FDOT TYPE "C" DBI	EA	3
14	425-3	FDOT TYPE "F" DBI	EA	2
15	425-4	FDOT TYPE "V" DBI	EA	2
16	430-1	18" ADS, N-12	LF	383
17	430-2	24" ADS, N-12	LF	33
18	430-3	24" MES	EA	1
19	520-1	CONCRETE TYPE "F" CURB- FIELD OFFICE	LF	982
20	520-2	CONCRETE TYPE "V" CURB- FIELD OFFICE	LF	240
21	520-3	CONCRETE WHEEL STOP- FIELD OFFICE	EA	8
22	522-1	CONCRETE SIDEWALK- FIELD OFFICE	SY	88
23	522-2	CONCRETE BOLLARDS- FIELD OFFICE	EA	17
24	522-3	8" PCC DRIVE APPROACH- FIELD OFFICE	SY	240
25	527-1	DETECTABLE WARNING SURFACES- FIELD OFFICE	EA	1
26	700-1	VEHICULAR SIGNAGE- FIELD OFFICE	LS	1
27	710-1	VEHICULAR PAVEMENT MARKINGS, (WHITE)- FIELD OFFICE	SF	305
28	710-2	VEHICULAR PAVEMENT MARKINGS, (BLUE)- FIELD OFFICE	SF	40
29	710-3	VEHICULAR PAVEMENT MARKINGS, (YELLOW)- FIELD OFFICE	SF	375
30	711-1	THERMOPLASTIC, STANDARD, WHITE, SOLID, 24"- FIELD OFFICE	LF	35
31	711-2	THERMOPLASTIC, STANDARD, YELLOW, SOLID, 6"- FIELD OFFICE	LF	116
32	711-3	THERMOPLASTIC, PREFORMED, WHITE, ARROW- FIELD OFFICE	EA	6
33	711-4	HANDICAP PARKING SYMBOL- FIELD OFFICE	EA	2
34	981-1	CENTIPEDE SOD- FIELD OFFICE	SY	2,840
35	981-2	LANDSCAPING- FIELD OFFICE	LS	1
36	AL-1-1	SPECIAL PROVISION NO. 2- UTILITY RELOCATION/REPLACEMENT- FIELD OFFICE	AL	1
37	FB-1	FIELD OFFICE BUILDING, COMPLETE	LS	1
38	02730-1	SANITARY SEWER INFRASTRUCTURE- FIELD OFFICE	LS	1

BID ALT NO. 1

ITEM NUMBER	BID ITEM	ITEM DESCRIPTION	UNIT	QUANTITY
1	550-1	FENCING- FIELD OFFICE	LF	735
2	550-2	VEHICULAR DOUBLE GATE- FIELD OFFICE	EA	3

MAINTENANCE BUILDING SUMMARY OF QUANTITIES

BASE BID

ITEM NUMBER	BID ITEM	ITEM DESCRIPTION	UNIT	QUANTITY
1	110-4	UTILITY/STORM/STRUCTURE DEMOLITION- MAINT. BLDG.	LS	1
2	120-2	UNCLASSIFIED EXCAVATION AND EMBANKMENT- MAINT. BLDG.	LS	1
3	160-2	12" STABILIZED SUBGRADE- MAINT. BLDG.	SY	4,735
4	285-2	8" GRADED AGGREGATE	SY	2,452
5	520-4	CONCRETE TYPE "F" CURB- MAINT. BLDG.	LF	170
6	520-5	CONCRETE WHEEL STOP (FURNISH ONLY)- MAINT. BLDG.	EA	14
7	522-4	CONCRETE PARKING WITH SIDEWALK- MAINT. BLDG.	SY	198
8	522-5	CONCRETE BOLLARDS- MAINT. BLDG.	EA	1
9	522-6	8" PCC DRIVE APPROACH- MAINT. BLDG.	SY	115
10	527-2	DETECTABLE WARNING SURFACES- MAINT. BLDG.	EA	1
11	700-2	VEHICULAR SIGNAGE- MAINT. BLDG.	LS	1
12	710-4	VEHICULAR PAVEMENT MARKINGS, (WHITE)- MAINT. BLDG.	SF	20
13	710-5	VEHICULAR PAVEMENT MARKINGS, (BLUE)- MAINT. BLDG.	SF	50
14	711-5	THERMOPLASTIC, STANDARD, WHITE, SOLID, 24"- MAINT. BLDG.	LF	17
15	711-6	THERMOPLASTIC, STANDARD, YELLOW, SOLID, 6"- MAINT. BLDG.	LF	50
16	711-7	HANDICAP PARKING SYMBOL- MAINT. BLDG.	EA	1
17	981-3	CENTIPEDE SOD- MAINT. BLDG.	SY	2,005
18	981-4	LANDSCAPING- MAINT. BLDG.	LS	1
19	AL-1-2	SPECIAL PROVISION NO. 2- UTILITY REPLACEMENT/RELOCATION- MAINT. BLDG.	AL	1
20	MB-1	MAINTENANCE BUILDING, COMPLETE	LS	1
21	02730-2	SANITARY SEWER INFRASTRUCTURE- MAINT. BLDG.	LS	1

BID ALT NO. 2

ITEM NUMBER	BID ITEM	ITEM DESCRIPTION	UNIT	QUANTITY
1	110-5	FENCE DEMOLITION- MAINT. BLDG.	LF	660
2	522-7	8" PCC APRON- MAINT. BLDG.	SY	1,540
3	550-3	FENCING- MAINT. BLDG.	LF	670
4	550-4	VEHICULAR DOUBLE GATE- MAINT. BLDG.	EA	2

THE FOLLOWING WORK SHALL BE FURNISHED AND INSTALLED BY OCWS AND NO PRICING SHALL BE PROVIDED BY THE CONTRACTOR:

- DEMOLITION INCLUDING BUILDINGS, DRIVEWAY, AND GRAVEL.
- FIRE HYDRANT INSTALLATION INCLUDING TAP, ETC.
- WATER AND SEWER SERVICE INSTALLATION FROM THE MAIN TO WITHIN 5 FEET OF THE BUILDING.
- REROUTING THE EXISTING SERVICE FOR THE CONVENIENCE STORE.

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FL LICENSE NO.: 64631
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SUMMARY OF QUANTITIES

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

G-3

GENERAL NOTES

1. CONTRACTOR SHALL PRESERVE AND PROTECT ALL PERMANENT REFERENCE MONUMENTS, PERMANENT CONTROL POINTS, PERMANENT BENCH MARKS AND PROPERTY CORNERS. IN THE EVENT THE MONUMENTS, POINTS OR MARKERS ARE DISTURBED THE CONTRACTOR SHALL EMPLOY A FLORIDA REGISTERED LAND SURVEYOR TO RESET OR REPLACE THEM.

2. CONTRACTOR SHALL PROTECT ALL EXISTING LANDSCAPING, SIDEWALKS, PAVEMENTS, CURBS, AND SOD NOT SPECIFIED FOR REMOVAL IN THESE PLANS. ANY DAMAGE TO THE EXISTING IMPROVEMENTS SHALL BE RESTORED BY THE CONTRACTOR AT NO COST TO THE OWNER, UNLESS OTHERWISE SPECIFIED HEREIN.

3. UNLESS OTHERWISE SPECIFIED, ALL WORK SHALL BE PERFORMED CONSISTENT WITH THE FOLLOWING SPECIFICATIONS: OKALOOSA COUNTY AND FDOT.

4. THIS DESIGN HAS BEEN BASED UPON SURVEY INFORMATION PROVIDED BY:

   OKALOOSA COUNTY WATER & SEWER ENGINEERING DATE: JANUARY 28, 2019.

   GEOTECH BY: NOVA ENGINEERING AND ENVIRONMENTAL, LLC JULY 18, 2019.

   AVCON INC. MAKES NO ASSURANCES REGARDING THE ACCURACY OF SUCH SURVEY.

5. CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE SITE, INCLUDING ALL SURFACE AND SUB-SURFACE CONDITIONS, THE WORK REQUIRED AND ALL OTHER CONDITIONS THAT MAY EFFECT THE SUCCESSFUL COMPLETION OF THE JOB PRIOR TO COMMENCEMENT OF WORK.

6. THE CONTRACTOR SHALL GIVE ALL NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND PERMIT CONDITIONS BEARING ON THE CONDUCT OF THE WORK, AS DRAWN AND SPECIFIED. IF THE CONTRACTOR OBSERVES THAT THE DRAWINGS AND SPECIFICATIONS ARE AT VARIANCE THEREWITH, HE SHALL PROMPTLY NOTIFY THE ENGINEER, IN WRITING, AND ANY NECESSARY CHANGES SHALL BE ADJUSTED, AS PROVIDED IN THE AGREEMENT FOR CHANGES IN THE WORK.

7. THE CONTRACTOR SHALL BE RESPONSIBLE TO THE OWNER AND THE ENGINEER FOR THE ACTS AND OMISSIONS OF CONTRACTOR'S EMPLOYEES AND ALL HIS SUBCONTRACTORS AND THEIR AGENTS AND EMPLOYEES AND OTHER PERSONS PERFORMING ANY OF THE WORK UNDER A CONTRACT WITH THE CONTRACTOR.

8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING ALL NECESSARY ARRANGEMENTS WITH GOVERNMENTAL DEPARTMENTS, PUBLIC UTILITIES, PUBLIC CARRIERS, SERVICE COMPANIES, AND CORPORATIONS OWNING OR CONTROLLING ROADWAYS, RAILWAYS, WATER, SEWER, GAS, ELECTRICAL, TELEPHONE, AND TELEGRAPH FACILITIES SUCH AS PAVEMENTS, TRACKS, PIPING, WIRES, CABLES, CONDUITS, POLES, GUYS, OR OTHER SIMILAR FACILITIES, INCLUDING INCIDENTAL STRUCTURES CONNECTED THEREWITH THAT ARE ENCOUNTERED IN THE WORK IN ORDER THAT SUCH ITEMS MAY BE PROPERLY SUPPORTED, PROTECTED OR LOCATED.

9. UNLESS OTHERWISE SPECIFIED IN THE GENERAL CONDITIONS, ALL CONSTRUCTION IS TO BE GOVERNED BY THE PLANS, APPLICABLE PERMITS, AND SPECIFICATIONS HEREIN, AND ALL APPLICABLE FEDERAL, STATE AND LOCAL BUILDING AND SAFETY CODES, LAWS AND ORDINANCES.

10. PRIOR TO PERFORMING ANY WORK WITHIN ANY PUBLIC RIGHT-OF-WAY, CONTRACTOR SHALL DEVELOP AND IMPLEMENT A TRAFFIC CONTROL PLAN CONSISTENT WITH THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" PUBLISHED BY THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION.

11. PRIOR TO PERFORMING ANY WORK WITHIN ANY UTILITY RIGHT-OF-WAY, CONTRACTOR SHALL OBTAIN AUTHORIZATION AND PERMIT FROM JURISDICTION RESPONSIBLE FOR SUCH RIGHT-OF-WAY.

12. IN THE EVENT THE CONTRACTOR DISCOVERS ANY ERRORS OR OMISSIONS IN THE PLANS, HE SHALL IMMEDIATELY NOTIFY THE ENGINEER.

13. THE OWNER, OWNER'S AGENT AND INSPECTORS OF APPLICABLE GOVERNMENT JURISDICTIONS, SHALL AT ALL TIMES HAVE ACCESS TO THE WORK WHEREVER AND WHENEVER IT IS IN PREPARATION OR PROGRESS; AND THE CONTRACTOR SHALL PROVIDE PROPER FACILITIES FOR SUCH ACCESS AND FOR THE INSPECTION.

14. IT IS THE CONTRACTOR'S RESPONSIBILITY TO TAKE ALL REASONABLE AND PRUDENT PRECAUTIONS TO ENSURE THAT ALL COMPLETED WORK, MATERIALS AND EQUIPMENT STORED ON SITE ARE SAFE AND SECURED FROM UNAUTHORIZED ACCESS OR USE. SUCH PRECAUTIONS MAY INCLUDE INSTALLATION OF SIGNS, FENCES, OR POSTING OF SECURITY GUARDS.

15. CONTRACTOR SHALL, AT ALL TIMES, UTILIZE ALL NORMALLY ACCEPTED AND REASONABLY EXPECTED SAFETY PRACTICES AND COMPLY WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS, ORDINANCES AND GUIDELINES PERTAINING TO SAFE UTILIZATION OF EQUIPMENT OR MATERIALS AS PUBLISHED BY MANUFACTURER.

16. PRIOR TO INITIATING ANY EXCAVATION (INCLUDING BUT NOT LIMITED TO TUNNELS, DITCHES, STORMWATER PONDS, CANALS) CONTRACTOR SHALL INSTALL FENCES AND TAKE ALL OTHER REASONABLE AND PRUDENT STEPS TO ENSURE THAT ACCESS TO EXCAVATION BY UNAUTHORIZED PERSONNEL IS PREVENTED.

17. THE CONTRACTOR SHALL TAKE ALL REASONABLE PRECAUTIONS FOR THE SAFETY OF, AND SHALL PROVIDE ALL REASONABLE PROTECTION TO PREVENT DAMAGE, INJURY OR LOSS TO:

    17.1. ALL EMPLOYEES ON THE WORK SITE AND ALL OTHER PERSONS WHO MAY BE AFFECTED THEREBY;

    17.2. ALL WORK AND ALL MATERIALS AND EQUIPMENT TO BE INCORPORATED THEREIN, WHETHER IN STORAGE ON OR OFF THE SITE, UNDER THE CARE, CUSTODY OR CONTROL OF THE CONTRACTOR OR ANY OF ITS SUBCONTRACTORS;

    17.3. ANY OTHER PROPERTY AT THE SITE OR ADJACENT THERETO, INCLUDING TREES, SHRUBS, LAWNS, WALKS, PAVEMENTS, ROADWAY, STRUCTURES AND UTILITIES NOT DESIGNATED FOR DEMOLITION IN THE COURSE OF CONSTRUCTION.

18. CONTRACTOR SHALL MAINTAIN PUBLIC ACCESS ON MAIN AIRPORT ENTRANCE ACCESS ROAD AT ALL TIMES.

19. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE SAFETY CODES AND WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC, QUASI-PUBLIC OR OTHER AUTHORITY HAVING JURISDICTION FOR THE SAFETY OF PERSONS OR PROPERTY OR FOR THEIR PROTECTION AGAINST DAMAGE, INJURY OR LOSS, OR DESIGNED TO PROTECT THE ENVIRONMENT. THE CONTRACTOR SHALL ERECT AND MAINTAIN, AS REQUIRED BY EXISTING CONDITIONS AND PROGRESS OF THE WORK, ALL REASONABLE SAFEGUARDS FOR SAFETY AND PROTECTION, INCLUDING POSTING DANGER SIGNS AND OTHER WARNINGS AGAINST HAZARDS, PROMULGATING SAFETY REGULATIONS AND NOTIFYING OWNERS AND USERS OF ADJACENT UTILITIES OF THE EXISTENCE OF HAZARDS AND OF THE SAFETY REGULATIONS.

20. ALL DAMAGE OR LOSS TO ANY PROPERTY REFERRED TO IN CLAUSES 19.2 AND 19.3 CAUSED IN WHOLE OR IN PART BY THE CONTRACTOR, A SUBCONTRACTOR, OR BY ANYONE FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, SHALL BE REMEDIED BY THE CONTRACTOR, EXCEPT DAMAGE OR LOSS PROPERLY ATTRIBUTABLE SOLELY TO THE ACTS OR OMISSIONS OF THE OWNER, OR THE ENGINEER OR ANYONE EMPLOYED BY THEM, OR FOR WHOSE ACTS ANY OF THEM MAY BE LIABLE, AND NOT PROPERLY ATTRIBUTABLE IN WHOLE OR IN PART, TO THE FAULT OR NEGLIGENCE OF THE CONTRACTOR.

21. UNTIL FINAL ACCEPTANCE OF THE WORK BY OWNER, THE CONTRACTOR SHALL HAVE THE CHARGE AND CARE OF AND SHALL BEAR THE RISK OF INJURY OR DAMAGE, LOSS OR EXPENSE TO ANY PART THEREOF, OR TO ANY MATERIALS STORED ON SITE, BY THE ACTION OF THE ELEMENTS OR FROM ANY OTHER CAUSE WHETHER ARISING FROM THE EXECUTION OR NON-EXECUTION OF THE WORK. THE CONTRACTOR SHALL REBUILD, REPAIR, RESTORE AND MAKE GOOD ALL INJURIES OR DAMAGES TO ANY PORTION OF THE WORK OCCASIONED BY ANY OF THE ABOVE CAUSES BEFORE FINAL ACCEPTANCE AND SHALL BEAR THE EXPENSES THEREOF.

22. THOSE PARTS OF WORK IN PLACE WHICH ARE SUBJECT TO DAMAGE BECAUSE OF OPERATIONS BEING CARRIED ON ADJACENT THERETO SHALL BE COVERED, BOARDED UP OR SUBSTANTIALLY ENCLOSED WITH ADEQUATE PROTECTION BY THE CONTRACTOR AT CONTRACTOR'S EXPENSE.

23. PERMANENT OPENINGS USED AS THOROUGHFARES FOR THE INTRODUCTION OF WORK AND MATERIALS TO THE STRUCTURE SHALL HAVE HEADS, JAMBS AND SILLS WELL BLOCKED AND BOARDED BY THE CONTRACTOR. OWNER RETAINS THE AUTHORITY, BUT ASSUMES NO DUTY, TO ESTABLISH STANDARDS OF PROTECTION, AND TO REVIEW THE EFFICIENCY OF PROTECTIVE MEASURES TAKEN BY THE CONTRACTOR.

24. ADEQUATE TRAFFIC CONTROL, BARRICADES AND FLAGMAN SERVICES SHALL BE FURNISHED AND MAINTAINED BY THE CONTRACTOR AT ALL POINTS WHERE CONVEYING EQUIPMENT ENGAGED ON THE WORK REGULARLY ENTERS ONTO OR CROSSES TRAFFIC-CARRYING ROADS.

25. THE CONTRACTOR SHALL COMPLY IN EVERY RESPECT WITH THE FEDERAL OCCUPATIONAL HEALTH AND SAFETY ACT OF 1970 AND ALL RULES AND REGULATIONS NOW OR HEREAFTER IN EFFECT UNDER SAID ACT, AND THE CONTRACTOR FURTHER AGREES TO COMPLY WITH ANY AND ALL APPLICABLE STATE LAWS AND REGULATIONS PERTAINING TO JOB SAFETY AND HEALTH.

26. THE CONTRACTOR SHALL PROTECT AND KEEP OWNER (INCLUDING THEIR AGENTS AND EMPLOYEES) FREE AND HARMLESS FROM ANY AND ALL LIABILITY, PUBLIC OR PRIVATE, PENALTIES, CONTRACTUAL OR OTHERWISE, LOSSES, DAMAGES, COSTS, ATTORNEY'S FEES, EXPENSES, CAUSES OF ACTION, CLAIMS OR JUDGMENTS RESULTING FROM THE FEDERAL OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970 AS AMENDED OR ANY RULE OR REGULATION PROMULGATED THEREUNDER OR OF ANY STATE LAWS OR REGULATIONS PERTAINING TO JOB SAFETY AND HEALTH ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE PERFORMANCE OF WORK OR WORK TO BE PERFORMED UNDER THIS CONTRACT, AND CONTRACTOR SHALL INDEMNIFY OWNER FROM ANY SUCH CLAIMS, PENALTIES, SUITS OR ACTIONS, PUBLIC OR PRIVATE, ADMINISTRATIVE OR JUDICIAL, INCLUDING ATTORNEY'S FEES PAID OR INCURRED BY OR ON BEHALF OF OWNER, JOINTLY OR SEVERALLY, AND/OR THEIR AGENTS AND EMPLOYEES. THE CONTRACTOR FURTHER AGREES, IN THE EVENT OF A CLAIMED VIOLATION OF ANY FEDERAL OR STATE SAFETY AND HEALTH LAW OR REGULATION ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE PERFORMANCE OF WORK OR WORK TO BE PERFORMED UNDER THIS CONTRACT, OWNER MAY IMMEDIATELY TAKE WHATEVER ACTION IS DEEMED NECESSARY BY OWNER TO REMEDY THE CLAIMED VIOLATION. ANY AND ALL COSTS OR EXPENSES PAID OR INCURRED BY OWNER IN TAKING SUCH ACTION SHALL BE BORNE BY CONTRACTOR, AND CONTRACTOR AGREES TO PROTECT, HOLD HARMLESS AND INDEMNIFY OWNER AGAINST ANY AND ALL SUCH COSTS OR EXPENSES.

27. ALL WORK PERFORMED UNDER THE CONTRACT, AND ALL EQUIPMENT, APPLIANCES, TOOLS AND LIKE ITEMS USED IN THE WORK SHALL CONFORM TO APPLICABLE SAFETY CODES AND REGULATIONS OF ANY PUBLIC OR OTHER AUTHORITY HAVING JURISDICTION. IN THE EVENT OF CONFLICTING REQUIREMENTS, THE MORE STRINGENT INTERPRETATION OR REGULATION SHALL GOVERN.

28. THE CONTRACTOR SHALL DEVELOP AND IMPLEMENT AN EROSION CONTROL PLAN TO MINIMIZE EROSION AND ENSURE FUNCTIONING OF STORMWATER MANAGEMENT SYSTEM UPON COMPLETION OF CONSTRUCTION.

29. CONTRACTOR AND ITS SUBCONTRACTORS SHALL USE, HANDLE, TRANSPORT, AND DISPOSE OF ALL HAZARDOUS MATERIALS (AS DEFINED PARAGRAPH 38.) IN COMPLIANCE WITH ALL PRESENT FEDERAL, STATE AND LOCAL ENVIRONMENTAL, HEALTH OR SAFETY LAW, INCLUDING, BUT NOT LIMITED TO, ALL SUCH STATUTES, REGULATIONS, RULES, ORDINANCES, CODES, AND RULES OF COMMON LAW.

30. CONTRACTOR FURTHER AGREES THAT CONTRACTOR AND ITS SUBCONTRACTORS SHALL NOT CAUSE THE DISCHARGE, RELEASE OR DISPOSAL OF ANY HAZARDOUS MATERIAL CREATED BY ITS WORK ON OR ABOUT THE JOB SITE. IN THE EVENT OF ANY SPILL, RELEASE OR ANY OTHER REPORTABLE OCCURRENCE, CONTRACTOR SHALL NOTIFY THE APPROPRIATE GOVERNMENTAL AGENCY AND SHALL TAKE SUCH ACTION AS MAY BE NECESSARY TO MINIMIZE THE DELETERIOUS EFFECT OF SUCH SPILL ON PERSONS OR PROPERTY.

31. CONTRACTOR AND ITS SUBCONTRACTORS SHALL, UPON COMPLETION OF PERFORMANCE OF ALL DUTIES UNDER THIS CONTRACT, REMOVE ALL SUPPLIES, MATERIALS, AND WASTE CONTAINING AND HAZARDOUS MATERIAL FROM THE JOB SITE. CONTRACTOR SHALL BEAR FULL FINANCIAL RESPONSIBILITY, AS BETWEEN THE PARTIES OF THIS CONTRACT, FOR THE COMPLIANCE OF CONTRACTOR AND ITS SUBCONTRACTORS WITH THE PROVISIONS OF THIS PARAGRAPH.

32. CONTRACTOR AGREES TO INDEMNIFY, DEFEND, PROTECT AND HOLD THE OWNER HARMLESS FROM AND AGAINST ANY CLAIMS INCLUDING, WITHOUT LIMITATION, ACTUAL ATTORNEY'S FEES AND ANY COSTS OF INVESTIGATION, SOILS TESTING, GOVERNMENTAL APPROVALS, REMEDIATION AND CLEAN-UP ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE FAILURE OF CONTRACTOR OR ITS SUBCONTRACTORS, OR THEIR AGENTS, EMPLOYEES, OFFICERS, OR REPRESENTATIVES, TO COMPLY WITH THE TERMS OF THIS ARTICLE.

33. SHOULD CONTRACTOR OR ITS SUBCONTRACTORS DISCHARGE, RELEASE OR DISPOSE OF ANY HAZARDOUS MATERIAL ON OR ABOUT THE JOB SITE IN VIOLATION OF REGULATIONS, CONTRACTOR SHALL IMMEDIATELY SO INFORM OWNER IN WRITING.

34. IN THE EVENT OF ANY SPILL, RELEASE OR ANY OTHER REPORTABLE OCCURRENCE, CONTRACTOR SHALL NOTIFY THE APPROPRIATE GOVERNMENTAL AGENCY AND SHALL TAKE SUCH ACTION AS MAY BE NECESSARY TO MINIMIZE THE DELETERIOUS EFFECT OF SUCH SPILL ON PERSONS OR PROPERTY. IN THE EVENT CONTRACTOR OR ITS SUBCONTRACTORS ENCOUNTER ON THE PREMISES ANY PIPELINE, UNDERGROUND STORAGE TANK OR OTHER CONTAINER, OF ANY KIND, THAT MAY CONTAIN A HAZARDOUS MATERIAL, OR ENCOUNTER MATERIAL REASONABLY BELIEVED TO BE A HAZARDOUS MATERIAL, CONTRACTOR SHALL IMMEDIATELY STOP WORK IN THE AREA AFFECTED AND REPORT THE CONDITION TO OWNER IN WRITING.

35. IF CONTRACTOR OR ITS SUBCONTRACTORS DO NOT COMPLY WITH FEDERAL AND STATE REQUIREMENTS, OWNER MAY, BUT IS NOT OBLIGATED TO, GIVE WRITTEN NOTICE OF VIOLATION TO CONTRACTOR. SHOULD CONTRACTOR OR ITS SUBCONTRACTORS FAIL TO COMPLY WITH THE REQUIREMENTS WITHIN TWENTY-FOUR (24) HOURS FROM THE TIME OWNER ISSUES SUCH WRITTEN NOTICE OF NONCOMPLIANCE OR WITHIN THE TIME OF AN ABATEMENT PERIOD SPECIFIED BY ANY GOVERNMENTAL AGENCY, WHICHEVER PERIOD IS SHORTER, CONTRACTOR SHALL BE IN MATERIAL DEFAULT OF THIS CONTRACT.

36. "HAZARDOUS MATERIAL" MEANS ANY SUBSTANCE: (A) THE PRESENCE OF WHICH REQUIRES INVESTIGATION OR REMEDIATION UNDER ANY PRESENT FEDERAL, STATE OR LOCAL STATUTE, REGULATION, ORDINANCE, RULE, CODE, ORDER, ACTION, POLICY OR COMMON LAW, OR (B) WHICH IS OR BECOMES DEFINED AS A "HAZARDOUS WASTE," "HAZARDOUS SUBSTANCE," POLLUTANT OR CONTAMINANT UNDER ANY PRESENT FEDERAL, STATE OR LOCAL STATUTE, REGULATION, RULE OR ORDINANCE OR AMENDMENTS THERETO INCLUDING, WITHOUT LIMITATION, THE COMPREHENSIVE ENVIRONMENTAL RESPONSE COMPENSATION AND LIABILITY ACT (42 U.S.C. SECTIONS 9601 ET SEQ.) AND/OR THE RESOURCE CONSERVATION AND RECOVERY ACT (42 U.S.C. SECTIONS 6901 ET SEQ.), OR (C) WHICH IS TOXIC, EXPLOSIVE, CORROSIVE, FLAMMABLE, INFECTIOUS, RADIOACTIVE, CARCINOGENIC, MUTAGENIC, OR OTHERWISE HAZARDOUS AND IS REGULATED BY ANY GOVERNMENTAL AUTHORITY, AGENCY, DEPARTMENT, COMMISSION, BOARD, AGENCY OR INSTRUMENTALITY OF THE UNITED STATES, THE STATE IN WHICH THE PREMISES ARE LOCATED OR ANY POLITICAL SUBDIVISION THEREOF, OR (D) THE PRESENCE OF WHICH ON THE PREMISES CAUSES OR THREATENS TO CAUSE A NUISANCE UPON THE PREMISES OR TO ADJACENT PROPERTIES OR POSES OR THREATENS TO POSE A HAZARD TO THE HEALTH OR SAFETY OF PERSONS ON OR ABOUT THE PREMISES, OR (E) WHICH CONTAINS GASOLINE, DIESEL FUEL OR OTHER PETROLEUM HYDROCARBONS, OR (F) WHICH CONTAINS POLYCHLORINATED BIPHENYLS (PCBS), ASBESTOS, LEAD OR UREA FORMALDEHYDE FOAM INSULATION.

37. THE EXISTING UTILITIES SHOWN ARE APPROXIMATE. THE CONTRACTOR SHALL FIELD LOCATE ALL EXISTING UTILITIES AS TO SIZE, LOCATION, AND ELEVATION. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY AND ALL CONFLICTS PRIOR TO BEGINNING CONSTRUCTION.

38. IF ANY TESTING, INSPECTION OR APPROVAL REVEAL DEFECTIVE WORK, CONTRACTOR SHALL NOT BE ALLOWED TO RECEIVE ANY ASSOCIATED COSTS AND THE OWNER SHALL BE ENTITLED TO DEDUCT FROM THE CONTRACT PRICE, BY ISSUING A CHANGE ORDER, OWNER'S COSTS ARISING OUT OF THE DEFECTIVE WORK, INCLUDING COSTS OF REPEATED PROCEDURES, COMPENSATION FOR ENGINEER'S AND DESIGN ENGINEER'S SERVICES AND OTHER RELATED COSTS.

GENERAL ORDER OF MAJOR EVENTS

1. OCWS TO DEMOLISH SOUTH ODD FELLOW WAREHOUSE BUILDING.
2. CONTRACTOR TO BUILD FIELD OFFICE BUILDING AND MAINTENANCE BUILDING; CONTRACTOR AND OCWS TO PERFORM SITE WORK ON SOUTH PORTION OF WEST PARCEL AND EAST PARCEL AND OBTAIN TEMPORARY CERTIFICATE OF OCCUPANCY.
3. OCWS EMPLOYEES MOVE INTO BOTH BUILDINGS.
4. OCWS TO DEMOLISH NORTH ODD FELLOW WAREHOUSE BUILDING.
5. CONTRACTOR AND OCWS TO COMPLETE SITE WORK ON WEST PARCEL.
6. OCWS TO BUILD A NEW NUCLEAR DENSITY BUILDING, THEN DEMOLISH THE OLD NUCLEAR DENISTY BUILDING.
7. OCWS TO DEMOLISH OR REMOVE OLD ENGINEERING TRAILER.
8. OCWS TO COMPLETE SITE WORK ON EAST PARCEL.
9. OBTAIN FINAL CERTIFICATE OF OCCUPANCY.

THE FOLLOWING WORK SHALL BE FURNISHED AND INSTALLED BY OCWS AND NO PRICING SHALL BE PROVIDED BY THE CONTRACTOR:

- DEMOLITION INCLUDING BUILDINGS, DRIVEWAY, AND GRAVEL.
- FIRE HYDRANT INSTALLATION INCLUDING TAP, ETC.
- WATER AND SEWER SERVICE INSTALLATION FROM THE MAIN TO WITHIN 5 FEET OF THE BUILDING.
- REROUTING THE EXISTING SERVICE FOR THE CONVENIENCE STORE.

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GENERAL NOTES

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

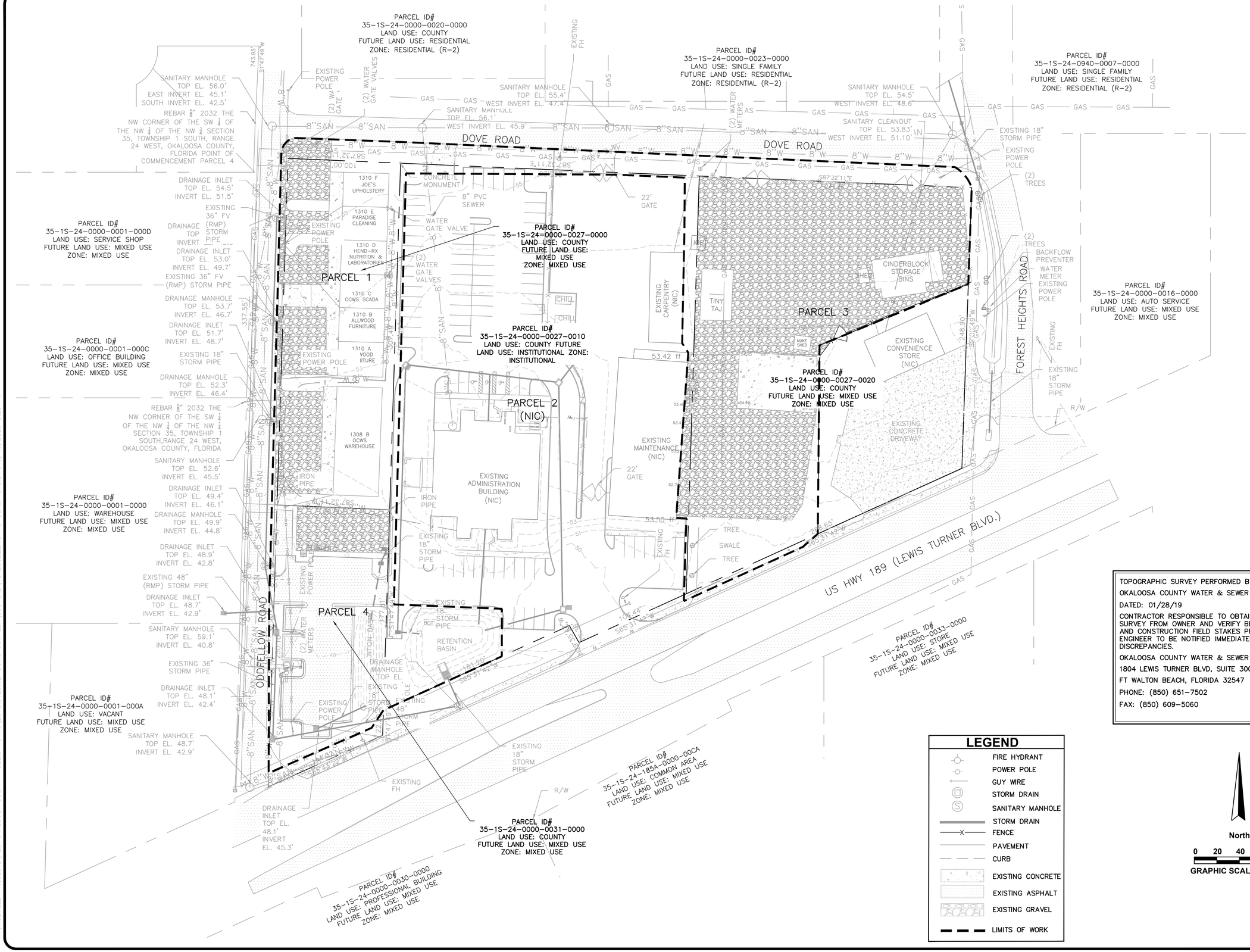
PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

G-4



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EXISITING CONDITIONS

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
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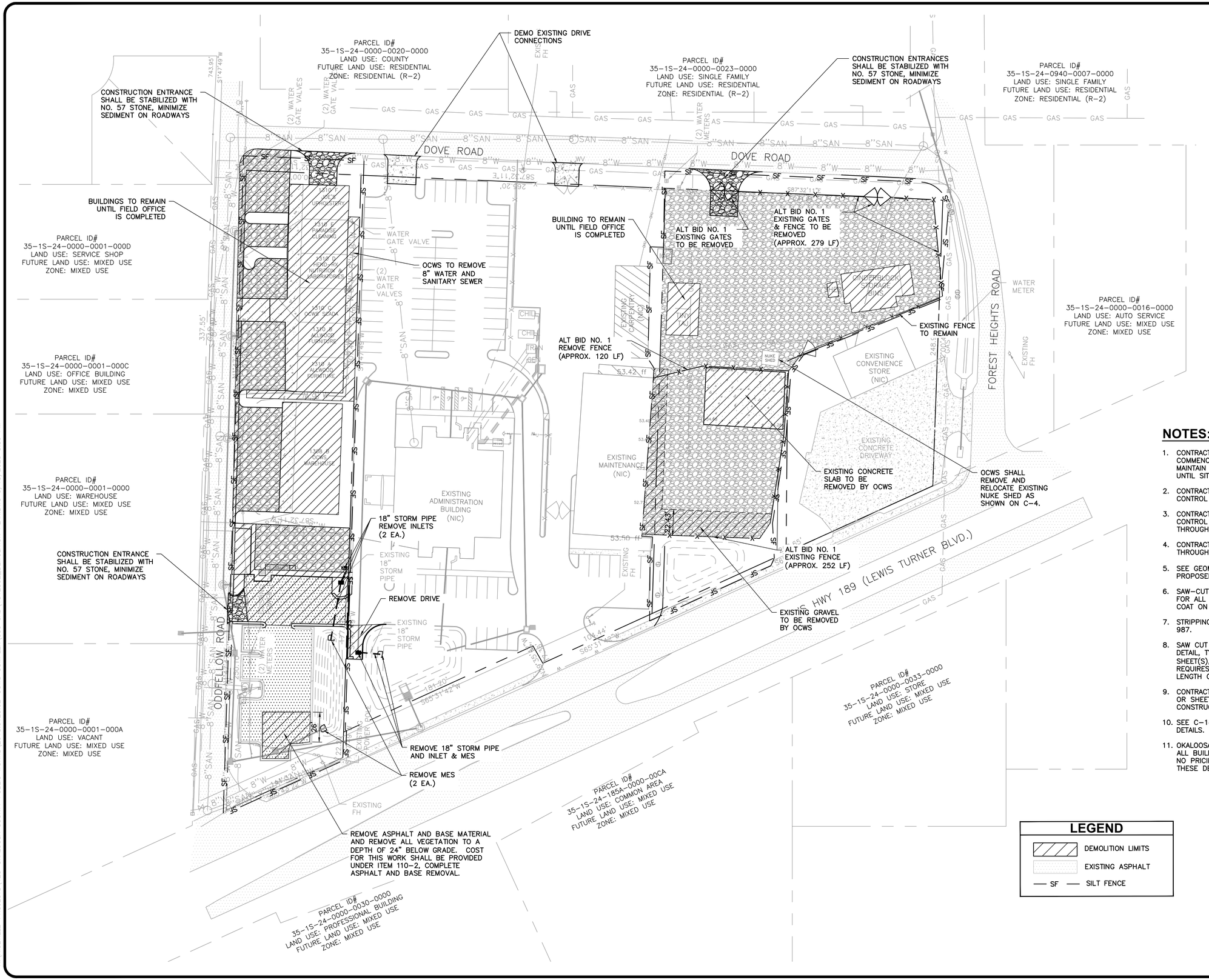
DATE:	SEPTEMBER 2020

SHEET NUMBER

C-1



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DEMOLITION, HAUL ROUTE & EROSION CONTROL PLAN

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

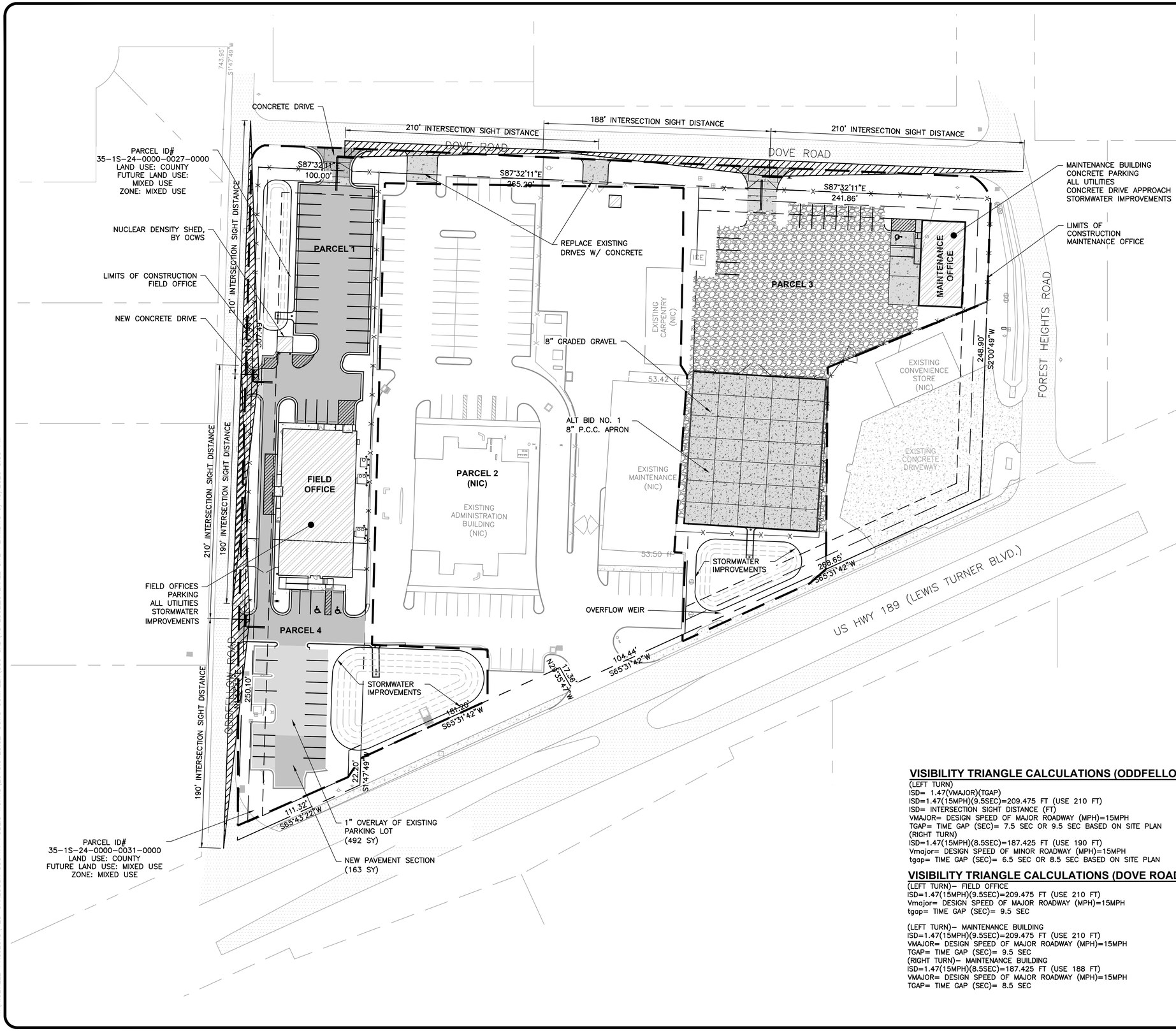
PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

C-2



SITE NOTES:

1. ALL WORK DETAILED IN CONSTRUCTION DRAWINGS SHALL CONFORM TO FDOT STD. PLANS AND SPECIFICATIONS, LATEST EDITION.
2. CONTRACTOR SHALL MAINTAIN PUBLIC ACCESS AT ALL TIMES ALONG ALL PUBLIC RIGHT-OF-WAYS.
3. ALL PAVEMENT MARKINGS SHALL CONFORM TO FDOT STD. PLANS 711-001.
4. ALL SIGNS AND PLACEMENTS OF SIGNS SHALL CONFORM TO FDOT STD. PLANS 700-101 AND MUTCD CHAPTER 2.
5. REFER TO STD. PLANS 102-600 FOR PLACEMENT OF TRAFFIC CONTROL DEVICES.
6. ALL DISTURBED AREAS SHALL BE SODDED WITHIN TWO WEEKS AFTER FINAL GRADING IS COMPLETED.
7. PAVEMENT SUBGRADE SHALL HAVE ALL UNSUITABLE MATERIALS REMOVED TO A DEPTH OF TWO FEET BELOW TOP OF SUBGRADE, AND 2.5 FEET BEYOND EDGE OF PAVEMENT OR BACK OF CURB. BACKFILL WITH SUITABLE MATERIAL.
8. THE SUBGRADE SHALL BE PREPARED IN ACCORDANCE WITH SECTION 160 OF THE FLORIDA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS.
9. THE BASE SHALL BE IN ACCORDANCE WITH APPLICABLE SECTIONS OF THE FLORIDA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS. ALLOWABLE BASE MATERIALS ARE INDICATED ON THE DRAWINGS.
10. ALL EXCAVATION AND EMBANKMENT CONSTRUCTION SHALL BE IN ACCORDANCE WITH SECTION 120 OF THE FLORIDA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS.
11. WHERE DAMAGED OR REQUIRED TO BE CUT BY THE CONTRACTOR'S OPERATIONS, SIDEWALKS AND DRIVEWAYS SHALL BE REPAIRED TO CONFORM TO THE EXISTING TYPE OF CONSTRUCTION IN ACCORDANCE WITH THE FLORIDA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS.
12. PROVIDE CONTRACTION JOINTS AT 10' O.C. AND EXPANSION JOINTS AT 50' O.C. ON ALL EXTERIOR SIDEWALKS AND CURBING.
13. ALL PERMANENT PAINT STRIPING WITHIN THE RIGHT-OF-WAY SHALL BE THERMO-PLASTIC REFLECTIVE PAINT, AND BE IN ACCORDANCE WITH THE CURRENT EDITION OF THE FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
14. THERMO-PLASTIC PAINT SHALL BE INCIDENTAL TO THE PARKING LOT PAVEMENT MARKING PAY ITEM. NO SEPARATE PAYMENT SHALL BE MADE FOR THERMO-PLASTIC MARKINGS.
15. PARKING LOT LIGHTING SHALL BE PROVIDED FOR THE SITE. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS AND PHOTOMETRICS FOR LIGHTING AS PROPOSED.

LEGEND

- BUFFER LINE
- SETBACK LINE
- LIMITS OF CONSTRUCTION
- PROPERTY LINE
- PROPOSED FENCE LINE
- EXISTING CONCRETE LOT
- EXISTING ASPHALT PAVEMENT
- PROPOSED GRAVEL AREA
- PROPOSED BUILDING
- PROPOSED ASPHALT
- PROPOSED CONCRETE PAD
- PROPOSED OVERLAY

VISIBILITY TRIANGLE CALCULATIONS (ODDFELLOW RD)

(LEFT TURN)
ISD= 1.47(VMAJOR)(TGAP)
ISD=1.47(15MPH)(9.5SEC)=209.475 FT (USE 210 FT)
ISD= INTERSECTION SIGHT DISTANCE (FT)
VMAJOR= DESIGN SPEED OF MAJOR ROADWAY (MPH)=15MPH
TGAP= TIME GAP (SEC)= 7.5 SEC OR 9.5 SEC BASED ON SITE PLAN
(RIGHT TURN)
ISD=1.47(15MPH)(8.5SEC)=187.425 FT (USE 190 FT)
Vmajor= DESIGN SPEED OF MINOR ROADWAY (MPH)=15MPH
tgap= TIME GAP (SEC)= 6.5 SEC OR 8.5 SEC BASED ON SITE PLAN

VISIBILITY TRIANGLE CALCULATIONS (DOVE ROAD)

(LEFT TURN)- FIELD OFFICE
ISD=1.47(15MPH)(9.5SEC)=209.475 FT (USE 210 FT)
Vmajor= DESIGN SPEED OF MAJOR ROADWAY (MPH)=15MPH
tgap= TIME GAP (SEC)= 9.5 SEC

(LEFT TURN)- MAINTENANCE BUILDING
ISD=1.47(15MPH)(9.5SEC)=209.475 FT (USE 210 FT)
VMAJOR= DESIGN SPEED OF MAJOR ROADWAY (MPH)=15MPH
TGAP= TIME GAP (SEC)= 9.5 SEC
(RIGHT TURN)- MAINTENANCE BUILDING
ISD=1.47(15MPH)(8.5SEC)=187.425 FT (USE 188 FT)
VMAJOR= DESIGN SPEED OF MAJOR ROADWAY (MPH)=15MPH
TGAP= TIME GAP (SEC)= 8.5 SEC

North

0 20 40 80

GRAPHIC SCALE IN FEET

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

TONIA D. NATION
FL LICENSE NO.: 64631
FBPR CERTIFICATE OF AUTHORIZATION NO. 5057

NO.	DATE	REVISION	BY
A	1/17/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

OVERALL SITE PLAN

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

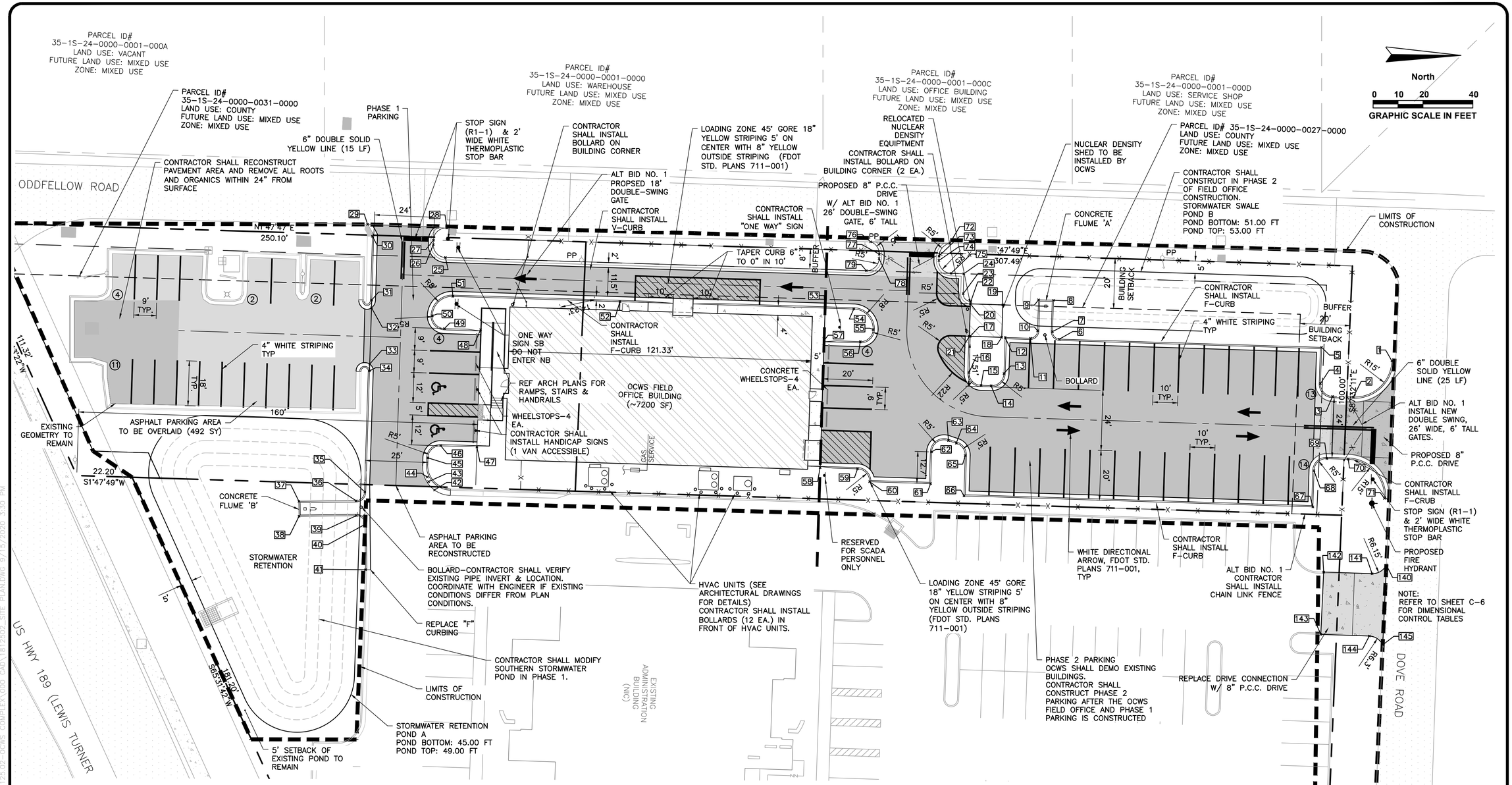
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

C-3

N:\NICEVILLE_PROJECTS\125_OKALOOSA_COUNTY_PUBLIC_WORKS\2018.0125.02_OCWS_COMPLEX\000_CAD\1812502_OVERALL_SITE_PLAN.DWG 9/15/2020 3:30 PM



WEST PARCEL SITE DATA TABLE

PARCEL IDENTIFICATION NUMBER:	35-1S-24-0000-0031-0000/ 35-1S-24-0000-0027-0000	
CURRENT USE:	UTILITY SERVICES	
FUTURE LAND USE:	MU-MIXED USE	
ZONE:	MU-MIXED USE	
SURROUNDING ZONE:		
NORTH	R2- RESIDENTIAL	
SOUTH, EAST, & WEST	MU-MIXED USE	
TOTAL AREA:	53,249 SF	(1.22 ACRES)
OKALOOSA WATER AND SEWER AREA:	53,249 SF	(1.22 ACRES)
GAS STATION LEASE AREA:	SF	(. ACRES)
	REQUIRED	PROVIDED
BUILDING HEIGHT	75 FT	23' 2"
TOTAL BUILDING AREA:		15,011 SF
EXISTING BUILDING AREA:	-	11,141 SF
DEMO BUILDING AREA:	-	3,330 SF
PROPOSED BUILDING AREA:	-	7,200 SF
EXISTING ISC:	75%	77.4%
PROPOSED ISC:	75%	64.6%

FLOOR AREA RATIO (FAR):	0.75	0.282
	REQUIRED	PROVIDED
BUILDING SETBACKS		
NORTH (FRONT)	20 FT	139 FT
SOUTH (FRONT)	20 FT	160 FT
WEST (FRONT)	20 FT	20 FT
EAST (SIDE)	N/A	N/A
	REQUIRED	PROVIDED
LANDSCAPE BUFFERS		
NORTH (FRONT)	10 FT	10 FT
SOUTH (FRONT)	10 FT	10 FT
WEST (FRONT)	10 FT*	8 FT*
EAST (SIDE)	N/A	N/A
	REQUIRED	PROVIDED
PARKING REQUIREMENTS:		
GOVERNMENT OFFICE BUILDING: (7,200 SF) 1 SPACE/ 250 SF	29 SPACES	54 SPACES
HANDICAP SPACES REQUIRED	2 SPACES	2 SPACES
TOTAL PARKING SPACES:	29 SPACES	54 SPACES
*TO BE COORDINATED WITH OKALOOSA COUNTY GROWTH MANAGEMENT		
*VARIANCE FROM 10FT REQUIRED BUFFER		

LEGEND

- BUFFER LINE
- SETBACK LINE
- LIMITS OF CONSTRUCTION
- PROPERTY LINE
- PROPOSED FENCE LINE
- EXISTING CONCRETE LOT
- EXISTING ASPHALT PAVEMENT
- PROPOSED GRAVEL AREA
- PROPOSED BUILDING
- PROPOSED ASPHALT
- PROPOSED CONCRETE PAD
- PROPOSED OVERLAY

PHASE 1– CONSISTS OF SOUTHERN STORMWATER POND, OVERLAY OF EXISTING SOUTHERN LOT, SOUTHERN PARKING RECONSTRUCTION AND FIELD OFFICE.

PHASE 2– CONSISTS OF THE DEMOLITION OF THE EXISTING BUILDINGS, CONSTRUCTION OF NORTH STORMWATER IMPROVEMENTS, AND NORTH PARKING LOT CONSTRUCTION. PHASE 2 SHALL COMMENCE AFTER THE TEMPORARY C.O. IS ISSUED FOR THE FIELD OFFICE.

AVCON, INC.
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320 BAYSHORE DRIVE, SUITE A
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TONIA D. NATION
FL LICENSE NO.: 64631
FBPR CERTIFICATE OF AUTHORIZATION NO. 5057

NO.	DATE	REVISION	BY
A	11/17/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

FIELD OFFICE SITE PLAN

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

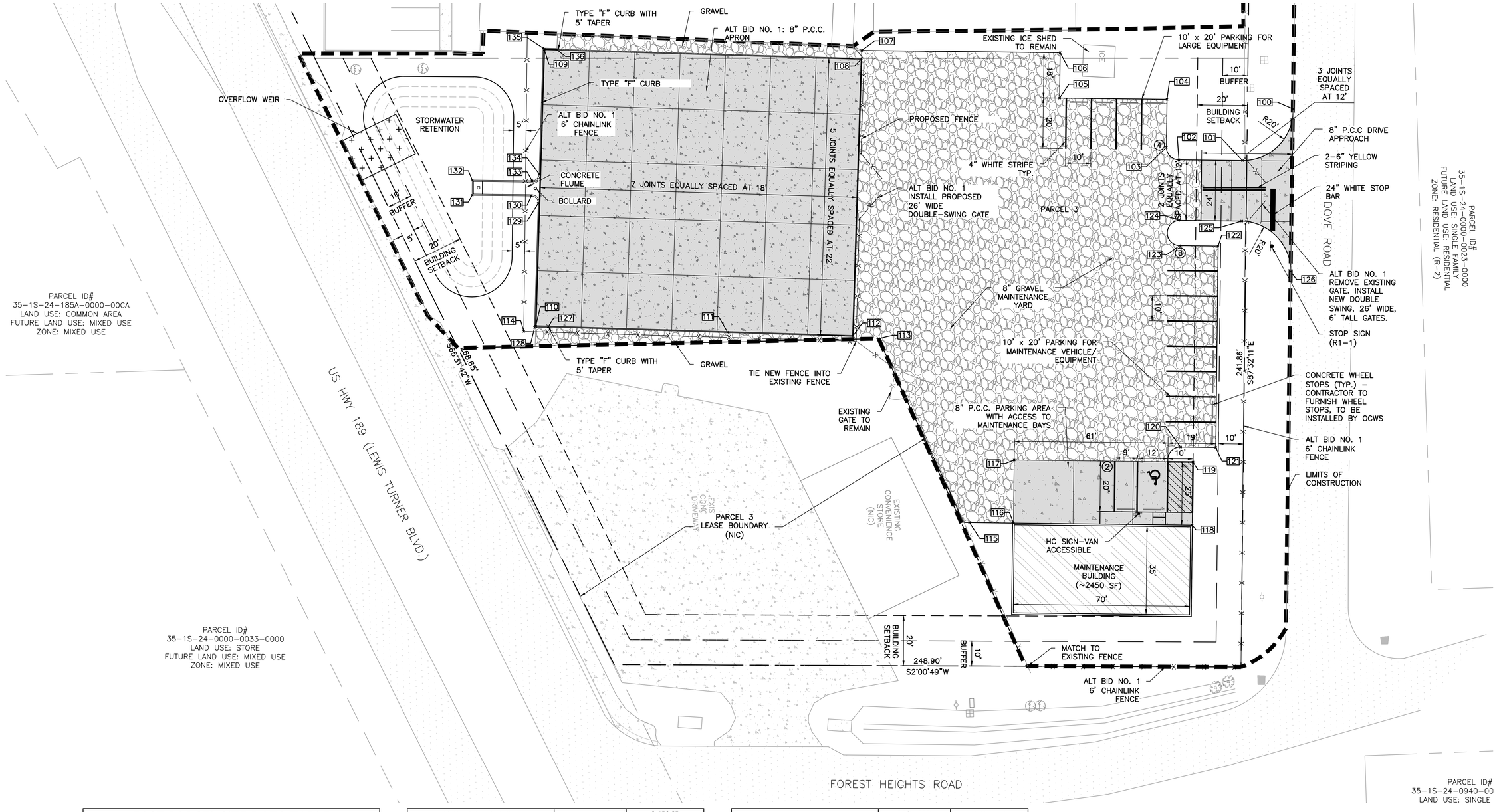
PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

C-4



EAST PARCEL SITE DATA TABLE

PARCEL IDENTIFICATION NUMBER:	35-1S-24-0000-0027-0020	
CURRENT USE:	UTILITY SERVICES	
FUTURE LAND USE:	MU-MIXED USE	
ZONE:	MU-MIXED USE	
SURROUNDING ZONE:		
NORTH	R2- RESIDENTIAL	
SOUTH, EAST, & WEST	MU-MIXED USE	
TOTAL AREA:	74,739 SF	(1.72 ACRES)
OKALOOSA WATER AND SEWER AREA:	52,358 SF	(1.2 ACRES)
GAS STATION LEASE AREA:	22,381 SF	(.51 ACRES)
	REQUIRED	PROVIDED
BUILDING HEIGHT	75 FT	23' 2"
TOTAL BUILDING AREA:		2,790 SF
EXISTING BUILDING AREA:		3,669 SF
DEMO BUILDING AREA:		3,330 SF

PROPOSED BUILDING AREA:		2,450 SF
EXISTING ISC:	75%	91.2%
PROPOSED ISC:	75%	83.7%
FLOOR AREA RATIO (FAR):	0.75	0.053
	REQUIRED	PROVIDED
BUILDING SETBACKS		
NORTH (FRONT)	20 FT	20 FT
SOUTH (FRONT)	20 FT	70 FT
EAST (FRONT)	20 FT	20 FT
WEST (SIDE)	N/A	N/A
	REQUIRED	PROVIDED
LANDSCAPE BUFFERS		
NORTH (FRONT)	10 FT	10 FT
SOUTH (FRONT)	10 FT	10 FT
EAST (FRONT)	10 FT	10 FT
WEST (SIDE)	N/A	N/A

	REQUIRED	PROVIDED
PARKING REQUIREMENTS:		
GOVERNMENT OFFICE BUILDING: (1,148 SF) 1 SPACE/ 250 SF	5 SPACES	9 SPACES
OFFICE BUILDING (GARAGE): (1,302 SF) 1 SPACE/ 250 SF	0	0
HANDICAP SPACES REQUIRED	1 SPACES	1 SPACES
TOTAL PARKING SPACES:	5 SPACES	9 SPACES

LEGEND

- BUFFER LINE
- SETBACK LINE
- LIMITS OF CONSTRUCTION
- PROPERTY LINE
- PROPOSED FENCE LINE
- EXISTING CONCRETE LOT
- EXISTING ASPHALT PAVEMENT
- PROPOSED GRAVEL AREA
- PROPOSED BUILDING
- PROPOSED CONCRETE PAD

North

0 10 20 40

GRAPHIC SCALE IN FEET

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MAINTENANCE BUILDING SITE PLAN

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY: JDC
DRAWN BY: NDU
CHECKED BY: TDN
APPROVED BY: VCL
PROJECT NO: 18.0125.02
DATE: SEPTEMBER 2020

SHEET NUMBER

C-5

FIELD OFFICE DIMENSIONAL CONTROL TABLE

Point #	Northing	Easting
1	538044.55	1297561.54
2	538029.09	1297576.03
3	538020.76	1297575.76
4	538015.92	1297570.61
5	538016.38	1297556.12
6	537911.19	1297552.82
7	537908.46	1297549.81
8	537908.85	1297537.24
9	537902.86	1297537.04
10	537902.47	1297549.46
11	537899.65	1297552.45
12	537889.44	1297552.13
13	537888.98	1297566.63
14	537883.83	1297571.47
15	537879.83	1297571.34
16	537874.99	1297566.19
17	537875.45	1297551.69
18	537888.11	1297552.08
19	537888.51	1297539.09
20	537875.52	1297538.68
21	537875.11	1297551.68
22	537875.72	1297537.69
23	537872.65	1297534.60
24	537872.90	1297526.60
25	537665.00	1297520.08
26	537660.16	1297514.93
27	537660.22	1297513.13
28	537665.65	1297508.31
29	537633.79	1297506.84
30	537635.72	1297511.57
31	537635.45	1297537.15
32	537635.35	1297540.27
33	537634.65	1297562.82
34	537634.56	1297565.55
35	537632.66	1297614.04
36	537629.19	1297617.58
37	537606.24	1297617.81
38	537606.30	1297623.81
39	537629.25	1297623.58
40	537632.78	1297627.04
41	537632.96	1297645.25
42	537660.61	1297613.29
43	537658.27	1297609.90
44	537657.74	1297608.11
45	537657.98	1297600.40
46	537663.13	1297595.56
47	537677.63	1297596.01
48	537679.10	1297549.04
49	537664.61	1297548.58
50	537659.77	1297543.43

FIELD OFFICE DIMENSIONAL CONTROL TABLE

Point #	Northing	Easting
51	537668.01	1297535.68
52	537734.98	1297537.78
53	537817.27	1297540.36
54	537828.77	1297540.73
55	537836.51	1297548.97
56	537831.36	1297553.81
57	537816.87	1297553.36
58	537815.27	1297604.32
59	537830.26	1297604.79
60	537835.10	1297609.95
61	537859.59	1297610.72
62	537859.99	1297598.02
63	537866.73	1297593.49
64	537869.86	1297594.54
65	537873.45	1297599.49
66	537872.94	1297615.65
67	538012.87	1297620.04
68	538013.33	1297605.55
69	538018.48	1297600.70
70	538027.05	1297600.97
71	538041.56	1297616.65
72	537867.26	1297514.41
73	537862.95	1297519.49
74	537862.89	1297521.29
75	537867.73	1297526.44
76	537835.52	1297513.83
77	537838.96	1297518.74
78	537838.91	1297520.53
79	537833.75	1297525.37
140	538042.35	1297643.33
141	538036.61	1297646.82
142	538017.19	1297646.16
143	538016.06	1297671.14
144	538035.48	1297671.80
145	538040.89	1297675.34
146	538035.68	1297789.85
147	538030.03	1297792.47
148	538015.56	1297791.98
149	538014.61	1297812.79
150	538029.32	1297813.29
151	538034.48	1297816.17

MAINTENANCE BUILDING DIMENSIONAL CONTROL TABLE

Point #	Northing	Easting
100	538030.25	1297909.03
101	538009.51	1297928.91
102	537984.29	1297927.83
103	537979.51	1297922.62
104	537980.33	1297903.64
105	537937.71	1297901.80
106	537938.48	1297883.82
107	537859.75	1297880.43
108	537859.54	1297883.84
109	537733.79	1297876.02
110	537726.96	1297985.81
111	537803.02	1297990.62
112	537852.72	1297993.63
113	537862.89	1297994.99
114	537722.15	1297987.71
115	537896.66	1298069.20
116	537914.11	1298069.95
117	537915.19	1298044.97
118	537985.05	1298073.00
119	537986.12	1298048.02
120	537981.39	1298041.81
121	537995.37	1298042.41
122	537998.81	1297962.49
123	537983.59	1297961.83
124	537983.98	1297951.84
125	538008.50	1297952.89
126	538027.31	1297973.58
127	537731.95	1297986.12
128	537726.48	1297986.28
129	537729.49	1297937.07
130	537726.81	1297934.10
131	537703.34	1297933.09
132	537703.57	1297927.09
133	537727.29	1297928.11
134	537730.21	1297925.49
135	537733.32	1297875.49
136	537738.78	1297876.33
200	537859.11	1297890.75
201	537733.36	1297882.93
202	537727.35	1297979.58
203	537853.10	1297987.40

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DIMENSIONAL CONTROL TABLES

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

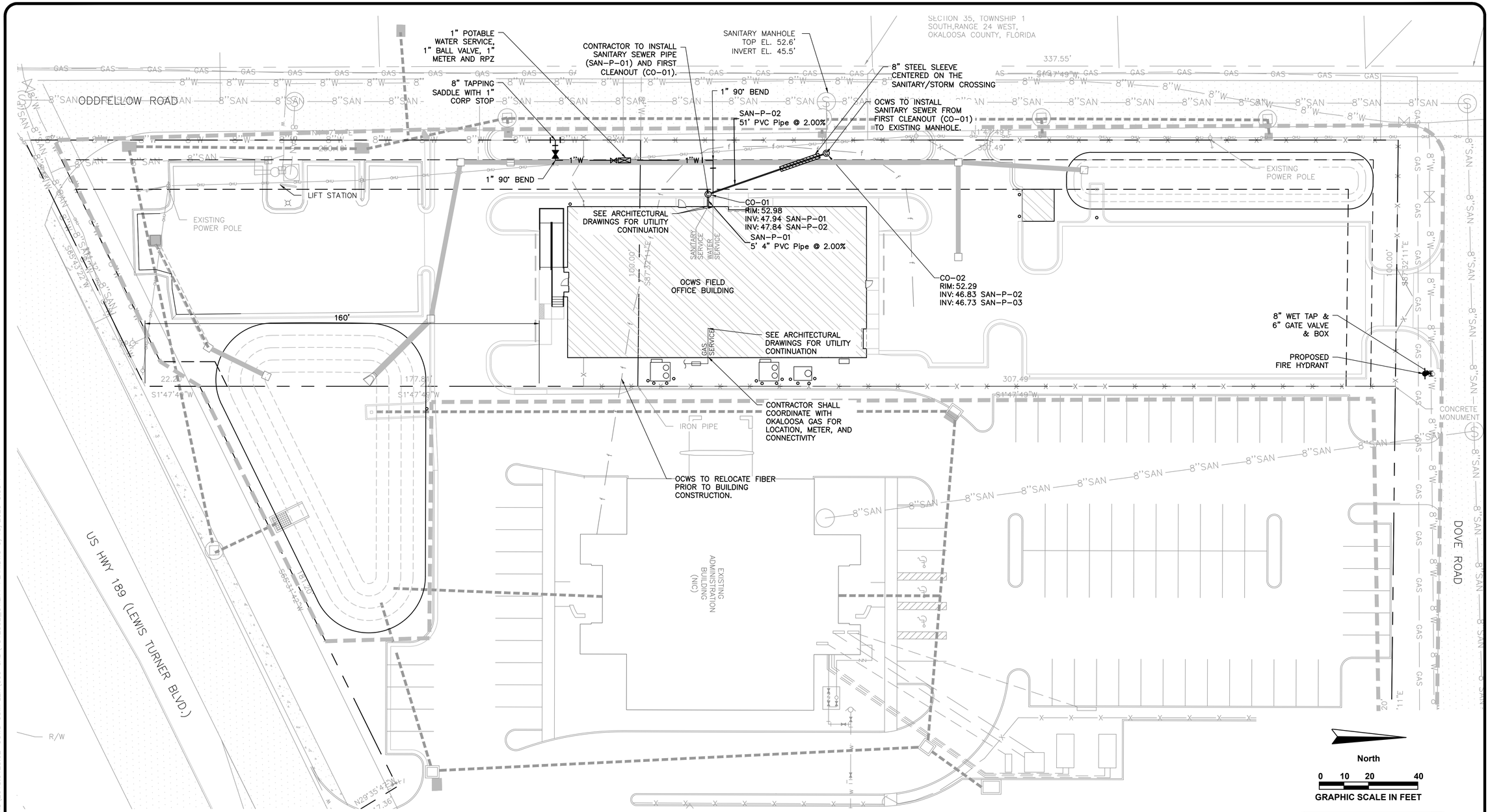
PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

C-6



NOTES:

1. WATER & SEWER INFRASTRUCTURE (FIRE HYDRANTS INCLUDED) LOCATED INSIDE THE PROPERTY BOUNDARY SHALL BE PRIVATELY OWNED AND MAINTAINED BY THE PROPERTY OWNER.
2. SEE SHEET C-20 FOR OKALOOSA COUNTY WATER & SEWER NOTES.

SPECIAL UTILITY NOTE:

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE PROJECT LIMITS. PRIOR TO ANY EXCAVATION OR DEMOLITION, THE CONTRACTOR SHALL PROVIDE A WRITTEN NOTICE (RETURN RECEIPT REQUESTED) TO EACH OF THE UTILITY COMPANIES AFFECTED BY THE PROJECT, ALONG WITH THE VARIOUS DEPARTMENTS OF FLORIDA SUNSHINE ONE CALL AS PRESCRIBED BY STATE LAW. THE CONTRACTOR SHALL PROVIDE THE OWNER AND THE OWNER'S REP WITH A COPY OF THE RECEIPT OF SAID WRITTEN NOTIFICATION TO EACH OF THE UTILITY COMPANIES OR WALTON COUNTY DEPARTMENTS. THIS REQUIREMENT IS IN ADDITION TO ANY OTHER STATE LAWS REGARDING PUBLIC NOTIFICATION PRIOR TO EXCAVATION.

CALL 2 WORKING DAYS BEFORE YOU DIG
IT'S THE LAW! DIAL 811
811 Know what's below. Call before you dig.
SUNSHINE STATE ONE CALL OF FLORIDA, INC.

LEGEND

- PROPOSED WATER LINE
- GATE VALVE
- REDUCER
- FIRE HYDRANT
- SANITARY SEWER MANHOLE
- SANITARY SEWER MAIN
- PROPOSED STORMWATER PIPES

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UTILITY PLAN (SHEET 1 OF 2)

RELEASE FOR BID

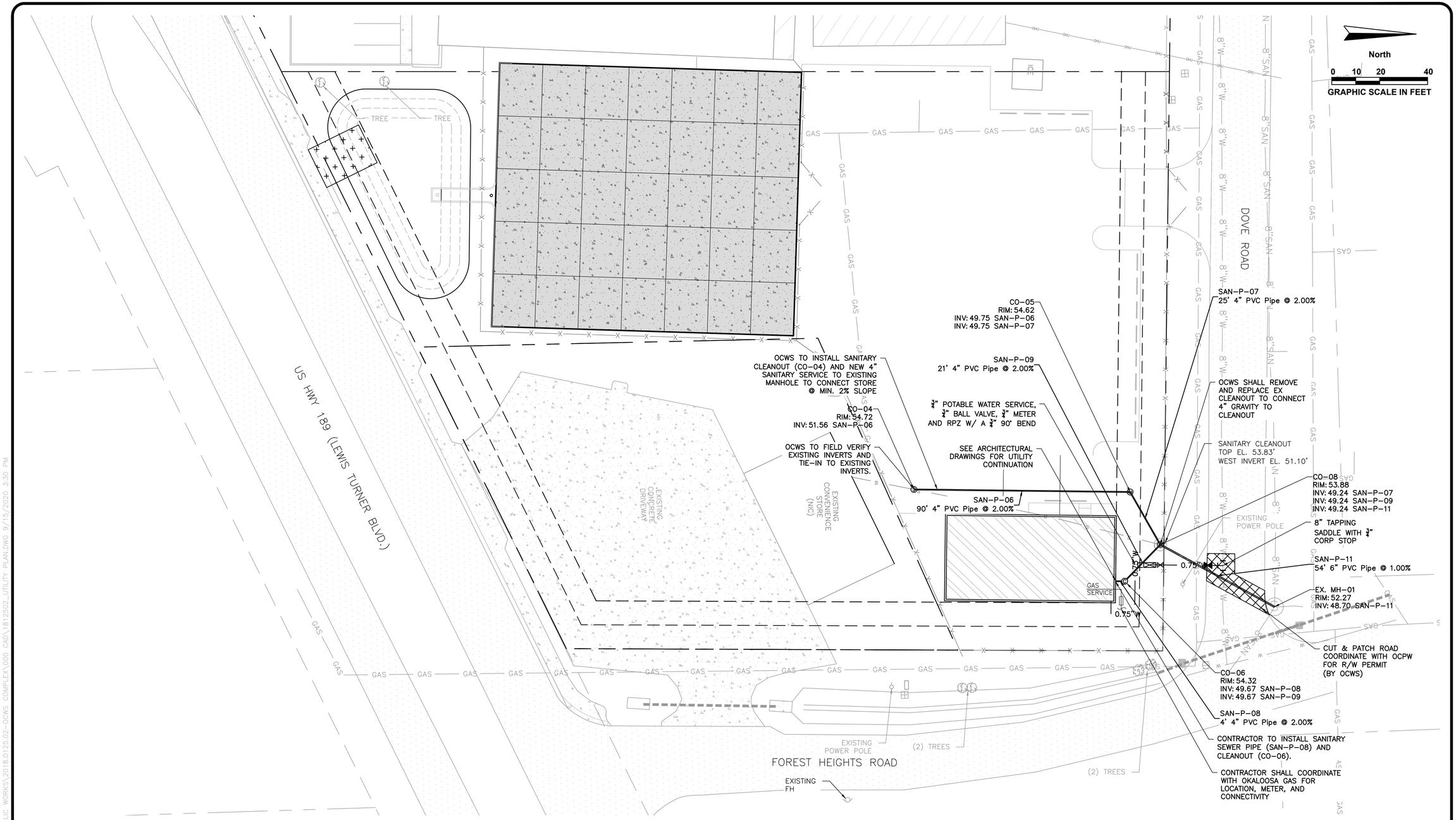
CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-7



NOTES:

1. WATER & SEWER INFRASTRUCTURE (FIRE HYDRANTS INCLUDED) LOCATED INSIDE THE PROPERTY BOUNDARY SHALL BE PRIVATELY OWNED AND MAINTAINED BY THE PROPERTY OWNER.
2. SEE SHEET C16 FOR OKALOOSA COUNTY WATER & SEWER NOTES.
3. SERVICE SIZES PROVIDED BY OKALOOSA COUNTY WATER AND SEWER.

SPECIAL UTILITY NOTE:

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE PROJECT LIMITS. PRIOR TO ANY EXCAVATION OR DEMOLITION, THE CONTRACTOR SHALL PROVIDE A WRITTEN NOTICE (RETURN RECEIPT REQUESTED) TO EACH OF THE UTILITY COMPANIES AFFECTED BY THE PROJECT, ALONG WITH THE VARIOUS DEPARTMENTS OF FLORIDA SUNSHINE ONE CALL AS PRESCRIBED BY STATE LAW. THE CONTRACTOR SHALL PROVIDE THE OWNER AND THE OWNER'S REP WITH A COPY OF THE RECEIPT OF SAID WRITTEN NOTIFICATION TO EACH OF THE UTILITY COMPANIES OR WALTON COUNTY DEPARTMENTS. THIS REQUIREMENT IS IN addition TO ANY OTHER STATE LAWS REGARDING PUBLIC NOTIFICATION PRIOR TO EXCAVATION.

LEGEND

- PROPOSED WATER LINE
- GATE VALVE
- REDUCER
- FIRE HYDRANT
- SANITARY SEWER MANHOLE
- SANITARY SEWER MAIN
- PROPOSED STORMWATER PIPES

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UTILITY PLAN (SHEET 2 OF 2)

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

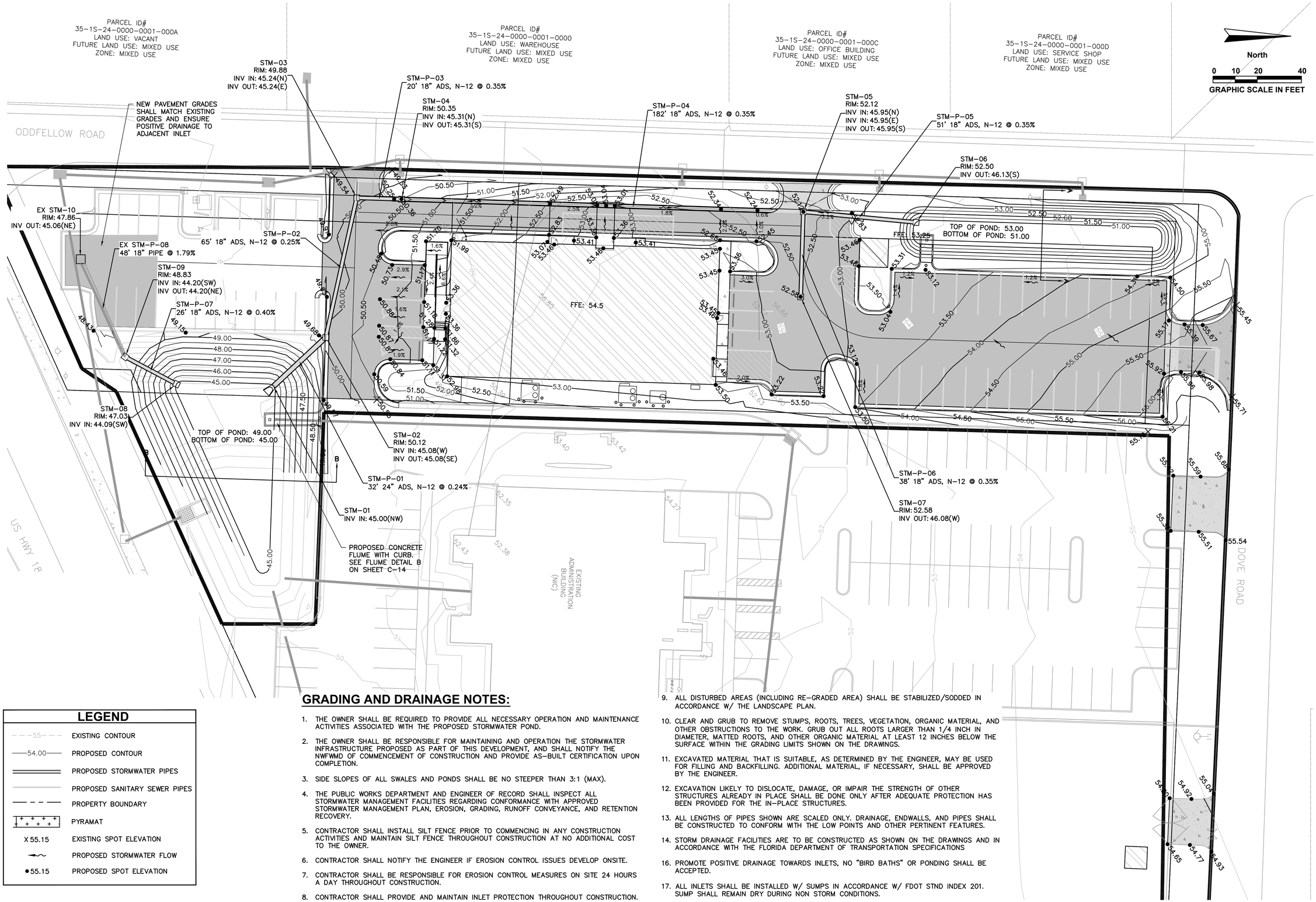
PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

C-8



LEGEND

55	EXISTING CONTOUR
54.00	PROPOSED CONTOUR
	PROPOSED STORMWATER PIPES
	PROPOSED SANITARY SEWER PIPES
	PROPERTY BOUNDARY
	PYRAMAT
X 55.15	EXISTING SPOT ELEVATION
	PROPOSED STORMWATER FLOW
● 55.15	PROPOSED SPOT ELEVATION

GRADING AND DRAINAGE NOTES:

1. THE OWNER SHALL BE REQUIRED TO PROVIDE ALL NECESSARY OPERATION AND MAINTENANCE ACTIVITIES ASSOCIATED WITH THE PROPOSED STORMWATER POND.
2. THE OWNER SHALL BE RESPONSIBLE FOR MAINTAINING AND OPERATION THE STORMWATER INFRASTRUCTURE PROPOSED AS PART OF THIS DEVELOPMENT, AND SHALL NOTIFY THE NWFWMD OF COMMENCEMENT OF CONSTRUCTION AND PROVIDE AS-BUILT CERTIFICATION UPON COMPLETION.
3. SIDE SLOPES OF ALL SWALES AND PONDS SHALL BE NO STEEPER THAN 3:1 (MAX).
4. THE PUBLIC WORKS DEPARTMENT AND ENGINEER OF RECORD SHALL INSPECT ALL STORMWATER MANAGEMENT FACILITIES REGARDING CONFORMANCE WITH APPROVED STORMWATER MANAGEMENT PLAN, EROSION, GRADING, RUNOFF CONVEYANCE, AND RETENTION RECOVERY.
5. CONTRACTOR SHALL INSTALL SILT FENCE PRIOR TO COMMENCING IN ANY CONSTRUCTION ACTIVITIES AND MAINTAIN SILT FENCE THROUGHOUT CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.
6. CONTRACTOR SHALL NOTIFY THE ENGINEER IF EROSION CONTROL ISSUES DEVELOP ONSITE.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR EROSION CONTROL MEASURES ON SITE 24 HOURS A DAY THROUGHOUT CONSTRUCTION.
8. CONTRACTOR SHALL PROVIDE AND MAINTAIN INLET PROTECTION THROUGHOUT CONSTRUCTION.
9. ALL DISTURBED AREAS (INCLUDING RE-GRADED AREA) SHALL BE STABILIZED/SODDED IN ACCORDANCE W/ THE LANDSCAPE PLAN.
10. CLEAR AND GRUB TO REMOVE STUMPS, ROOTS, TREES, VEGETATION, ORGANIC MATERIAL, AND OTHER OBSTRUCTIONS TO THE WORK. GRUB OUT ALL ROOTS LARGER THAN 1/4 INCH IN DIAMETER, MATTED ROOTS, AND OTHER ORGANIC MATERIAL AT LEAST 12 INCHES BELOW THE SURFACE WITHIN THE GRADING LIMITS SHOWN ON THE DRAWINGS.
11. EXCAVATED MATERIAL THAT IS SUITABLE, AS DETERMINED BY THE ENGINEER, MAY BE USED FOR FILLING AND BACKFILLING. ADDITIONAL MATERIAL, IF NECESSARY, SHALL BE APPROVED BY THE ENGINEER.
12. EXCAVATION LIKELY TO DISLOCATE, DAMAGE, OR IMPAIR THE STRENGTH OF OTHER STRUCTURES ALREADY IN PLACE SHALL BE DONE ONLY AFTER ADEQUATE PROTECTION HAS BEEN PROVIDED FOR THE IN-PLACE STRUCTURES.
13. ALL LENGTHS OF PIPES SHOWN ARE SCALED ONLY. DRAINAGE, ENDWALLS, AND PIPES SHALL BE CONSTRUCTED TO CONFORM WITH THE LOW POINTS AND OTHER PERTINENT FEATURES.
14. STORM DRAINAGE FACILITIES ARE TO BE CONSTRUCTED AS SHOWN ON THE DRAWINGS AND IN ACCORDANCE WITH THE FLORIDA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS
16. PROMOTE POSITIVE DRAINAGE TOWARDS INLETS, NO "BIRD BATHS" OR PONDING SHALL BE ACCEPTED.
17. ALL INLETS SHALL BE INSTALLED W/ SUMPS IN ACCORDANCE W/ FDOT STND INDEX 201. SUMP SHALL REMAIN DRY DURING NON STORM CONDITIONS.
18. CURB ELEVATIONS INDICATE FLOWLINE ELEVATIONS.

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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

TONIA D. NATION
FL LICENSE NO.: 64631
FBPR CERTIFICATE OF AUTHORIZATION NO. 5057

NO.	DATE	REVISION	BY
A	1/17/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

GRADING & DRAINAGE PLAN (SHEET 1 OF 2)

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

C-9

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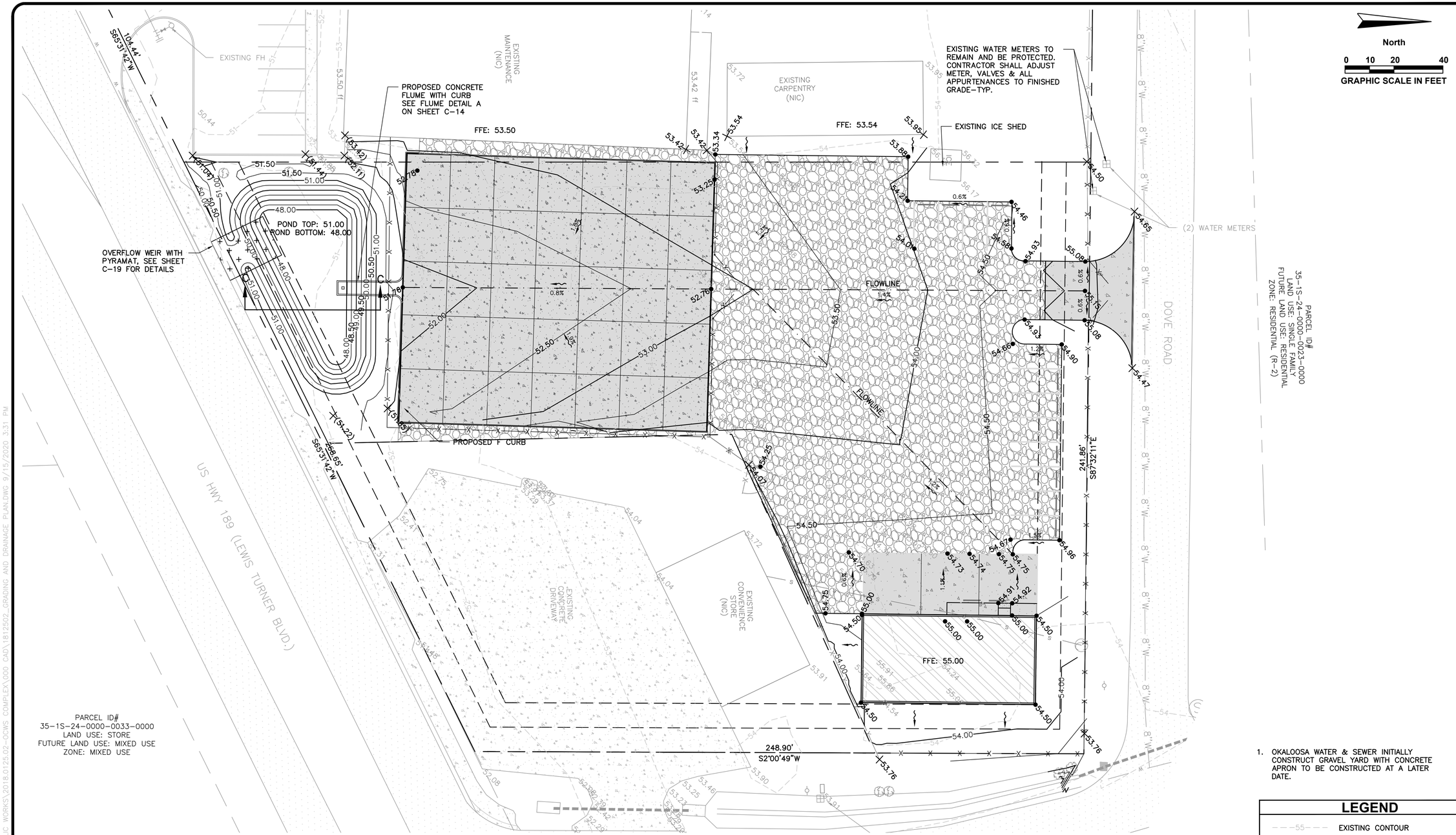

1. OKALOOSA WATER & SEWER INITIALLY CONSTRUCT GRAVEL YARD WITH CONCRETE APRON TO BE CONSTRUCTED AT A LATER DATE.

LEGEND

--55--	EXISTING CONTOUR
54.00	PROPOSED CONTOUR
	PROPOSED STORMWATER PIPES
	PROPOSED SANITARY SEWER PIPES
	PROPERTY BOUNDARY
	PYRAMAT
X 55.15	EXISTING SPOT ELEVATION
	PROPOSED STORMWATER FLOW
● 55.15	PROPOSED SPOT ELEVATION

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A	11/17/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

GRADING & DRAINAGE PLAN (SHEET 2 OF 2)

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-10

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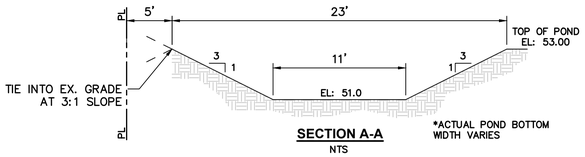
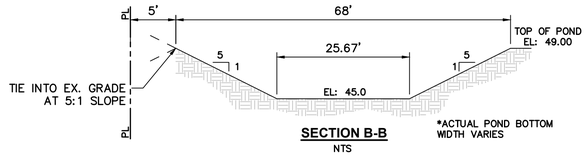


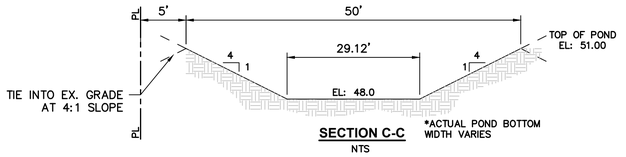
SECTION A-A
NTS

*ACTUAL POND BOTTOM WIDTH VARIES



SECTION B-B
NTS

*ACTUAL POND BOTTOM WIDTH VARIES



SECTION C-C
NTS

*ACTUAL POND BOTTOM WIDTH VARIES

STORMWATER STRUCTURE TABLE

STRUCTURE NAME	STRUCTURE TYPE	DETAILS	NORTHING/EASTING
EX STM-10	Rectangular Junction Structure NF	RIM = 47.86 EX STM-P-08 INV OUT = 45.06	N: 537523.27 E: 1297548.3066
STM-01	24" MES	RIM = 47.65 STM-P-01 INV IN = 45.00	N: 537610.42 E: 1297605.7301
STM-02	FDOT TYPE "5" TOP FDOT TYPE "P" ALT B BOTTOM	RIM = 50.12 STM-P-02 INV IN = 45.08 STM-P-01 INV OUT = 45.08	N: 537633.99 E: 1297583.7028
STM-03	FDOT TYPE "F" DBI	RIM = 49.88 STM-P-03 INV IN = 45.24 STM-P-02 INV OUT = 45.24	N: 537648.03 E: 1297520.5499
STM-04	FDOT TYPE "V" DBI	RIM = 50.35 STM-P-04 INV IN = 45.31 STM-P-03 INV OUT = 45.31	N: 537668.33 E: 1297521.1863
STM-05	FDOT TYPE "V" DBI	RIM = 52.12 STM-P-05 INV IN = 45.95 STM-P-06 INV IN = 45.95 STM-P-04 INV OUT = 45.95	N: 537849.95 E: 1297526.8825
STM-06	FDOT TYPE "C" DBI	RIM = 52.50 STM-P-05 INV OUT = 46.13	N: 537900.93 E: 1297531.6562
STM-07	FDOT TYPE "F" DBI	RIM = 52.58 STM-P-06 INV OUT = 46.08	N: 537848.75 E: 1297565.3575
STM-08	FDOT TYPE "C" DBI	RIM = 47.03 STM-P-07 INV IN = 44.09	N: 537566.55 E: 1297604.7925
STM-09	FDOT TYPE "C" DBI	RIM = 48.83 EX STM-P-08 INV IN = 44.20 STM-P-07 INV OUT = 44.20	N: 537543.31 E: 1297592.4560

STORMWATER PIPE TABLE

NAME	DESCRIPTION	LENGTH	SLOPE
EX STM-P-08	18" PIPE	48.48'	1.79%
STM-P-01	24" ADS, N-12	32.26'	0.24%
STM-P-02	18" ADS, N-12	64.70'	0.25%
STM-P-03	18" ADS, N-12	20.30'	0.35%
STM-P-04	18" ADS, N-12	181.71'	0.35%
STM-P-05	18" ADS, N-12	51.20'	0.35%
STM-P-06	18" ADS, N-12	38.49'	0.35%
STM-P-07	18" ADS, N-12	26.32'	0.40%

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GRADING & DRAINAGE TABLES

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
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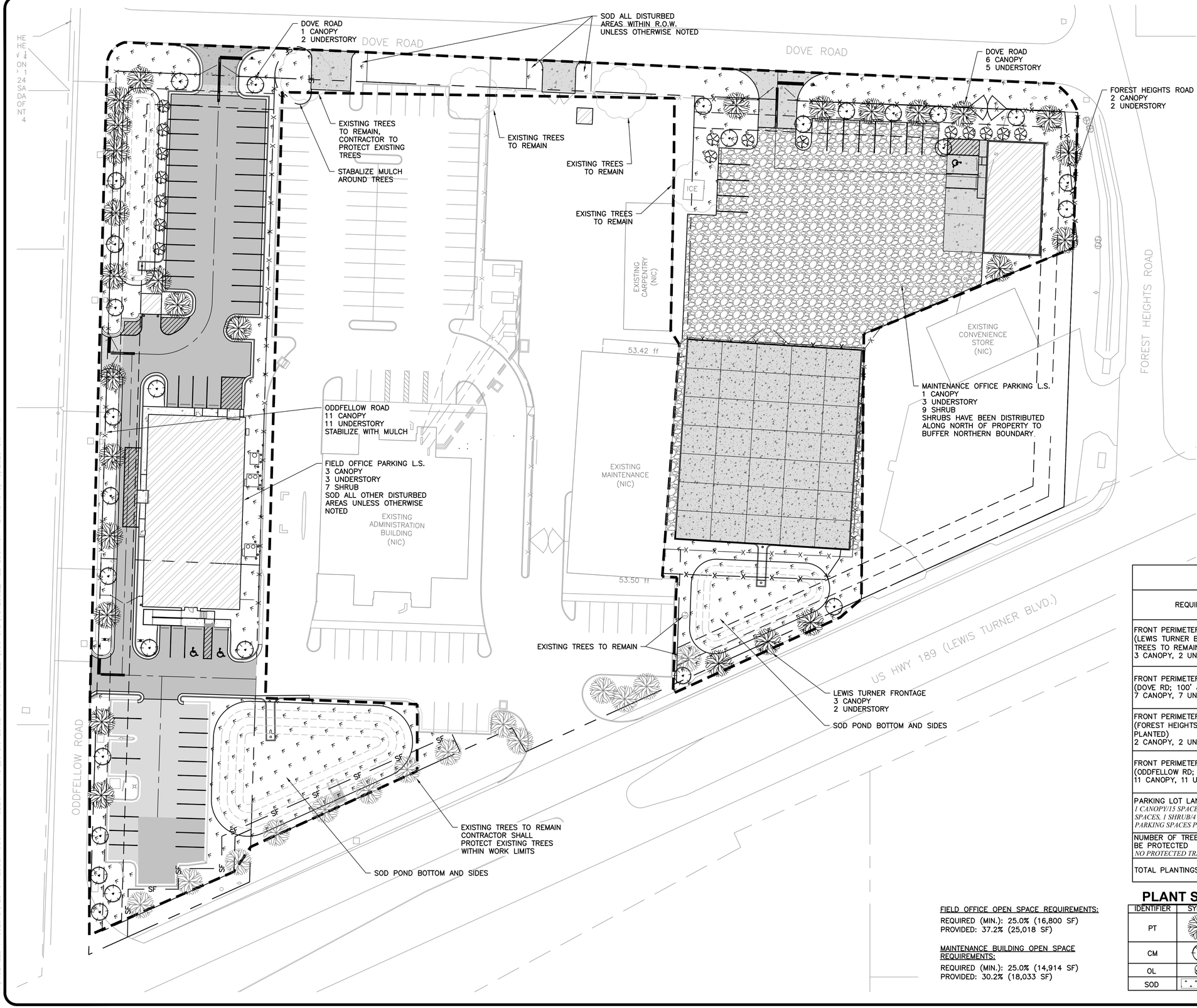

SET BACK AND BUFFER REQUIREMENTS:

REQUIRED LANDSCAPE BUFFER:
FRONT: 10'
REAR: 10'
SIDE: 10'

LANDSCAPE NOTES:

1. TOTAL SITE AREA = 2.91 ACRES
2. SHADE TREES SHALL BE 6' TALL AT THE TIME OF PLANTING.
3. SHRUBS SHALL MEASURE 18" IN HEIGHT AT THE TIME OF PLANTING.
4. BUFFER ZONES ARE TO PROVIDE A CONTINUOUS 6' TALL (MINIMUM) 50% OPAQUE SCREEN.
5. PLANT MATERIALS ARE TO BE IN ACCORDANCE WITH "GRADES AND STANDARDS FOR NURSERY PLANTS," 1963, PARTS I AND II, STATE OF FLORIDA, DEPARTMENT OF AGRICULTURE.
6. ALL LANDSCAPING SHALL COMPLY WITH THE VISIBILITY TRIANGLE REQUIREMENTS SET FORTH IN SECTION 6.05.02 OF THE OKALOOSA COUNTY LAND DEVELOPMENT CODE.
7. CONTRACTOR SHALL COORDINATE WITH A LANDSCAPE ARCHITECT OR CERTIFIED NURSERY PRIOR TO IMPLEMENTING TREE LOCATION PLAN.
8. THE OWNER/CONTRACTOR SHALL WATER AND MAINTAIN THE SITE VEGETATION IN ACCORDANCE WITH THE RECOMMENDED MAINTENANCE SCHEDULE PROVIDED BY THE PLANT DISTRIBUTOR OR PLANT NURSERY.
9. THE IRRIGATION SYSTEM WATER SOURCE SHALL BE A SHALLOW WELL AND DESIGN PROVIDED BY OTHERS.
10. ALL DISTURBED AREAS SHALL BE SODDED.

TREE SUMMARY CHART

REQUIREMENT	REQUIRED	PROVIDED
FRONT PERIMETER BUFFER (LEWIS TURNER BLVD; EXISTING TREES TO REMAIN, 120' PLANTED) 3 CANOPY, 2 UNDERSTORY	3 CANOPY	3 CANOPY
	2 UNDERSTORY	2 UNDERSTORY
	0 SHRUB	0 SHRUB
FRONT PERIMETER BUFFER (DOVE RD; 100' & 241' PLANTED) 7 CANOPY, 7 UNDERSTORY	7 CANOPY	7 CANOPY
	7 UNDERSTORY	7 UNDERSTORY
	0 SHRUB	0 SHRUB
FRONT PERIMETER BUFFER (FOREST HEIGHTS RD; 87' PLANTED) 2 CANOPY, 2 UNDERSTORY	2 CANOPY	2 CANOPY
	2 UNDERSTORY	2 UNDERSTORY
	0 SHRUB	0 SHRUB
FRONT PERIMETER BUFFER (ODDFELLOW RD; 558' FRONTAGE) 11 CANOPY, 11 UNDERSTORY	11 CANOPY	11 CANOPY
	11 UNDERSTORY	11 UNDERSTORY
	0 SHRUBS	0 SHRUBS
PARKING LOT LANDSCAPING *1 CANOPY/15 SPACES, 1 UNDERSTORY/10 SPACES, 1 SHRUB/4 SPACES; 63 PARKING SPACES PROVIDED*	4 CANOPY	4 CANOPY
	6 UNDERSTORY	6 UNDERSTORY
	16 SHRUBS	16 SHRUBS
NUMBER OF TREES REQUIRED TO BE PROTECTED *NO PROTECTED TREES ONSITE.*	0 TREES	0 TREES
TOTAL PLANTINGS	71 TREES	71 TREES

FIELD OFFICE OPEN SPACE REQUIREMENTS:
REQUIRED (MIN.): 25.0% (16,800 SF)
PROVIDED: 37.2% (25,018 SF)

MAINTENANCE BUILDING OPEN SPACE REQUIREMENTS:
REQUIRED (MIN.): 25.0% (14,914 SF)
PROVIDED: 30.2% (18,033 SF)

PLANT SCHEDULE

IDENTIFIER	SYMBOL	PLANT TYPE	NAME	QUANTITY
PT		SHADE/CANOPY TREE	SOUTHERN RED OAK (OR APPROVED EQUAL)	27
CM		UNDERSTORY TREE	CRAPE MYRTLE	28
OL		SHRUB	OLEANDER	16
SOD		SOD	CENTIPEDE	5021 SY

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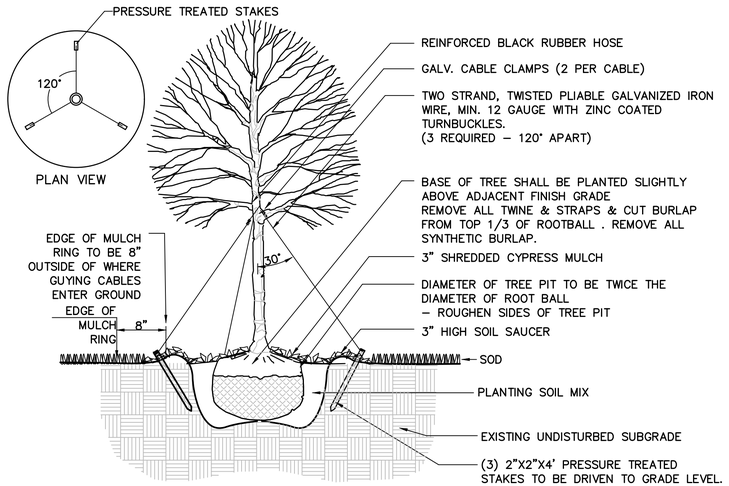
TREE LOCATION PLAN
RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

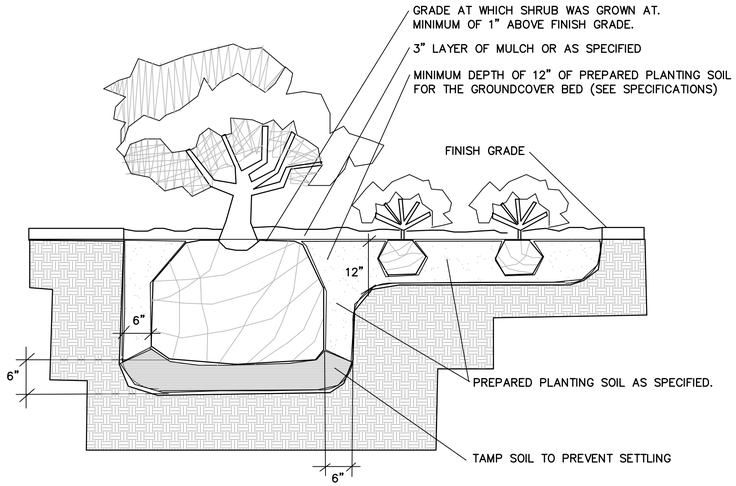
DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-12



TREE PLANTING DETAIL

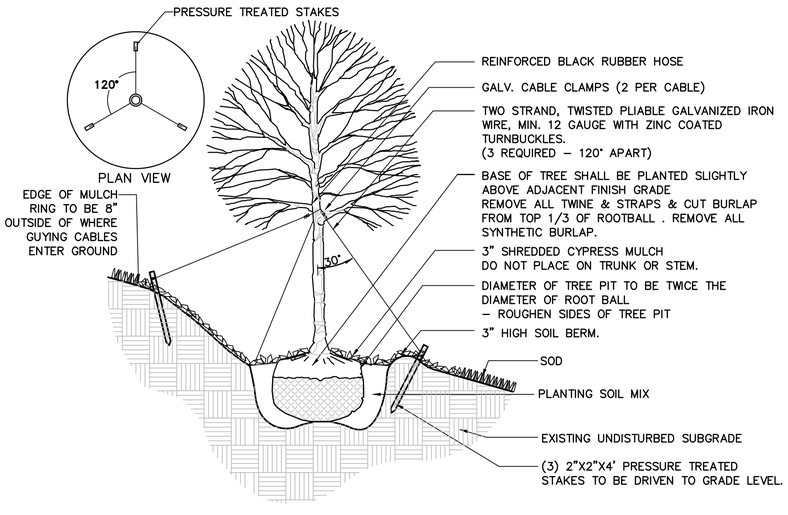
N.T.S.



NOTE: WHEN SHRUBS OR GROUNDCOVERS ARE USED IN MASSES, THE ENTIRE BED SHALL BE EXCAVATED TO RECIEVE THE PLANTING SOIL AND PLANT MATERIAL, UNLESS OTHERWISE SPECIFIED.

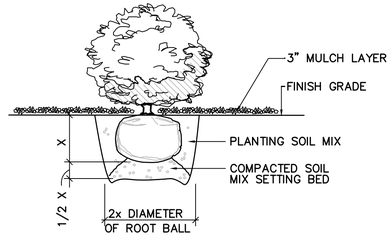
TYPICAL SHRUB AND GROUNDCOVER PLANTING DETAIL

N.T.S.



TREE PLANTING DETAIL - ON SLOPE

N.T.S.



SHRUB PLANTING DETAIL

N.T.S.

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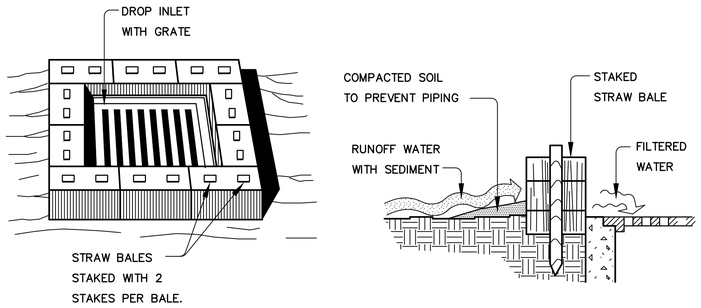
TREE PLANTING DETAILS
RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-13

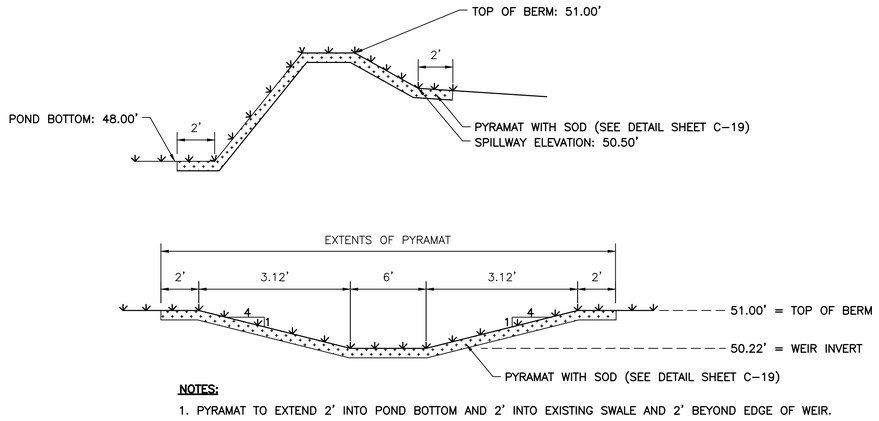


STRAW BALE DROP INLET SEDIMENT FILTER

N.T.S.

SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (SLOPES NO GREATER THAN 5 PERCENT) WHERE SHEET OR OVERLAND FLOWS (NOT EXCEEDING 0.5 CFS) ARE TYPICAL. THE METHOD SHALL NOT APPLY TO INLETS RECEIVING CONCENTRATED FLOWS, SUCH AS IN STREET OR HIGHWAY MEDIANS.

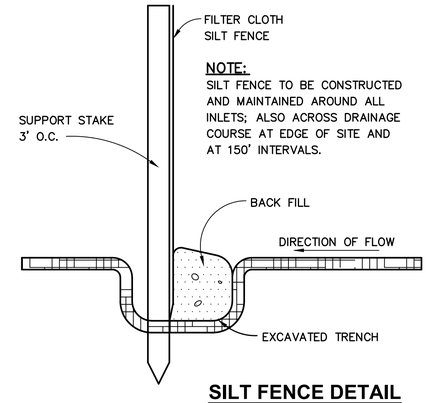


NOTES:

1. PYRAMAT TO EXTEND 2' INTO POND BOTTOM AND 2' INTO EXISTING SWALE AND 2' BEYOND EDGE OF WEIR.

OVERFLOW WEIR DETAIL

N.T.S.

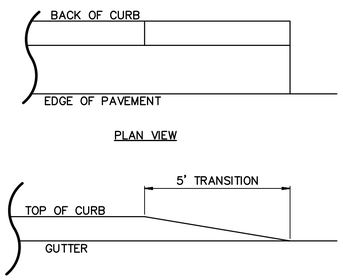


SILT FENCE DETAIL

N.T.S.

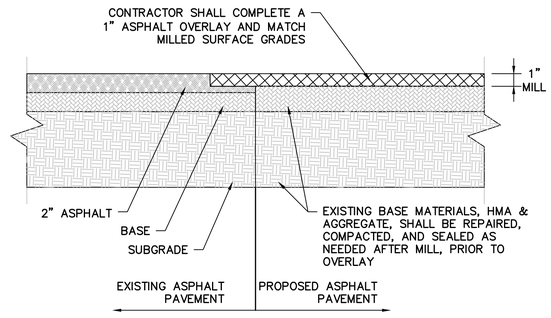
EROSION NOTES:

1. EROSION PROTECTION: SOIL EROSION SEDIMENTATION MUST BE CONTROLLED AND RETAINED ON SITE DURING CONSTRUCTION. THEREFORE, EROSION PROTECTION, SUCH AS STAKED BALED HAY AND SILT FENCE BARRIERS, MUST BE INSTALLED PRIOR TO START OF CONSTRUCTION.
2. SILT FENCE BARRIER SHALL BE INSTALLED AS SHOWN ON PLANS, AND IN ALL AREAS SUBJECT TO SOIL EROSION SEDIMENTATION.
3. STORMWATER DETENTION AREAS SHALL BE SODDED.
4. ALL GRADES AT CURBS ARE AT FLOWLINE.
5. SYNTHETIC FILTER FABRIC SHALL BE A PERVIOUS SHEET OF PROPYLENE, NYLON, POLYESTER, OR POLYETHYLENE YARN. IT SHALL CONTAIN ULTRAVIOLET RAY INHIBITORS AND STABILIZERS TO PROVIDE A MINIMUM OF 6 MONTHS OF EXPECTED USABLE CONSTRUCTION LIFE AT A TEMPERATURE RANGE OF 0°F TO 120°F.
6. THE STAKES FOR A SILT FENCE SHALL BE 1 X 2 INCHES (2.5 X 5 CM) WOOD (PREFERRED), OR EQUIVALENT METAL WITH A MINIMUM LENGTH OF 3 FEET.
7. WIRE FENCE REINFORCEMENT FOR SILT FENCES USING STANDARD-STRENGTH FILTER CLOTH SHALL BE A MINIMUM OF 36 INCHES (90 CM) IN HEIGHT, SHALL BE A MINIMUM OF
8. 14 GAUGE, AND SHALL HAVE A MAXIMUM MESH SPACING OF 6 INCHES (15 CM).
9. ALL EROSION CONTROL MEASURES SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF THE FLORIDA STORMWATER, EROSION AND SEDIMENTATION CONTROL INSPECTOR'S MANUAL, CHAPTER 4.



CURB TAPER DETAIL

N.T.S.

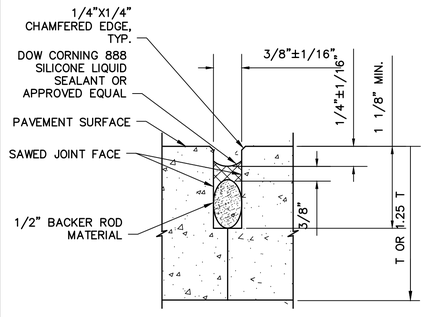


NOTES:

1. CONTRACTOR SHALL COMPLETE A 1" MILL ACCROSS EXISTING PAVEMENT TO REMAIN
2. CONTRACTOR SHALL REPAIR AND SEAL ALL JOINTS PRIOR TO OVERLAY
3. CONTRACTOR SHALL COMPLETE THE 1" OVERLAY AT THE TIME OF NEW PAVEMENT INSTALLATION
4. NEW PAVEMENT 1" HMA BASE SHALL BE AT SAME ELEVATION OF MILLED SURFACE PRIOR TO OVERLAY/HMA TOPCOAT INSTALLATION.

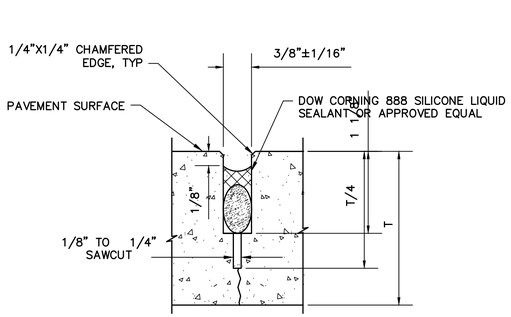
MILL / OVERLAY SECTION

N.T.S.



CONSTRUCTION JOINT (1)

NTS



CONTRACTION JOINT (2)

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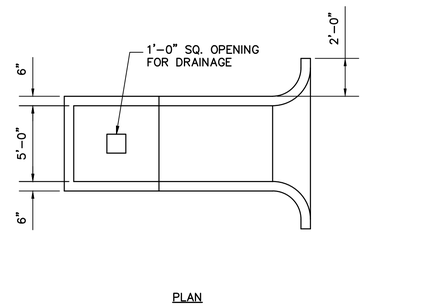
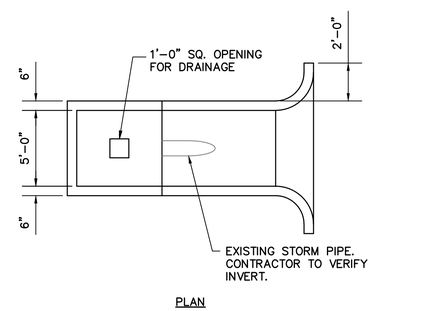


CONCRETE FLUME DETAIL A

N.T.S.



CONCRETE FLUME DETAIL B

N.T.S.

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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

TONIA D. NATION
FL LICENSE NO.: 64631
FBPR CERTIFICATE OF AUTHORIZATION NO. 5057

NO.	DATE	REVISION	BY
A	1/17/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

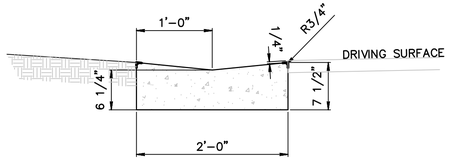
MISCELLANEOUS DETAILS (SHEET 1 OF 5)

RELEASE FOR BID

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

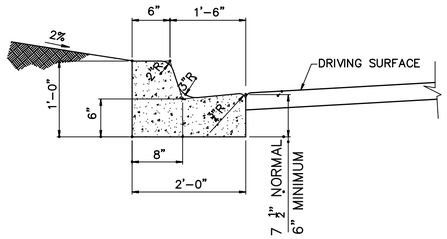
SHEET NUMBER

C-14



VALLEY CURB DETAIL

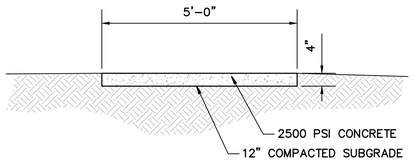
N.T.S.



TYPE "F" CURB DETAIL

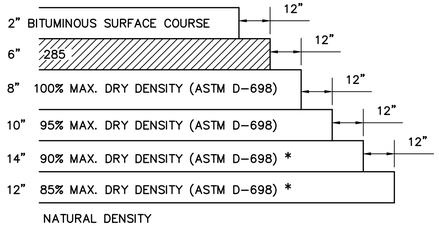
N.T.S.

NOTE:
WHEN USED ON HIGH SIDE OF ROADWAYS, THE CROSS SLOPE OF THE GUTTER SHALL MATCH THE CROSS SLOPE OF THE ADJACENT PAVEMENT. THE THICKNESS OF THE LIP SHALL BE 6", UNLESS OTHERWISE SHOWN ON PLANS.



TYPICAL SIDEWALK SECTION

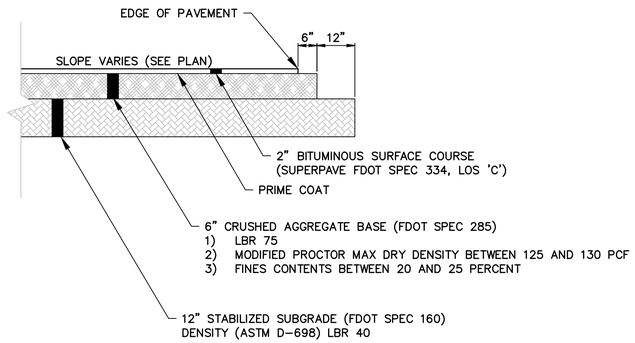
N.T.S.



* MINIMUM COMPACTION AT LEAST 95% OF MODIFIED PROCTOR MAX. DENSITY (ASTM D-1557) REQUIRED FOR ALL BACKFILLED MATERIALS BENEATH PAVEMENT.

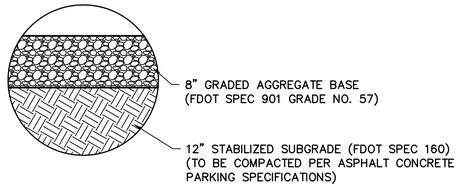
DETAIL B
SUBGRADE COMPACTION

N.T.S.



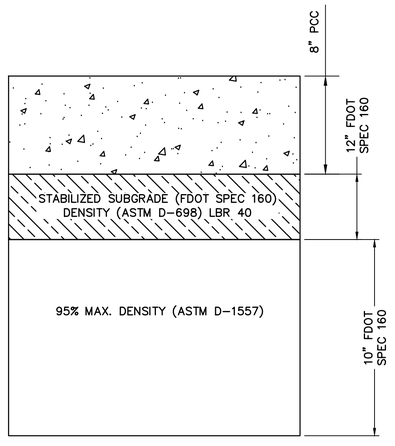
TYPICAL PAVEMENT SECTION

N.T.S.



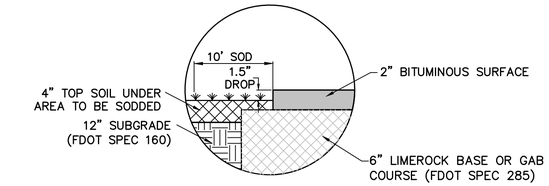
TYPICAL GRAVEL PARKING SECTION

FDOT SPEC 901
JAN. 2019
N.T.S.



TYPICAL PCC PAVEMENT SECTION

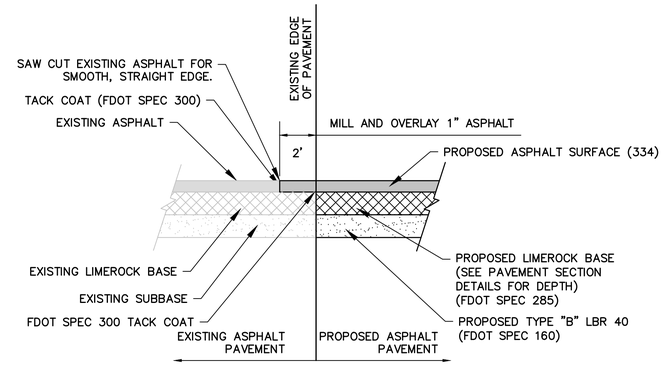
N.T.S.



DETAIL A

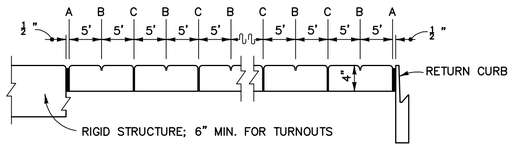
TRANSITION COMPACTED SHOULDER TO EDGE OF PAVEMENT

N.T.S.

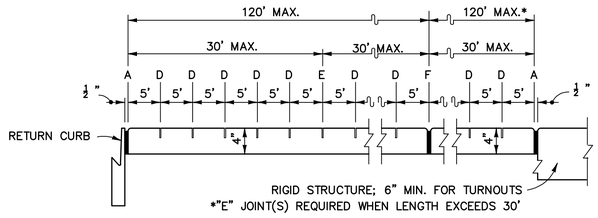


ASPHALT/ASPHALT PAVEMENT BUTT JOINT DETAIL

N.T.S.



OPEN JOINTS



SAWED JOINTS
LONGITUDINAL SECTION

CONCRETE SIDEWALK JOINT DETAIL

N.T.S. – FDOT STANDARD PLANS 550-001 LATEST EDITION

LEGEND:
- A– 1/2" EXPANSION JOINTS (PREFORMED JOINT FILLER) BETWEEN THE SIDEWALK AND: DRIVEWAYS, SIDEWALK–INTERSECTIONS, AND ALL OTHER FIXED OBJECTS (E.G. DRAINAGE INLETS AND UTILITY POLES)
- B– 1/8" DUMMY JOINTS, TOOLED
- C– 1/8" FORMED OPEN JOINTS
- D– 3/16" SAW CUT JOINTS, 1 1/2" DEEP (96 HOUR) MAX. 5' CENTERS
- E– 3/16" SAW CUT JOINTS, 1 1/2" DEEP (WITHIN 12 HOURS) MAX. 30' CENTERS JOINT(S) REQUIRED WHEN LENGTH EXCEEDS 30'
- F– 1/2" EXPANSION JOINT WHEN RUN OF SIDEWALK EXCEEDS 120' INTERMEDIATE LOCATIONS WHEN CALLED FOR IN THE PLANS OR AT LOCATIONS AS DIRECTED BY THE ENGINEER.
- G– COLD JOINT WITH BOND BREAKER, TOOLED

AVCON, INC.
ENGINEERS & PLANNERS
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MISCELLANEOUS DETAILS (SHEET 2 OF 5)
RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES
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OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
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PROJECT NO:	18.0125.02
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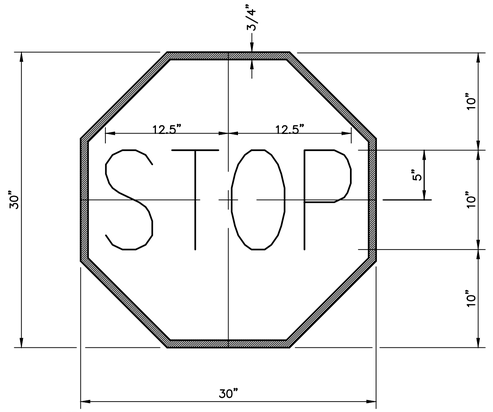
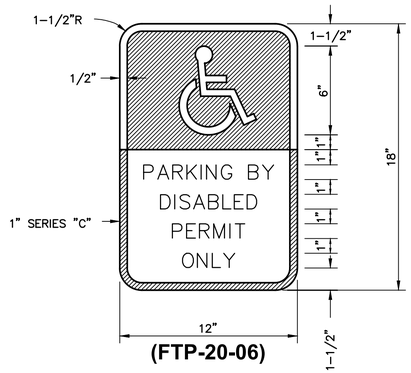
SHEET NUMBER
C-15



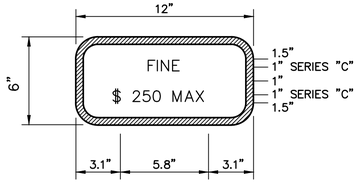
NOTE:

SIGN DESIGNATION:	R1–1	(REFL.)
RELECTORIZATION:	LEGEND, BORDER BACKGROUND	(REFL.)
SIGN COLORS:	LEGEND, BORDER BACKGROUND	(WHITE) (RED)

STOP SIGN DETAIL



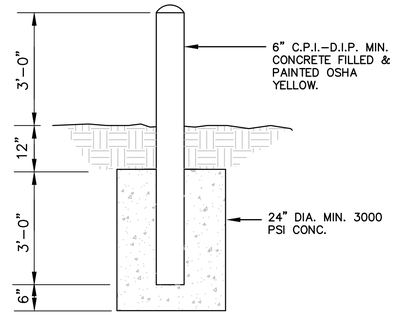
(FTP-20-06)



(FTP - 22-06)

HANDICAP SIGN DETAIL

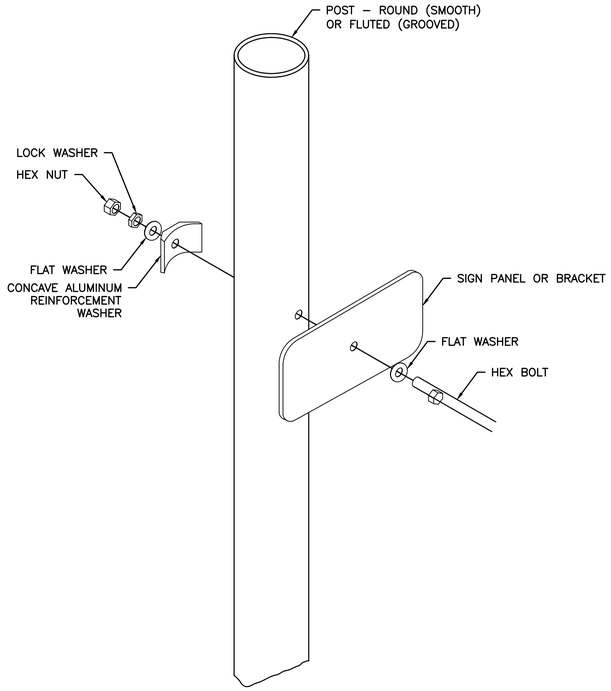
(F.D.O.T. STANDARD PLANS 700–102)
N.T.S.



NOTE:
SITE LOCATION AND THE DEVICE TO BE PROTECTED, MAY REQUIRE A LARGER DIAMETER PIPE AND CONCRETE ANCHOR.

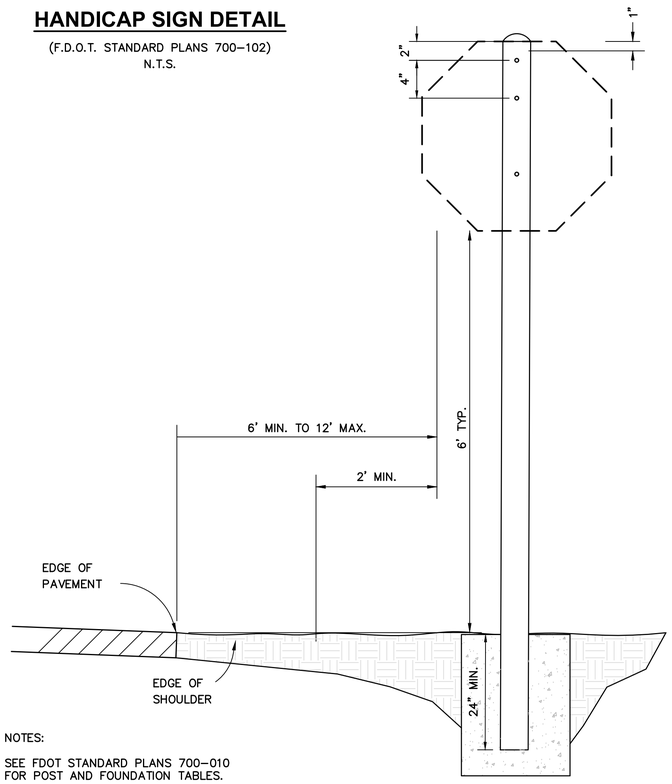
BOLLARD DETAIL

N.T.S.



MOUNTING DETAIL

N.T.S.

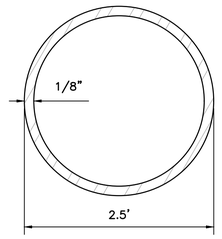


NOTES:

SEE FDOT STANDARD PLANS 700–010 FOR POST AND FOUNDATION TABLES.

TRAFFIC SIGN POST DETAIL

N.T.S.



NOTE:
ALUMINUM COLUMN POST RATED FOR 130 MPH WIND SPEEDS

POST SECTION

N.T.S.

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ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
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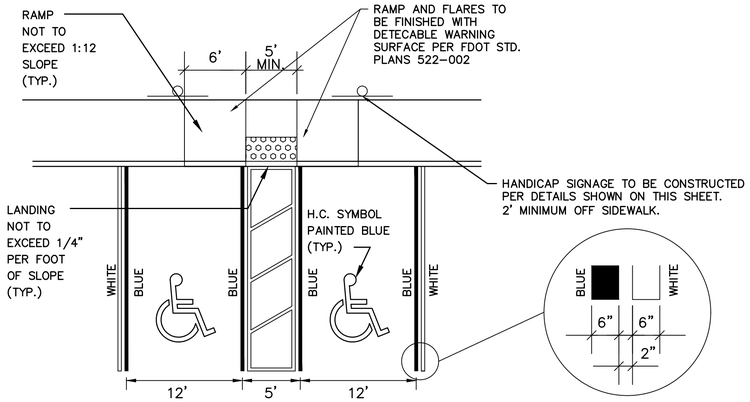
MISCELLANEOUS DETAILS (SHEET 3 OF 5)
RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-16



SEE CODE 6.04.051

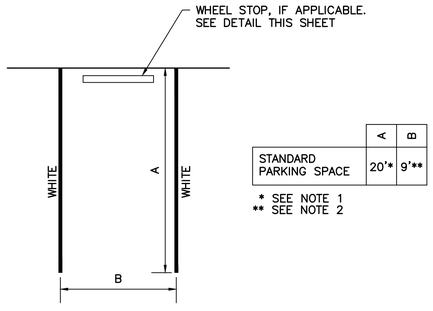
TYPICAL HANDICAPPED STRIPING AND RAMP DETAIL

N.T.S.

NOTES:

1. EACH SUCH PARKING SPACE SHALL BE CONSPICUOUSLY OUTLINED IN BLUE PAINT OR THERMOPLASTIC, AND SHALL BE POSTED AND MAINTAINED WITH A PERMANENT, ABOVE GRADE SIGN BEARING THE INTERNATIONAL SYMBOL OF ACCESSIBILITY, OR THE CAPTION "PARKING BY DISABLED PERMIT ONLY." OR BEARING BOTH SUCH SYMBOL AND CAPTION. SUCH SIGNS SHALL NOT BE OBSCURED BY A VEHICLE PARKED IN THE SPACE. ALL HANDICAPPED PARKING SPACES MUST BE SIGNED AND MARKED IN ACCORDANCE WITH THE STANDARDS ADOPTED BY THE DEPARTMENT OF TRANSPORTATION.

2. F.D.O.T. RECOMMENDS MEASURING PARKING SPACE WIDTH FROM CENTER TO CENTER BETWEEN BLUE STRIPES.



	A	B
STANDARD PARKING SPACE	20'*	9'**

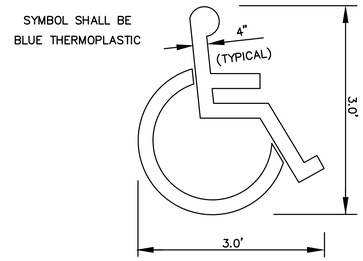
* SEE NOTE 1
** SEE NOTE 2

NOTES:

1. SOME PARKING SPACES ARE 18' IN LENGTH WITH A 2' OVERHANG. REFER TO SITE GEOMETRY PLAN.
2. SOME PARKING SPACES ARE 10' IN WIDTH. REFER TO SITE GEOMETRY PLAN.
3. ALL PAVEMENT MARKINGS SHALL CONFORM TO FDOT STD. PLANS 711-001.

TYPICAL PARKING STRIPING DETAIL

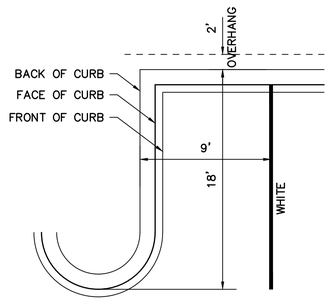
N.T.S.



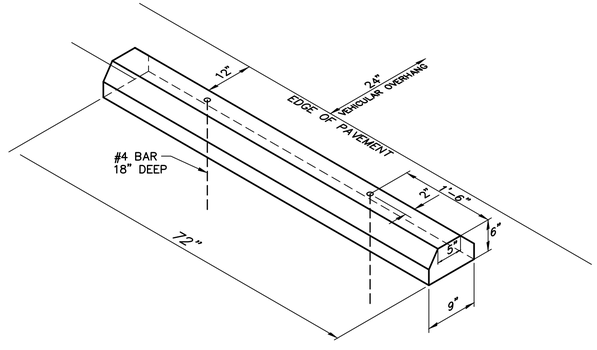
ACCESSIBLE PARKING SYMBOL

N.T.S.

NOTE:
1. EACH SUCH PARKING SPACE SHALL BE CONSPICUOUSLY OUTLINED IN BLUE PAINT. AND SHALL BE POSTED AND MAINTAINED WITH A PERMANENT, ABOVE GRADE SIGN.



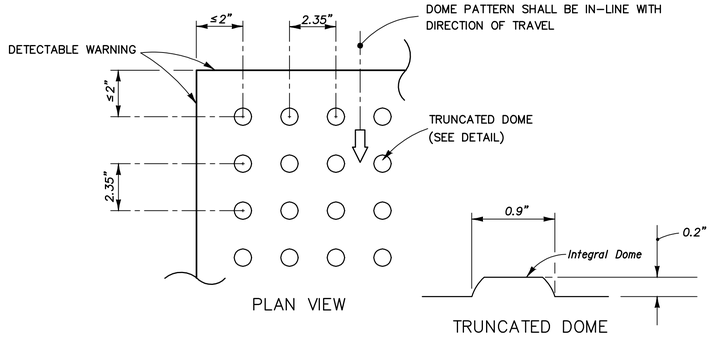
PARKING SPACE DETAIL



** WHEEL STOP SHALL BE BARCO PRODUCTS, MODEL # WHLSTP, YELLOW, 6" SOLID WHEEL STOP, 72"X6"X4", OR APPROVED EQUAL.

WHEEL STOP (RECYCLABLE MATERIALS)

N.T.S.
FOR PARKING USING 2.0' VEHICULAR OVERHANG



ALL SIDEWALK CURB RAMPS SHALL HAVE DETECTABLE WARNING SURFACES THAT EXTEND THE FULL WIDTH OF THE RAMP AND IN THE DIRECTION OF TRAVEL 24 INCHES (610 MM) FROM THE BACK OF CURB.

DETECTABLE WARNING

NTS – YELLOW IN COLOR

AVCON, INC.
ENGINEERS & PLANNERS
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CONSTRUCT OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-17

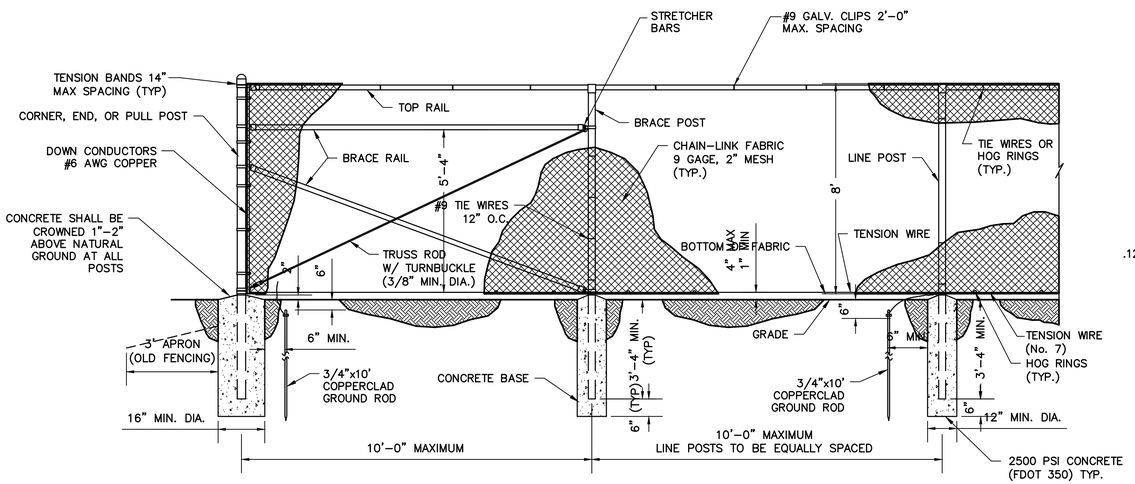
FENCE NOTES:

1. COATINGS: ZINC COATINGS ON POSTS, RAILS, GATE FRAMES AND STEEL FITTINGS SHALL AVERAGE 2.0 OZ./S.F. PER ASTM A123. NO INDIVIDUAL SPECIMEN SHALL HAVE LESS THAN 1.8 OZ./S.F. IF OTHER TYPES OF COATING ARE FURNISHED, THEY SHALL MEET THE APPROPRIATE ASTM OR FEDERAL SPECIFICATION IN NOTE 1.
2. BOTTOM TENSION WIRE SHALL BE STRETCHED TAUT FROM TERMINAL POST TO TERMINAL POST AND SECURELY FASTENED TO EACH INTERMEDIATE POST 6 INCHES ABOVE GROUND LINE AND TO THE FABRIC CHAIN LINK.
3. PULL POSTS SHALL BE INSTALLED AT 500 FOOT INTERVALS ON STRAIGHT RUNS.
4. GATE POST ASSEMBLIES SHALL CONSIST OF A BRACE POST AND CORNER, END, OR PULL POST WITH BRACE AND TRUSS ROD ON EACH SIDE OF THE GATE.
5. CONNECTIONS TO EXISTING FENCES OR BUILDINGS SHALL BE MADE BY SETTING A NEW ANCHOR POST WITH BRACE ASSEMBLEY AT JUNCTION POINT.
6. DIMENSIONS: ALL DIMENSIONS, SIZES, GAUGES, WEIGHTS, OR THICKNESS' SHOWN ARE THE MINIMUM ACCEPTABLE, UNLESS OTHERWISE INDICATED.
7. SPECIFICATIONS: MATERIALS AND CONSTRUCTION METHODS NOT DETAILED HEREON SHALL BE IN ACCORDANCE WITH THE FDOT SPECIFICATION 550 UNLESS OTHERWISE NOTED ON THE CONTRACT PLANS.

   THE FDOT SPECIFICATION SHALL BE INTERPRETED TO MEAN THE LATEST ISSUE OR AMENDMENT OF SUCH SPECIFICATION IN EFFECT ON THE DATE OF PLAN APPROVAL.
8. MEASUREMENTS: FENCES ARE MEASURED IN PLACE, FROM CENTER TO CENTER OF END, CORNER OR GATE POSTS. MEASUREMENT DOES NOT INCLUDE GATE OPENINGS. GATES ARE MEASURED IN UNITS FOR EACH TYPE AND SIZE INSTALLED.
9. FABRIC INSTALLATION: WIRE OR FABRIC ON BOUNDARY AND SECURITY FENCES AND GATES SHALL BE ON THE SIDE OF THE POSTS AWAY FROM SECURE AREA.
10. PVC COATING: BROWN OR AS APPROVED BY OWNER.
11. CONCRETE: CONCRETE SHALL BE OF A COMMERCIAL GRADE WITH A MINIMUM 28 DAY STRENGTH OF 2500 P.S.I. FOOTING TOPS SHALL BE 1–INCH MINIMUM ABOVE GROUND AT ALL THE POSTS AND TROWEL FINISHED TO SLOPE AWAY FROM THE POST.
12. OPENING UNDER FENCE:

    ANY OPENING UNDER FENCES, WHEREIN THE BOTTOM FENCE WIRE IS MORE THAN 4 INCHES ABOVE GROUND AND THE TOTAL AREA OF OPENING IS 96 SQUARE INCHES OR MORE, SHALL BE CLOSED USING THE DETAIL FOR SPANNING DITCHES OR APPROVED EQUAL.

    OPENINGS LESS THAN 18 INCHES HIGH SHALL BE CLOSED BY INSTALLING ONE OR MORE ADDITIONAL LINE POSTS BETWEEN THE OPENING CENTER AND ADJACENT LINE POSTS AT A 6–INCH MAXIMUM VERTICAL SPACING. THIS WORK SHALL BE INCIDENTAL TO FENCE INSTALLTION COSTS.
13. GROUNDING AND LIGHTNING PROTECTION, CHAIN LINK FENCE ONLY:
14. ALL FENCE AND GATES TO BE GROUNDED IN ACCORDANCE WITH SPECIFICATIONS. EACH GATE LEAF FRAME SHALL BE CONNECTED TO THE GATE POSTE BY A BRAIDED, FLEXIBLE COPPER STRAP. EACH GATE POST SHALL BE GROUNDED. GROUND RODS SHALL BE PRE SECTION 550. GROUND CABLE SHALL BE NO. 2 AWG COPPER MINIMUM BARE STRANDED COPPER WIRE. CONNECTIONS TO GATE, FENCE, ETC. ABOVE GROUND SHALL BE MADE WITH SUITABLE NON–CORROSIVE METAL CLAMPS, LUGS OR CONNECTORS. CONNECTIONS TO GROUND RODS SHALL BE MADE BY THE EXOTHERMIC PROCESS. EACH ELEMENT OF THE FENCE SHALL BE GROUNDED. INSTALL GROUND RODS AND BONDING CONDUCTORS IN ACCORDANCE WITH 550.
15. FENCE LINE AND ALIGNMENT: FENCE LINES SHALL BE CLEARED OF ALL OBSTRUCTIONS AND SMOOTH GRADED TO THE GENERAL CONTOUR OF THE ADJACENT GROUND. STUMPS AND ROOTS NOT INTERFERING WITH FENCE CONSTRUCTION, MAY BE CHIPPED TO GROUND LEVEL. THE FENCE SHALL BE CONSTRUCTED VERTICAL, STRAIGHT AND TRUE TO LINE. THE LONGITUDINAL GRADIENT SHALL PARALLEL TO THE GENERAL SLOPE OF THE GROUND. CONTRACTOR SHALL LAY OUT THE FENCE ALIGNMENT AS SHOWN ON THE CONSTRUCTION PLANS. THE ENGINEER SHALL APPROVE THE ALIGNMENT, LINE AND GRADE OF THE FENCE AND THE GATE LOCATION(S) PRIOR TO CONSTRUCTION.
16. THE CAP ARE SHALL BE DESIGNED TO PROVIDE A DRIVE FIT OVER THE TOP OF POSTS AND THE EXCLUDE MOISTURE IN POSTS WITH TUBULAR SECTIONS.
17. GATES SHALL BE INSTALLED PLUMB, LEVEL, AND SECURE, WITH FULL OPENING WITHOUT INTERFERENCE. GROUND–SET ITEMS SHALL BE INSTALLED IN CONCRETE FOR ANCHORAGE. HARDWARE SHALL BE ADJUSTED FOR SMOOTH OPERATION.
18. PERIMETER GATE FRAMES SHALL BE FABRICATED OR TUBULAR MEMBERS. ADDITIONAL HORIZONTAL AND VERTICAL MEMBERS SHALL BE PROVIDED AS REQUIRED TO ENSURE PROPER GATE OPERATION AND FOR ATTACHMENT OF FABRIC AND HARDWARE. SIZES OF FRAME MEMBERS LISTED ARE MINIMUM; LARGER SIZES SHALL BE PROVIDED AS REQUIRED.
19. GATE FRAME ASSEMBLY SHALL BE WELDED OR ASSEMBLED WITH SPECIAL MALLEABLE OR PRESSED STEEL FITTINGS AND RIVETS TO PROVIDE RIGID CONNECTIONS. FABRIC SHALL BE INSTALLED WITH STRETCHER BARS AT VERTICAL EDGES. STRETCHER BARS MAY ALSO BE USED AT THE TOP AND BOTTOM EDGES. STRETCHER BARS AND FABRIC SHALL BE ATTACHED TO GATE FRAMES ON ALL SIDES AT INTERVALS NOT EXCEEDING 15 INCHES. HARDWARE SHALL BE ATTACHED WITH RIVETS OR BY OTHER MEANS THAT WILL PROVIED EQUAL SECURITY AGAINST BREAKAGE OR REMOVAL.
20. WHERE BARDED WIRE IS INDICATED ABOVE GATES, THE END MEMBERS OF GATE FRAMES SHALL BE EXTENDED APPROXIMATELY ONE (1) FOOT ABOVE THE TOP MEMBER WITH PROVISION FOR ATTACHING THE WIRE. VERTICAL SUPPORT ARMS SHALL BE PROVIDED AT INTERMEDIATE POINTS, WITH SPACING TO MATCH THE SPACING OF THE LINE POSTS.
21. DIAGONAL CROSS–BRACING SHALL BE PROVIDED, CONSISTING OF 3/8 INCH DIAMETER ADJUSTABLE LENGTH TRUSS RODS ON WELDED GATE FRAMES WHERE NECESSARY TO OBTAIN FRAME RIGIDITY WITHOUT SAG OR TWIST. NON–WELDED GATE FRAMES SHALL HAVE DIAGONAL BRACING.
22. GALVANIZED STEEL LINE FENCE POST SHALL BE 2.25" IN DIAMETER.
23. GALVANIZED STEEL CORNER, PULL, AND END POSTS SHALL BE 3.5" DIAMETER.
24. WHEN CONNECTING TO EXISTING FENCE, CONTRACTOR SHALL INSTALL A CORNER POST.
25. FABRIC FASTENERS: MINIMUM 3/16"x3/4" STRETCHER BAR BANDED TO TERMINAL POSTS, OR INTEGRAL FABRIC FITTINGS ON TERMINAL POSTS, USE No.6 WIRE CLIPS FOR LINE POSTS AND No.9 WIRE CLIPS FOR BRACES, RAILS, AND TENSION WIRES. ALL FASTENERS SPACED 14" MAX. VERTICALLY, 24" MAX. HORIZONTALLY.
26. FABRIC INSTALLATION: WIRE OR FABRIC ON BOUNDARY AND SECURITY FENCES SHALL BE ON THE SIDE OF POSTS AWAY FROM AIRPORT PROPERTY. FENCES BETWEEN TERMINAL BUILDINGS AND APRONS, OR ADJACENT TO SIDEWALKS SHALL HAVE FABRIC ON THE BUILDING OR SIDEWALK SIDE OF POSTS. ALL OTHER BUILDING AREA FENCES SHALL HAVE FABRIC ON SIDE OF POSTS AWAY FROM BUILDING OR INSTALLATION BEING FENCED. UNLESS OTHERWISE NOTED.



CHAIN LINK SECURITY FENCE DETAILS

N.T.S.

NO TRESPASSING
RESTRICTED AREA

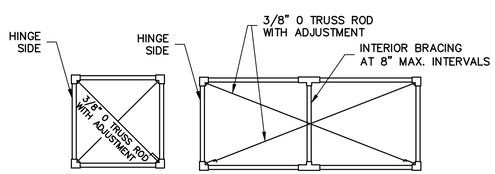
.125" ALUMINUM

NOTES

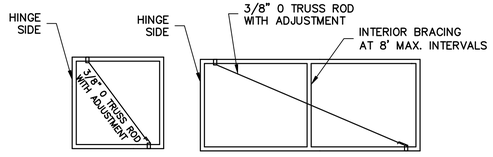
1. SIGN SHALL HAVE WHITE LETTERS ON GREEN BACKROUND AND A 1" WHITE BORDER ON EDGES. IT SHALL BE CONSTRUCTED OF .125" THICK ALUMINUM PLATE WITH ROUNDED CORNERS AND ATTACHED TO THE GATE FABRIC WITH No. 6 GAUGE GALVANIZED WIRE CLIPS SECURELY CLINCHED TO THE FABRIC AT ALL FOUR CORNERS.
2. A SIGN SHALL BE PLACED BEFORE EACH DRIVEWAY GATE AND AT NOT MORE THAN 300' INTERVALS OF FENCELINE.

NO TRESPASSING SIGN

N.T.S.



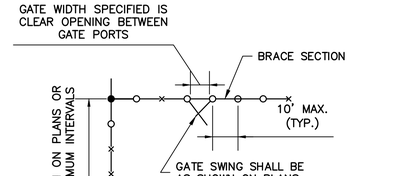
FITTED CONNECTIONS



WELDED CONNECTIONS

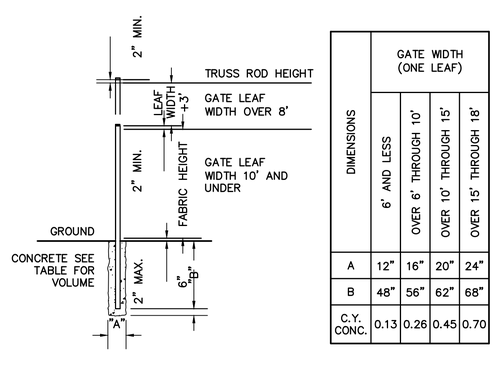
GATE FRAMES

N.T.S.



TYPICAL FENCE LAYOUT

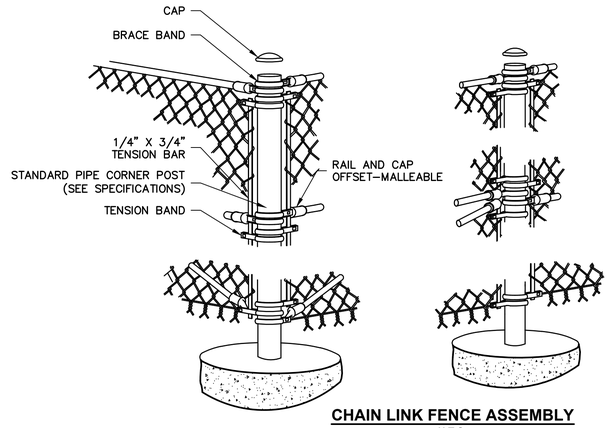
N.T.S.



DIMENSIONS	GATE WIDTH (ONE LEAF)			
	6' AND LESS	OVER 6' THROUGH 10'	OVER 10' THROUGH 15'	OVER 15' THROUGH 18'
A	12"	16"	20"	24"
B	48"	56"	62"	68"
C.Y. CONC.	0.13	0.26	0.45	0.70

GATE POST DETAIL

N.T.S.



CHAIN LINK FENCE ASSEMBLY

N.T.S.

AVCON, INC.
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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

TONIA D. NATION
FL LICENSE NO.: 64631
FBPR CERTIFICATE OF AUTHORIZATION NO. 5057

NO.	DATE	REVISION	BY
	11/17/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

MISCELLANEOUS DETAILS (SHEET 5 OF 5)
RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-18

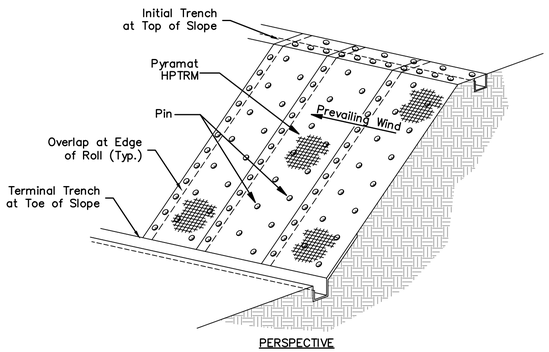


FIGURE 1: OVERVIEW OF PYRAMAT® HPTRM ON SLOPE

*Note: For Clarity, Perspective View does not show all pins

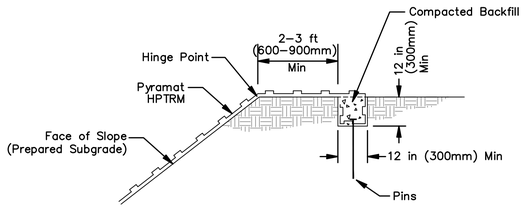


FIGURE 2: INITIAL TRENCH AT TOP OF SLOPE DETAIL

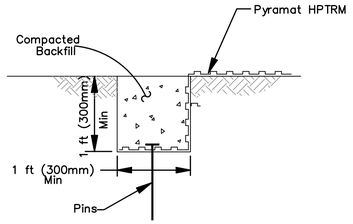


FIGURE 3: LONGITUDINAL EDGE TRENCH DETAIL

FIGURE 4: PYRAMAT® HPTRM OVERLAP AT ROLL EDGE DETAIL

FIGURE 5: PYRAMAT® HPTRM OVERLAP AT ROLL END DETAIL

*Note: Pyramat HPTRM Edge Shingle/Overlap placement depends on down slope direction (i.e Shingle in the direction of the down slope)

FIGURE 7: SIMULATED CHECK SLOT DETAIL

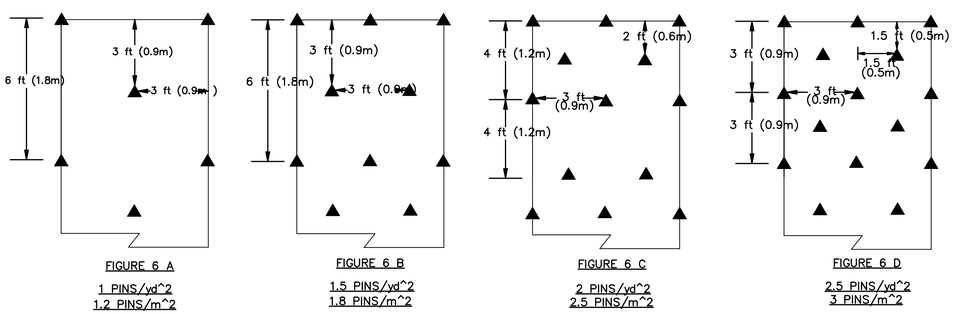
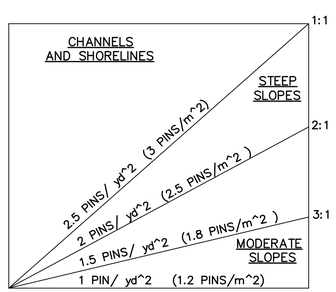


FIGURE 6: PIN PATTERN DETAIL



PIN PATTERN GUIDE

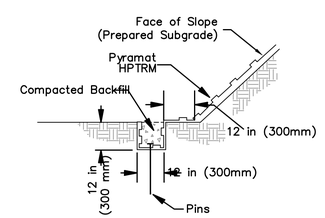


FIGURE 8: TERMINAL TRENCH AT TOE OF SLOPE DETAIL

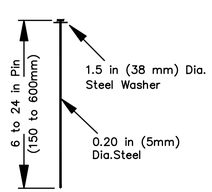


FIGURE 9: PIN DETAIL

PYRAMAT®HPTRM ON A SLOPE

PRE–CONSTRUCTION
- A pre–construction meeting should be held with the construction team and a representative from Propex. This meeting shall be scheduled by the contractor with at least two weeks notice. Also, Propex suggests that installation monitoring of the Pyramat→HPTRM be performed by a qualified independent third party.

SITE PREPARATION
- Grade and compact area of Pyramat→HPTRM installation as directed and approved by Engineer. Subgrade shall be uniform and smooth. Remove all rocks, clods, vegetation or other objects so the installed mat will have direct contact with soil surface.
- Prepare seedbed by loosening the top 2–3 in (50–75 mm) minimum of soil.
- Incorporate amendments such as lime and fertilizer and/or wet the soil, if needed.
- Do not mulch areas where mat is to be placed.

SEEDING
- Apply seed to soil surface before installing mat. Disturbed areas shall be reseeded.
- Consult project plans and/or specifications for seed types and application rates.

INSTALLATION ON A SLOPE
- Figure 1 shows general installation layout and details for Pyramat→HPTRM on a slope.
- Excavate initial trench 12 in wide x 12 in deep (300 mm x 300 mm) minimum 2–3 ft (600–900 mm) over crest of slope (see Figure 2).
- Excavate longitudinal edge trenches 12 in wide x 12 in deep (300 mm x 300 mm) minimum along both sides of the installation to bury edges of mat (see Figure 3). The longitudinal edge trenches shall be located along the first and last installed rolls.
- Beginning at the downstream end of prevailing winds, place roll end into the initial trench and secure with pinning devices on 12 in (300 mm) centers (see Figure 2). Position adjacent rolls and secure in trench in same manner. Backfill and compact soil into trench as directed and approved by Engineer.
- Unroll mat down the slope over the compacted initial trench.
- Secure longitudinal edge trench with pinning devices on 12 in (300 mm) centers (see Figure 3).
- Continue installation as described above, overlapping adjacent rolls as follows:
  A. Roll edge overlap: 6 in (150 mm) minimum overlap with upstream mat on top. Secure with one row of ground pinning devices on 12 in (300 mm) centers (see Figure 4).
  B. Roll end overlap: 12 in (300 mm) minimum overlap with upslope mat on top. Secure with two rows of ground pinning devices staggered 12 in (300 mm) apart on 12 in (300 mm) centers (see Figure 5).
- Secure mat using suggested ground pinning devices for appropriate frequency and pattern shown on the Pin Pattern Guide (see Figure 6).
- For slope heights greater than 45 ft (13.7 m), install simulated check slots per Figure 7. This method includes placing two staggered rows of pins on 4 in (100 mm) centers at 30 ft (9.1 m) intervals (see Figure 7) or across the midpoint of the slope height for slope heights less than 60 ft (18.2 m).
- Excavate terminal trench 12 in wide by 12 in deep (300 mm x 300 mm) minimum 12 in (300 mm) from the toe of slope (see Figure 8).
- Pin, backfill and compact end of mat in terminal trench (see Figure 8). Terminal trench pinning devices should be spaced on 12 in (300 mm) centers (see Figure 8).

GROUND PINNING DEVICES
- Metal pins should be at least 0.20 in (5 mm) diameter steel with a 1 1/2 in (38 mm) steel washer at the head of the pin (see Figure 9). Metal pins should be driven flush to the soil surface. Pins should be between 6–24 in (150–600 mm) long and have sufficient ground penetration to resist pullout. Longer pins may be required for looser soils. Heavier metal stakes may be required in rocky soils. Depending on soil pH and design life of the pin, galvanized or stainless steel pins may be required. Consult project plans and/or specifications for tie down device details.

SPECIAL TRANSITIONS
- For applications that require special transitions (i.e. connections to riprap, concrete, headwalls, etc.), refer to Page 6 of the Installation Guidelines for Landlok→TRMs and Pyramat→HPTRMs.

SOIL FILLING
- Installed Pyramat→HPTRM shall be re–seeded and soil–filled.
- After seeding, spread and lightly rake 1/2 – 3/4 in (12–19 mm) of fine site soil or topsoil into the mat and completely fill the voids using backside of rake or other flat tool.
- If equipment must operate on the mat, make sure it is of the rubber–tired type. No tracked equipment or sharp turns are allowed on the mat.
- Avoid any traffic over the mat if loose or wet soil conditions exist.
- Smooth soil–fill in order to just expose the top of Pyramat→HPTRM. Do not place excessive soil above the mat.
- Broadcast additional seed and install a Landlok→ECB above the soil–filled mat (if desired).
- Irrigate as necessary to establish/maintain vegetation. Do not over irrigate.

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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

TONIA D. NATION
FL LICENSE NO.: 64631
FBPR CERTIFICATE OF AUTHORIZATION NO. 5057

NO.	DATE	REVISION	BY
A	1/17/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

PYRAMAT DETAILS

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-19

GENERAL UTILITY NOTES:

1. THE CONTRACTOR SHALL NOTIFY THE RESPECTIVE LOCAL UTILITY SERVICES FOR SITE UTILITY STAKE–OUT PRIOR TO BEGINNING WORK. PROJECT CONTACTS ARE AS FOLLOWS:

	SUNSHINE LOCATES	800–432–4770
		(48 HRS NOTICE REQUIRED)
JOEY DEVRIES–	GULF POWER	850–244–4747
BILL McCLEOD–	SPRINT	850–599–1444
ESSA RHEBI–	OKALOOSA GAS	850–729–4870
RODGER DIXON–	COX COMMUNICATIONS	850–259–5083
MARK WISE–	OKALOOSA COUNTY WATER & SEWER	850–651–7136

2. LOCATIONS OF UTILITIES SHOWN ON THIS PLAN ARE AN APPROXIMATION ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE FIELD VERIFICATION OF THE LOCATION, TYPE, DEPTH, ETC. OF ALL UTILITIES. THE CONTRACTOR SHALL MAINTAIN A LOG OF ALL UTILITIES LOCATED IN THE FIELD AND SHALL INDICATE THEM ON THE RECORD (AS–BUILT) DRAWINGS.

3. ALL METHODS AND MATERIALS OF RELOCATION, INSTALLATION, AND PROTECTION SHALL BE IN ACCORDANCE WITH INDIVIDUAL UTILITY STANDARDS. WHERE PROPOSED UTILITY INSTALLATIONS OR MODIFICATIONS CROSS EXISTING PAVEMENTS TO REMAIN, CONTRACTOR SHALL MAINTAIN EXISTING PAVEMENT OR RESTORE PAVEMENT TO MATCH EXISTING CONDITION. NO SEPARATE PAYMENT SHALL BE MADE FOR PAVEMENT RESTORATION.

4. ALL UTILITIES SHALL REMAIN IN PLACE AND IN SERVICE UNLESS SHOWN OTHERWISE.

OCWS WATER AND SEWER NOTES:

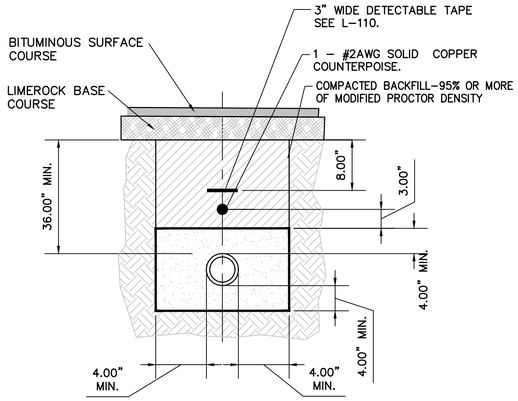
1. A MANDATORY PRECONSTRUCTION MEETING SHALL BE HELD, AT THE OCWS ENGINEERING DEPT, WITH ALL INVOLVED PARTIES, INCLUDING THE DEVELOPER, ENGINEER–OF–RECORD, AND CONTRACTOR, A MINIMUM OF TWO (2) WEEKS PRIOR TO CONSTRUCTION, IN ORDER TO ADDRESS CONSTRUCTION AND INSPECTION REQUIREMENTS. FAILURE TO HOLD A PRECONSTRUCTION MEETING COULD RESULT IN EXPENSIVE REWORK OF ITEMS NOT ACCEPTABLE BY OCWS STANDARDS.
2. COORDINATE WITH LOCAL FIRE DEPARTMENT ON INSPECTION REQUIREMENTS AND TESTING.
3. COORDINATE ALL UTILITY TIE–INS WITH OCWS MAINTENANCE (850) 609–7034 A MINIMUM OF FIFTEEN (15) WORKING DAYS PRIOR TO CONSTRUCTION. OCWS WILL PERFORM AND/OR OVERSEE ALL CONNECTIONS TO EXISTING WATER OR SEWER MAINS.
4. ALL UTILITY CONSTRUCTION SHALL BE INSPECTED BY THE OCWS ENGINEERING DEPARTMENT (850) 609–5056, INCLUDING, BUT NOT LIMITED TO PRESSURE TESTING, FINISHED GRADE DEPTH, AND SERVICE LOCATIONS. AS A MINIMUM, A MANDATORY FORTY–EIGHT (48) HOUR NOTICE IS REQUIRED FOR ALL INSPECTIONS.
5. PRIOR TO OCWS SIGNING FDEP CLEARANCE APPLICATIONS (INVOLVING NEW MAINS), THE FOLLOWING ITEMS ARE REQUIRED:
   a. PASSING PRESSURE TESTS
   b. PASSING BACTERIOLOGICAL TESTS
   c. SATISFACTORY INSPECTION
   d. COMPLETE, ACCURATE AS–BUILTS RECEIVED
6. PRIOR TO OCWS ACCEPTANCE OF INFRASTRUCTURE AND THE SETTING OF WATER METERS, THE FOLLOWING ITEMS ARE REQUIRED:
   a. FDEP CLEARANCE
   b. PASSING FINAL INSPECTION, AT ESTABLISHED FINISHED GRADE
   c. ASSOCIATED RIGHT–OF–WAY AND/OR EASEMENTS EXECUTED AND RECORDED
   d. WATER & SEWER CONSTRUCTION COST
   e. 12–MONTH WARRANTY AGREEMENT, TO COVER ANY DAMAGES TO OCWS' MAINTAINED UTILITIES, WHICH MAY BE CAUSED BY THE INSTALLATION OF OTHER UTILITIES OR INFRASTRUCTURE. THE WARRANTY REQUIRES THE DEVELOPER AND CONTRACTOR TO MAKE ALL REPAIRS OR PAY ASSOCIATED COST REQUIRED TO CORRECT DAMAGE(S).
7. CAPACITY EXPANSION CHARGES SHALL BE PAID IN FULL PRIOR TO THE ISSUANCE OF A BUILDING PERMIT. COORDINATE CAPACITY EXPANSION CHARGES, ACCOUNT SETUP, AND HYDRANT METERS WITH THE OCWS TAPS OFFICE AT (850) 609–6182.
8. A MINIMUM 15'–0" CLEARANCE SHALL BE MAINTAINED BETWEEN UTILITY MAINS AND PROPOSED BUILDINGS. THE CONTRACTOR SHALL PROVIDE PROPER SEPARATION FROM PROPOSED DRAINAGE SYSTEMS AND UTILITY PIPES, INCLUDING SERVICES.
9. NO UTILITY CONNECTIONS WILL BE MADE INTO COUNTY/FDOT RIGHT–OF–WAY AND/OR EASEMENTS WITHOUT AN APPROVED UTILITY PERMIT. ALL CROSSINGS UNDER EXISTING ROADS WILL BE BORED, UNLESS PERMITTED OTHERWISE. THE CONTRACTOR MUST REPAIR ANY PAVEMENT CUTS WITHIN TIME SPECIFIED ON PERMIT AND COORDINATE ALL CUTS WITH GOVERNING AUTHORITY A MINIMUM 15 DAYS PRIOR TO WORK BEING DONE.
10. THE CONTRACTOR WILL BE RESPONSIBLE FOR EXTENDING THE PROPOSED WATER AND SEWER MAINS FROM THE UTILITY MAIN CONNECTIONS PROVIDED BY OCWS INTO THE DEVELOPMENT.
11. ALL WATER UTILITIES SHALL BE CONSTRUCTED IN ACCORDANCE WITH OCWS REQUIREMENTS AND SPECIFICATIONS. ALL WATER MAIN PIPING SHALL BE C–900 DR 18 OR LESS, WITH 2 EXCEPTIONS: DUCTILE IRON PIPE IS REQUIRED FROM TEES TO HYDRANTS, OR AS OTHERWISE SPECIFIED BY OCWS. HYDRANTS SHALL BE MUELLER SUPER CENTURION A423 OR AMERICAN DARLING B84B.
12. A MINIMUM 36" (AND A MAXIMUM 42" FOR WATER) COVER IS REQUIRED FROM TOP OF ALL PROPOSED UTILITY LINES AND SERVICES FROM FINISHED GRADES, INCLUDING SWALES AND BASINS.
13. ALL LOT CORNERS, RIGHTS–OF–WAY, AND REAR EASEMENT LINES SHALL BE LOCATED AND PROPERLY MARKED, PRIOR TO THE CONTRACTOR INSTALLING MAINS AND SERVICES, THEN AGAIN PRIOR TO FINAL INSPECTION. OCWS ENGINEERING WILL REQUIRE EXACT VERIFICATION OF EACH SERVICE PLACEMENT, BEFORE FINAL ACCEPTANCE IS MADE.
14. A MINIMUM HORIZONTAL CLEARANCE OF 36" IS REQUIRED FROM POWER TRANSFORMER/BOX PERIMETER TO ANY UTILITY MAINS AND SERVICES.
15. CLEANOUTS ARE REQUIRED ON ALL SEWER SERVICES AND SHOULD BE LOCATED AT THE BACK OF THE RIGHT–OF–WAY OR EASEMENT LINE. THE TOP OF THE CLEANOUT SHALL BE 6–12" BELOW GRADE AND INSIDE A PLASTIC METER BOX WITH A GREEN LID. IF THE CLEANOUT IS LOCATED IN PAVEMENT, IT SHALL BE TRAFFIC–RATED/BRASS, AND NO METER BOX IS REQUIRED

GENERAL WATER MAIN NOTES:

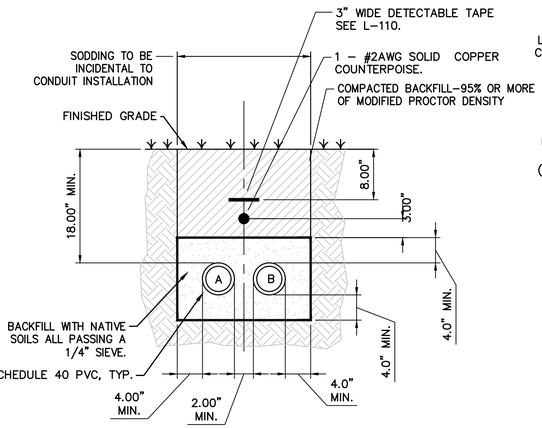
1. THE CONTRACTOR SHALL OBTAIN BACTERIOLOGICAL EXAMINATIONS ON ALL NEW WATER MAIN AS REQUIRED BY ALL MUNICIPAL, COUNTY, AND STATE AGENCIES PRIOR TO PLACING A WATERLINE INTO SERVICE.
2. INSTALLATION OF WATER MAINS AND SERVICE SHALL COMPLY WITH ALL MUNICIPAL, COUNTY AND STATE REQUIREMENTS.
3. THE CONTRACTOR SHALL VERIFY ALL FIELD DIMENSIONS AND REPORT ANY DISCREPANCIES (INCLUDING FIELD STAKE OUT) PRIOR TO COMMENCING WORK.
4. ALL PIPE SHALL BE P.V.C. UNLESS OTHERWISE NOTED OR REQUIRED.
5. FITTINGS SHALL BE CAST IRON WITH RETAINER GLAND MECHANICAL JOINTS.
6. THRUST BLOCKS SHALL BE SIZED TO RESIST HYDRAULIC TEST PRESSURES AGAINST UNDISTURBED SOILS (150 P.S.I.).
7. CONTRACTOR SHALL PROVIDE 30" OF COVER OVER THE CROWN OF ALL MAINS IN THE RIGHT–OF–WAY; 24" OVER SERVICE CONNECTIONS IN THE RIGHT–OF–WAY; AND A MINIMUM OF 18" ON SERVICE CONNECTIONS OUTSIDE THE RIGHT–OF–WAY.
8. CONTRACTOR SHALL PROVIDE AS–BUILT DRAWINGS TO THE ENGINEER. CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANIES 48 HOURS PRIOR TO CONSTRUCTION.

GENERAL SANITARY SEWER NOTES:

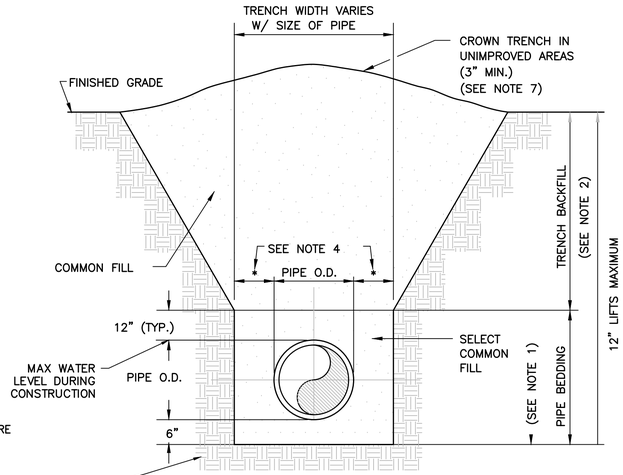
1. CONCRETE STRENGTH SHALL BE 4,000 P.S.I. AT 28 DAYS.
2. PRECAST REINFORCED CONCRETE MANHOLE TOP, BASE, AND SECTIONS SHALL CONFORM TO ASTM SPECIFICATIONS C–478.
3. GROUT ALL RISER JOINTS AND ENTRY PIPES.
4. INVERT GROUTING SHALL BE UNIFORM AND SMOOTH–SLOPED TO CENTER LINE OF PIPE.
5. MINIMUM RADIUS 20".
6. USE COUPLINGS OR BELLS FOR ALL PIPES ENTERING OR EXITING M.H. INSTALL 45° BEND AND EXTEND ALL SEWER SERVICE LATERALS 18" ABOVE GROUND.
7. ALL MANHOLES PLACED IN PAVED AREAS SHALL BE PROTECTED WITH 9"X1' WIDE CONCRETE RING.
8. CONTRACTOR SHALL PROVIDE AS–BUILT DRAWINGS TO THE ENGINEER.
9. CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANIES 48 HOURS PRIOR TO CONSTRUCTION.



1 WAY 4" DIRECT IN PAVED AREAS
N.T.S.



2 WAY 4" DIRECT IN TURFED AREAS
N.T.S.



CLASS B BEDDING AND TRENCHING DETAIL
N.T.S.

NOTES:
1. PIPE BEDDING: SELECT COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO T–180.
2. TRENCH BACKFILL: COMPACTED PER FAA P–152.
3. PIPE BEDDING UTILIZING SELECT COMMON FILL OR BEDDING ROCK IN ACCORDANCE WITH CLASS B BEDDING AND TRENCHING DETAIL MAY BE REQUIRED AS DIRECTED BY THE COUNTY.
4. (*): 12" FOR PIPE DIAMETER LESS THAN 24", AND 24" MAX. FOR PIPE DIAMETER 24" AND LARGER.
5. WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
6. ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF THE FLOW.
7. FINAL RESTORATION IN IMPROVED AREAS SHALL BE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OF GOVERNING AGENCIES.

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NO.	DATE	REVISION	BY
A	1/17/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

UTILITY DETAILS (SHEET 1 OF 3)

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

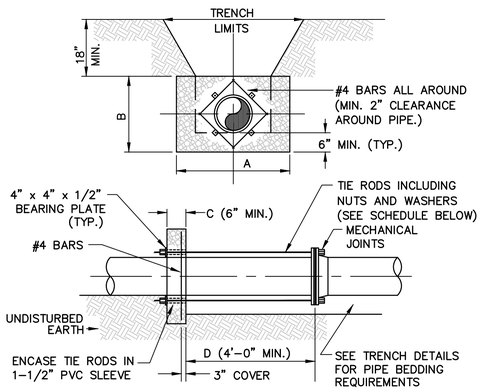
PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-20

SCHEDULE OF DIMENSIONS AND MATERIALS						
PIPE SIZE (INCHES)	DIMENSIONS				TIE RODS REQ'D	
	A	B	C	D	DIA.	NO.
6	2'–6"	1'–6"	6"	4'–0"	3/4"	4
8	3'–2"				3/4"	4
12	4'–6"	3'–0"	8"	6'–0"	3/4"	4
24	4'–6"	3'–0"	10"	8'–0"	3/4"	4
NOTE: THRUST BLOCK AREAS TO BE COMPUTED ON BASIS OF LBS. PER SQ. FT. SOIL RESTRAINT BEARING. 2000 (1,500 MIN) SEE NOTE 5						

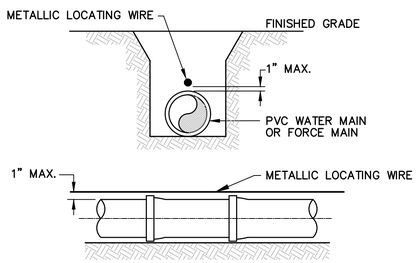


NOTES:

1. ADDITIONAL REINFORCEMENTS SHALL BE AS SPECIFIED BY THE ENGINEER.
2. MINIMUM COMPRESSIVE STRENGTH FOR CONCRETE SHALL BE 2500 PSI.
3. BEDDING, BACKFILL, AND COMPACTION SHALL BE AS SPECIFIED ELSEWHERE IN THE STANDARD DRAWINGS.
4. ALL FORM BOARDS SHALL BE REMOVED PRIOR TO BACKFILL.
5. NO ALLOWANCE SHALL BE MADE FOR FRICTION BETWEEN THE PIPE WALL AND THE THRUST COLLAR.
6. DESIGN PRESSURE: 150 P.S.I.

WATER MAIN THRUST COLLAR DETAIL

N.T.S.



NOTES:

1. PVC PIPE SHALL REQUIRE INSULATED METALLIC LOCATING WIRE (14 GAUGE COPPER) CAPABLE OF DETECTION BY A CABLE LOCATOR AND SHALL BE BURIED DIRECTLY ABOVE THE CENTERLINE OF THE PIPE.
2. LOCATING WIRE SHALL TERMINATE AT THE TOP OF EACH VALVE BOX AND BE CAPABLE OF EXTENDING 12" ABOVE TOP OF BOX IN SUCH A MANNER SO AS NOT TO INTERFERE WITH VALVE OPERATION.
3. USE DUCT TAPE AS NECESSARY TO HOLD WIRE DIRECTLY ON THE TOP OF THE PIPE.

PVC PIPE LOCATING WIRE DETAIL

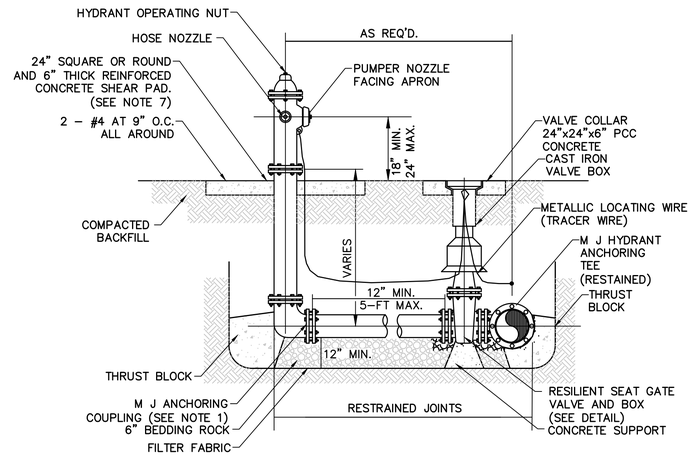
N.T.S.

MINIMUM LENGTH (FT) TO BE RESTRAINED ON EACH SIDE OF FITTING(S). *				
	PIPE SIZE			
	6"	8"		
90° BEND	26	34		
45° BEND	11	14		
22–1/2° BEND	5	7		
PLUG OR BRANCH OF TEE	5	25		
DEAD END	69	80		

NOTES:

1. FITTINGS SHALL BE RESTRAINED JOINTS UNLESS OTHERWISE INDICATED.
2. INSTALL FULL LENGTH JOINTS WITH TOTAL LENGTH EQUAL TO OR GREATER THAN SHOWN IN THE TABLE.
3. WHERE TWO OR MORE FITTINGS ARE TOGETHER, USE FITTING WHICH YIELDS GREATEST LENGTH OF RESTRAINED PIPE.
4. IN LINE VALVES AND THROUGH RUN OF TEES OUTSIDE LIMITS OF RESTRAINED JOINTS FROM OTHER FITTINGS NEED NOT BE RESTRAINED UNLESS OTHERWISE INDICATED.
5. LENGTHS SHOWN IN THE TABLE HAVE BEEN CALCULATED IN ACCORDANCE WITH THE PROCEDURE OUTLINED IN "THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE" AS PUBLISHED BY DIPRA, WITH THE FOLLOWING ASSUMPTIONS:
   WORKING PRESSURE: 150 P.S.I. LAYING CONDITIONS: TY 2
   SOIL DESIGNATION: COH–GRAN DEPTH (FT): 6
6. FOR PIPE ENCASED IN POLYETHYLENE, INCREASE THE GIVEN VALUE BY A FACTOR OF 1.5.

RESTRAINED PIPE TABLE

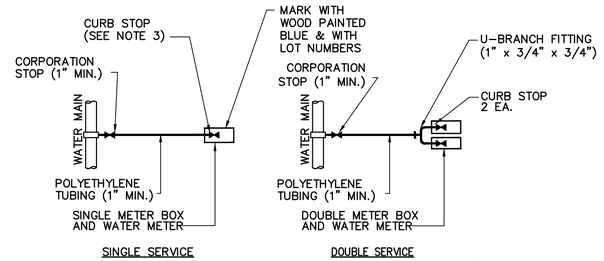


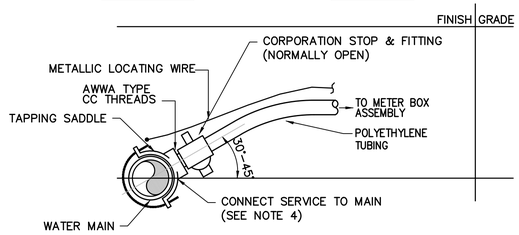
NOTES:

1. USE MECHANICAL JOINT RETAINER CLAND CLOW MODEL NO. F1058 OR APPROVED EQUAL.
2. HYDRANT SETBACK SHALL BE SET TO THE BACK OF THE EASEMENT OR RIGHT OF WAY.
3. SERVICE LINES FOR FIRE HYDRANTS TO BE SIZED TO ALLOW A MINIMUM OF 20 PSI RESIDUAL PRESSURE AT THE HYDRANT UNDER FIRE FLOW CONDITIONS.
4. TWO BLUE REFLECTIVE PAVEMENT MARKERS FOR IDENTIFICATION OF THE HYDRANT AND ITS VALVE LOCATION SHALL BE INSTALLED ON THE CENTER OF THE ADJACENT PAVED DRIVE LANE TO THE HYDRANT; MARKERS SHALL BE SPACED 1–FT APART. PERPENDICULAR TO THE ROAD CENTERLINE.
5. THE ELEVATION OF THE HYDRANT BASE SHALL BE EQUAL TO OR GREATER THAN THE ELEVATION OF THE EDGE OF PAVEMENT, BUT NOT LESS THAN 3 INCHES ABOVE THE FINISH GROUND ELEVATION.
6. FIRE HYDRANT SHALL BE SUPPLIED WITH A WEEP HOLE.
7. THE BUILDER MAY INSTALL THE SHEAR PAD RECESSED UP TO 4 INCHES BELOW FINISHED GRADE AND SOD THE RECESSED SECTION. CLEARANCE BETWEEN BOTTOM OF BOLTS AND TOP OF SHEAR PAD SHALL BE A 6" MINIMUM.
8. FIRE HYDRANT SHALL BE MUELLER "SUPER CENTURION" TYPE.

FIRE HYDRANT ASSEMBLY DETAIL

N.T.S.



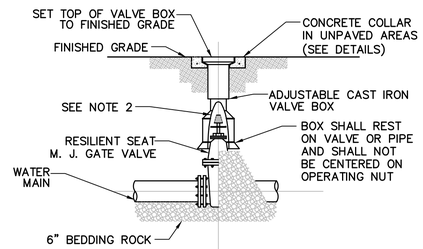


NOTES:

1. ALL FITTINGS SHALL BE BRASS WITH COMPRESSION/PACK JOINT TYPE CONNECTIONS.
2. NO SERVICE LINE SHALL TERMINATE UNDER A DRIVEWAY.
3. EACH SERVICE SHALL TERMINATE AT A CURB STOP(S) WHICH SHALL BE BURIED APPROXIMATELY 3" BELOW FINAL GRADE AND SHALL BE CLEARLY MARKED WITH A 2" X 2" X 18" STAKE WITH THE TOP PAINTED BLUE AND MARKED WITH THE NUMBER OF THE LOT(S) TO BE SERVED.
4. SHALL BE CONNECTED WITH ROCKWELL NO. 313 DOUBLE STRAP TAPPING SADDLE WITH EPOXY COATING AND STAINLESS STEEL CLAMPS, OR APPROVED EQUAL.

WATER SERVICE CONNECTION DETAILS

N.T.S.



NOTES:

1. PVC EXTENSIONS SHALL NOT BE USED ON VALVE BOX INSTALLATION.
2. THE ACTUATING NUT FOR DEEPER VALVES SHALL BE EXTENDED TO COME UP TO 4 FOOT DEPTH BELOW FINISHED GRADE.
3. SEE WATER SYSTEM NOTES AND SPECIFICATIONS FOR FURTHER INSTALLATION DETAIL.

GATE VALVE AND BOX DETAIL

N.T.S.

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL. 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

TONIA D. NATION
FL LICENSE NO.: 64631
FBPR CERTIFICATE OF AUTHORIZATION NO. 5057

NO.	DATE	REVISION	BY
A	1/17/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

UTILITY DETAILS (SHEET 2 OF 3)

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

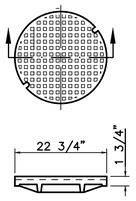
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER
C-21

SANITARY SEWER NOTES

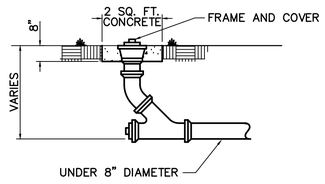
1. CONCRETE COMPRESSIVE STRENGTH SHALL BE 4,000 P.S.I. AT 28 DAYS.
2. PRECAST REINFORCED CONCRETE MANHOLE TOP, BASE, AND SECTIONS SHALL CONFORM TO ASTM SPECIFICATIONS C-478.
3. GROUT ALL RISER JOINTS AND ENTRY PIPES.
4. INVERT GROUTING SHALL BE UNIFORM AND SMOOTH-SLOPED TO CENTER LINE OF PIPE.
5. MINIMUM RADIUS 20'.
6. USE COUPLINGS OR BELLS FOR ALL PIPES ENTERING OR EXITING M.H.
7. INSTALL 45° BEND AND EXTEND ALL SEWER SERVICE LATERALS 18" ABOVE GROUND.
8. CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS TO THE ENGINEER.
9. CONTRACTOR SHALL COORDINATE WITH UTILITY COMPANIES 48 HOURS PRIOR TO CONSTRUCTION.
10. MANHOLE RINGS AND FRAMES SHALL BE RATED FOR AASHTO H-20 TRAFFIC LOADINGS.
11. REFER TO PVC PIPE LOCATING WIRE DETAIL ON SHEET U4 FOR PVC SANITARY PIPE LOCATING WIRE INSULATION.



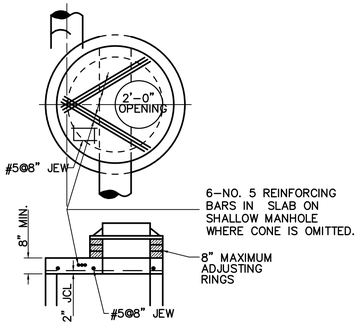
SOLID- INDENTED

MIN. WEIGHTS
FRAME- 260
COVER- 120

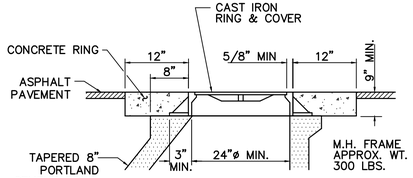
MANHOLE COVER
N.T.S.



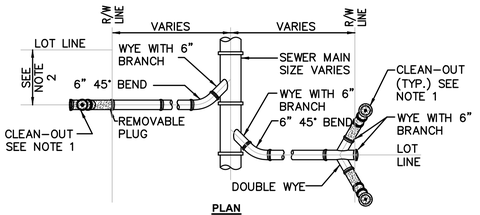
CLEAN OUT DETAIL
N.T.S.



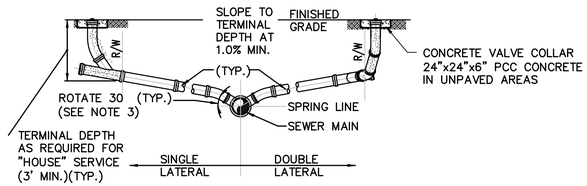
SLAB TOP FOR SHALLOW MANHOLE
N.T.S.



MANHOLE IN PAVEMENT
N.T.S.



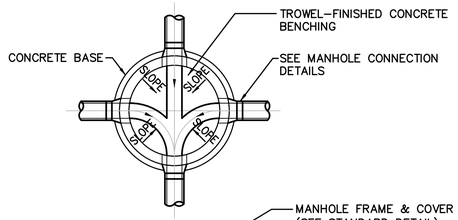
PLAN

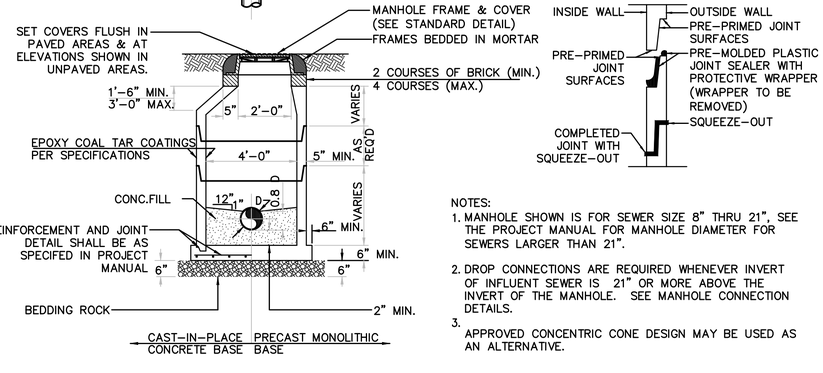


PROFILE

NOTES:
1. CLEAN-OUT (SHOWN SHADED) SHALL BE INSTALLED BY THE BUILDER IN ACCORDANCE WITH STANDARD PLUMBING CODE.
2. INVERT OF SERVICE LATERAL SHALL NOT ENTER SEWER MAIN BELOW SPRING LINE.

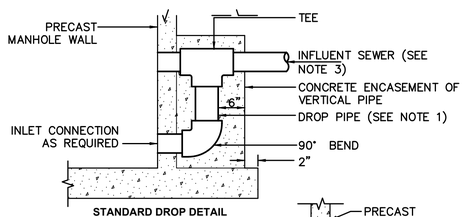
SANITARY SERVICE LATERAL DETAIL
N.T.S.



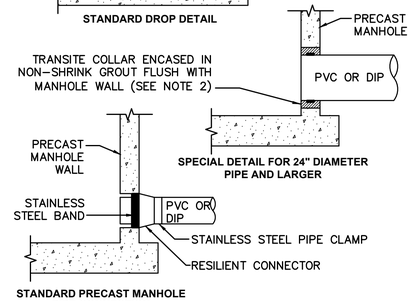


NOTES:
1. MANHOLE SHOWN IS FOR SEWER SIZE 8" THRU 21", SEE THE PROJECT MANUAL FOR MANHOLE DIAMETER FOR SEWERS LARGER THAN 21".
2. DROP CONNECTIONS ARE REQUIRED WHENEVER INVERT OF INFLUENT SEWER IS 21" OR MORE ABOVE THE INVERT OF THE MANHOLE. SEE MANHOLE CONNECTION DETAILS.
3. APPROVED CONCENTRIC CONE DESIGN MAY BE USED AS AN ALTERNATIVE.

PRECAST CONCRETE MANHOLE PLAN AND SECTION
N.T.S.



STANDARD DROP DETAIL



SPECIAL DETAIL FOR 24" DIAMETER PIPE AND LARGER

STANDARD PRECAST MANHOLE PIPE CONNECTION

NOTES:
1. DROP PIPE AND FITTINGS SHALL BE OF EQUAL SIZE AND MATERIAL AS THE INFLUENT SEWER.
2. THE COUNTY MAY APPROVE ALTERNATE WATER TIGHT CONNECTION DETAILS FOR CONNECTION OF 21" DIAMETER PIPES AND LARGER.
3. AN OUTSIDE DROP CONNECTION SHALL BE REQUIRED FOR ALL INFLUENT WHICH HAVE AN INVERT 2' OR MORE ABOVE THE MANHOLE INVERT.

MANHOLE CONNECTION DETAILS
N.T.S.

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL. 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

TONIA D. NATION
FL LICENSE NO.: 64631
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NO.	DATE	REVISION	BY
1	11/7/20	REVISED PER COUNTY REVIEW COMMENTS	TDN

UTILITY DETAILS (SHEET 3 OF 3)

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	NDU
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	SEPTEMBER 2020

SHEET NUMBER

C-22

GENERAL NOTES:

1. TO THE BEST OF OUR KNOWLEDGE, THE STRUCTURAL PLANS AND SPECIFICATIONS COMPLY WITH THE APPLICABLE REQUIREMENTS OF THE FLORIDA BUILDING CODE, 2017, 6TH EDITION.
2. THE STRUCTURAL DOCUMENTS ARE TO BE USED IN CONJUNCTION WITH THE ARCHITECTURAL DOCUMENTS. USE THESE NOTES IN CONJUNCTION WITH THE SPECIFICATIONS. IF A CONFLICT EXISTS, THE MORE STRINGENT GOVERNS.
3. COMPLY WITH REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE, AND ALL OTHER APPLICABLE FEDERAL STATE, AND LOCAL CODES, STANDARDS, REGULATIONS AND LAWS.
4. ALL REFERENCED STANDARDS REFER TO THE EDITION IN FORCE AT THE TIME THESE PLANS AND SPECIFICATIONS ARE ISSUED FOR BIDDING.
5. REVIEW ALL CONTRACT DOCUMENTS, DIMENSIONS AND SITE CONDITIONS AND COORDINATE WITH FIELD DIMENSIONS AND PROJECT SHOP DRAWINGS PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES IN WRITING TO THE ARCHITECT/ENGINEER. DO NOT CHANGE SIZE OR DIMENSIONS OF STRUCTURAL MEMBERS WITHOUT WRITTEN INSTRUCTIONS FROM THE STRUCTURAL ENGINEER OF RECORD.
6. ANY DISCREPANCIES, OMISSIONS, OR VARIATIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS DISCOVERED DURING THE BIDDING PERIOD SHALL BE IMMEDIATELY COMMUNICATED IN WRITING TO THE ARCHITECT/ENGINEER.
7. PROTECT EXISTING FACILITIES, STRUCTURES AND UTILITY LINES FROM ALL DAMAGE. EACH CONTRACTOR SHALL PROTECT HIS WORK, ADJACENT PROPERTY AND THE PUBLIC. EACH CONTRACTOR IS SOLELY RESPONSIBLE FOR DAMAGE OR INJURY DUE TO HIS ACT OR NEGLECT.
8. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR JOB SAFETY AND CONSTRUCTION PROCEDURES.
9. DO NOT SCALE DRAWINGS; USE DIMENSIONS.
10. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR SIZE AND LOCATION OF OPENINGS IN STRUCTURE NOT SHOWN ON STRUCTURAL DRAWINGS.
11. DETAILS LABELED "TYPICAL DETAILS" ON THE DRAWINGS APPLY TO ALL SITUATIONS THAT ARE THE SAME OR SIMILAR TO THOSE SPECIFICALLY DETAILED. SUCH DETAILS APPLY WHETHER OR NOT THEY ARE KEYED IN AT EACH LOCATION. QUESTIONS REGARDING APPLICABILITY OF TYPICAL DETAILS SHALL BE RESOLVED BY THE ARCHITECT/ENGINEER.
12. REVISIONS ARE IDENTIFIED BY A REVISION NUMBER WITHIN A TRIANGLE. ALL REVISIONS ISSUED ON A SINGLE DATE WILL BE IDENTIFIED BY THE SAME REVISION NUMBER ISSUED CONSEQUENTLY.
13. CURRENT REVISIONS ARE ENCIRCLED BY AN IRREGULAR "CLOUD", AS WELL AS FLAGGED WITH THE CURRENT REVISION NUMBER. CLOUDS ARE REMOVED FROM PREVIOUSLY ISSUED REVISIONS.

14. DESIGN LOADS AND CRITERIA:

FLOOR LIVE LOAD	40 PSF
PARTITION LOAD	15 PSF
ROOF LIVE LOAD	20 PSF
FLOOR DEAD LOAD	SELF WEIGHT
WIND CRITERIA	ASCE 7-10
ULTIMATE WIND SPEED	160 MPH
RISK CATEGORY	IV
IMPORTANCE FACTOR	1.00
STRUCTURE TYPE	ENCLOSED

SHOP DRAWING SUBMITTALS:

1. THE FOLLOWING REQUIREMENTS IN NO WAY REDUCE OR LIMIT ANY ADDITIONAL REQUIREMENTS OF SPECIFICATIONS.
2. REVIEW OF SUBMITTALS BY THE STRUCTURAL ENGINEER IS FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT AS PRESENTED BY THE CONTRACT DOCUMENTS. NO DETAILED CHECK OF QUANTITIES OR DIMENSIONS WILL BE MADE. ONLY THOSE SHOP DRAWINGS REQUIRED BY THE CONTRACT DOCUMENTS TO BE SUBMITTED WILL BE REVIEWED. ALL OTHERS WILL BE RETURNED WITHOUT COMMENT.
3. IN ACCORDANCE WITH THE SPECIFICATIONS, SUBMIT A COPY OF THE SHOP DRAWING SUBMITTAL REGISTER TO THE STRUCTURAL ENGINEER, SHOWING DATES OF SUBMITTAL FOR EACH SPECIFIC STRUCTURAL SECTION OF THE WORK, CONSISTENT WITH THE FOLLOWING CRITERIA:
   A. ALLOW ADEQUATE TIME FOR TRANSIT AND PROCESSING BEFORE FABRICATION. THE STRUCTURAL ENGINEER WILL REVIEW AN AVERAGE SUBMITTAL WITHIN 10 WORKING DAYS OF RECEIPT BY THEM.
   B. SCHEDULE AND SUBMIT SHOP DRAWINGS FOR SPECIFIC COMPONENTS, SUCH AS COLUMNS FOOTINGS, ETC., IN THEIR ENTIRETY. SHOP DRAWINGS FOR SIMILAR FLOORS SHALL BE SUBMITTED IN THE SAME PACKAGE.
   C. SUBMIT SHOP DRAWINGS IN A TIMELY MANNER, CONSISTENT WITH THE ABOVE REQUIREMENTS.
4. ALL CHANGES AND ADDITIONS MADE ON RESUBMITTALS MUST BE CLEARLY FLAGGED AND NOTED. THE PURPOSE OF THE RESUBMITTALS MUST BE CLEARLY NOTED ON THE LETTER OF TRANSMITTAL. ARCHITECT / ENGINEER REVIEW WILL BE LIMITED TO THE ITEMS CAUSING THE RESUBMITTAL.
5. DO NOT REPRODUCE THE CONTRACT DOCUMENTS FOR USE AS SHOP DRAWINGS.
6. SHOP DRAWINGS NOT MEETING THE ABOVE CRITERIA OR SUBMITTED AFTER FABRICATION WILL NOT BE REVIEWED AND WILL BE RETURNED WITHOUT COMMENT.
7. RESPONSIBILITIES OF DETAILERS AND FABRICATORS;
   A. GENERAL - SUBMIT SHOP DRAWINGS AND ANY OTHER SPECIAL INFORMATION NECESSARY FOR PROPER FABRICATION, ERECTION, AND PLACEMENT OF STRUCTURAL FABRICATIONS. INCLUDE PLANS, ELEVATIONS, AND SECTIONS. CLEARLY SHOW ANCHORAGES, CONNECTIONS, AND ACCESSORY ITEMS.THE DETAILER MUST INTERPRET THE CONTRACT DOCUMENTS AND CLEARLY CONVEY THIS INTERPRETATION TO THE FIELD IN THE FORM OF PLACING OR ERECTION DRAWINGS.
   B. CONCRETE REINFORCING DETAILER - PROVIDE PLACING DRAWINGS FOR FABRICATION AND PLACING OF REINFORCING STEEL. THESE DRAWINGS SHALL INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING: BAR LISTS, SCHEDULES, BENDING DETAILS, PLACING DETAILS, PLACING PLANS, AND PLACING ELEVATIONS.
      - CLEARLY SHOW ELEVATIONS OF ALL FOUNDATION WALLS. INDICATE CONTROL JOINTS, EXPANSION JOINTS, LINTELS, CONCRETE BOND BEAMS, AND OPENINGS, DETAILS OF ALL REINFORCING WITH LOCATIONS OF SPLICES, AND HOOKS, PILASTERS.
      - CLEARLY SHOW GRADE BEAM ELEVATIONS AND SECTIONS. INDICATE BAR LENGTHS, HOOKS, STIRRUP SPACING, LAP SPLICES, OFFSETS, AND LOCATION OF BARS WITH RESPECT TO ALL SUPPORTS.
      - CLEARLY SHOW COLUMN ELEVATIONS AND SECTIONS. INDICATE DOWELS, OFFSETS, LAP SPLICES, AND TIES. PLAN SECTIONS OF ALL COLUMNS MUST CLEARLY BE SHOWN.
      - CLEARLY SHOW FOUNDATION REINFORCING. INDICATE BAR LENGTHS, LOCATION AND SPLICES OF CONTINUOUS BARS, AND BAR SUPPORTS.
      - CLEARLY SHOW LOCATIONS OF ALL DOWELS ON PLAN. INDICATE FOOTING STEP LOCATIONS AND PROVIDE DETAILS.
8. FOR ADDITIONAL CRITERIA APPLICABLE TO SHOP DRAWINGS REQUIRING ENGINEERING INPUT BY A SPECIALTY ENGINEER, SEE BELOW

SHOP DRAWINGS REQUIRING ENGINEERING INPUT BY SPECIALTLY ENGINEER:

1. SPECIALTY ENGINEER:
   A. DEFINITION - A FLORIDA REGISTERED PROFESSIONAL ENGINEER WHO SPECIALIZES IN AND WHO UNDERTAKES THE DESIGN OF STRUCTURAL COMPONENTS OR STRUCTURAL SYSTEMS INCLUDED IN A SPECIFIC SUBMITTAL PREPARED FOR THIS PROJECT.
   B. SHALL BE:
      1. AN EMPLOYEE OR OFFICER OF A FABRICATOR.
      2. AN EMPLOYEE OR OFFICER OF AN ENTITY SUPPLYING COMPONENTS TO A FABRICATOR.
      3. AN INDEPENDENT CONSULTANT RETAINED BY THE FABRICATOR OR HIS SUPPLIER.
2. THE FOLLOWING SYSTEMS AND COMPONENTS AS A MINIMUM REQUIRE FABRICATION AND ERECTION DRAWINGS WITH INPUT BY A SPECIALTY ENGINEER. PRE-ENGINEERED STEEL BUIDING AND ROOF COMPONENTS
3. THE SPECIALTY ENGINEER OR MANUFACTURER SHALL DESIGN, PROVIDE, AND INSTALL THEIR COMPONENTS AND THE COMPONENT CONNECTIONS TO THE PRIMARY STRUCTURE PER THE WIND CRITERIA STATED IN GENERAL NOTE 14 OR THE CURRENT GOVERNING BUILDING CODES, WHICHEVER IS MORE STRINGENT.
4. SUBMITTALS SHALL CLEARLY IDENTIFY THE SPECIFIC PROJECT AND APPLICABLE CODES, LIST THE DESIGN CRITERIA, AND SHOW ALL DETAILS AND PLANS NECESSARY FOR PROPER FABRICATION AND INSTALLATION. CALCULATIONS AND SHOP DRAWINGS SHALL IDENTIFY SPECIFIC PRODUCT UTILIZED. GENERIC PRODUCTS WILL NOT BE ACCEPTED.
5. SHOP DRAWINGS AND CALCULATIONS MUST BE PREPARED UNDER THE DIRECT SUPERVISION AND CONTROL OF THE SPECIALTY ENGINEER.
6. SHOP DRAWINGS AND CALCULATIONS REQUIRE THE EMBOSSED OR PRINTED SEAL, DATE AND SIGNATURE OF THE SPECIALTY ENGINEER. COMPUTER PRINTOUTS ARE AN ACCEPTABLE SUBSTITUTE FOR MANUAL COMPUTATIONS PROVIDED THEY ARE ACCOMPANIED BY SUFFICIENT DESCRIPTIVE INFORMATION TO PERMIT THEIR PROPER E VALUATION. SUCH DESCRIPTIVE INFORMATION SHALL BEAR THE EMBOSSED SEAL AND SIGNATURE OF THE SPECIALTY ENGINEER AS AN INDICATION THAT HE HAS ACCEPTED RESPONSIBILITY FOR THE RESULTS. THE STRUCTURAL ENGINEER WILL RETAIN ONE SIGNED AND SEALED SET FOR RECORD.
7. CATALOG INFORMATION ON STANDARD PRODUCTS DOES NOT REQUIRE THE SEAL OF A SPECIALTY ENGINEER.
8. REVIEW BY THE STRUCTURAL ENGINEER OF RECORD OF SUBMITTALS IS LIMITED TO VERIFYING THE FOLLOWING:
   A. THAT THE SPECIFIED STRUCTURAL SUBMITTALS HAVE BEEN FURNISHHED.
   B. THAT THE STRUCTURAL SUBMITTALS HAVE BEEN SIGNED AND SEALED BY THE SPECIALTY ENGINEER.
   C. THAT THE SPECIALTY ENGINEER HAS UNDERSTOOD THE DESIGN INTENT AND HAS USED THE SPECIFIED STRUCTURAL CRITERIA. (NO DETAILED CHECK OF CALCULATIONS WILL BE MADE.)
   D. THAT THE CONFIGURATION SET FORTH IN THE STRUCTURAL SUBMITTALS IS CONSISTENT WITH THE CONTRACT DOCUMENTS. (NO DETAILED CHECK OF DIMENSIONS OR QUANTITIES WILL BE MADE.)
9. A LIST SHALL BE PREPARED AND MAINTAINED BY THE CONTRACTOR FOR ALL SHOP DRAWINGS REQUIRING PARTICIPATION OF A SPECIALTY ENGINEER. THE LIST SHALL CONTAIN PROJECT NAME, NAME OF CONTRACTOR, NAME OF SUBCONTRACTOR, NAME OF SPECIALTY ENGINEER, DRAWING NUMBER, DRAWING TITLE AND THE LATEST REVISION NUMBER AND DATE. FOR PARTIAL SUBMITTALS, THE LIST SHALL CONTAIN ALL ANTICIPATED DRAWING NUMBERS AND TITLES REQUIRED TO COMPLETE THE CONTRACT. THE CONTRACTOR IS RESPONSIBLE FOR SUBMITTING THE LATEST UPDATED LIST OF DRAWINGS WITH EACH SUBMITTAL.
10. SUBMITTALS NOT MEETING THE ABOVE CRITERIA WILL NOT BE REVIEWED AND WILL BE RETURNED TO C ONTRACTOR MARKED REVISE AND RESUBMIT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DELAYS WHICH MAY RESULT.

REINFORCED CONCRETE:

1. USE STRUCTURAL CONCRETE AND CONCRETING PRACTICES CONFORMING TO ACI-316 AND 301 AND PROPORTION CONCRETE IN ACCORDANCE WITH ACI-318 CH. 4 AND MEETING A MIN. ULTIMATE COMPRESSIVE STRENGTH IN 28 DAYS AS FOLLOWS:

FOOTING	3000 PSI
GRADE BEAMS	3000 PSI

   PROVIDE CURRENT (MAX. 1 YEAR OLD) STATISTICAL DATA FOR EACH CONCRETE IX DESIGN SUBMITTED.
2. WHERE CONCENTRATION OF REINFORCING STEEL HINDERS PROPER CONSOLIDATION OF CONCRETE USE CONCRETE CONTAINING A SUPERPLASTICIZING (N.R.W.R.) ADMIXTURE, ASTM C494 TYPE F. SLUMP AFTER ADDITION OF SUPERPLASTICIZER SHALL BE 7"±1".
3. IF CONCRETE IS PUMPED, SLUMP MAY BE INCREASED TO 6" AT THE TRUCK, PROVIDED THE SLUMP SPECIFIED IN NOTE 2 IS MAINTAINED AT THE DISCHARGE END. USE A MINIMUM 4-INCH PUMP, UNLESS PRE-APPROVED BY ARCHITECT. TAKE CONCRETE SAMPLES FOR SLUMP AT TRUCK AND AT DISCHARGE END. TAKE CONCRETE SAMPLES FOR CYLINDER TESTING AT DISCHARGE END.
4. USE ASTM A-615 GR. 60 FOR ALL REINFORCING STEEL, CONFORM TO ACI-301, ACI-315,ACI-318, AND CRSI "MANUAL OF STANDARD PRACTICE". ALL REINFORCING SHALL BE ACCURATELY PLACED, RIGIDLY SUPPORTED AND FIRMLY TIED IN PLACE WITH BAR SUPPORTS AND SPACERS IN ACCORDANCE WITH THE ABOVE REQUIREMENTS. PROVIDE CLASS 'B' LAP SPLICE FOR CONTINUOUS BARS, U.O.N. LAP BOTTOM STEEL OVER SUPPORTS AND TOP STEEL AT MIDSPAN UNLESS OTHERWISE SPECIFIED. HOOK DISCONTINUOUS ENDS OF ALL TOP BARS AND ALL BARS IN WALLS U.O.N. USE 1" COVER OVER REINFORCING EXCEPT AS FOLLOWS:

	BOTTOM	TOP	SIDES
FOOTING/PILECAP	3"	2"	3"

5. USE PLAIN COLD-DRAWN ELECTRICALLY-WELDED STEEL WIRE FABRIC CONFORMING TO ASTM A 185. SUPPLY IN FLAT SHEETS ONLY. LAP SPLICES SHALL BE MEASURED BETWEEN THE OUTERMOST CROSS WIRES OF EACH FABRIC SHEET AND SHALL BE NOT LESS THAN TWICE THE SPACING OF THE CROSS WIRES PLUS 2".
6. SLEEVE ALL PIPES THROUGH SLABS INDIVIDUALLY, UNLESS APPROVED BY THE ENGINEER. WHERE PIPES OR DUCTS PENETRATE THE SLAB, A MAXIMUM OF TWO SLAB BARS MAY BE CUT PROVIDED THEY ARE #5 BARS OR SMALLER, PROVIDED SPLICED BARS ARE PLACED ALONGSIDE THE OPENING IN EACH DIRECTION WITH A 36 BAR DIAMETER SPLICE AT THE END OF EACH CUT BAR. SPLICE BARS SHALL HAVE THE EQUIVALENT CROSS-SECTIONAL AREA AS THE CUT BARS. FOR OPENINGS LARGER THAN 6" NOT SHOWN ON THE STRUCTURAL DRAWINGS SUBMIT SHOP DRAWINGS SHOWING SIZE AND LOCATION FOR THE ENGINEER'S REVIEW. PROVIDE (1) # 5x6'-0" EACH WAY DIAGONALLY AT CORNERS OF ALL OPENINGS LARGER THAN 12", UNLESS OTHERWISE NOTED.

STRUCTURAL STEEL:

1. ALL STEEL WORK (INCLUDING FABRICATION AND ERECTION) SHALL CONFORM TO THE AISC MANUAL OF STEEL CONSTRUCTION 9TH EDITION AND PROJECT SPECIFICATIONS. USE THE FOLLOWING:
   A. ROLLED SHAPES, PLATES, AND BARS: ASTM A992 50 KSI.
   B. COLD-FORMED STEEL TUBING: ASTM A500, GRADE B.
   C. HOT-FORMED STEEL TUBING: ASTM A501.
   D. STEEL PIPE: ASTM A3, TYPE E OR S, GRADE B.
2. USE STRUCTURAL STEEL THAT IS FULLY WELDABLE WITHIN GRADES AND FROM ANY GRADE TO ANY OTHER GRADE. WELD ALL SHOP CONNECTIONS, U.O.N.
3. ALL SHOP AND FIELD WELDING SHALL CONFORM TO THE STRUCTURAL WELDING CODE AWS D1.1, LATEST EDITION, PUBLISHED BY THE AMERICAN WELDING SOCIETY (AWS). USE ELECTRODES CONFORMING TO AWS D1.1, E70 SERIES, U.O.N. SHOW ALL SHOP WELDS ON THE FABRICATION DRAWINGS AND ALL FIELD WELDS ON THE ERECTION DRAWINGS.
4. ALL SHOP AND FIELD WELDERS, WELDING OPERATORS, AND TACKERS SHALL BE CERTIFIED ACCORDING TO AWS PROCEDURES FOR THE WELDING PROCESS AND WELDING POSITION USED. SUBMIT CERTIFICATES TO ARCHITECT/ENGINEER FOR THEIR RECORDS BEFORE BEGINNING WELDING.
5. ALL JOINT WELDING PROCEDURES TO BE USED SHALL BE PREPARED BY THE FABRICATOR OR CONTRACTOR AS WRITTEN PROCEDURE SPECIFICATIONS AND SUBMITTED TO THE ARCHITECT/ENGINEER FOR THEIR RECORD. ALL JOINT WELDING PROCEDURES SHALL BE QUALIFIED PRIOR TO USE ACCORDING TO AWS PROCEDURES. SUBMIT PROPERLY DOCUMENTED EVIDENCE OF QUALIFICATION TESTS TO ARCHITECT/ENGINEER FOR THEIR RECORDS.
6. A325 BOLTS:
   A. A325 BOLTS SHALL CONFORM TO ASTM A 325 TYPE 1, HIGH STRENGTH BOLTS FOR STRUCTURAL STEEL JOINTS. DO NOT USE TYPE 2 BOLTS.
   B. PROVIDE HARDENED WASHERS CONFORMING TO ASTM F 436. PLACE HARDENED WASHERS UNDER PART BEING TURNED.
   C. ALL BOLTS SHALL BE NEW AND DOMESTICALLY MANUFACTURED. DO NOT REUSE BOLTS. BOLTS AND NUTS SHALL BE WAX DIPPED BY THE BOLT SUPPLIER OR LUBRICATED WITH JOHNSON'S STICK WAX 140.
   D. BEARING-TYPE BOLTS (A-325N) SHALL BE TIGHTENED TO THE SNUG TIGHT CONDITIONS. THE SNUG TIGHT CONDITION IS DEFINED AS THE TIGHTNESS THAT EXISTS WHEN ALL PLIES IN A JOINT ARE IN FIRM CONTACT. THIS MAY BE ATTAINED BY A FEW IMPACTS OF AN IMPACT WRENCH OR THE FULL EFFORT OF A MAN USING AN ORDINARY SPUD WRENCH.
   E. SLIP CRITICAL TYPE BOLTS (A325SC) SHALL BE TIGHTENED TO THE MINIMUM FASTENER TENSION INDICATED IN SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A-325 OR ASTM A490 BOLTS, SECTION 5, TABLE 3. TENSION SHALL BE DETERMINED SOLELY BY USE OF DIRECT TENSION INDICATORS, COMPLYING WITH ASTM F959-85, OR "LOHR" TENSION CONTROL BOLTS. HARDENED WASHERS SHALL BE USED FOR FRICTION-TYPE BOLTS. PROVIDE ONLY DOMESTICALLY MANUFACTURED BOLTS AND D.T.I.'S FRICTION-TYPE BOLTED CONNECTIONS MAY BE INSTALLED.
7. CONNECTIONS NOT COMPLETELY DETAILED ON STRUCTURAL DRAWINGS SHALL BE DESIGNED AND DETAILED BY FABRICATOR'S SPECIALTY ENGINEER ACCORDING TO AISC SPECIFICATIONS AND THE SPECIFIED LOADS AND IN COMPLIANCE WITH APPLICABLE PARAGRAPHS OF THIS SECTION.
8. USE A-307 BOLTS FOR ERECTION BOLTS AND ANCHOR BOLTS OR WHEN SPECIFICALLY CALLED FOR ON THE DRAWINGS.
9. CUT, DRILL, OR PUNCH HOLES PERPENDICULAR TO METAL SURFACES. DO NOT FLAME CUT HOLES OR ENLARGE HOLES BY BURNING.
10. SPLICING OF STRUCTURAL STEEL MEMBERS IN THE FIELD OR IN THE SHOP IS PROHIBITED EXCEPT WHERE INCLUDED ON THE DRAWINGS.
11. ALL EXTERIOR STRUCTURAL PLATES ANGLES AND EXTERIOR BEAMS SHALL BE HOT-DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A-153.
12. REFER TO ARCHITECTURAL PLANS FOR FIREPROOFING OF STRUCTURAL STEEL MEMBERS, REFER TO SPECIFICATIONS FOR PAINTING OF EXPOSED STRUCTURAL STEEL.
13. SUBMIT STRUCTURAL STEEL SHOP DRAWINGS TO ARCHITECT/ENGINEER FOR REVIEW BEFORE FABRICATION OF STRUCTURAL STEEL.
14. PROVIDE TEMPORARY BRACING AS NECESSARY TO INSURE A STABLE STRUCTURE DURING CONSTRUCTION.
15. DO NOT REPRODUCE THE STRUCTURAL DRAWINGS FOR USE AS SHOP DRAWINGS.
16. NO CUTTING OF SECTIONS, FLANGES, WEBS, OR ANGLES SHALL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE ENGINEER OF RECORD.

Wind Loads - MWFRS h≤60' (Low-rise Buildings) Enclosed/partially enclosed only

Kz = Kh (case 1) = 0.85 | Edge Strip (a) = 3.0 ft
Base pressure (qh) = **47.3 psf** | End Zone (2a) = 6.0 ft
GCpi = +/-0.18 | Zone 2 length = 15.0 ft

Ultimate Wind Surface Pressures (psf)

1	29.3	12.2		-12.8	-29.8
2	-24.1	-41.1		-24.1	-41.1
3	-10.5	-27.6		-9.0	-26.0
4	-7.2	-24.2		-12.8	-29.8
5				27.4	10.4
6				-5.2	-22.2
1E	40.0	23.0		-14.2	-31.2
2E	-42.1	-59.1		-42.1	-59.1
3E	-18.8	-35.8		-16.6	-33.6
4E	-14.8	-31.8		-14.2	-31.2
5E				37.4	20.3
6E				-11.8	-28.8

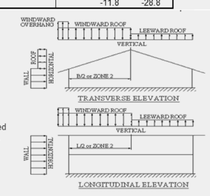
Horizontal MWFRS Simple Diaphragm Pressures (psf)

Transverse direction (normal to L)
Interior Zone: Wall 36.4 psf
Roof -13.6 psf **
End Zone: Wall 54.8 psf
Roof -23.3 psf **

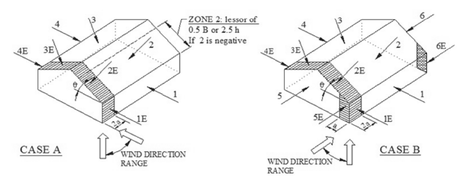
Longitudinal direction (parallel to L)
Interior Zone: Wall 32.6 psf
End Zone: Wall 49.2 psf

** NOTE: Total horiz force shall not be less than that determined by neglecting roof forces (except for MWFRS moment frames).

The code requires the MWFRS be designed for a min ultimate force of 16 psf multiplied by the wall area plus an 8 psf force applied to the vertical projection of the roof.



Location of MWFRS Wind Pressure Zones



NOTE: Torsional loads are 25% of zones 1 - 6. See code for loading diagram.

ASCE 7 -99 and ASCE 7-10 (& later)

Wind Loads - MWFRS h≤60' (Low-rise Buildings) Enclosed/partially enclosed only

Kz = Kh (case 1) = 0.85 | Edge Strip (a) = 3.0 ft
Base pressure (qh) = **47.3 psf** | End Zone (2a) = 6.0 ft
GCpi = +/-0.18 | Zone 2 length = 15.0 ft

Ultimate Wind Surface Pressures (psf)

1	29.3	12.2		-12.8	-29.8
2	-24.1	-41.1		-24.1	-41.1
3	-10.5	-27.6		-9.0	-26.0
4	-7.2	-24.2		-12.8	-29.8
5				27.4	10.4
6				-5.2	-22.2
1E	40.0	23.0		-14.2	-31.2
2E	-42.1	-59.1		-42.1	-59.1
3E	-18.8	-35.8		-16.6	-33.6
4E	-14.8	-31.8		-14.2	-31.2
5E				37.4	20.3
6E				-11.8	-28.8

Horizontal MWFRS Simple Diaphragm Pressures (psf)

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End Zone: Wall 49.2 psf

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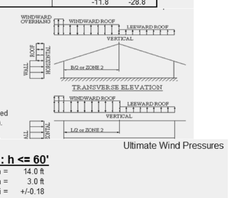
The code requires the MWFRS be designed for a min ultimate



Ultimate Wind Pressures

Wind Loads - Components & Cladding : h <= 60'

Kh (case 1) = 0.85 | h = 14.0 ft
Base pressure (qh) = **47.3 psf** | a = 3.0 ft
Minimum parapet ht = 0.0 ft | GCpi = +/-0.18
Roof Angle (θ) = 9.5 deg
Type of roof = Gable

Roof

Area	GCp +/- GCpi 10 sf	GCp +/- GCpi 50 sf	GCp +/- GCpi 100 sf	Surface Pressure (psf) 10 sf	Surface Pressure (psf) 50 sf	Surface Pressure (psf) 100 sf	User input 75 sf	User input 500 sf
Negative Zone 1	-1.08	-1.01	-0.98	-51.1	-47.8	-46.3	-46.9	-46.3
Negative Zone 2	1.88	1.63	1.38	88.9	72.4	65.3	68.2	66.3
Negative Zone 3	-2.78	-2.36	-2.18	-131.5	-111.6	-103.1	-106.6	-103.1
Positive All Zones	0.68	0.54	0.48	32.2	25.5	22.7	23.9	22.7
Overhang Zone 2	-2.20	-2.20	-2.20	-104.0	-104.0	-104.0	-104.0	-104.0
Overhang Zone 3	-3.70	-2.86	-2.50	-175.0	-135.3	-118.2	-125.3	-118.2

Overhang pressures in the table above assume an internal pressure coefficient (Gcpi) of 0.0
Overhang soffit pressure equals adjacent wall pressure reduced by internal pressure of 8.5 psf

Walls

Area	GCp +/- GCpi 10 sf	GCp +/- GCpi 100 sf	GCp +/- GCpi 500 sf	Surface Pressure (psf) 10 sf	Surface Pressure (psf) 100 sf	Surface Pressure (psf) 500 sf	User input 50 sf	User input 200 sf
Negative Zone 4	-1.17	-1.01	-0.90	-55.3	-47.8	-42.6	-50.1	-45.5
Negative Zone 5	-1.44	-1.12	-0.90	-68.1	-53.1	-42.6	-57.6	-48.5
Positive Zone 4 & 5	1.08	0.92	0.81	51.1	43.6	38.3	45.8	41.3

Note: GCp reduced by 10% due to roof angle <= 10 deg.

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TRANSFORMING TODAYS IDEAS INTO TOMORROW'S REALITY

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JDF ARCHITECTURE, LLC
201 HOLLYWOOD BLVD, NE
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

GENERAL NOTES

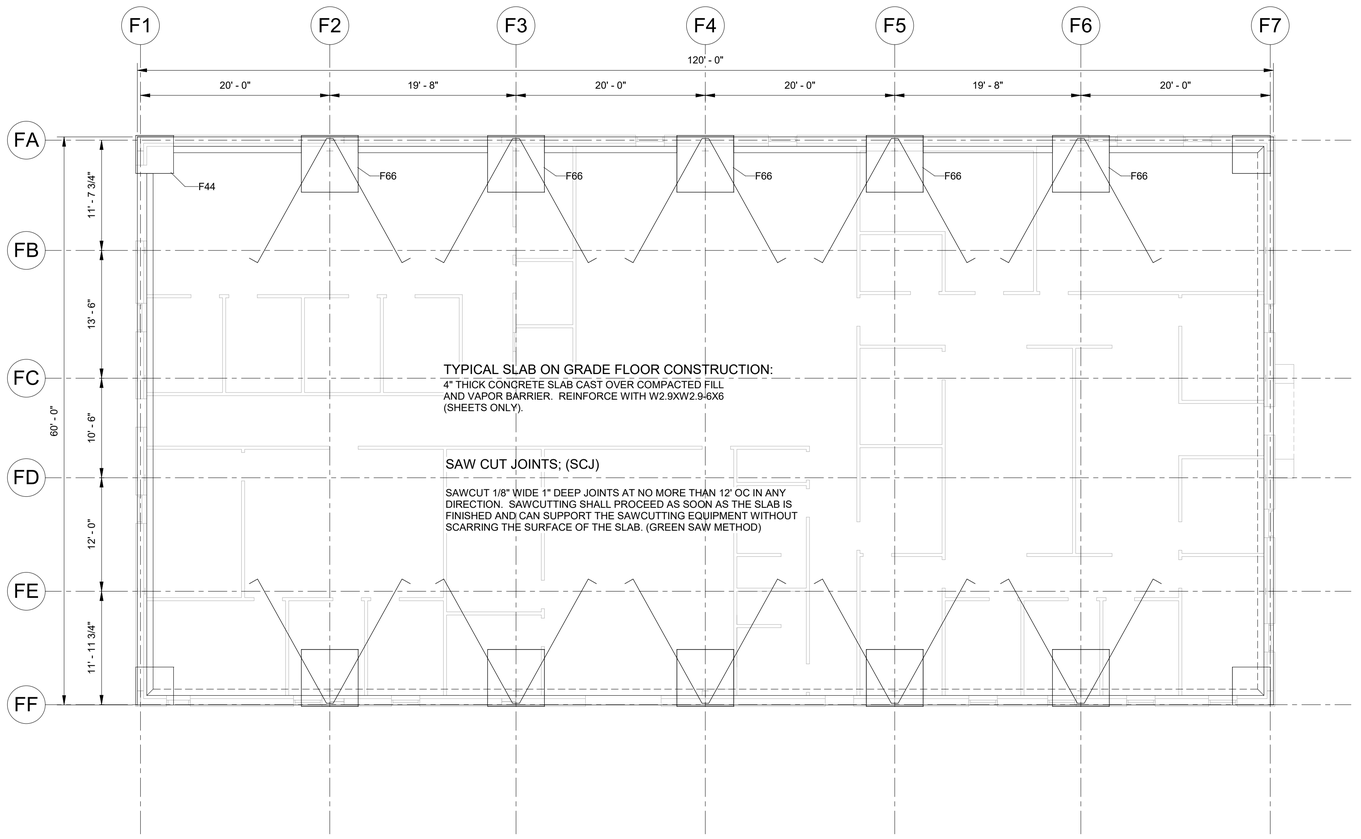
RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

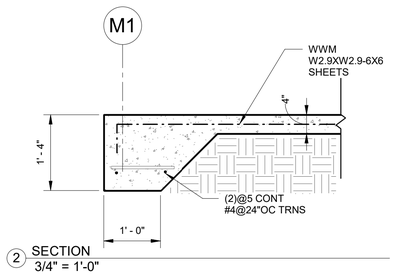
DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER

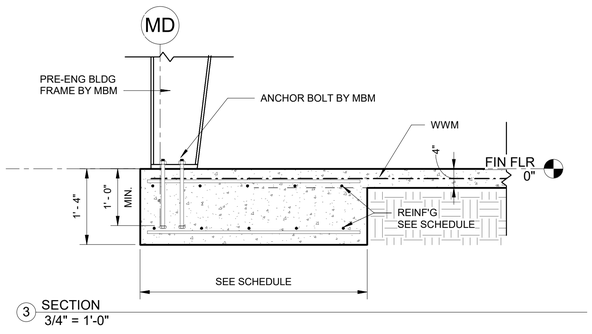
SF.0



1 FEILD OFFICE FOUNDATION PLAN
1/8" = 1'-0"



2 SECTION
3/4" = 1'-0"



3 SECTION
3/4" = 1'-0"

PRE-ENGINEERED STEEL BUILDING

1. CONTRACTOR SHALL SUPPLY THE FINAL REACTIONS TO THE ARCHITECT / ENGINEER FOR REVIEW AS SOON AS THEY BECOME AVAILABLE.

2. THE SHOP DRAWINGS SHALL INDICATE THE DIAMETER AND NUMBER OF ANCHOR BOLTS PER COLUMN. SEE THE CONTRACT DOCUMENTS FOR THE EMBEDMENT REQUIREMENTS.

FOOTING SCHEDULE:

FOOTING ID	SIZE	REINF'G	NOTES
GB-1	1'-4"X1-0" CONT.	SEE SECTION	RUN CONT BARS THRU FOOTING
F44	4'X4'X1'-4"	#5@10"OC E.W.T&B	
F66	6'X6'X1'-4"	#5@10"OC E.W.T&B	

ROGER ALLEN CRAFT
LICENSE
No. 23694
STATE OF FLORIDA
PROFESSIONAL ENGINEER

AVCON, INC.
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NO.	DATE	REVISION	BY

FOUNDATION
PLAN
SECTION &
NOTES
RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
SF.1

APPLICABLE CODES

BUILDING CODE	2017 FLORIDA BUILDING CODE 2017 FLORIDA PLUMBING CODE 2017 FLORIDA MECHANICAL CODE 2015 FLORIDA FIRE PREVENTION CODE 2012 NFPA 1 & NFPA 101

BUILDING AREA

GROSS SQUARE FOOTAGE:	7,200 SQUARE FEET
NET HEATED & COOLED SQUARE FOOTAGE:	6,560 SQUARE FEET

SITE INFORMATION

WIND LOAD:	160 MPH FASTEST MILE WIND LOAD
EXPOSURE:	EXPOSURE "B"
RISK CATEGORY:	IV
JURISDICTION:	OKALOOSA COUNTY

CODE ANALYSIS

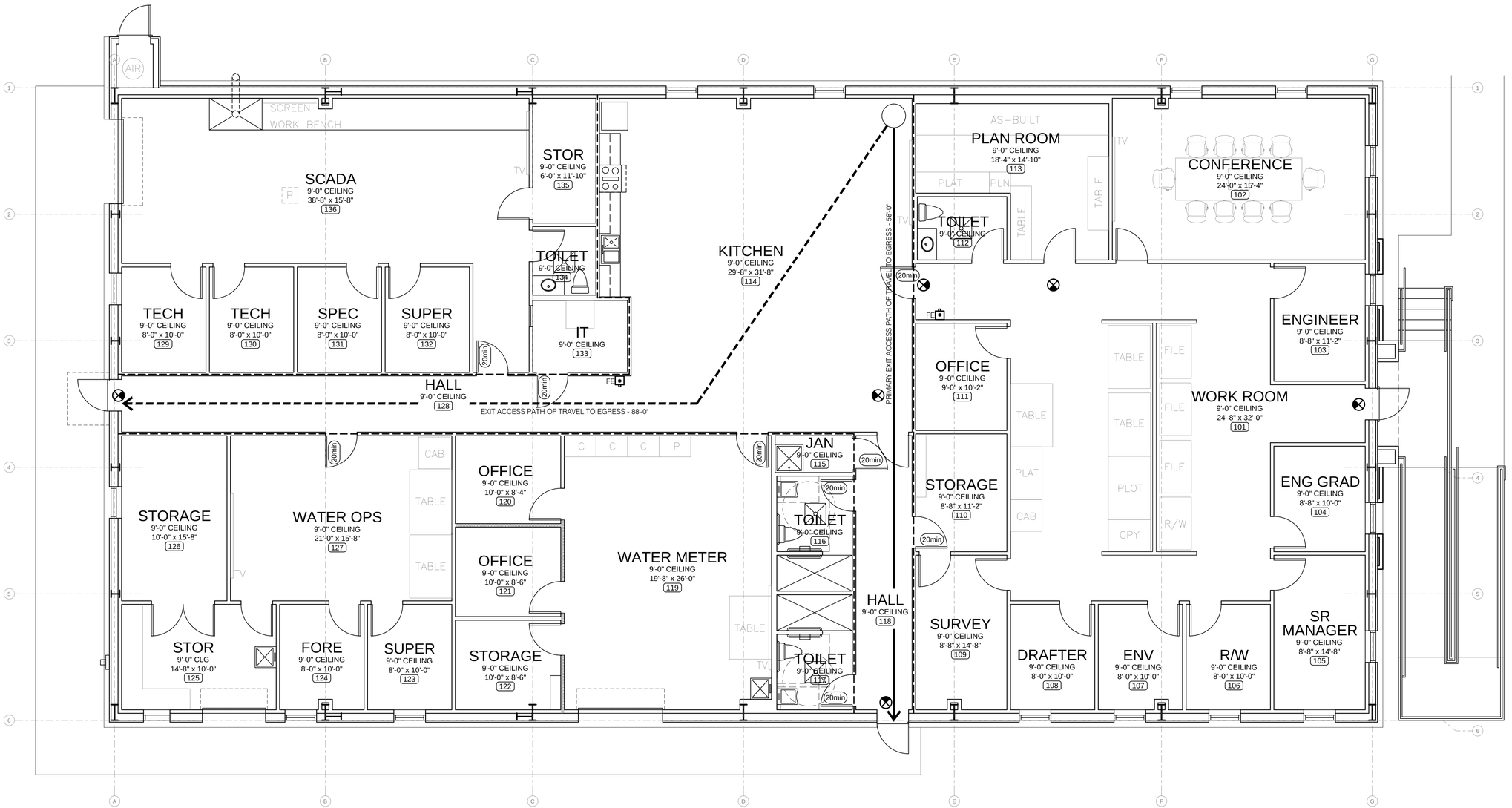
FLORIDA BUILDING CODE 2017

304	B - BUSINESS OCCUPANCY	
TABLE 504.3	TYPE II-B - 55' HEIGHT LIMIT	
TABLE 504.4	3 STORY	
TABLE 506.2	23,000 SF LIMIT	
	ACTUAL MAXIMUM HEIGHT = 24'-0"	
	ACTUAL NUMBER OF STORIES = 1	
TABLE 601	CONSTRUCTION TYPE	II-B
	STRUCTURAL FRAME =	0 HOURS
	BEARING WALLS - EXTERIOR =	0 HOURS
	BEARING WALLS - INTERIOR =	0 HOURS
	NON-BEARING WALLS =	0 HOURS
	FLOOR CONSTRUCTION =	0 HOURS
	ROOF CONSTRUCTION =	0 HOURS (NOT REQUIRED FOR ROOF CONSTRUCTION OVER 20' A.F.F.)
TABLE 602	PERIMETER WALLS GREATER THAN 10' and LESS THAN 30' FROM PROPERTY LINE REQUIRES NO FIRE RATING	
TABLE 803.11	NON-SPRINKLERED BUILDING	
	EXIT ENCLOSURES & EXIT PASSAGEWAYS:	CLASS A FINISH
	CORRIDORS:	CLASS B FINISH
	ROOMS & ENCLOSED SPACES:	CLASS C FINISH
903	AUTOMATIC SPRINKLER SYSTEM NOT REQUIRED BY CODE	
906	FIRE EXTINGUISHERS REQUIRED THROUGHOUT BUILDING	
907.2.2	MANUAL FIRE ALARM SYSTEM IS NOT REQUIRED	
CH. 10	OCCUPANT LOAD (BUSINESS) 72 OCC - TOTAL	

1005.1	EGRESS WIDTH:	
	OTHER COMPONENTS= 0.2"/PERSON	
TABLE 1006.2.1	COMMON PATH OF EGRESS TRAVEL: 75 FEET IN GROUP B	
1008	EMERGENCY LIGHTING IS REQUIRED	
1010	REQUIRED EGRESS DOORS WILL COMPLY WITH ADA	
1013	EXIT SIGNS REQUIRED ALONG THE EGRESS PATH	
TABLE 1017.2	EXIT ACCESS TRAVEL DISTANCE: 200FT. (B)	
CH. 11	ACCESSIBILITY:	
	PARKING	CLEAR FLOOR SPACE
	ACCESSIBLE PATH	ACCESSORY MOUNTING
	TACTILE SURFACES	HEIGHT
	THRESHOLD	ELEVATION
	CLEAR WIDTH	EMERGENCY LIGHTING
CH. 12	INTERIOR ENVIRONMENT- REFER TO MEP	
CH. 13	WILL COMPLY WITH FLORIDA ENERGY EFFICIENCY CODE	

LIFE SAFETY PLAN SYMBOLS LEGEND

- PRIMARY EXIT ACCESS PATH OF TRAVEL TO EGRESS
- SECONDARY EXIT ACCESS PATH OF TRAVEL TO EGRESS
- 1 HOUR FIRE RATED PARTITION (UL WALL ASSEMBLY U425)
- LOCATION OF EXIT SIGNS (COORDINATE W/ ELECTRICAL DRAWINGS)
- FE — FIRE EXTINGUISHER UNDER CABINET - 5lbs. (VERIFY LOCATIONS WITH LOCAL FIRE MARSHALL)



1 FIELD OFFICE LIFE SAFETY PLAN

SCALE: 3/16" = 1'-0"

3' 18" 0 3' 6'

05 MAY 20

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(850) 496-2166

NO.	DATE	REVISION	BY

LIFE SAFETY PLAN

RELEASE FOR BID

OCWS FIELD OFFICES

PREPARED FOR

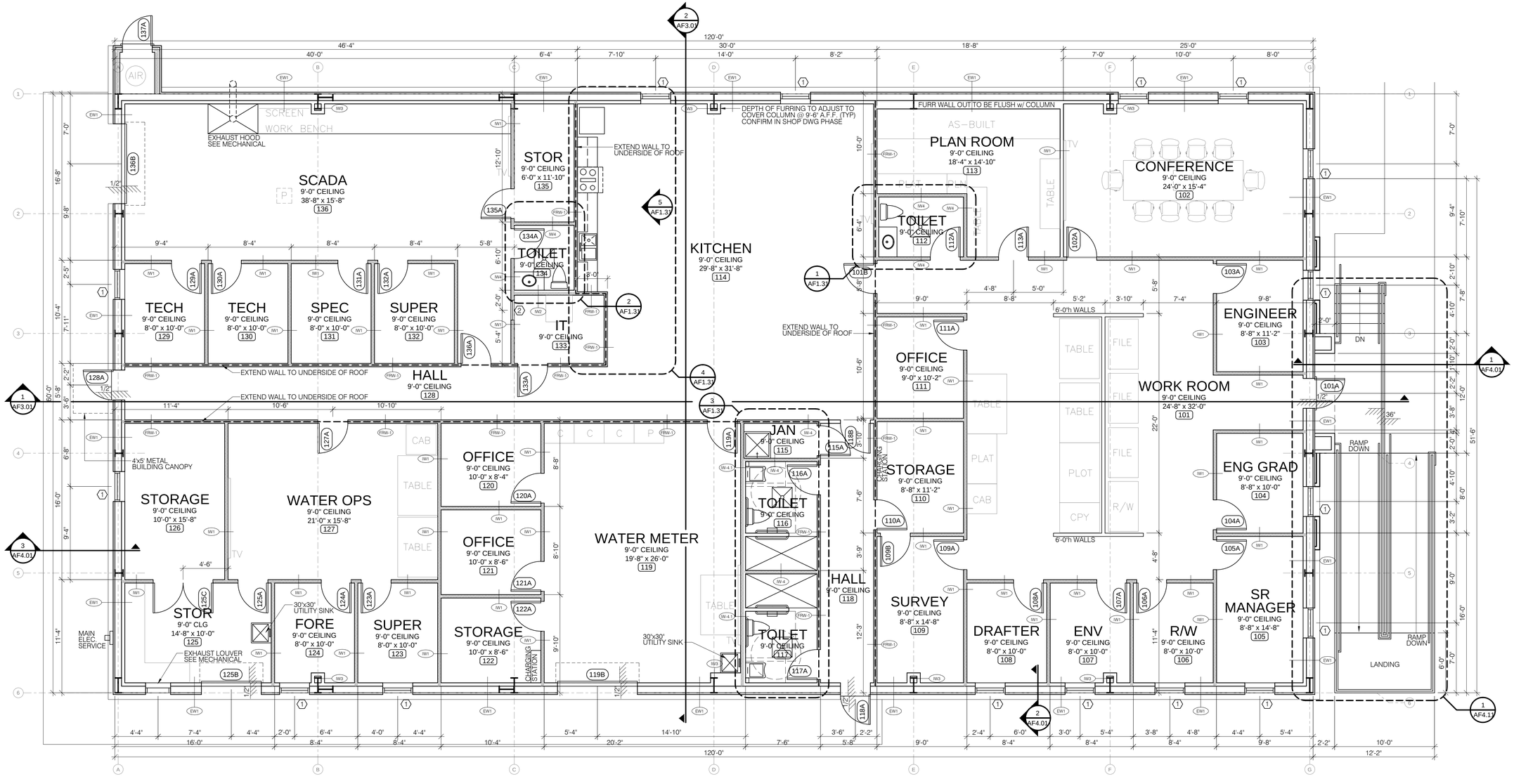
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER

AF1.01

C:\USERS_JDF ARCHITECTURE_DOCUMENTS_+ JDF ARCHITECTURE_1901A — OCWS FIELD OFFICES_03 — CONSTRUCTION DOCUMENTS_02 — DRAWINGS_A1.01 FO-LIFE SAFETY PLAN.DWG 10/8/2020 10:32 AM



1 FIELD OFFICE BUILDING FLOOR PLAN

SCALE: 3/16" = 1'-0"

05 MAY 20

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
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jdf+ architecture llc
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NO.	DATE	REVISION	BY

FLOOR PLAN

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY
WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
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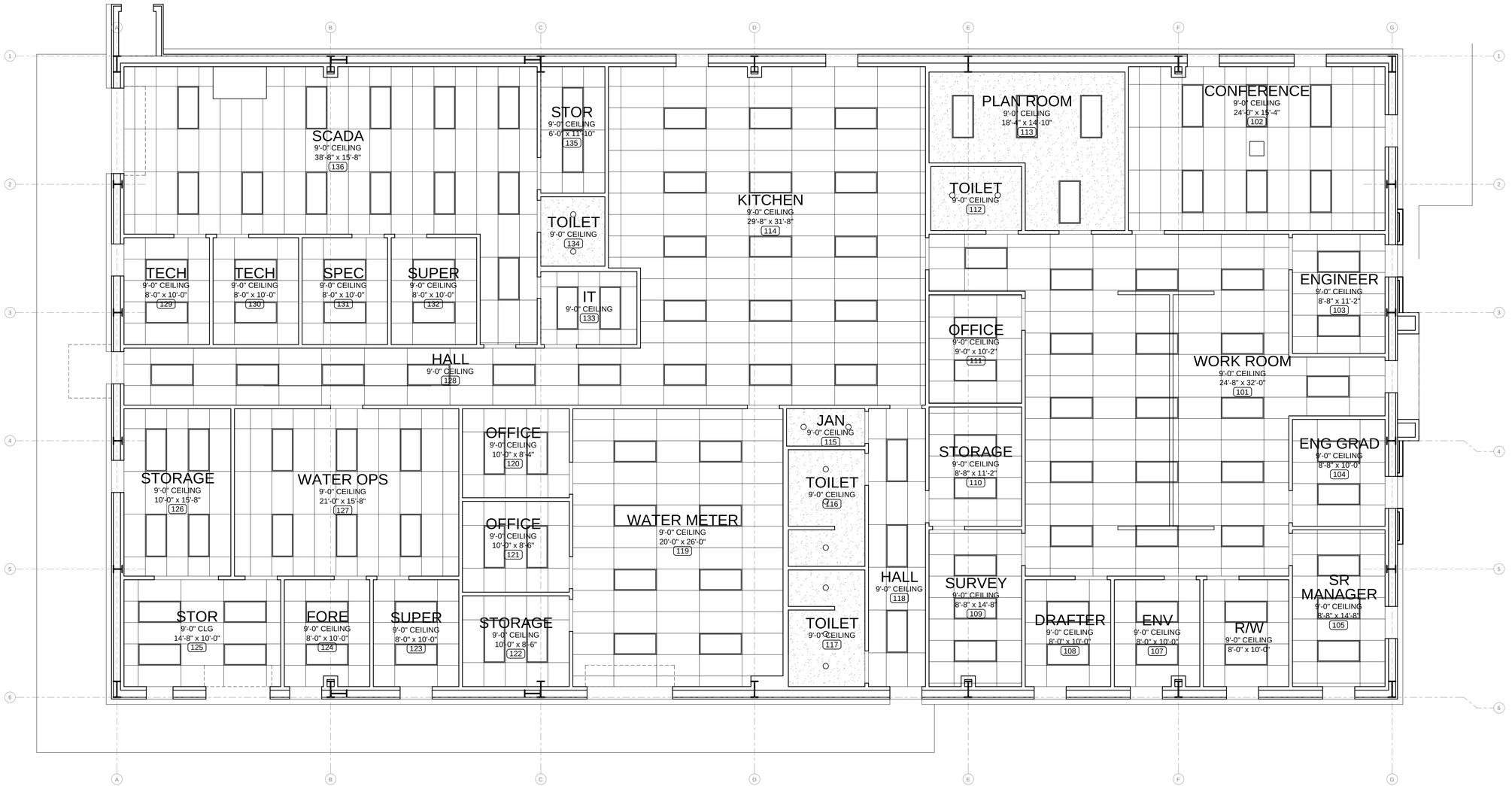
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
AF1.11



1 FIELD OFFICE REFLECTED CEILING PLAN

SCALE: 3/16" = 1'-0"

05 MAY 20

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

jdf+ architecture llc
JDF ARCHITECTURE, LLC
201 HOLLYWOOD BLVD, NE
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

REFLECTED CEILING PLAN

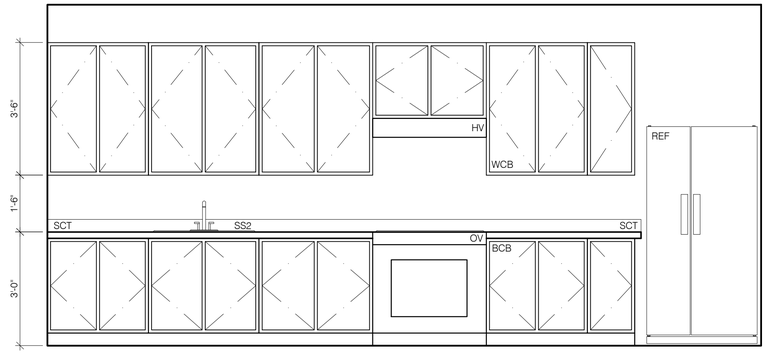
RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

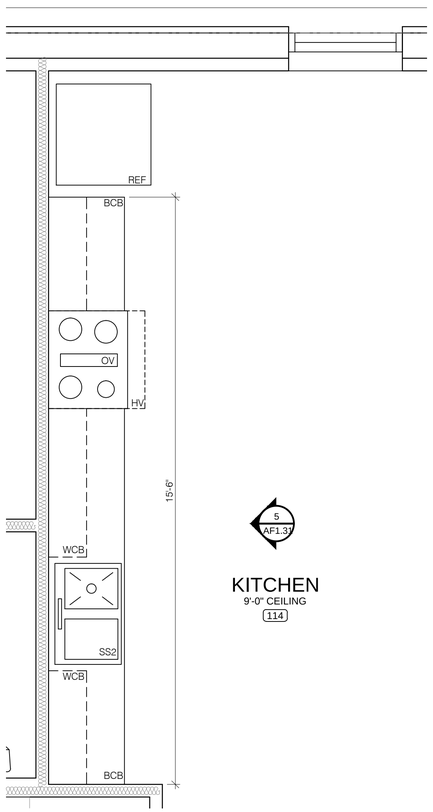
SHEET NUMBER
AF1.21

C:\USERS\JDF ARCHITECTURE\DOCUMENTS\ - JDF ARCHITECTURE\1901A - OCWS FIELD OFFICES\03 CONSTRUCTION DOCUMENTS\02 DRAWINGS\AF1.21 TO-REFLECTED CEILING PLAN.DWG 10/8/2020 10:32 AM



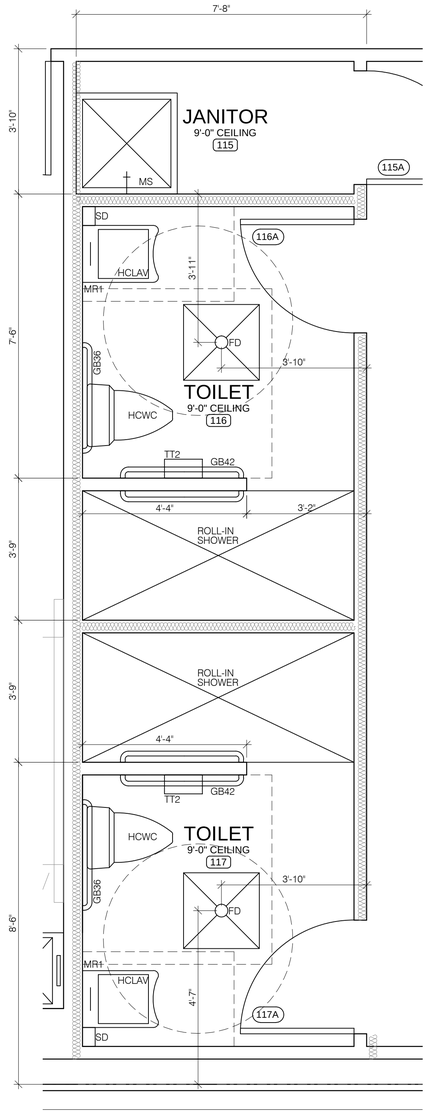
5 INTERIOR ELEVATION

SCALE: 1/2" = 1'-0"



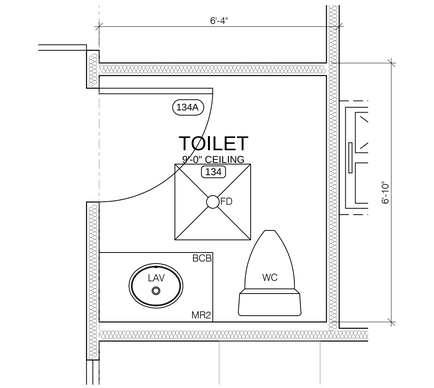
4 ENLARGED RESTROOM

SCALE: 1/2" = 1'-0"



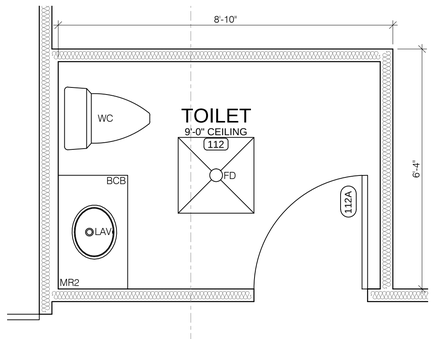
3 ENLARGED RESTROOM

SCALE: 1/2" = 1'-0"



2 ENLARGED TOILET ROOM

SCALE: 1/2" = 1'-0"



1 ENLARGED TOILET ROOM

SCALE: 1/2" = 1'-0"

ACCESSORIES

BCB	BASE CABINETS
DF	DRINKING FOUNTAIN
FD	FLOOR DRAIN
GB36	36" ADA HORIZONTAL GRAB BAR
GB42	42" ADA HORIZONTAL GRAB BAR
HCDF	ADA DRINKING FOUNTAIN
HCLAV	ADA WALL MOUNTED SINK
HCWC	ADA WATER CLOSET; FLOOR MOUNTED
HV	HOOD VENT (REF MECHANICAL)
LAV	LAVATORY
MR1	FRAMED MIRROR (1'-6"wX3'h)
MR2	FRAMED MIRROR (3'-0"wX3'h)
MS	MOP SINK (30"X30")
OV	RANGE w/ OVEN
REF	REFRIGERATOR
SCT	SOLID SURFACE COUNTER TOP
SD	SOAP DISPENSER
SWR	ROLL-IN SHOWER
SS2	STAINLESS STEEL SINK (2 BOWL)
TT2	DOUBLE TOILET TUSSUE DISPENSER
VEND	VENDING MACHINE
WC	WATER CLOSET
WCB	WALL CABINETS

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NO.	DATE	REVISION	BY

FLOOR PLAN

RELEASE FOR BID

OCWS FIELD OFFICES

PREPARED FOR

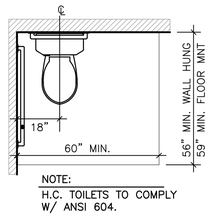
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

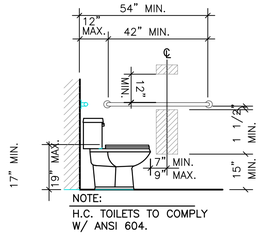
SHEET NUMBER

AF1.31

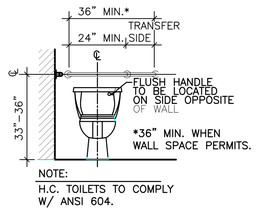
STANDARD CLEARANCES and MOUNTING HEIGHTS



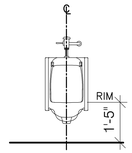
1 H.C. TOILET LOCATION & CLEARANCE ANSI FIG. 604.2 & 604.3.1
SCALE: 3/8"= 1'-0"



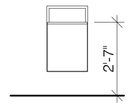
2 SIDE WALL GRAB BAR ANSI FIG. 604, 604.5.1 & 604.7 (A) & (B)
SCALE: 3/8"= 1'-0"



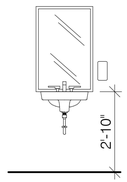
3 REAR GRAB BAR ANSI 604.5.2
SCALE: 3/8"= 1'-0"



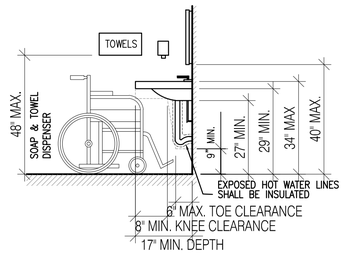
4 H.C. URINAL
SCALE: 3/8"= 1'-0"



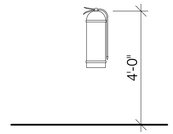
5 PAPER/TRASH DISPOSAL
SCALE: 3/8"= 1'-0"



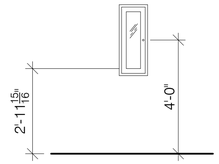
6 H.C. LAV & MIRROR
SCALE: 3/8"= 1'-0"



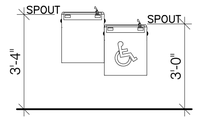
7 LAV MOUNTING HEIGHTS
SCALE: 3/8"= 1'-0"



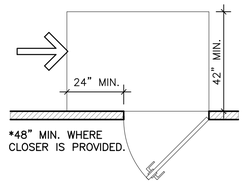
8 FIRE EXT. BRACKET
SCALE: 3/8"= 1'-0"



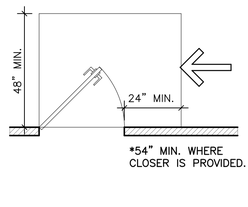
9 FIRE EXT. CABINET
SCALE: 3/8"= 1'-0"



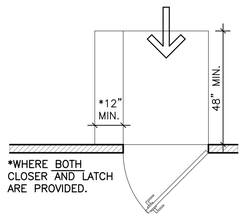
10 H.C. WATER FOUNTAIN
SCALE: 3/8"= 1'-0"



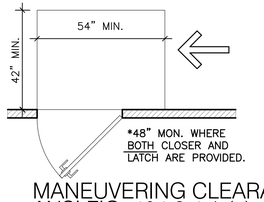
11 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (g)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ LATCH APPROACH, PUSH SIDE.



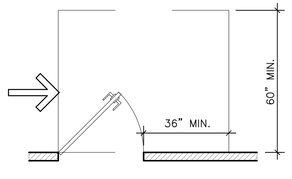
12 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (f)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ LATCH APPROACH, PULL SIDE.



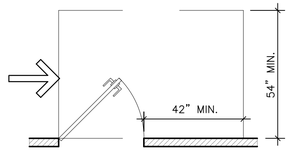
13 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (b)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ FRONT APPROACH, PUSH SIDE.



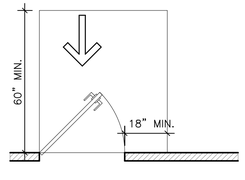
14 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (e)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ HINGE APPROACH, PUSH SIDE.



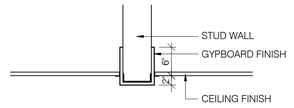
15 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (c)
SCALE: 3/8"= 1'-0"SWINGING DOOR W/ HINGE APPROACH, PULL SIDE.



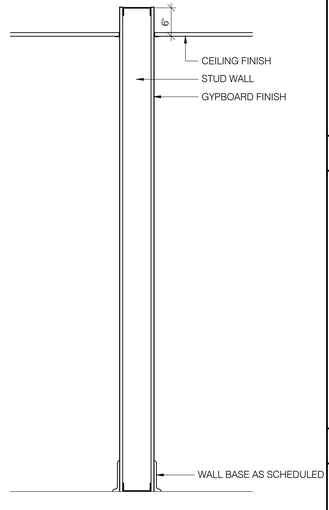
16 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (d)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ HINGE APPROACH, PULL SIDE.



17 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (a)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ FRONT APPROACH, PULL SIDE.



2 TYPICAL HEADER DETAIL
SCALE: 3/4" = 1'-0"



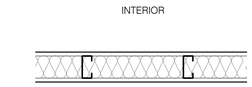
1 TYPICAL WALL DETAIL
SCALE: 3/4" = 1'-0"

WALL TYPE NOTES

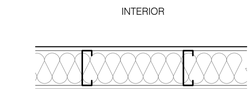
1. SEE FLOOR PLANS FOR WALL INSULATION LOCATIONS
2. SEE PARTITION TYPES FOR REQUIRED WALL INSULATION.
3. PROVIDE CEMENT BACKER BOARD FOR ALL WALL TILE INSTALLATION.
4. LOCATE ALL FIRE EXTINGUISHERS PER CODE.
5. USE 5/8" GYP BOARD ON ALL INTERIOR WALLS PARTITIONS.
6. PROVIDE CONTINIOUS FIBERGLASS PAPER BACKED INSULATION & SEALANT FOR ALL BATHROOM AND PLUMBING WALLS AND ABOVE CEILINGS WHERE PLUMBING AND FANS OCCUR. (SEE FLOOR PLANS FOR LOCATIONS)
7. USE 5/8" TYPE "X" DENSGLASS GOLD AS SUBSTRATE AT EXTERIOR WALLS AS REQUIRED (TYP)
8. ALL INTERIOR WALLS TO RECEIVE BASE BOARD AS SCHEDULED.

WALL TYPES

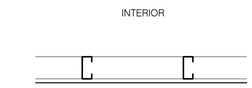
INTERIOR WALL TYPES



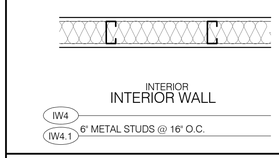
WALL TYPE IW1
1 LAYER 5/8" GYP. BOARD
3 5/8" METAL STUDS @ 16" O.C.
BATT INSULATION
1 LAYER 5/8" GYP. BOARD



WALL TYPE IW2
1 LAYER 5/8" GYP. BOARD
6" METAL STUDS @ 16" O.C.
BATT INSULATION
1 LAYER 5/8" GYP. BOARD

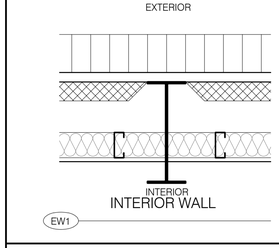


WALL TYPE IW3
3 5/8" METAL STUDS @ 16" O.C.
1 LAYER 5/8" GYP. BOARD



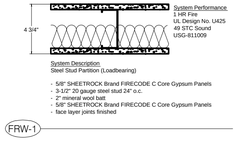
WALL TYPE IW4
1 LAYER 5/8" MOISTURE RESIST. GYP. BOARD
3 5/8" METAL STUDS @ 16" O.C.
BATT INSULATION
1 LAYER 5/8" MOISTURE RESIST. GYP. BOARD

EXTERIOR WALL TYPES



WALL TYPE EW1
BRICK BASE
EXTERIOR FINISH PANEL
METAL BUILDING EXTERIOR WALL INSULATION
8" METAL GIRT
3 5/8" METAL STUDS @ 16" O.C.
R-13 BATT INSULATION
1 LAYER 5/8" GYP. BOARD

FIRE RATED PARTITION - UL U425



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NO.	DATE	BY
	REVISION	

CLEARANCES and MOUNTING HEIGHTS, WALL TYPES & DETAILS

RELEASE FOR BID

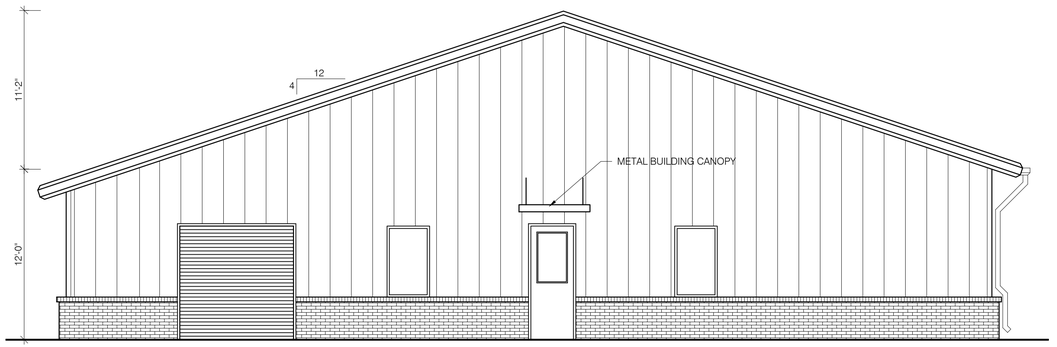
OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
AF1.41

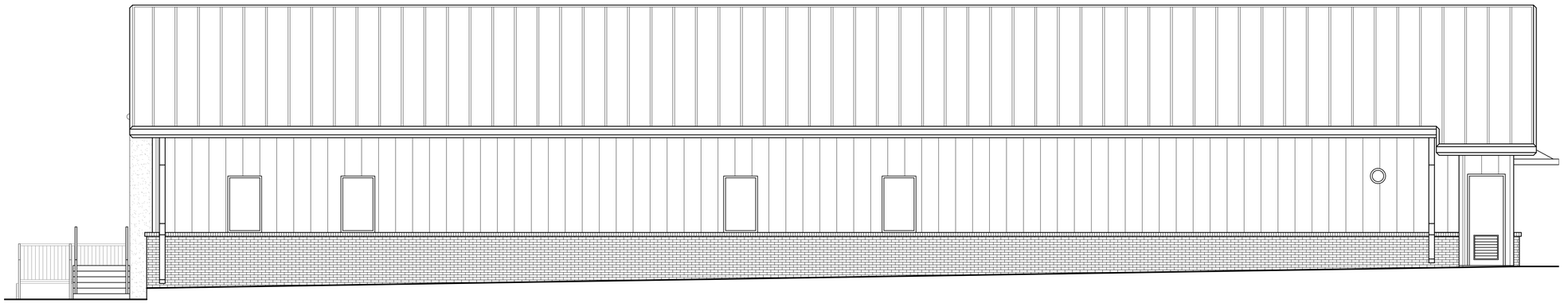
3 FIELD OFFICE SOUTH BUILDING ELEVATION

SCALE: 3/16" = 1'-0"



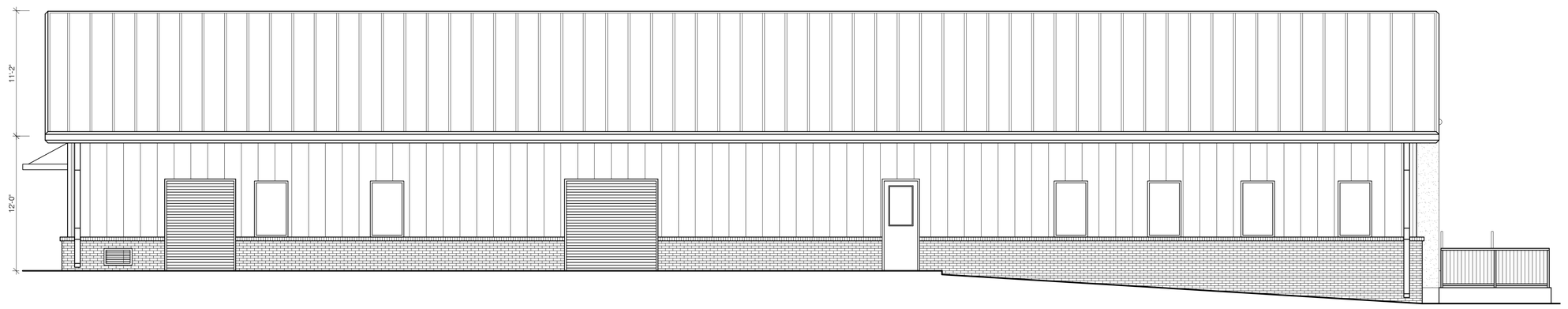
4 FIELD OFFICE NORTH BUILDING ELEVATION

SCALE: 3/16" = 1'-0"



2 FIELD OFFICE EAST BUILDING ELEVATION

SCALE: 3/16" = 1'-0"



1 FIELD OFFICE WEST BUILDING ELEVATION

SCALE: 3/16" = 1'-0"

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NO.	DATE	REVISION	BY

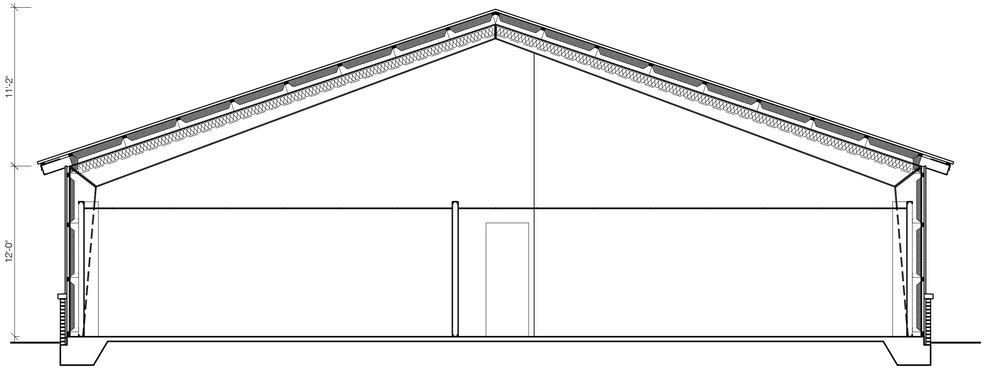
ELEVATIONS

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

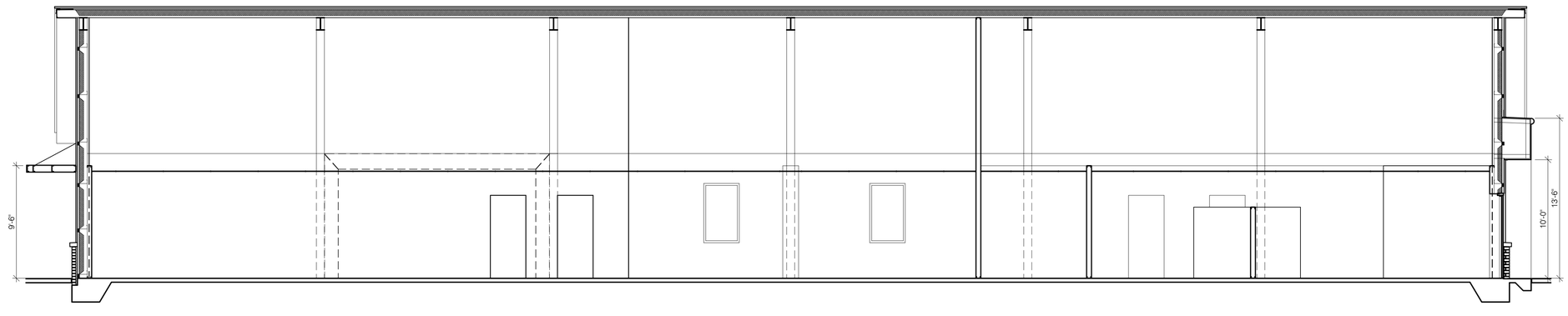
SHEET NUMBER
AF2.01



2 FIELD OFFICE BUILDING SECTION

SCALE: 3/16" = 1'-0"

3' 18" 0 3' 6'



1 FIELD OFFICE BUILDING SECTION

SCALE: 3/16" = 1'-0"

3' 18" 0 3' 6'

05 MAY 20

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NO.	DATE	REVISION	BY

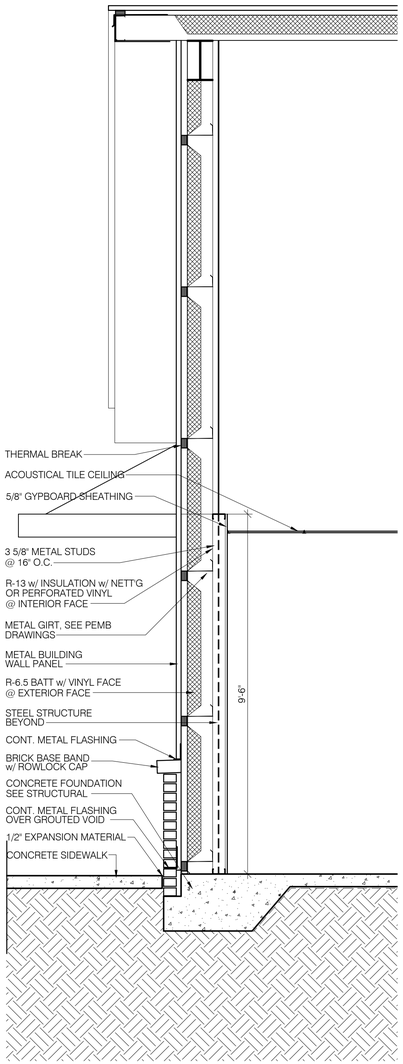
BUILDING SECTIONS

RELEASE FOR BID

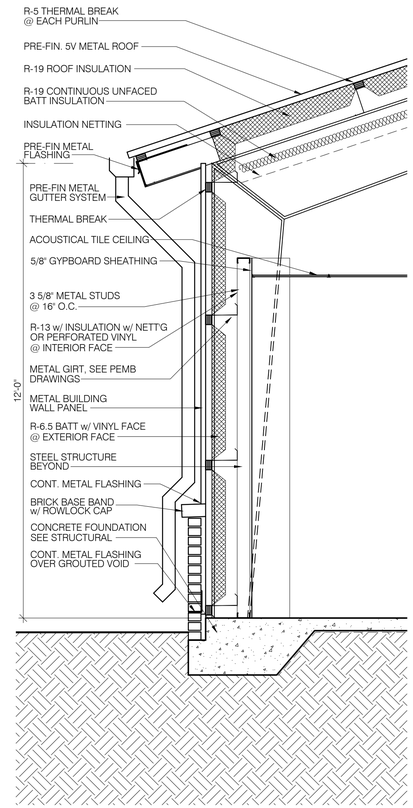
OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

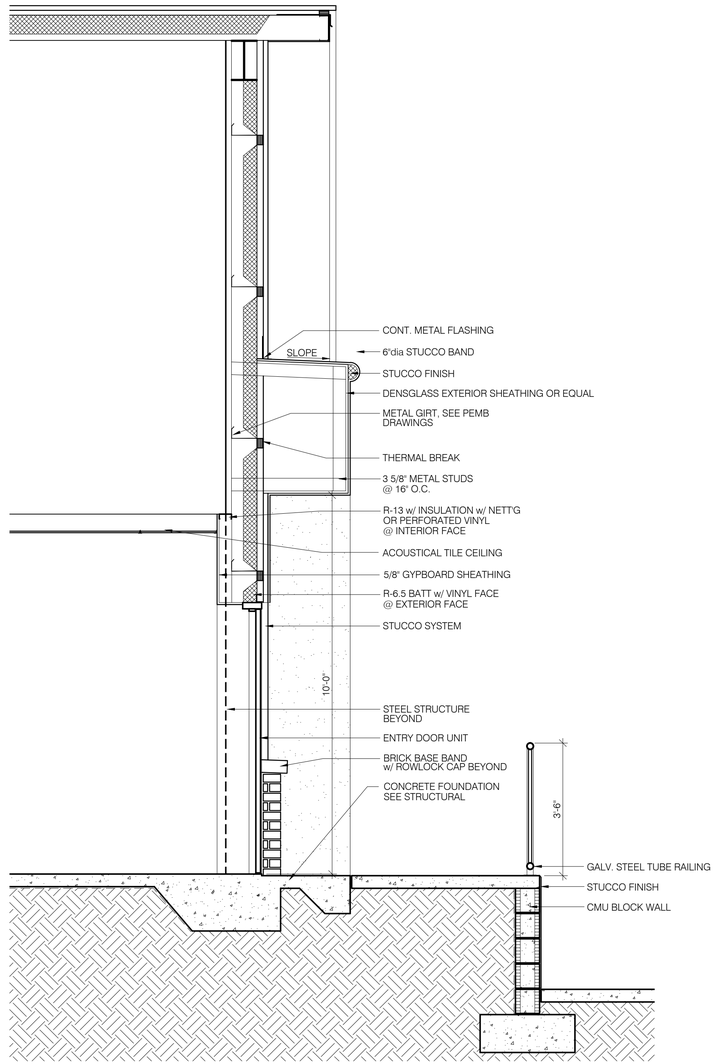
SHEET NUMBER
AF3.01



3 WALL SECTION
SCALE: 1/2" = 1'-0"



2 WALL SECTION
SCALE: 1/2" = 1'-0"



1 WALL SECTION
SCALE: 1/2" = 1'-0"

05 MAY 20

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

jdf architecture llc
JDF ARCHITECTURE, LLC
201 HOLLYWOOD BLVD, NE
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

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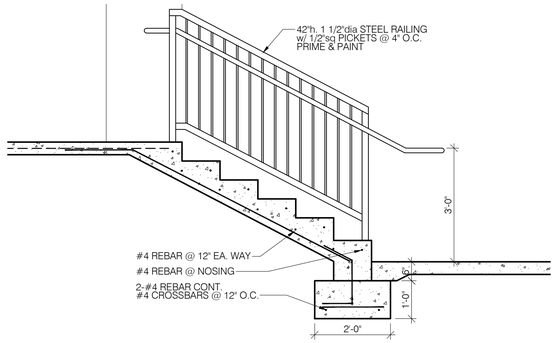
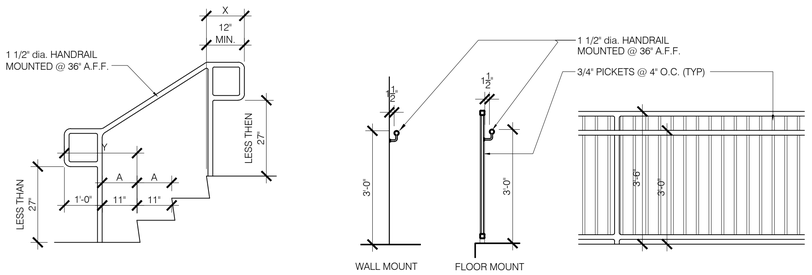


4 ENTRY STAIR SECTION

SCALE: 1/2" = 1'-0"



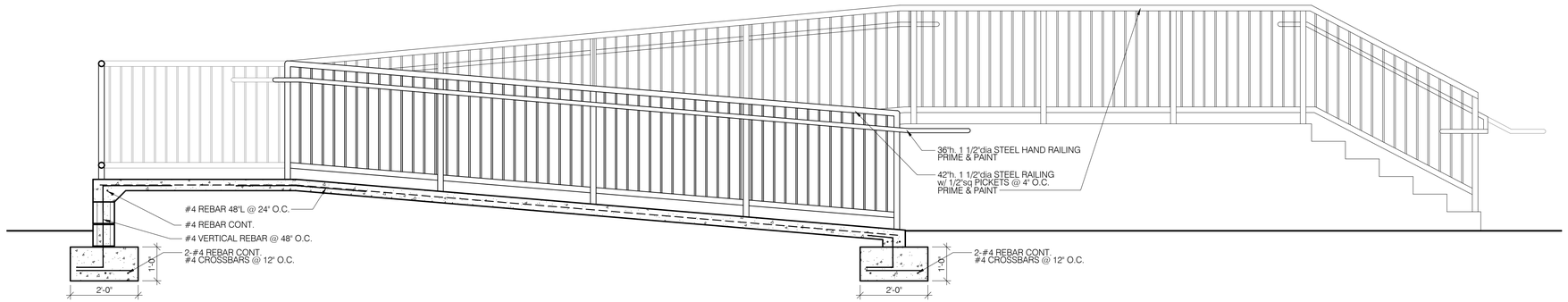
NOTE:

X IS THE 12 INCH MINIMUM HANDRAIL EXTENSION REQUIRED AT EACH TOP RISER.

Y IS THE MINIMUM HANDRAIL EXTENSION OF 12 INCHES PLUS THE WIDTH OF ONE TREAD THAT IS REQUIRED AT EACH BOTTOM RISER.

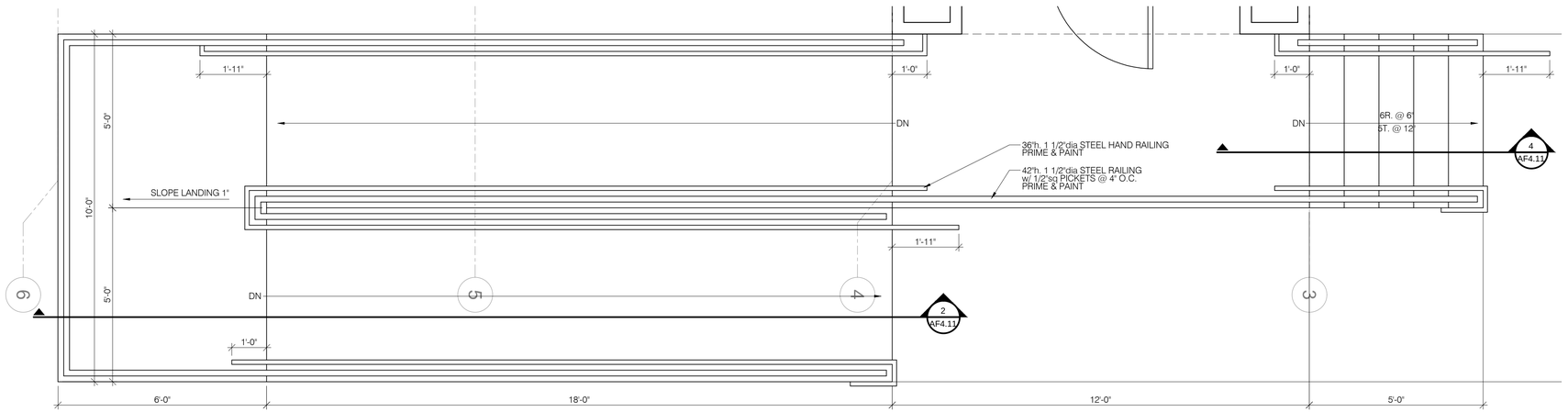
3 TYPCAIL STAIR/GUARD RAIL DETAILS

SCALE: 1/2" = 1'-0"



2 ENTRY RAMP SECTION

SCALE: 1/2" = 1'-0"



1 ENTRY RAMP FLOOR PLAN

SCALE: 1/2" = 1'-0"

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RAMP DETAILS

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C:\USERS\JDF ARCHITECTURE\DOCUMENTS\+ JDF ARCHITECTURE\1901A - OCWS FIELD OFFICE\03 - CONSTRUCTION DOCUMENTS\02 - DRAWINGS\A4.11 FD-RAMP DETAILS.DWG 10/9/2020 10:31 AM

FINISH SCHEDULE

NO.	ROOM NAME	FLOOR	WALL MAT'L	WALL FINISH	WALL BASE	CEILING FINISH	CEILING HT	REMARKS
101	WORK ROOM	SC	GYP	PNT	RB	ACT1	9'-0"	
102	CONFERENCE	CAR1	GYP	PNT	RB	ACT1	9'-0"	
103	ENGINEER	CAR1	GYP	PNT	RB	ACT1	9'-0"	
104	ENGINEER GRAD	CAR1	GYP	PNT	RB	ACT1	9'-0"	
105	SENIOR MANAGER	CAR1	GYP	PNT	RB	ACT1	9'-0"	
106	RIGHT of WAY	CAR1	GYP	PNT	RB	ACT1	9'-0"	
107	ENVIRONMENTAL	CAR1	GYP	PNT	RB	ACT1	9'-0"	
108	DRAFTER	CAR1	GYP	PNT	RB	ACT1	9'-0"	
109	SURVEY	CAR1	GYP	PNT	RB	ACT1	9'-0"	
110	STORAGE	SC	GYP	PNT	RB	ACT1	9'-0"	
111	OFFICE	CAR1	GYP	PNT	RB	ACT1	9'-0"	
112	TOILET	SC	MRGB	PNT	RB	MRGB	9'-0"	
113	PLAN ROOM	CAR1	GYP	PNT	RB	GYP	9'-0"	
114	KITCHEN	SC	GYP	PNT	RB	ACT1	9'-0"	
115	JANITOR	SC	MRGB	PNT	RB	MRGB	9'-0"	FRP ON WALLS TO +6'-0" AFF
116	TOILET	SC	MRGB	PNT	RB	MRGB	9'-0"	WALL TILE TO 8'-0" AFF IN SHOWERS
117	TOILET	SC	MRGB	PNT	RB	MRGB	9'-0"	WALL TILE TO 8'-0" AFF IN SHOWERS
118	HALL	SC	GYP	PNT	RB	ACT1	9'-0"	
119	WATER METER	SC	GYP	PNT	RB	ACT1	9'-0"	
120	OFFICE	CAR1	GYP	PNT	RB	ACT1	9'-0"	
121	OFFICE	CAR1	GYP	PNT	RB	ACT1	9'-0"	
122	STORAGE	SC	GYP	PNT	RB	ACT1	9'-0"	
123	SUPERINTENDENT	CAR1	GYP	PNT	RB	ACT1	9'-0"	
124	FOREMAN	CAR1	GYP	PNT	RB	ACT1	9'-0"	
125	STORAGE	SC	GYP	PNT	RB	ACT1	9'-0"	
126	OPERATORS	SC	GYP	PNT	RB	ACT1	9'-0"	
127	WATER OPS	SC	GYP	PNT	RB	ACT1	9'-0"	
128	HALL	SC	GYP	PNT	RB	ACT1	9'-0"	
129	TECH	SC	GYP	PNT	RB	ACT1	9'-0"	
130	TECH	SC	GYP	PNT	RB	ACT1	9'-0"	
131	SPEC	SC	GYP	PNT	RB	ACT1	9'-0"	
132	SUPERINTENDENT	SC	GYP	PNT	RB	ACT1	9'-0"	
133	IT	SC	GYP	PNT	RB	ACT1	9'-0"	
134	TOILET	SC	MRGB	PNT	RB	MRGB	9'-0"	
135	STORAGE	SC	GYP	PNT	RB	ACT1	9'-0"	
136	SCADA	SC	GYP	PNT	RB	ACT1	9'-0"	

ABBREVIATIONS

GENERAL

- EXP - EXPOSED
- FD - FLOOR DRAIN
- MFR - MANUFACTURER

FLOORING

- CAR1 - COMMERCIAL GRADE 24"x24" CARPET TILE SHAW - SELECTED BY OWNER
- EP - EPOXY FLOOR FINISH
- SC - SEALED CONCRETE
- TILE1 - COMMERCIAL GRADE PORCELAIN TILE
- VCT - VINYL COMPOSITE TILE; SEE DETAIL FOR PATTERN

BASE

- RB - 6" RUBBER BASE

WALLS

- CB - CEMENT BACKER BOARD BEHIND WALL TILE
- GYP - 5/8" TYPE 'X' GYPSUM BOARD
- MRGB - 5/8" MOISTURE RESISTANT GYPSUM BOARD
- PNT - INTERIOR LATEX PAINT
- TL2 - COMMERCIAL GRADE CERAMIC WALL TILE @ +6'-0" A.F.F.

CEILINGS

- ACT1 - LAY-IN ACOUSTICAL CEILING TILE 2'x4'-WHITE
- GYP - 5/8" TYPE 'X' GYPSUM BOARD

DOORS

- ALUM - ALUMINUM STORE FRONT SYSTEM
- HM - HOLLOW METAL FRAME
- MTL - INSULATED METAL DOOR
- WD - SOLID CORE WOOD DOOR

ACCESSORIES

AC	AIR COMPRESSOR
HCDF	ADA DRINKING FOUNTAIN
DF	DRINKING FOUNTAIN
FD	FLOOR DRAIN
FO	FLOOR OUTLET
FS	FLOOR SINK; SEE PLUMBING
GB36	36" ADA HORIZONTAL GRAB BAR
GB42	42" ADA HORIZONTAL GRAB BAR
HCLAV	ADA WALL MOUNTED SINK
HCWC	ADA WATER CLOSET; FLOOR MOUNTED
HWS	HANDWASH SINK
MR1	FRAMED MIRROR (1'-6"wX3'h)
MR2	FRAMED MIRROR (4'-6"wX3'h)
MS	MOP SINK w/ MOP RACK
MW	MICROWAVE
RD	ROOF DRAIN; COORDINATE w/ PLUMBING
REF	REFRIGERATOR
SS1	STAINLESS STEEL SINK (1 BOWL)
SS3	STAINLESS STEEL SINK (3 BOWL)

GENERAL NOTES

1. SEE REFLECTED CEILING PLAN AND DETAILS FOR EXACT CEILING HEIGHT LOCATIONS.
2. ANTI-FRACTURE MAT SHALL BE INSTALLED UNDER ALL FLOOR TILE SURFACES.
3. CONCRETE BACKER BOARD SHALL BE INSTALLED BEHIND ALL WALL TILE.
4. ALL EXPOSED CELIING STRUCTURE SHALL BE PAINTED FLAT BLACK.
5. ALL DIMENSIONS TAKEN AT FLOOR SLAB ELEVATION.
6. ALL EXTERIOR DOORS TO HAVE ½" STEP FROM FINISHED INTERIOR FLOOR SLAB TO EXTERIOR WALKWAY.

DOOR SCHEDULE

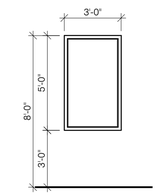
DOOR NO.	SIZE	TYPE	MAT'L	HDW	FRAME MAT'L	FRAME HEAD	FRAME JAMB	FRAME SILL	FIRE RATING	REMARKS
101A	3'-0" x 8'-0"	A	FG	HW-1	HM	4/AF6.11	5/AF6.11	6/AF6.11		
101B	3'-0" x 7'-0"	B	WD	HW-6	HM	1/AF6.11	2/AF6.11	3/AF6.11	20 MIN	
102A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
103A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
104A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
105A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
106A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
107A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
108A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
109A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
109B	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AF6.11	2/AF6.11	3/AF6.11		
110A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AF6.11	2/AF6.11	3/AF6.11	20 MIN	
111A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
112A	3'-0" x 7'-0"	B	WD	HW-3	HM	1/AF6.11	2/AF6.11	3/AF6.11		
113A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AF6.11	2/AF6.11	3/AF6.11		
115A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AF6.11	2/AF6.11	3/AF6.11	20 MIN	
116A	3'-0" x 7'-0"	B	WD	HW-3	HM	1/AF6.11	2/AF6.11	3/AF6.11	20 MIN	
117A	3'-0" x 7'-0"	B	WD	HW-3	HM	1/AF6.11	2/AF6.11	3/AF6.11	20 MIN	
118A	3'-0" x 8'-0"	A	FG	HW-1	HM	4/AF6.11	5/AF6.11	6/AF6.11		
118B	3'-0" x 7'-0"	B	WD	HW-6	HM	1/AF6.11	2/AF6.11	3/AF6.11		
119A	3'-0" x 7'-0"	B	WD	HW-6	HM	1/AF6.11	2/AF6.11	3/AF6.11	20 MIN	
119B	8'-0" x 8'-0"	C	MTL	MFR	MTL	MFR	MFR	MFR		MOTORIZED DOOR
120A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
121A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
122A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AF6.11	2/AF6.11	3/AF6.11		
123A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
124A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
125A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AF6.11	2/AF6.11	3/AF6.11		
125B	6'-0" x 8'-0"	C	MTL	MFR	MTL	MFR	MFR	MFR		MANUAL PULL CHAIN DOOR
125C	6'-0" x 7'-0"	B	WD	HW-4	HM	1/AF6.11	2/AF6.11	3/AF6.11		
127A	3'-0" x 7'-0"	B	WD	HW-6	HM	1/AF6.11	2/AF6.11	3/AF6.11	20 MIN	
128A	3'-0" x 8'-0"	A	FG	HW-1	HM	4/AF6.11	5/AF6.11	6/AF6.11		
129A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
130A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
131A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
132A	3'-0" x 7'-0"	B	WD	HW-5	HM	1/AF6.11	2/AF6.11	3/AF6.11		
133A	3'-0" x 7'-0"	B	WD	HW-2	HM	1/AF6.11	2/AF6.11	3/AF6.11	20 MIN	
134A	3'-0" x 7'-0"	B	WD	HW-3	HM	1/AF6.11	2/AF6.11	3/AF6.11		
135A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AF6.11	2/AF6.11	3/AF6.11		
136A	3'-0" x 7'-0"	B	WD	HW-6	HM	1/AF6.11	2/AF6.11	3/AF6.11	20 MIN	
136B	8'-0" x 8'-0"	C	MTL	MFR	MTL	MFR	MFR	MFR		MOTORIZED DOOR
137A	3'-0" x 8'-0"	D	MTL	HW-7	HM	4/AF6.11	5/AF6.11	6/AF6.11		

HARDWARE SCHEDULE

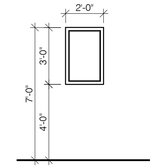
- HW-1 ENTRY LOCKSET, DEAD-BOLT, 3 HINGES, LEVER HARDWARE, CLOSER, WEATHERSTRIPPING. WIRED FOR KEY FOB ACCESS CONTROL, STRIKE PLATE.
- HW-2 LEVER HARDWARE, CLOSER, WIRED FOR KEY FOB ACCESS CONTROL, STRIKE PLATE.
- HW-3 3 HINGES, FLOOR STOP, CLOSER, PRIVACY SET.
- HW-4 3 HINGES, FLOOR STOP, CLOSER, STORAGE SET.
- HW-5 3 HINGES, FLOOR STOP, OFFICE SET.
- HW-6 3 HINGES, PASSAGE SET, CLOSER.
- HW-7 STORAGE LOCKSET, 3 HINGES, LEVER HARDWARE, WEATHERSTRIPPING

WINDOW TYPES

SCALE: 1/4" = 1'-0"



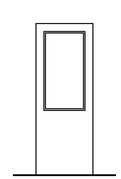
TYPE 1
EXTERIOR
ALUMINUM STOREFRONT
IMPACT RATED GLAZING
INSULATED; LOW-E



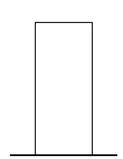
TYPE 2
INTERIOR
ALUMINUM STOREFRONT
TEMPERED GLAZING

DOOR TYPES

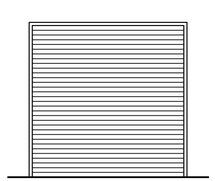
SCALE: 1/4" = 1'-0"



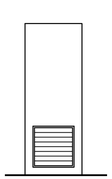
TYPE A
FIBERGLASS; PAINTED
IMPACT RATED GLAZING
INSULATED; LOW-E



TYPE B
SOLID CORE WOOD
PRIME & PAINT



TYPE C
PRE-FIN INSULATED METAL
ROLL-UP COILING DOOR
IMPACT RATED



TYPE D
HOLLOW METAL DOOR
w/ LOUVER
PRIME & PAINT

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DOOR / WINDOW TYPES and SCHEDULES

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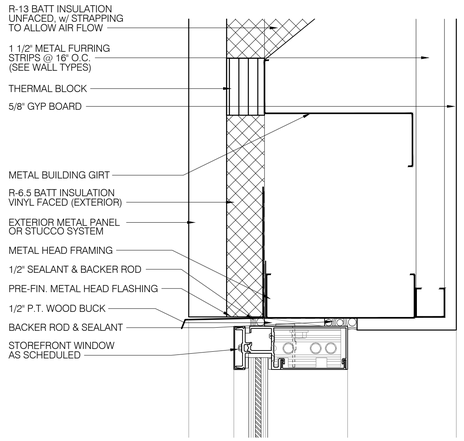
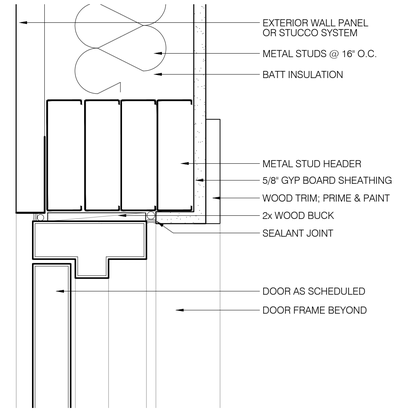
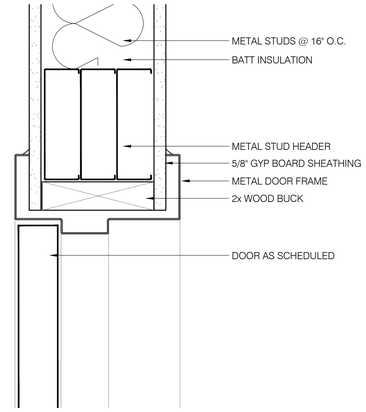


7 HEAD DETAIL
SCALE: 3" = 1'-0"



4 HEAD DETAIL
SCALE: 3" = 1'-0"



1 HEAD DETAIL
SCALE: 3" = 1'-0"

8 JAMB DETAIL
SCALE: 3" = 1'-0"

5 JAMB DETAIL
SCALE: 3" = 1'-0"

2 JAMB DETAIL
SCALE: 3" = 1'-0"

9 SILL DETAIL
SCALE: 3" = 1'-0"

6 SILL DETAIL
SCALE: 3" = 1'-0"

3 SILL DETAIL
SCALE: 3" = 1'-0"

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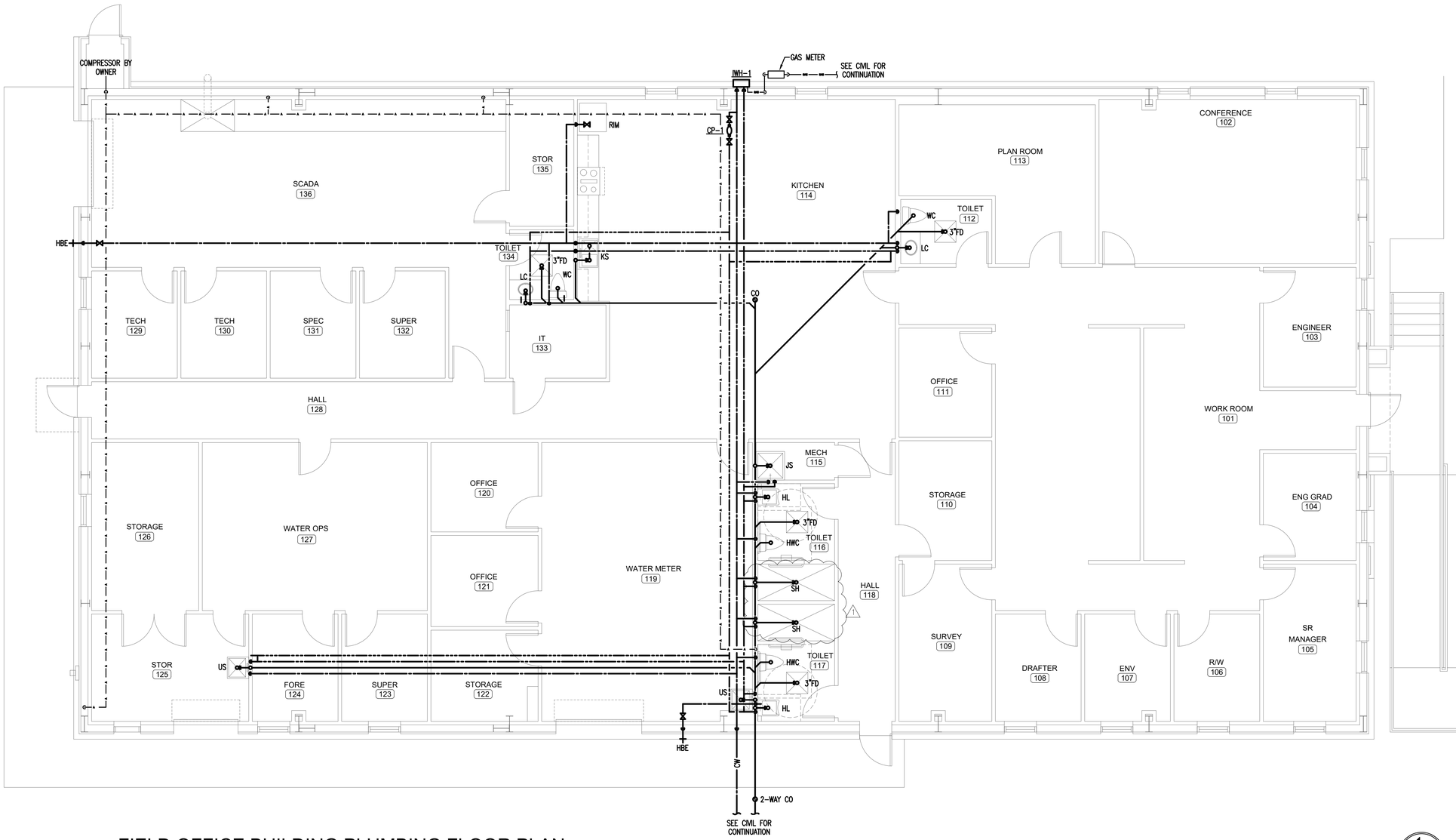
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
AF6.11



1 FIELD OFFICE BUILDING PLUMBING FLOOR PLAN

SCALE: 3/16" = 1'-0"

0 1/8" 0 3 6"

OCTOBER 2020

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL. 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

JDF ARCHITECTURE, LLC
201 MIRACLE STRIP BLVD SE
FT WALTON BEACH, FLORIDA 32548
(850) 498-2166

NO.	DATE	REVISION	BY
1	10/9/20	COUNTY COMMENTS	JJ

FIELD OFFICE
BUILDING PLUMBING
FLOOR PLAN

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	OCTOBER 2020

SHEET NUMBER

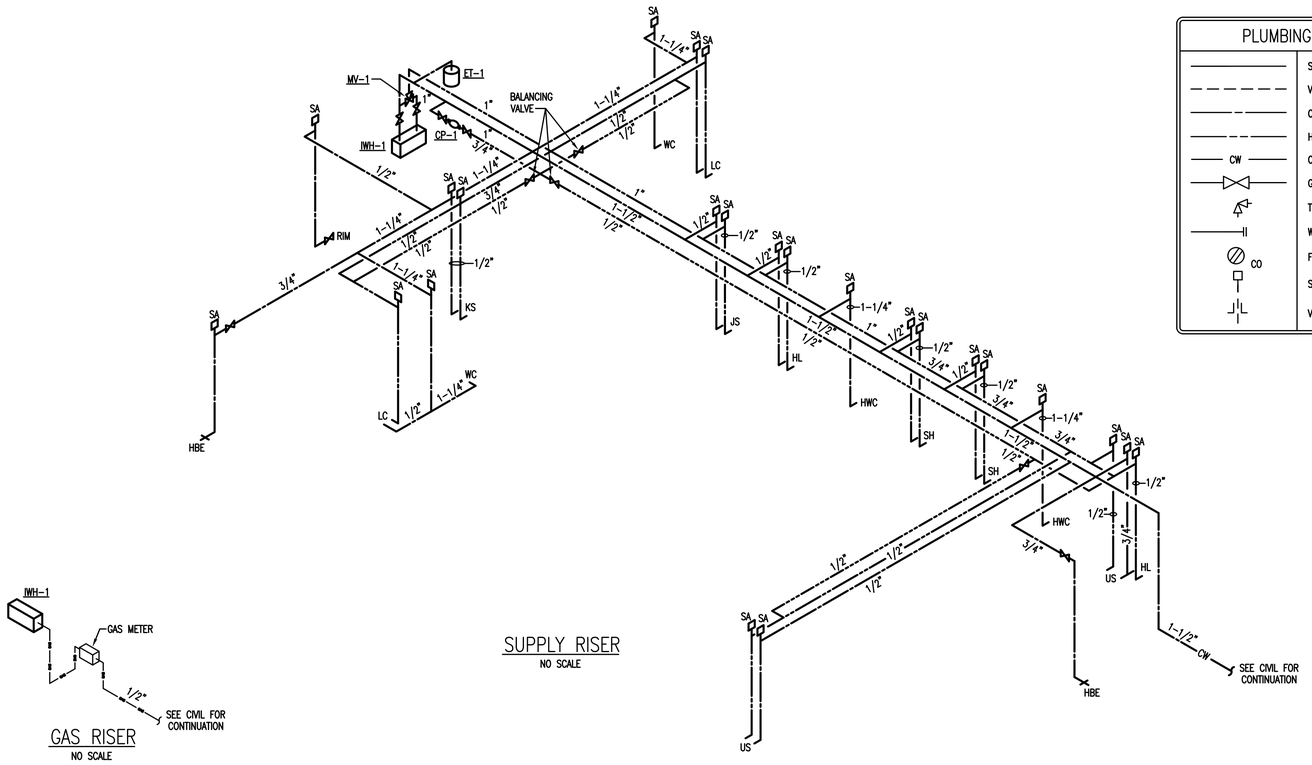
PF1.11

JOHNSON PEADEN ENGINEERING INC.
329 Brooks Street SE, Fort Walton Beach, FL 32548, 850.244.6189V 850.244.0545F
827 Grace Avenue, Panama City, FL 32401, 850.215.4068V 850.215.4069F
Alabama #CD-2429-E Arkansas #1654 Florida #00009014
Georgia #PEF003983 Mississippi #E-00000862
Texas #F-16637 Missouri #2018035834

JPE Job Number: 1950

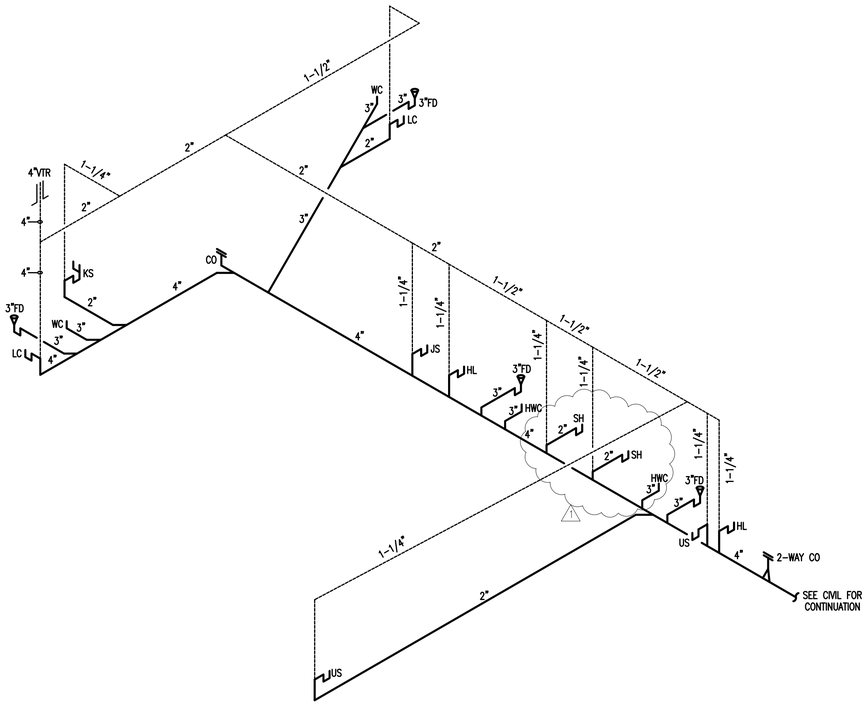
Z:\CAD\Jason Floyd\Okaloosa County Water & Sewer\P1.11r FO.dwg, 10/8/2020 10:50:50 AM, Johnson, Peaden Engineering, Inc.

Z:\CAD\JASON FLOYD\OKALOOSA COUNTY WATER & SEWER\P1.11R FO.DWG 10/8/2020 10:50 AM



SUPPLY RISER
NO SCALE

GAS RISER
NO SCALE



WASTE & VENT RISER
NO SCALE

PLUMBING LEGEND

	SOIL OR WASTE LINE
	VENT
	COLD WATER (CW)
	HOT WATER (HW)
CW	COLD WATER (EXTERIOR)
	GATE VALVE
	T & P RELIEF VALVE
	WALL CLEANOUT
CO	FLOOR CLEANOUT
	SHOCK ABSORBER
	VENT THRU ROOF

GENERAL PLUMBING NOTES

1. FURNISH ALL LABOR, MATERIALS AND EQUIPMENT NEEDED TO PROVIDE A COMPLETE PLUMBING SYSTEM. THIS INCLUDES, BUT IS NOT LIMITED TO, WATER PIPING, WASTE AND VENT PIPING, AND ALL NECESSARY VALVES, TRAPS, AND ACCESSORIES.
2. ALL WORK SHALL BE PERFORMED BY SKILLED AND EXPERIENCE WORKMEN. WORK SHALL COMPLY WITH ALL APPLICABLE STATE AND LOCAL CODES. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED PERMITS, LICENSES, AND INSPECTIONS.
3. ROUGH-INS SHALL BE MADE FROM ARCHITECTURAL DRAWINGS AND FIELD VERIFICATION, NOT FROM PLUMBING DRAWINGS AS THEY ARE ONLY SCHEMATIC. THIS CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS AND TAPS, AND FOR CHECKING ALL ELEVATIONS, GRADES, AND INVERTS BEFORE THE START OF CONSTRUCTION. IF UNSATISFACTORY CONDITIONS EXIST, NOTIFY THE ARCHITECT IMMEDIATELY.
4. THIS CONTRACTOR SHALL COORDINATE ALL WORK WITH THE ELECTRICAL, MECHANICAL, AND FIRE PROTECTION CONTRACTORS TO AVOID CONFLICTS WITH OTHER TRADES. MAKE DEVIATIONS AS NECESSARY FROM THE WORK SHOWN ON THE DRAWINGS TO ENSURE THE WORK FITS THE SPACE(S) PROVIDED. NOTIFY THE ARCHITECT OF ALL NECESSARY DEVIATIONS.
5. IF NEW CONNECTIONS REQUIRE INTERRUPTION OF EXISTING SERVICES, ALL PREPARATORY WORK SHALL BE COMPLETED EARLY TO MINIMIZE TIME. WHERE POSSIBLE, PROVIDE TEMPORARY CONNECTIONS TO MAINTAIN UTILITY SERVICE.
6. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND WITHOUT DEFECTS. SUBMIT SHOP DRAWINGS FOR ALL EQUIPMENT AND MATERIALS. ALL WORK DONE BY THIS CONTRACTOR SHALL BE WARRANTED FOR ONE YEAR FROM THE TIME THE OWNER GIVES ACCEPTANCE OR GAINS BENEFICIAL USE, WHICHEVER IS FIRST.
7. ALL SANITARY AND VENT LINES SHALL BE HUBLESS CAST IRON PIPE CISPI 310-78 STANDARD WEIGHT WITH SPIGOT ENDS FOR COUPLING. HUBLESS CAST IRON JOINTS TO BE CISPI 310 STAINLESS STEEL SHIELD OVER ONE PIECE NEOPRENE SLEEVE. THIS CONTRACTOR MAY USE PVC PIPE AND FITTINGS CONFORMING TO ASTM D-2665 WHERE ALLOWED BY CODE.
8. ROOF PENETRATIONS SHALL BE FLASHED AND MADE WATER-TIGHT IN A MANNER APPROVED BY THE MANUFACTURER OF THE ROOFING MATERIAL AND COMPLYING WITH ARCHITECTURAL REQUIREMENTS.
9. PROVIDE CLEANOUTS WHERE INDICATED ON PLANS AND AS NECESSARY TO COMPLY WITH THE STANDARD PLUMBING CODE. ALL CLEANOUTS SHALL BE IN ACCESSIBLE LOCATIONS.
10. INSULATE ALL DOMESTIC WATER PIPING ABOVE GRADE WITH 3/4" THICK FLEXIBLE CLOSED-CELL POLYETHYLENE INSULATION. SEAL ALL JOINTS AND SEAMS AND INSULATE FITTINGS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
11. HANGERS FOR EQUIPMENT AND PIPING SHALL BE SECURED TO THE BUILDING STRUCTURE. NO HANGERS SHALL BE ATTACHED TO THE FLOOR OR ROOF DECK MATERIAL, OR CONCRETE DECKS LESS THAN 4" THICK.
12. INSTALL SHOCK ABSORBERS VERTICALLY AT EACH FIXTURE. OFFSET AS NEEDED TO GAIN A MINIMUM HEIGHT OF 18". ALL SHOCK ABSORBERS SHALL BE A MINIMUM OF ONE PIPE SIZE LARGER THAN THE BRANCH BEING SERVED.
13. PROVIDE CHROME PLATED BRASS ESCUTCHEON PLATES AT ALL PENETRATIONS OF WALLS, FLOORS OR CEILINGS IN FINISHED AREAS AND UNDER LAVATORIES. PROVIDE STOPS AND TRAPS FOR ALL FIXTURES.
LEAK TEST WATER PIPING, FOR NOT LESS THAN 90 MINUTES AT 100 PSI. FILL SANITARY SEWER SYSTEM TO A MINIMUM HEIGHT OF TEN FEET AND LET STAND FOR AT LEAST 30 MINUTES WITHOUT LEAKAGE.
AFTER PRESSURE TESTS HAVE BEEN MADE, THOROUGHLY FLUSH THE ENTIRE DOMESTIC WATER SYSTEM WITH WATER UNTIL ALL ENTRAINED DIRT AND MUD HAVE BEEN REMOVED, AND STERILIZE. THE STERILIZING MATERIAL SHALL BE EITHER LIQUID CHLORINE CONFORMING THE FED. SPEC. BB-C-120, OR HYPOCHLORITE CONFORMING TO FED. SPEC. O-C-114, OR FED. SPEC. O-S-602M. THE CHLORINATING AGENT SHALL PROVIDE A MINIMUM DOSAGE OF 50 PPM AND SHALL BE RETAINED IN THE SYSTEM FOR 90 MIN. THE SYSTEM WILL THEN BE FLUSHED WITH CLEAN POTABLE WATER UNTIL THE RESIDUAL CHLORINE IS REDUCED TO LESS THAN 1.0 PPM. HAVE THREE STATE-APPROVED INDEPENDENT TESTING FACILITIES TAKE SAMPLES AND DELIVER CERTIFICATES OF APPROVAL TO THE OWNER. ANY NEGATIVE RESULTS MUST BE INVESTIGATED, AND IF NECESSARY CORRECTED, BEFORE THE BUILDING MAY BE ACCEPTED.

PLUMBING FIXTURE SCHEDULE

MARK	FIXTURE	SANITARY	C.W.	H.W.
HWC	WATER CLOSET, FLOOR, FLUSH VALVE, ADA COMPLIANT	3"	1-1/4"	–
WC	WATER CLOSET, FLOOR, FLUSH VALVE	3"	1-1/4"	–
HL	LAVATORY, WALL HUNG, ADA COMPLIANT	1 1/4"	1/2"	1/2"
LC	LAVATORY, COUNTERTOP	1 1/4"	1/2"	1/2"
SH	SHOWER	2"	1/2"	1/2"
JS	JANITOR SINK	1 1/2"	1/2"	1/2"
US	FREESTANDING UTILITY SINK	1 1/2"	1/2"	1/2"
HEWC	ELECTRIC WATER COOLER, ADA COMPLIANT	1 1/4"	1/2"	–
RIM	REFRIGERATOR ICE MAKER CONNECTION	–	1/2"	–
KS	KITCHEN SINK	1 1/2"	1/2"	1/2"
FD	FLOOR DRAIN W/ TRAP PRIMER	ON DWG	–	–
HBE	HOSE BIBB, EXTERIOR	–	3/4"	–
IWH-1	INSTANTANEOUS GAS WATER HEATER, MAX 199 MBH INPUT, MINIMUM			
	15 MBH INPUT, 0.4 GPM TURN ON FLOW, 5.5 GPM @ 70°F RISE, MAX			
	LEAVING WATER TEMP OF 110°F, EQ. RINNIA CU-199e	–	1"	1"
CP-1	CIRCULATION PUMP, ON/OFF WITH AQUASTAT, MIN. 10 GPM FLOW AT			
	10 FOOT HEAD, 1725 RPM, EQ. B&G 2.5_IN	–	–	3/4"
ET-1	DOMESTIC WATER EXPANSION TANK, 2 GALLON, 0.9 GALLON ACCEPTANCE			
	LEAD FREE, EQ. B&G PT-5	–	–	1/2"
MV-1	MIXING VALVE, MIN. 1 GPM FLOW, MAX 5 PSI ΔP, MAX FLOW 26 GPM			
	LOCKING SET POINT, LEAD FREE, EQ. LEONARD VALVE TM-26-LF	–	3/4"	3/4"

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Texas #F-16637 Missouri #2018035834

JPE Job Number: 1950

OCTOBER 2020

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jdf+ architecture llc
JDF ARCHITECTURE, LLC
201 JAMES LEE BLVD
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY
		COUNTY COMMENTS	JJ
1	10/9/20		

FIELD OFFICE
PLUMBING NOTES, SCHEDULES, RISERS, & LEGEND

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

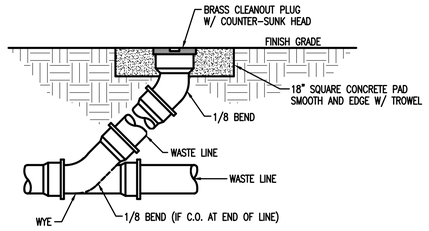
DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	OCTOBER 2020

SHEET NUMBER
PF2.11

Z:\CAD\JASON FLOYD\OKALOOSA COUNTY WATER & SEWER\P1.11R FO.DWG 10/8/2020 10:50 AM

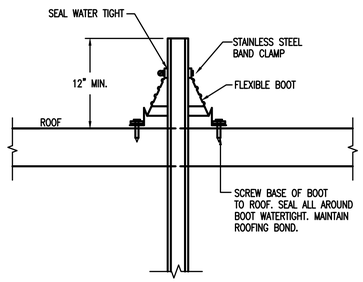
Z:\CAD\Jason Floyd\Okaloosa County Water & Sewer\P1.11r FO.dwg, 10/8/2020 10:50:51 AM, Johnson, Peaden Engineering, Inc.

NOTE: IF CLEANOUT IS LOCATED INSIDE BUILDING, SET TOP LEVEL WITH CARPETING OR FLOORING MATERIAL.



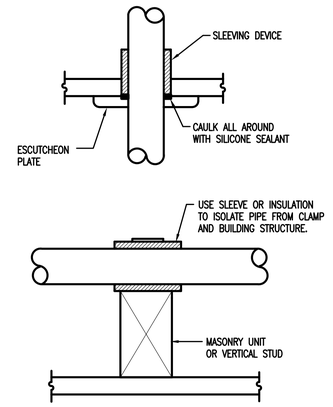
CLEANOUT DETAIL

NOT TO SCALE



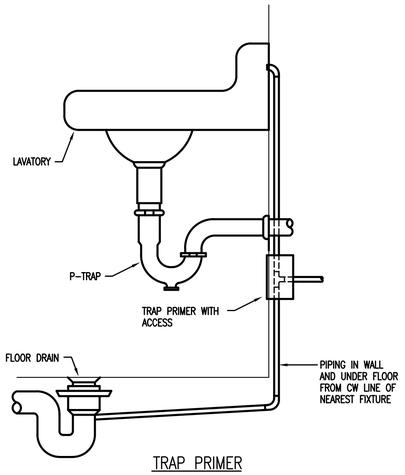
VENT THROUGH ROOF DETAIL

NOT TO SCALE



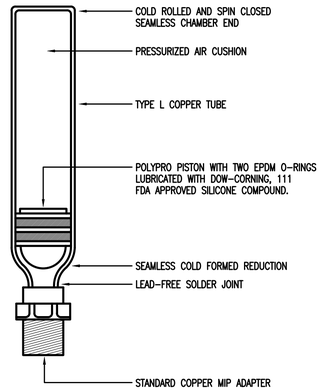
METHODS OF SECURING PIPE PENETRATIONS AND SUPPORTS

NO SCALE



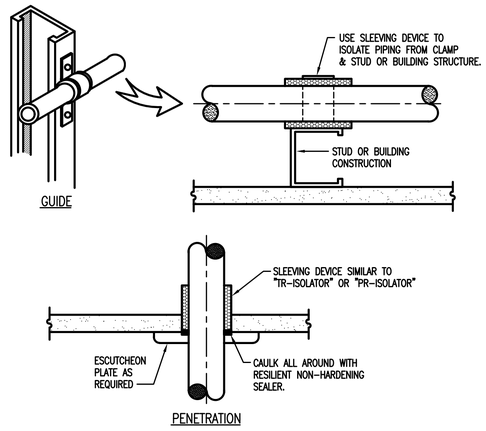
TRAP PRIMER

NO SCALE



WATER HAMMER ARRESTER

NOT TO SCALE



DETAIL OF CONSTRUCTION PENETRATIONS & GUIDES FOR CONTROL OF PLUMBING NOISE & VIBRATION

NO SCALE

AVCON, INC.
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(850) 496-2166

NO.	DATE	REVISION	BY

FIELD OFFICE
PLUMBING DETAILS

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	OCTOBER 2020

SHEET NUMBER

PF2.12

JOHNSON PEADEN ENGINEERING INC.
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Alabama #CD-2429-E Arkansas #1654 Florida #00009014
Georgia #PEF003983 Mississippi #E-00000862
Texas #F-16637 Missouri #2018035834

JPE Job Number: 1950

OCTOBER 2020

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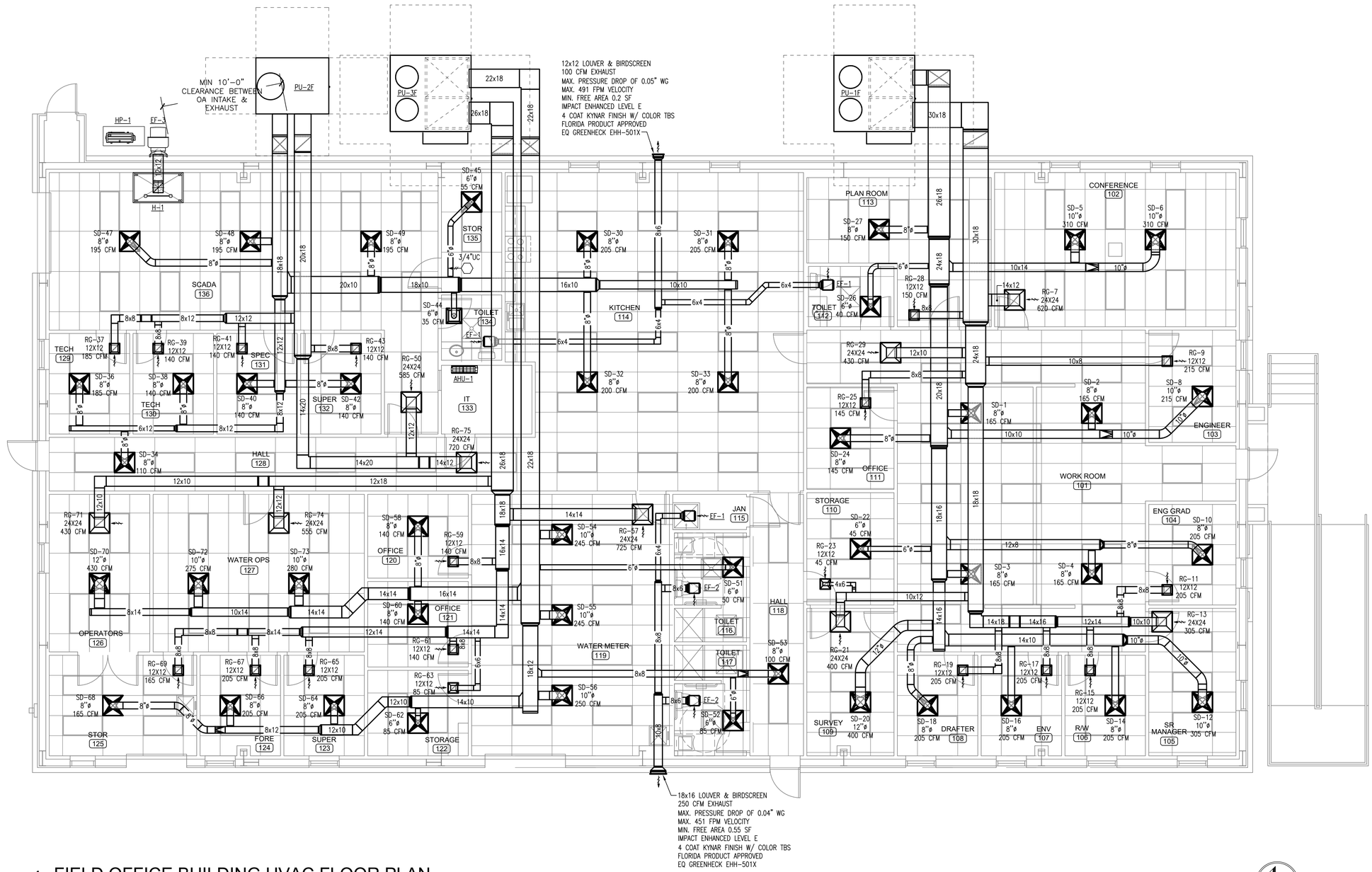

1 FIELD OFFICE BUILDING HVAC FLOOR PLAN

SCALE: 3/16" = 1'-0"

3" 18" 0 3' 6'

OCTOBER 2020

AVCON, INC.
ENGINEERS & PLANNERS
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jdf+ architecture llc
JDF ARCHITECTURE, LLC
204 E. NEW YORK AVE. SUITE E
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

FIELD OFFICE BUILDING HVAC FLOOR PLAN

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

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DRAWN BY:	JDF
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MF1.11

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827 Grace Avenue, Panama City, FL 32401, 850.215.4068V 850.215.4069F
Alabama #CD-2429-E Arkansas #1654 Florida #00009014
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ROOFTOP UNIT SCHEDULE

MARK	MFG	MODEL	EER (MBH/KW)	ELECTRICAL				SUPPLY FAN				EXHAUST FAN	COOLING								REFRIG.	COMP. TYPE	COMP. QTY.	ELECTRIC HEAT		FILTER				UNIT CONTROLS	SHIP WT. (LB)	OPER. WT. (LB)
				VOLT	PH	MCA (A)	MOCP (A)	EQUIPMENT NOMINAL (CFM)	FAN TYPE	ESP (IN-WG)	MOTOR VFD	AIRFLOW (CFM)	TOT. CAP. (BTU/H)	SENS. CAP. (BTU/H)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	ROWS	FPI	APD (IN-WG)	FACE VEL. (FPM)				CAPACITY (KW)	CONTROL STEPS	DESCRIPTION	FACE AREA (SF)	SIZE	APD (IN-WG)	MERV			
PU-1F	DAIKIN APPLIED	DPS007	12.2	460	3	32	35	3400	SWSI AF	1.00	Yes	1200	90081	74341	74.1	63.0	54.1	54.0	3	15	0.17	243	R410A	Scroll	2	18	4 Stage	2 inch MERV 8	18.0	18 x 24 x 2	0.07	MERV 8	Variable Air Volume, Single Zone	2149	2149
PU-2F	DAIKIN APPLIED	DPS006	11.3	460	3	23	25	2200	SWSI AF	1.00	Yes	1200	69844	52121	75.8	64.4	53.7	53.5	4	16	0.52	358	R410A	Scroll	1	18	4 Stage	2 inch MERV 8	7.1	16 x 16 x 2	0.14	MERV 8	Variable Air Volume, Single Zone	1411	1411
PU-3F	DAIKIN APPLIED	DPS007	12.2	460	3	30	30	2900	SWSI AF	1.00	Yes	1200	90081	74341	74.1	63.0	54.1	54.0	3	15	0.17	243	R410A	Scroll	2	18	4 Stage	2 inch MERV 8	18.0	18 x 24 x 2	0.07	MERV 8	Variable Air Volume, Single Zone	2149	2149

REMARKS
1. UNIT SHALL BE EQUIPPED WITH DDC CONTROLS, VARIABLE SPEED COMPRESSOR OR INVERTER, ANTI-SHORT-CYCLE TIMER & LOW AMBIENT COOLING.
2. UNIT SHALL BE MOUNTED ON 34" HIGH CURB TECHNOLOGIES CURB TO TRANSITION FROM VERTICAL DISCHARGE TO HORIZONTAL DISCHARGE. CURB SHALL BE INSULATED MINIMUM R-8.

IT ROOM MINISPLIT AIR HANDLER SCHEDULE

Mark	Air Flow	EAT CLG	LAT CLG	EAT HTG	LAT HTG	Max Sound Pressure Level	Full Load Ampacity	Minimum Circuit Ampacity	Voltage/Phase
AHU-1	425	76.7°FDB/67.0°FWB	59.3°F	70.0°F	N/A	43	0.33 A	1 A	208 V / 1Ø

PROVIDE WIRELESS THERMOSTAT FOR INDOOR UNIT, INTEGRAL FILTER, PIPE CONDENSATE TO SPLASH BLOCK OUTSIDE

IT ROOM CONDENSING UNIT SCHEDULE

Mark	Total Cooling Capacity	Sensible Cooling Capacity	Heating Capacity	SEER	IEER	Minimum Circuit Ampacity	Maximum Overcurrent Protection	Voltage/Phase
HP-1	11,786 Btu/h	8,416 Btu/h	13,491 Btu/h	15.2	10.1	13 A	15 A	208 V / 1Ø

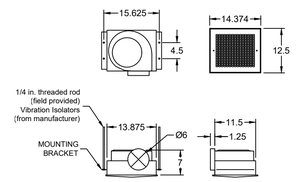
PROVIDE INVERTER DUTY COMPRESSOR & COIL GUARD. OUTDOOR UNIT SHALL POWER INDOOR UNIT.

EQUIPMENT SCHEDULE

Ceiling Exhaust Fan — MARK: EF-1

Qty	Greenheck Model	Volume (CFM)	External SP Total SP (in wg)	FRPM	Operating Power (hp)	Weight (Lb.)	Motor Information Size (hp)	V/C/P	Encl:	Motor RPM	Windings	FLA
1	SP-B70	50	0.25	652	0.01	12	NA	115/60/1	OP	675	1	NA
			0.25									

OPTIONS AND ACCESSORIES
- UL/cUL 507 Listed - Electric Fan
- Solid State Speed Control, 6 Amp, Shipped Loose
- Aluminum Grille with White Enamel Finish, (PN: 504879)
- Isolation Kit, (PN: VI KIT-SP/CSP), Shipped Loose
- Aluminum Wheel Material
- Energy Star Rated
- Can Be Used to Comply with: ASHRAE 62.2, California Title 24, and Washington State Energy Code

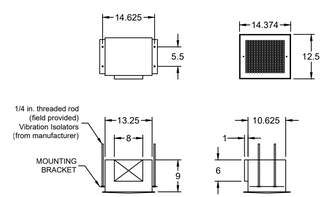


EQUIPMENT SCHEDULE

Ceiling Exhaust Fan — MARK: EF-2

Qty	Greenheck Model	Volume (CFM)	External SP Total SP (in wg)	FRPM	Operating Power (hp)	Weight (Lb.)	Motor Information Size (hp)	V/C/P	Encl:	Motor RPM	Windings	FLA
1	SP-A110	100	0.25	950	0.01	20	NA	115/60/1	OP	950	1	NA
			0.238									

OPTIONS AND ACCESSORIES
- UL/cUL 507 Listed - Electric Fan
- Solid State Speed Control, 6 Amp, Shipped Loose
- Aluminum Grille with White Enamel Finish, (PN: 504878)
- Isolation Kit, (PN: VI KIT-SP/CSP), Shipped Loose
- Aluminum Wheel Material
- Energy Star Rated
- Can Be Used to Comply with: ASHRAE 62.2, California Title 24, and Washington State Energy Code



GENERAL MECHANICAL NOTES

1. FURNISH ALL LABOR, EQUIPMENT, AND MATERIALS TO PROVIDE A COMPLETE MECHANICAL SYSTEM. DUE TO THE SCHEMATIC NATURE OF THESE PLANS, THE CONTRACTOR SHALL FIELD-VERIFY LOCATIONS FOR EQUIPMENT DUCTWORK, AND ACCESSORIES. IN ADDITION, THIS WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID CONFLICTS. THE CONTRACTOR SHALL ALSO REVIEW THE STRUCTURAL DRAWINGS BEFORE FABRICATING AND INSTALLING DUCTWORK OR EQUIPMENT.
2. ALL WORK SHALL BE PERFORMED BY SKILLED AND EXPERIENCED WORKMEN. WORK SHALL COMPLY WITH ALL APPLICABLE STATE AND LOCAL CODES. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED PERMITS, LICENSES, AND INSPECTIONS.
3. ALL MATERIALS SHALL BE NEW AND WITHOUT DEFECTS. SUBMIT SHOP DRAWINGS FOR ALL MATERIALS AND EQUIPMENT. ALL WORK DONE BY THIS CONTRACTOR SHALL BE WARRANTED FOR ONE YEAR FROM THE TIME THE OWNER GIVES ACCEPTANCE OR GAINS BENEFICIAL USE, WHICHEVER IS FIRST. ALL EQUIPMENT SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
4. DUCT SIZES ON DRAWINGS ARE INSIDE CLEAR DIMENSIONS. DUCT SHALL BE OF LOW-PRESSURE (2.0" w.g.) CONSTRUCTION AS CLASSIFIED BY SMACNA UNLESS OTHERWISE NOTED. ALL DUCT SHALL HAVE MINIMUM 2" EXTERNAL WRAP (MINIMUM R-6.0). LINER MAY ONLY BE USED WHERE REQUIRED FOR SOUND ATTENUATION. DUCTBOARD SHALL NOT BE USED.
5. FLEXIBLE DUCT MAY BE INSTALLED ONLY WHERE SHOWN ON THE DRAWINGS. DUCT SHALL BE EXTERNALLY-INSULATED CORRUGATED METAL WITH A MAXIMUM LENGTH OF 6'-0". FOR TAKE-OFFS LONGER THAN 6'-0", THE REMAINDER OF THE DISTANCE SHALL BE EXTERNALLY-WRAPPED SINGLE-WALL ROUND DUCT WITH A SPIN-IN STYLE TAP AT THE MAIN DUCT.
6. HANGERS FOR EQUIPMENT AND PIPING SHALL BE SECURED TO THE BUILDING STRUCTURE. NO HANGERS SHALL BE ATTACHED TO THE FLOOR OR ROOF DECK MATERIAL, OR CONCRETE DECKS LESS THAN 4" THICK.
7. ALL RETURN AND EXHAUST GRILLES SHALL HAVE OPPOSED-BLADE DAMPERS. ALL SUPPLY-SIDE TAKE-OFFS SHALL HAVE A BALANCING DAMPER.
8. FIRE DAMPERS AND FIRE-STOPPING SHALL BE PROVIDED FOR ANY PENETRATIONS OF FIRE-RATED PARTITIONS. VERIFY LOCATIONS OF ALL FIRE-STOPPING ON THE ARCHITECTURAL DRAWINGS.
9. ALL GRILLES AND REGISTERS SHALL BE EQUAL TO TITUS WITH ALUMINUM CONSTRUCTION. SUPPLY GRILLES SHALL BE EQUAL TO MODEL TDC. SUPPLY REGISTERS SHALL BE EQUAL TO MODEL 301. RETURN, EXHAUST AND TRANSFER GRILLES SHALL BE EQUAL TO MODEL 355 WITH OPPOSED-BLADE DAMPERS. GRILLE FINISH SHALL BE APPROVED BY THE OWNER AND THE ARCHITECT.
10. EQUIPMENT INSTALLED UNDER THIS CONTRACT SHALL BE ABLE TO PROVIDE THE REQUIRED CAPACITIES IN THE MIDDLE OF IT'S PERFORMANCE RANGE. ALL COMPRESSORS SHALL HAVE A MINIMUM 5-YEAR WARRANTY UNLESS OTHERWISE NOTED. THE EQUIPMENT SHALL HAVE ALL THE NECESSARY CONTROLS AND ACCESSORIES TO ALLOW FOR FULL OPERATION. IF EQUIPMENT HAS COMPONENTS OF A VIBRATIVE NATURE, THE CONTRACTOR SHALL PROVIDE THE NECESSARY VIBRATION CONTROLS.
11. REFRIGERANT PIPING SHALL BE HARD-DRAWN TYPE K OR L COPPER WITH COPPER SOLDER FITTINGS. PIPING SHALL BE SOLDERED WITH SILVER SOLDER AND INSULATED WITH 1/2" THICK THERMAL TUBULAR JACKETING. SEAL INSULATION JOINTS WITH TAPE AND CEMENT OR PER MANUFACTURER'S INSTRUCTIONS. PRE-INSULATED AND PRE-CHARGED REFRIGERANT LINES MAY BE USED AS PROVIDED BY THE EQUIPMENT MANUFACTURER. WHERE INSULATION IS EXPOSED TO WEATHER PROTECT LINES WITH AN ALUMINUM COVER AND PAINT TO MATCH EXTERIOR FINISH.
12. CONDENSATE DRAINS SHALL BE FULL-SIZE (1" MINIMUM) COPPER OR SCHEDULE 40 PVC. DRAINS SHALL BE INSULATED IN THE SAME MANNER AS REFRIGERANT LINES. DISCHARGE AS SHOWN ON THE DRAWINGS.
13. CONTROLS SHALL BE EQUAL TO MANUFACTURER'S CONTROLS. OUTDOOR UNITS SHALL HAVE FACTORY-WIRED TIME DELAYS, PRESSURE SWITCHES, LOW-AMBIENT CONTROLS AND DEFROST CONTROLS. THERMOSTATS SHALL BE DIGITAL AND PROGRAMMABLE WITH BATTERY BACK-UP. SETPOINTS SHALL FOLLOW DESIGN CONDITIONS OR BE AS DIRECTED BY THE OWNER. MOUNT ALL THERMOSTATS AND TEMPERATURE SENSORS 60" A.F.F.
14. THE HVAC SYSTEM SHALL BE TESTED AND BALANCED ACCORDING TO AABC STANDARDS. THE CONTRACTOR SHALL PROVIDE THE ARCHITECT WITH A COPY OF THE TEST AND BALANCE REPORT AND THE OWNER WITH A LETTER STATING THAT THE SYSTEM(S) HAVE BEEN BALANCED TO WITHIN 10% OF DESIGN PARAMETERS.

MECHANICAL LEGEND

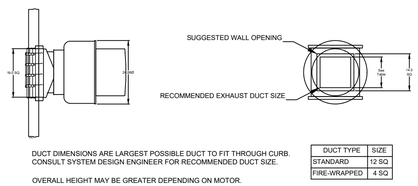
MARK	DESCRIPTION
CFM	CUBIC FEET PER MINUTE
CU	CONDENSING UNIT/HEAT PUMP
CD	SUPPLY DIFFUSER (TITUS TDCA-AAA)
RR	RETURN REGISTER (TITUS 25FL)
OA	OUTSIDE AIR
TG	TRANSFER GRILLE (TITUS 25FL)
WSR	WALL REGISTER (TITUS 300FS)
RTU	ROOFTOP UNIT
EX	EXISTING
	SUPPLY AIR
AD	AUTOMATIC DAMPER (24 VOLT)
	RETURN OR EXHAUST AIR
T	THERMOSTAT/SENSOR
S	SMOKE DETECTOR
WRR	WALL RETURN REGISTER (TITUS 350)
FD	FIRE DAMPER
	TURNING VANES IN DUCT
MD	MANUAL VOLUME DAMPER
	SUPPLY DIFFUSER (TITUS TDCA-AAA)
	SUPPLY OR OUTSIDE AIR DUCT IN SECTION
	EXISTING DUCTWORK
	SUPPLY AIR DUCTWORK
	EXHAUST AIR DUCTWORK
	RETURN AIR DUCTWORK
	OUTSIDE AIR DUCTWORK
	RETURN REGISTER (TITUS 25FL)

Direct Drive Upblast Centrifugal Wall Exhaust Fan

MARK INFORMATION QTY	MARK	MODEL	VOLUME (CFM)	FAN INFORMATION TOTAL EXTERNAL SP (IN WG)	FAN RPM	OPERATING POWER (HP)	WEIGHT (LB.)	MOTOR INFORMATION SIZE (HP)	V/C/P	ENCLOSURE	MOTOR RPM	WINDINGS	NEC FLA*
1	EF-3	CUE-101HP-VG	600	0.388	1,662	0.14	63	0.25	115/60/1	OP	1725	1	5.8

*NEC FLA - Based on tables 150 or 148 of National Electrical Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory.

EF-3 : SELECTED OPTIONS AND ACCESSORIES
- Sidewall Mounting - Fan Configured for Wall-Mounted Applications
- UL/cUL 705 Listed - "Power Ventilators"
- Switch, NEMA-1, Toggle, Shipped with Unit
- High Wind Rated (+/- 150 PSF Rating)
- Florida Product Approval #FL13225.1 & Miami-Dade NOA #19-0717.02
- Hinged Bracket Kit (PN 877580) (Shipped Loose)
- Foam Curb Seal (Attached)
- Damper Shipped Loose, WD-330-PB-12X12, Gravity Operated, Not Coated
- Stainless Steel Fasteners - 300 Series
- Birdscreen: Aluminum, nom. 86% Free Area
- Aluminum Rub Ring



DUCT TYPE	SIZE
STANDARD	12 SQ
FIRE-WRAPPED	4 SQ

HOOD INFORMATION

MARK	MODEL	HOOD DIMENSIONS (IN.) LENGTH	WIDTH	HEIGHT	HOOD CONSTR.	EXHAUST TOTAL CFM	COLLAR(S) WIDTH	LENGTH	CFM	S.P.	TOTAL WEIGHT LBS.	SECTION LOCATION	LIGHTING DETAILS FIXTURE TYPE BULB / LAMP INFO	QTY	FOOT CANDLES
H-1	GO-60-S	60.00	36	12	430 SS 100%	600.0	12	12	600	0.032	140	SINGLE	INCANDESCENT (GLOBE) 100W A19 (BULBS NOT INCL.)	2	42.66

HOOD OPTIONS
- 18 IN HIGH CEILING ENCLOSURES - FRONT LEFT RIGHT - FIELD INSTALLED
- FACTORY MOUNTED EXHAUST COLLAR(S)
- WALL UTILITY CABINET 24 IN HIGH 36 IN LONG 12 IN WIDE

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Alabama #CD-2429-E Arkansas #1654 Florida #00009014
Georgia #PEF003983 Mississippi #E-00000862
Texas #F-16637 Missouri #2018035834

JPE Job Number: 1950

OCTOBER 2020

AVCON, INC.
ENGINEERS & PLANNERS
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NICEVILLE, FL. 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

JDF ARCHITECTURE, LLC
201 LAZY WATER BLVD
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NO.	DATE	REVISION	BY

FIELD OFFICE
BUILDING HVAC
SCHEDULES

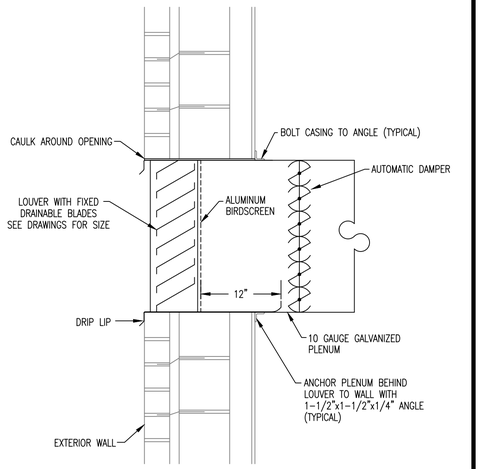
RELEASE FOR BID

CONSTRUCT OCWS
FIELD OFFICES

PREPARED FOR
OKALOOSA COUNTY
WATER & SEWER

DESIGNED BY: JDF
DRAWN BY: JDF
CHECKED BY: JDF
APPROVED BY: VCL
PROJECT NO: 18.0125.02
DATE: OCTOBER 2020

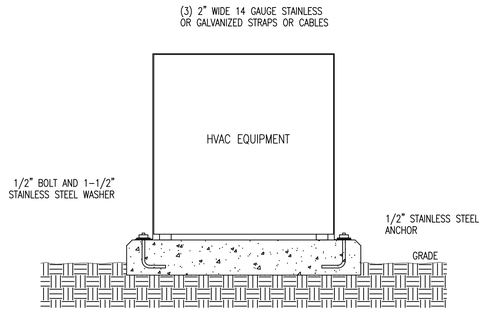
SHEET NUMBER
MF2.11



LOUVER THROUGH WALL W/ AD

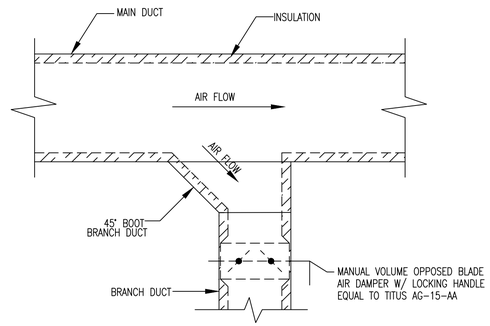
NOT TO SCALE

NOTES:
1. ALL PADS SHALL BE 6" THICK MINIMUM. EXTERIOR PADS SHALL HAVE AT LEAST 2" BELOW GRADE AND AT LEAST 4" ABOVE GRADE.
2. ANCHORS SHALL EXTEND INTO SLAB MINIMUM 3".
3. SECURE STRAPS AND CABLES TIGHT TO EQUIPMENT WITH MINIMUM 1/8" THICK RUBBERS STRIPS BETWEEN STRAPS/CABLES AND EQUIPMENT.



EXTERIOR CONCRETE EQUIPMENT PAD

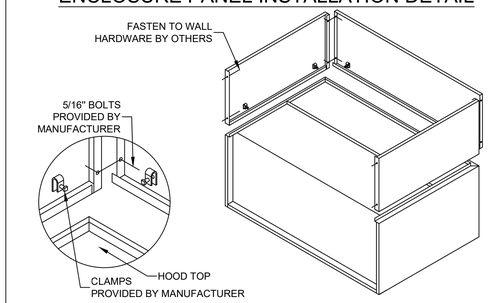
NOT TO SCALE



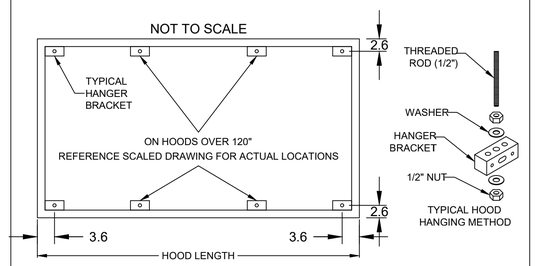
BRANCH DUCT TAP FROM MAIN

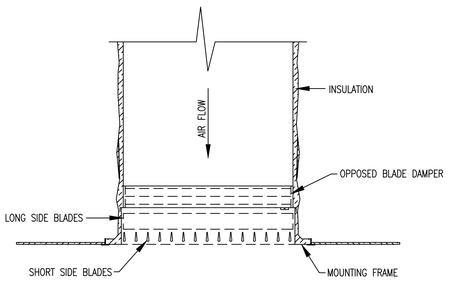
NOT TO SCALE

ENCLOSURE PANEL INSTALLATION DETAIL



HOOD HANGER BRACKET DETAIL

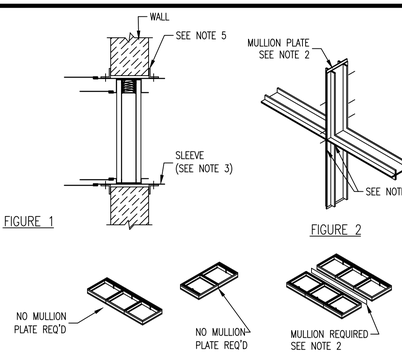




NOTES:
1. ALL REGISTERS SHALL BE DOUBLE DEFLECTION TYPE ALL ALUMINUM CONSTRUCTION.
2. BLADES SHALL BE NO FURTHER THAN 3/4" SPACING OR LESS THAN 1/2" SPACING.
3. CENTER REGISTER IN CEILING GRID.
4. IF DUCT IS INTERNALLY INSULATED, DIFFUSER SHALL BE WRAPPED WITH R-6 INSULATION AROUND ALL EXPOSED PARTS ABOVE CEILING.
5. REGISTER BASED UPON TITUS MODEL 300FS.

REGISTER DETAIL

NOT TO SCALE



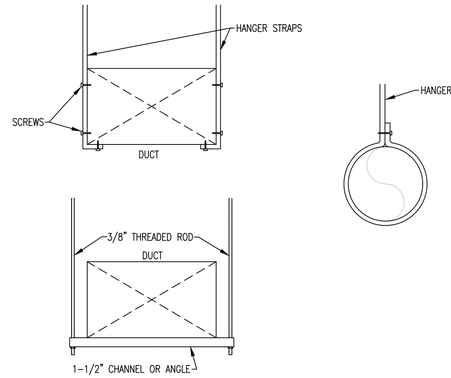
VERTICAL INSTALLATION

INSTALLATION DETAIL NOTES:

1. Opening in wall or floor shall be larger than damper/sleeve. See manufacturer's requirements.
2. For multiple sections and assembly refer to manufacturer's requirements to maintain UL rating and integrity.
3. Sleeves to dampers must be equal or thicker than duct connecting to the damper.
4. Follow "Air Flow" and "Mount with Arrow Up" labels for correct orientation for Dynamic dampers.
5. Do not weld of fasten angles together at corners of dampers. Use manufacturer's mounting angles and fasteners.
6. Duct/Sleeve connections must be made to allow the duct to break away from the dampers. See manufacturer's approved methods to seal duct to dampers.
7. The dampers must be installed so it is square and free from racking. All dampers require UL 555 and NFPA 90A approval at minimum.

FIRE DAMPER DETAIL

NOT TO SCALE



TYPICAL LOW-PRESSURE DUCT HANGERS

NOT TO SCALE

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NO.	DATE	REVISION	BY

FIELD OFFICE BUILDING HVAC DETAILS

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	OCTOBER 2020

SHEET NUMBER

MF2.12

JOHNSON PEADEN ENGINEERING INC.
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Alabama #CD-2429-E Arkansas #1654 Florida #00009014
Georgia #PEF003983 Mississippi #E-00000862
Texas #F-16637 Missouri #2018035834

JPE Job Number: 1950

OCTOBER 2020

MANUFACTURERS CONSIDERED EQUAL MUST SUBMIT TO ENGINEER 10 DAYS PRIOR TO BID FOR APPROVAL

LIGHTING FIXTURE SCHEDULE

MARK	MANUFACTURER AND CATALOG No. (or approved equal)	LAMPS No.	LAMPS TYPE	MOUNTING	REMARKS
DL	H.E. WILLIAMS 6DR-L20-835-DIM-UNV-O-W-OF-CS-N		19W LED ARRAY 2000 LUMEN/3500K	CEILING RECESSED	6" ROUND LED DOWNLIGHT, WIDE DISTRIBUTION, 120V
DLE	H.E. WILLIAMS 6DR-L20-835-DIM-UNV-O-W-OF-CS-N-EM/10W		19W LED ARRAY 2000 LUMEN/3500K	CEILING RECESSED	6" ROUND LED DOWNLIGHT, WIDE DISTRIBUTION, EMERGENCY UNIT BATTERY PACK, 120V
LTA	H.E. WILLIAMS LT-24-L40-835-AF-DIM-UNV		32W LED ARRAY 4000 LUMEN/3500K	CEILING RECESSED	2' X 4' RECESSED LED TROFFER, 120V
LTAE	H.E. WILLIAMS LT-24-L40-835-AF-DIM-UNV-EM/10W		32W LED ARRAY 4000 LUMEN/3500K	CEILING RECESSED	2' X 4' RECESSED LED TROFFER, EMERGENCY UNIT BATTERY PACK, 120V
LTB	H.E. WILLIAMS LT-24-L52-835-AF-DIM-UNV		37W LED ARRAY 5200 LUMEN/3500K	CEILING RECESSED	2' X 4' RECESSED LED TROFFER, 120V
LTBE	H.E. WILLIAMS LT-24-L52-835-AF-DIM-UNV-EM/10W		37W LED ARRAY 5200 LUMEN/3500K	CEILING RECESSED	2' X 4' RECESSED LED TROFFER, EMERGENCY UNIT BATTERY PACK, 120V
LTC	H.E. WILLIAMS LT-22-L49-835-AF-DIM-UNV		36W LED ARRAY 4900 LUMEN/3500K	CEILING RECESSED	2' X 2' RECESSED LED TROFFER, 120V
SH	H.E. WILLIAMS 6DR-L20-835-DIM-UNV-S-W-OF-CS-AD-WET/CC-N-F1		19W LED ARRAY 2000 LUMEN/3500K	CEILING RECESSED	6" ROUND LED SHOWER DOWNLIGHT, WIDE DISTRIBUTION, 120V
WB	H.E. WILLIAMS VWPH-L30/740-P3-SDGL-DIM-UNV		36W LED ARRAY 3000 LUMEN/4000K	WALL @ 10'-0" AFF	WALL MOUNTED AREA LIGHT WITH TYPE III DISTRIBUTION, FINISH SELECTED BY ARCHITECT, 120V
WBE	H.E. WILLIAMS VWPH-L30/740-P3-SDGL-DIM-UNV-EM/10WC		36W LED ARRAY 3000 LUMEN/4000K	WALL @ 8'-0" AFF	WALL MOUNTED AREA LIGHT WITH TYPE III DISTRIBUTION, FINISH SELECTED BY ARCHITECT, EMERGENCY UNIT BATTERY PACK, 120V
VP	H.E. WILLIAMS 96-2-L29-835-HIAFR-UNV		25W LED ARRAY 3028 LUMEN/3500K	CEILING SURFACE	1' X 2' SURFACE MOUNTED LED VAPOR PROOF, FULLY GASKETED INDUSTRIAL, UNIVERSAL VOLTAGE BALLAST
X	WILLIAMS EXIT-R-EM-WHT-SDT		LED	WALL ABOVE DOOR	LED EXIT LIGHT WITH THERMOPLASTIC HOUSING, EMERGENCY BATTERY BACKUP, PROVIDE DIRECTIONAL ARROWS AS INDICATED, 120V

1/2" LETTERS

PANEL LA

208Y/120 VOLTS
3 PHASE 4 WIRE
SERVED FROM PANEL MP
IN ELEC RM
10,000 AIC RATING

1/4" LETTERS

TYPICAL ELECTRICAL EQUIPMENT IDENTIFICATION DETAIL

NOT TO SCALE

ELECTRICAL EQUIPMENT IDENTIFICATION DETAIL NOTES:

1. MECHANICALLY AFFIX NAMEPLATE TO PANELBOARDS, CONTROL PANELS, MOTOR CONTROL CENTERS, DISCONNECTS, STARTERS OR SIMILAR DEVICES.
2. LETTERS SHALL BE WHITE ON BLACK BACKGROUND; SIZE OF LETTERS INDICATED ON DETAIL.
3. INFORMATION IN LABEL IS A GENERIC EXAMPLE – DESIGNATE EQUIPMENT IN A SIMILAR WAY USING RELEVANT INFORMATION (NAME OF PANEL, VOLTS, PHASE, LOCATION, AIC RATING ETC.) ACCORDING TO EACH INDIVIDUAL LOCATION OF EQUIPMENT.

WARNING

Arc Flash Hazard
Appropriate PPE Required

Do not operate controls or open covers without appropppriate personal protection equipment.
Failure to comply may result in injury or death!

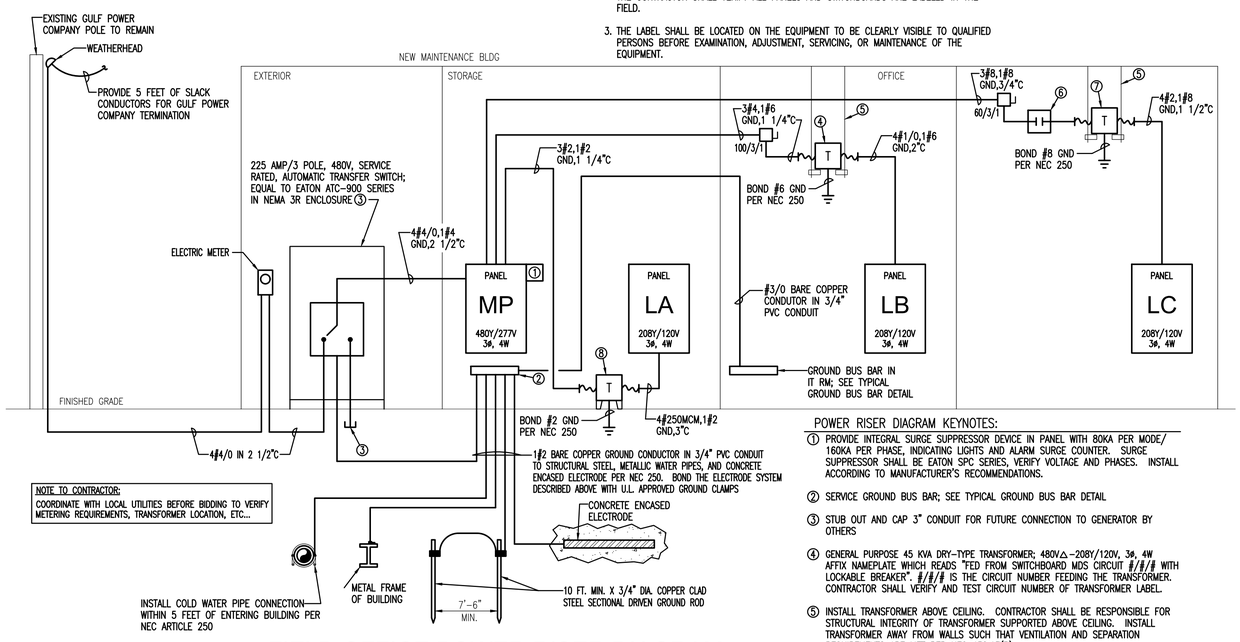
REFER TO NFPA 70E FOR MINIMUM PPE REQUIREMENTS

TYPICAL ARC FLASH HAZARD LABEL DETAIL

NOT TO SCALE

ARC FLASH LABEL DETAIL NOTES:

1. PROVIDE SELF-ADHESIVE VINYL LABEL TO AFFIX TO ALL PANEL AND SWITCHBOARDS IN ACCORDANCE WITH NEC 110.16 AND NFPA 70E.
2. LABELING MAY BE COMPLETED BY EQUIPMENT MANUFACTURER, VENDOR, OR CONTRACTOR. THE CONTRACTOR SHALL VERIFY ALL PANELS AND SWITCHBOARDS ARE LABELED IN THE FIELD.
3. THE LABEL SHALL BE LOCATED ON THE EQUIPMENT TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE OF THE EQUIPMENT.



FIELD OFFICE POWER RISER DIAGRAM

NOT TO SCALE

POWER RISER DIAGRAM KEYNOTES:

① PROVIDE INTEGRAL SURGE SUPPRESSOR DEVICE IN PANEL WITH 80KA PER MODE/ 160KA PER PHASE, INDICATING LIGHTS AND ALARM SURGE COUNTER. SURGE SUPPRESSOR SHALL BE EATON SPC SERIES, VERIFY VOLTAGE AND PHASES. INSTALL ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

② SERVICE GROUND BUS BAR; SEE TYPICAL GROUND BUS BAR DETAIL

③ STUB OUT AND CAP 3" CONDUIT FOR FUTURE CONNECTION TO GENERATOR BY OTHERS

④ GENERAL PURPOSE 45 KVA DRY-TYPE TRANSFORMER; 480V△-208Y/120V, 3ø, 4W AFFIX NAMEPLATE WHICH READS "FED FROM SWITCHBOARD MDS CIRCUIT #/#/# WITH LOCKABLE BREAKER". #/#/# IS THE CIRCUIT NUMBER FEEDING THE TRANSFORMER. CONTRACTOR SHALL VERIFY AND TEST CIRCUIT NUMBER OF TRANSFORMER LABEL.

⑤ INSTALL TRANSFORMER ABOVE CEILING. CONTRACTOR SHALL BE RESPONSIBLE FOR STRUCTURAL INTEGRITY OF TRANSFORMER SUPPORTED ABOVE CEILING. INSTALL TRANSFORMER AWAY FROM WALLS SUCH THAT VENTILATION AND SEPARATION REQUIREMENTS ARE MET PER NEC 450.13(B).

⑥ 60 AMP/3 POLE, 600V, CONTACTOR TO CONTROL PANEL LC; SEE RECEPTACLE CONTROL DIAGRAM

⑦ GENERAL PURPOSE 30 KVA DRY-TYPE TRANSFORMER; 480V△-208Y/120V, 3ø, 4W AFFIX NAMEPLATE WHICH READS "FED FROM SWITCHBOARD MDS CIRCUIT #/#/# WITH LOCKABLE BREAKER". #/#/# IS THE CIRCUIT NUMBER FEEDING THE TRANSFORMER. CONTRACTOR SHALL VERIFY AND TEST CIRCUIT NUMBER OF TRANSFORMER LABEL.

⑧ GENERAL PURPOSE 75 KVA DRY-TYPE TRANSFORMER; 480V△-208Y/120V, 3ø, 4W

ELECTRICAL LEGEND

CEILING OUTLETS

- "A" RECESSED 2' X 2' LED FIXTURE MARK "A"
- INDICATES FIXTURE WITH INTEGRAL EMERGENCY UNIT BATTERY PACK
- RECESSED OR SURFACE MOUNTED LED FIXTURE
- J JUNCTION BOX
- CEILING RECESSED MOUNTED LIGHTING FIXTURE
- CEILING SURFACE MOUNTED EMERGENCY EXIT LIGHT WITH REMOTE BATTERY
- EF EXHAUST FAN

WALL OUTLETS

- DUPLEX RECEPTACLE – 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
- QUADRAPLEX RECEPTACLE – 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
- G DUPLEX RECEPTACLE – 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
- G DUPLEX RECEPTACLE – 20 AMP, 125 VOLT, GFI, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 6" ABOVE COUNTER
- WP DUPLEX RECEPTACLE – 20 AMP, 125 VOLT, GFI, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA GF-5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE; PROVIDE WEATHERPROOF BOX FOR RECEPTACLE
- DUPLEX RECEPTACLE CONTROLLED BY TIMER/CONTACTOR – 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE; MARK IN ACCORDANCE WITH 2014 NEC 406.3(E)
- MULTICANGED FLOOR BOX WITH POWER/JBOX; SIZED FOR NUMBER OF BOXES; SELECTION OF MATERIAL & COLOR BY ARCHITECT; CARLON E976 SERIES; SUPPLY ALL ACCESSORIES AS REQUIRED FOR A FINISHED INSTALLATION.
- 250V RECEPTACLE; 4 WIRE; MT 14" AFF TO C/L; NEMA 10-50R; HUBBELL SERIES 7962
- JUNCTION BOX WITH BLANK SCREW COVER AND FLEXIBLE CONDUIT CONNECTION

WALL SWITCHES (UNLESS OTHERWISE NOTED, MOUNT 48" A.F.F.)

- S A.C. TYPE, SINGLE POLE, 20 AMP, 120/277 VOLT
- S_R WALL MOUNTED OCCUPANCY SENSOR; INFRARED TYPE TECHNOLOGY; MOUNT 48" AFF TO C/L; EQUAL TO WATTSTOPPER PW-100
- S_{RD} WALL MOUNTED OCCUPANCY SENSOR; DUAL TYPE (INFRARED AND ULTRASONIC) TECHNOLOGY; MOUNT 48" AFF TO C/L; EQUAL TO WATTSTOPPER DW-100
- S_M MOTOR RATED TOGGLE SWITCH DISCONNECT

TELEPHONE & TV SYSTEM

- TELECOMMUNICATIONS OUTLET AT 18" AFF; STUB 1"C WITH PULLSTRING TO ABOVE ACCESSIBLE CEILING
- C WALL MOUNTED TELECOMMUNICATIONS OUTLET MOUNTED 6" ABOVE COUNTER; STUB 1"C WITH PULLSTRING TO ABOVE ACCESSIBLE CEILING

PANELS AND POWER

- 277/480 VOLT SURFACE MOUNTED PANELBOARD
- 120/240 VOLT SURFACE MOUNTED PANELBOARD
- 120/240 VOLT FLUSH MOUNTED PANELBOARD
- NON-FUSIBLE DISCONNECT SWITCH; XX/YY/ZZ WHERE X INDICATES AMPERAGE, Y INDICATES # OF POLES, AND Z INDICATES NEMA RATING; SS INDICATES ENCLOSURE SHALL BE STAINLESS STEEL

BRANCH CIRCUITING

- RUN CONCEALED UNDER FLOOR OR IN GRADE
- RUN CONCEALED IN CEILING OR WALLS
- LA-1 HOMERUN TO PANEL. ANY CIRCUIT WITHOUT FURTHER IDENTIFICATION INDICATES 2 #12, 1 #12 GROUND – 1/2" C; 3 #12, 1 #12 GROUND – 1/2" C; 4 #12, 1 #12 GROUND – 3/4" C; ETC. AS PER NEC. LETTERS AND NUMERALS INDICATE PANEL AND CIRCUIT NUMBER.
- LIQUID-TIGHT FLEXIBLE CONDUIT CONNECTION
- SURFACE MOUNTED CONDUIT; RUN PARALLEL OR PERPINDICULAR TO BUILDING LINES

MISCELLANEOUS

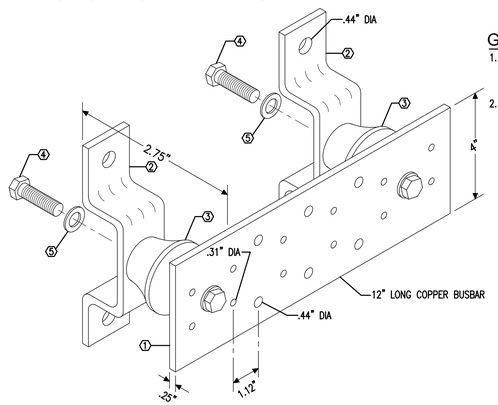
- A.F.F. ABOVE FINISH FLOOR
- WP WEATHERPROOF
- U.N.O. UNLESS NOTED OTHERWISE

OCCUPANCY SENSORS AND RELAYS

- 360° CEILING MOUNTED OCCUPANCY SENSOR WITH DUAL TECHNOLOGY (INFRARED AND ULTRASONIC) WATTSTOPPER DT-300-1
- P POWER PACK RELAY EQUAL TO WATTSTOPPER BZ50; INSTALL IN ACCESSIBLE LOCATION FOR MAINTENANCE PURPOSES
- 360° CEILING MOUNTED OCCUPANCY SENSOR WITH ULTRASONIC TECHNOLOGY ONLY; WATTSTOPPER WT-305-3-U; SENSOR IS DIRECTION ORIENTED, POINT LONG DIRECTION ALONG LENGTH OF CORRIDOR; PROVIDE WITH 20 AMP POWER PACK

ELECTRICAL GENERAL NOTES

1. CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER TRADES PRIOR TO INSTALLATION. REFER TO MECHANICAL AND PLUMBING DRAWINGS FOR EXACT SIZE AND LOCATION OF EQUIPMENT WHICH IS FURNISHED BY OTHERS AND CONNECTED BY ELECTRICAL.
2. RECEPTACLES, SWITCHES AND COVERPLATES COLOR SHALL BE SELECTED BY THE ARCHITECT FROM STANDARD COLORS.
3. LOCATION OF LIGHTING FIXTURES, DISCONNECT SWITCHES, ETC. FOR MECHANICAL EQUIPMENT/ROOM SHALL BE COORDINATED WITH FINAL MECHANICAL EQUIPMENT LOCATION TO PROVIDE NATIONAL ELECTRIC CODE REQUIRED ACCESS SPACE.
4. FINAL CONNECTION TO ALL MOTORS SHALL BE WITH FLEXIBLE CONDUIT CONNECTION.
5. ALL EXIT AND EMERGENCY FIXTURES SHALL BE CONNECTED TO LIGHT CIRCUIT AHEAD OF LOCAL SWITCH.
6. ALL PANELBOARDS, BACKBOARDS, TERMINAL CABINETS, DISCONNECTS, ETC SHALL HAVE CUSTOM ENGRAVED MICARTA NAMEPLATE MECHANICALLY AFFIXED IDENTIFYING SYSTEM.
7. GENERAL CONTRACTOR SHALL FIELD-VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK, AND SHALL IMMEDIATELY NOTIFY THE ARCHITECT OF ANY DISCREPANCIES. FAILURE TO DO SO INDICATES THAT THE CONTRACTOR ACCEPTS THE CONDITIONS AS THEY EXIST, AND SHALL PERFORM THE WORK REQUIRED AS SHOWN AND SPECIFIED.
8. THE ELECTRICAL CONTRACTOR SHALL OBTAIN AND REVIEW THE MECHANICAL AND SPECIAL EQUIPMENT SUBMITTALS PRIOR TO SUBMITTING THE ELECTRICAL SUBMITTALS. ANY ELECTRICAL EQUIPMENT, CONDUIT, AND WIRE SIZE CHANGES RESULTING FROM THIS REVIEW SHALL ALSO BE SUBMITTED FOR APPROVAL.
9. FURNISH ALL EQUIPMENT AND LABOR, PERFORM ALL LABOR WITH SUPERVISION, BEAR ALL EXPENSES, AS NECESSARY FOR THE SATISFACTORY COMPLETION OF ALL WORK READY FOR OPERATION.
10. COMPLY WITH ALL LOCAL CODE, LAWS, AND ORDINANCES APPLICABLE TO ELECTRICAL WORK, THE STATE BUILDING CODE AND THE NATIONAL ELECTRIC CODE. OBTAIN ALL PERMITS REQUIRED BY LOCAL ORDINANCES.
11. OBTAIN ARCHITECTS APPROVAL OF ALL LIGHT FIXTURES, SWITCHES, RECEPTACLES, PANELBOARDS, ETC. PRIOR TO PURCHASING.
12. THE GENERAL CONTRACTOR SHALL NOTIFY THE ARCHITECT IMMEDIATELY OF ANY CONFLICTS/DISCREPANCIES BETWEEN DISCIPLINES BEFORE ORDERING EQUIPMENT/MATERIALS.
13. DECORATIVE COVER PLATES FOR RECEPTACLE OUTLETS, SWITCHES, ETC. SHALL BE STAINLESS STEEL; REFER TO ELECTRICAL SPECIFICATIONS
14. INSTALL OCCUPANCY SENSORS AND ACCESSORIES PER MANUFACTURER'S RECOMMENDATIONS. ALL CONDUCTORS (INCLUDING CONTROLS) ASSOCIATED WITH OCCUPANCY SENSORS AND POWER PACKS SHALL BE INSTALLED IN 1/2" CONDUIT MINIMUM.
15. ELECTRICAL CONTRACTOR SHALL PAINT AND LABEL ALL JUNCTION BOXES TO IDENTIFY PANEL AND CIRCUIT; SEE ELECTRICAL SPECIFICATIONS.
16. ALL CONDUCTORS INDICATED ON PLAN SHALL BE COPPER.
17. EQUIPMENT GROUNDING CONDUCTOR SHALL BE PULLED IN ALL BRANCH CIRCUIT WIRING. CONDUIT GROUND SHALL NOT BE ACCEPTABLE.
18. THE ELECTRICAL WORK SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER. ALL NOT SO INSTALLED SHALL BE REMOVED AND REPLACED AT NO COST TO THE OWNER.
19. ALL CONDUCTORS LESS THAN 100A. SHALL BE COPPER #12 & #10 SOLID, #8 AND LARGER STRANDED, #6 AND SMALLER TO BE TYPE TW, 600 VOLT INSULATION AND TYPE THW FOR #4 AND LARGER.



TYPICAL GROUND BUS BAR DETAIL

NOT TO SCALE

GROUND BAR GENERAL NOTES:

1. INSTALL GROUND BUS BAR ON COMMUNICATIONS BACKBOARD IN EACH COMMUNICATIONS ROOM. MOUNT BUS BAR AT 18" AFF. REFER TO FLOOR PLAN FOR EXACT LOCATION AT BACKBOARD.
2. INSTALL 1#3/0 COPPER CONDUCTOR IN 1" CONDUIT TO EACH GROUND BUS BAR FROM THE MAIN GROUND BUS BAR. INSTALL A #3/0 COPPER GROUND FROM THE MAIN BUS BAR TO THE ELECTRICAL SERVICE GROUND.

GROUND BAR MATERIALS:

① TIN PLATED HIGH CONDUCTIVE COPPER GROUND BAR
② WALL MOUNTING BRACKET
③ INSULATORS
④ 3/8" CAP SCREWS
⑤ 3/8" LOCKWASHERS

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15 MAY 20

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NO.	DATE	REVISION	BY

FIELD OFFICE
ELECTRICAL LEGEND, NOTES AND DETAILS

RELEASE FOR BID

OCWS FIELD OFFICES

PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	RQY
DRAWN BY:	RQY
CHECKED BY:	RQY
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
EF0.01

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277/480 VOLT 3ø 4W
225 AMP MAIN BREAKER

CIRCUIT BREAKER PANEL SCHEDULE
PANEL MP

SURFACE MOUNTED

CKT	LOAD DESCRIPTION	BREAKER POLE	BREAKER AMP	LOAD KVA		BREAKER AMP	BREAKER POLE	LOAD DESCRIPTION	CKT
1									2
3	PANEL LA VIA XFRMR	3	70	44.84	22.71	70	3	PANEL LB VIA XFRMR	4
5									6
7									8
9	PANEL LC VIA XFRMR	3	50	14.52	21.36	35①	3	PU-1F	10
11									12
13									14
15	PU-2F	3	25①	15.29	19.94	30①	3	PU-3F	16
17									18
19						20	1	SPARE	20
21	SPARE	3	60			20	1	SPARE	22
23						20	1	SPARE	24
25	SPACE	1	--			--	1	SPACE	26
27	SPACE	1	--			--	1	SPACE	28
29	SPACE	1	--			--	1	SPACE	30
31	SPACE	1	--			--	1	SPACE	32
33	SPACE	1	--			--	1	SPACE	34
35	SPACE	1	--			--	1	SPACE	36
37	SPACE	1	--			--	1	SPACE	38
39	SPACE	1	--			--	1	SPACE	40
41	SPACE	1	--			--	1	SPACE	42

TOTAL CONNECTED LOAD: 138.66 KVA
MINIMUM INTERRUPTING CAPACITY: 22,000 AMPS SYMMETRICAL

① HACR RATED BREAKER; VERIFY SIZE REQUIRED FOR EQUIPMENT FURNISHED

120/208 VOLT 3ø 4W
150 AMP MAIN BREAKER

CIRCUIT BREAKER PANEL SCHEDULE
PANEL LB

FLUSH MOUNTED

CKT	LOAD DESCRIPTION	BREAKER POLE	BREAKER AMP	LOAD KVA		BREAKER AMP	BREAKER POLE	LOAD DESCRIPTION	CKT
1	LTS-WORK RM,OFFICE,STRG,ENV	1	20	1.40	.72	20	1	REFRIGERATOR KITCHEN	2
3	LTS-PLAN,CONF,ENG,MANGR,R/W	1	20	1.25	.36	20	1	REC-KITCHEN COUNTERTOP	4
5	LTS-HALL,KITCHEN	1	20	1.20	.36	20	1	REC-KITCHEN COUNTERTOP	6
7	IWH-1	1	20	.50	1.26	20	1	REC-KITCHEN	8
9	CP-1	1	20	.50	1.0	20	1	REC-PLAN RM,TLT	10
11	RANGE	2	50	8.0	1.08	20	1	REC-OFFICE,STORAGE	12
13					.72	20	1	REC-SURVEY,DRAFTER	14
15	SPARE	1	20		.90	20	1	REC-ENV,R/W	16
17	SPARE	1	20		.90	20	1	REC-ENG GRAD,SR MANAGER	18
19	SPARE	1	20		.90	20	1	REC-ENGINEER,WORK RM,EXTER	20
21	SPARE	1	20		1.0	20	1	FLOOR REC-CONF RM	22
23	SPARE	1	20		.66	20	1	REC-CONF RM	24
25	SPARE	1	20			20	1	SPARE	26
27	SPARE	1	20			20	1	SPARE	28
29	SPARE	1	20			20	1	SPARE	30
31	SPACE	1	--			--	1	SPACE	32
33	SPACE	1	--			--	1	SPACE	34
35	SPACE	1	--			--	1	SPACE	36
37	SPACE	1	--			--	1	SPACE	38
39	SPACE	1	--			--	1	SPACE	40
41	SPACE	1	--			--	1	SPACE	42

TOTAL CONNECTED LOAD: 22.71 KVA
MINIMUM INTERRUPTING CAPACITY: 10,000 AMPS SYMMETRICAL

120/208 VOLT 3ø 4W
250 AMP MAIN BREAKER

CIRCUIT BREAKER PANEL SCHEDULE
PANEL LA

SURFACE MOUNTED

CKT	LOAD DESCRIPTION	BREAKER POLE	BREAKER AMP	LOAD KVA		BREAKER AMP	BREAKER POLE	LOAD DESCRIPTION	CKT
1	LTS-STRG,OFFICES,MTR OPS,OPS	1	20	1.2	1.08	20	1	REC-STOR,FORE	2
3	LTS-SCADA,TECH,SPEC,SPR,STRG	1	20	1.35	1.08	20	1	REC-SUPER,STORAGE	4
5	LTS-WATER METER,TOILET,MECH	1	20	.95	.66	20	1	REC-WATER OPS,OPERATORS	6
7	LTS-EXTERIOR	1	20	.48	.72	20	1	REC-OPERATORS,EXTERIOR	8
9	REC-IT RM	1	20	1.0	1.0	20	1	REC-TABLE WATER OPS	10
11	REC-IT RM	1	20	1.0	1.08	20	1	REC-OFFICES,WATER METER	12
13	REC-IT RM	1	20	1.0	1.0	20	1	REC-CHARGING STATIONS STOR	14
15	REC-IT RM	1	20	1.0	.72	20	1	REC-WATER METER,TLT,HALL	16
17	REC-IT RM	1	20	1.0	.72	20	1	REC-TECH RMS	18
19	EF-3	1	20	.70	.90	20	1	REC-SPEC,SUPER	20
21	SPARE	1	20		1.0	20	1	REC-CEILING PROJECTOR	22
23	SPARE	1	20	⚠	1.02	20	1	REC-SCADA	24
25	SPARE	1	20		.90	20	1	REC-TLT,STOR	26
27	SPARE	1	20			20	1	SPARE	28
29	SPARE	1	20			20	1	SPARE	30
31	SPACE	1	--			--	1	SPACE	32
33	SPACE	1	--			--	1	SPACE	34
35	OWNER FURNISHED EQUIPMENT	2	50①	8.0	8.0	50①	2	OWNER FURNISHED EQUIPMENT	36
37									38
39	HP-1	2	15	2.16	5.82	60	2	AIR COMPRESSOR (5HP)	40
41									42

TOTAL CONNECTED LOAD: 44.84 KVA
MINIMUM INTERRUPTING CAPACITY: 10,000 AMPS SYMMETRICAL

① VERIFY BREAKER SIZE/POLES WITH OWNER FURNISED EQUIPMENT

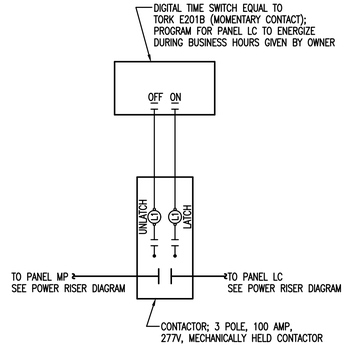
120/208 VOLT 3ø 4W
110 AMP MAIN BREAKER

CIRCUIT BREAKER PANEL SCHEDULE
PANEL LC

FLUSH MOUNTED

CKT	LOAD DESCRIPTION	BREAKER POLE	BREAKER AMP	LOAD KVA		BREAKER AMP	BREAKER POLE	LOAD DESCRIPTION	CKT
1	REC-OPERATORS	1	20	.60	.90	20	1	REC-SURVEY,OFFICE,WATER MTR	2
3	REC-WATER OPS,OPERATORS	1	20	.72	1.08	20	1	REC-DRAFTER,ENV,R/W	4
5	REC-FORE,SUPER,WATER OPS	1	20	.90	.90	20	1	REC-SR MANAGER,ENG GRAD	6
7	REC-OFFICES	1	20	.72	1.0	20	1	COPIER-WORK RM	8
9	PRINTER-WATER METER	1	20	1.0	1.0	20	1	PLOTTER-WORK RM	10
11	COPIER-WATER METER	1	20	1.0	.54	20	1	REC-TABLES WORK RM	12
13	COPIER-WATER METER	1	20	1.0	.72	20	1	REC-ENGINEER,CONF RM	14
15	COPIER-WATER METER	1	20	1.0	.90	20	1	REC-CONF RM,PLAN RM	16
17	REC-KITCHEN	1	20	.54		20	1	SPARE	18
19	SPARE	1	20			20	1	SPARE	20
21	SPARE	1	20			20	1	SPARE	22
23	SPARE	1	20			20	1	SPARE	24
25	SPACE	1	--			--	1	SPACE	26
27	SPACE	1	--			--	1	SPACE	28
29	SPACE	1	--			--	1	SPACE	30

TOTAL CONNECTED LOAD: 14.52 KVA
MINIMUM INTERRUPTING CAPACITY: 10,000 AMPS SYMMETRICAL



RECEPTACLE CONTROL DIAGRAM

NOT TO SCALE

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15 MAY 20

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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

JDF ARCHITECTURE, LLC
2014 LAKEWOOD DRIVE
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY
3	JUN 20	ADD EXHAUST HOOD	

PANEL SCHEDULES AND DETAILS

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	RQY
DRAWN BY:	RQY
CHECKED BY:	RQY
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
EF0.02

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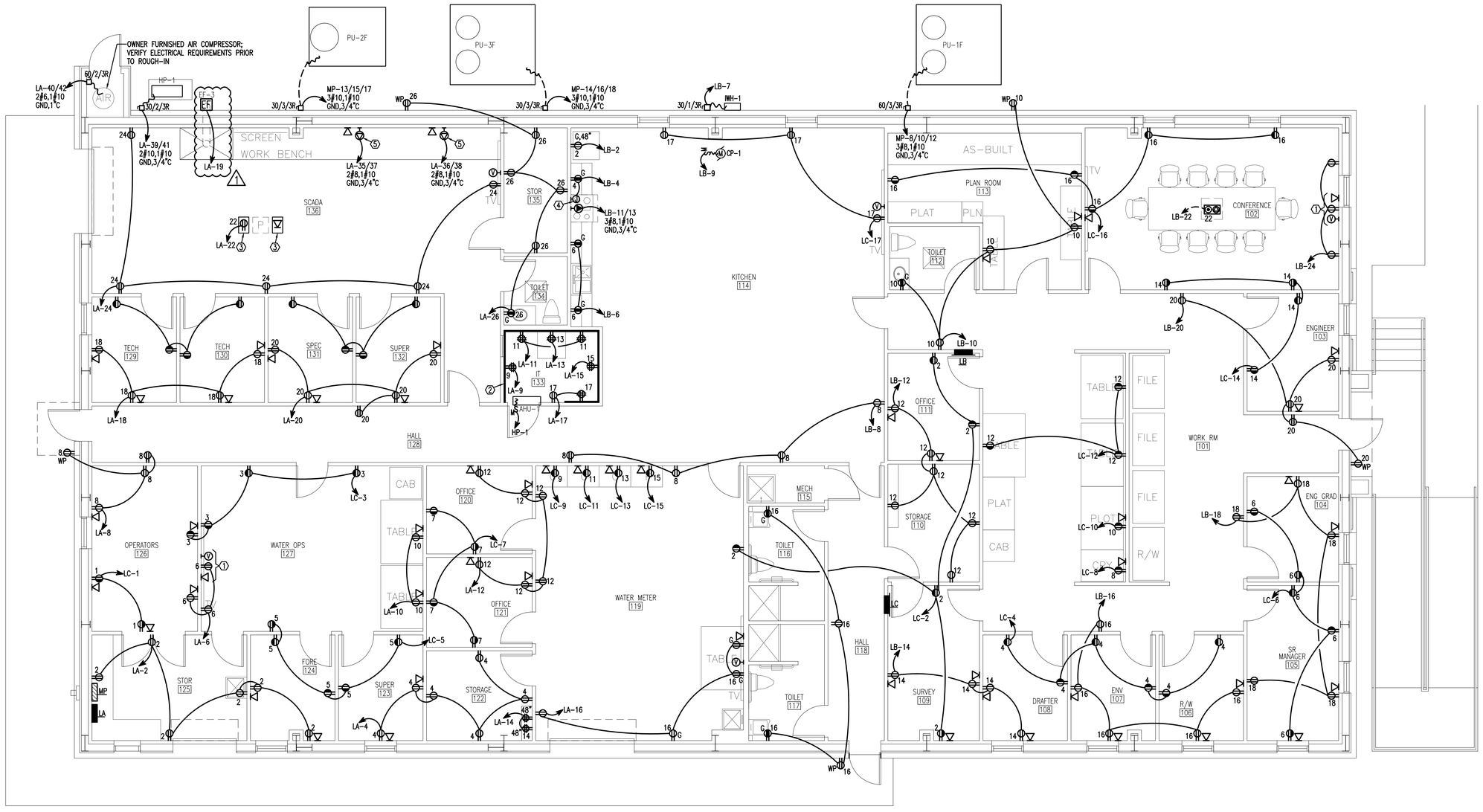

FIELD OFFICE BUILDING POWER & SIGNAL PLAN

SCALE: 3/16" = 1'-0"

KEYNOTES:

1. INSTALL TV, POWER, AND TELECOMM OUTLETS IN COMMON GANG BOX AT 60" AFF; VERIFY LOCATION WITH OWNER PRIOR TO ROUGH-IN
2. TELEPHONE BACKBOARD, WIDTH OF ROOM INDICATED X 4 FT. HIGH X 3/4" EXTERIOR PLYWOOD. PAINT TWO COATS FIRE RETARDANT PAINT. INSTALL ONE No. 3/0 COPPER GROUND CONDUCTOR IN 3/4" CONDUIT TO BUILDING GROUND, LEAVE 4 FT. SLACK CONDUCTOR AT BACKBOARD.
3. OUTLETS MOUNTED IN CEILING FOR PROJECTOR; PROVIDE HANGERS FOR SUPPORT
4. JUNCTION BOX FOR RANGE HOOD
5. 250V RECEPTACLE FOR OWNER FURNISHED EQUIPMENT; VERIFY ELECTRICAL REQUIREMENTS WITH OWNER PRIOR TO ROUGH-IN

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NO.	DATE	REVISION	BY
1	3 JUN 20	ADD EXHAUST HOOD	

FIELD OFFICE
POWER & SIGNAL PLAN

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	RQY
DRAWN BY:	RQY
CHECKED BY:	RQY
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
EF1.00

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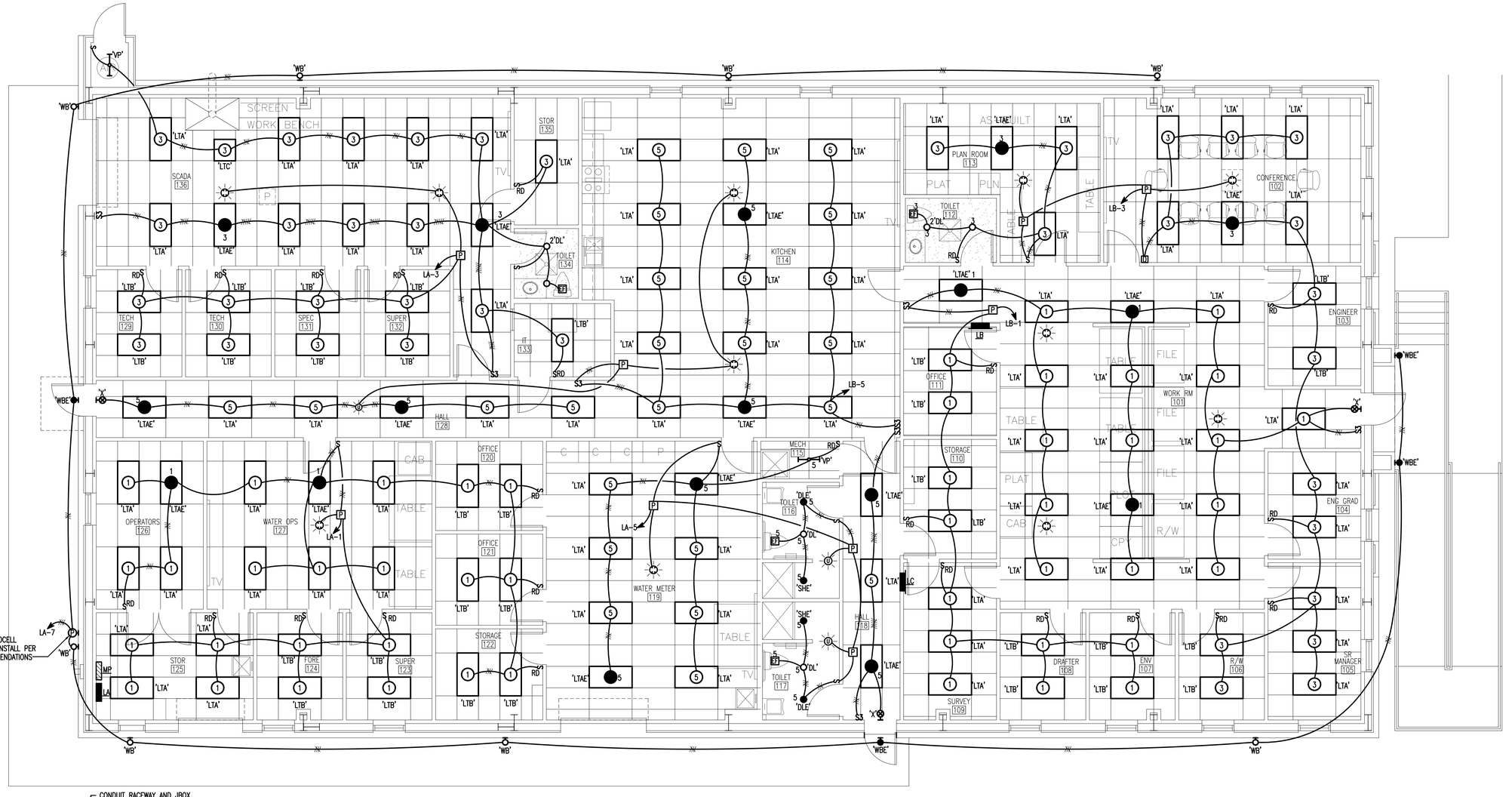
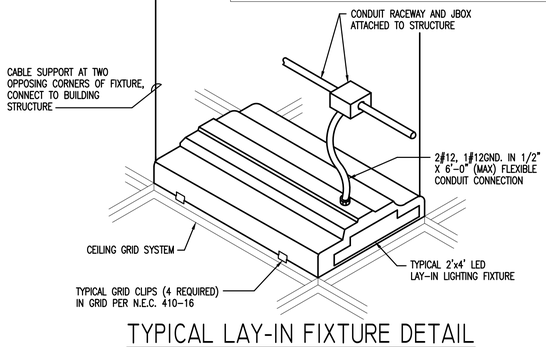


FIELD OFFICE BUILDING LIGHTING PLAN

SCALE: 3/16" = 1'-0"



TYPICAL LAY-IN FIXTURE DETAIL

NOT TO SCALE

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NO.	DATE	REVISION	BY

FIELD OFFICE LIGHTING PLAN

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	RQY
DRAWN BY:	RQY
CHECKED BY:	RQY
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
EF1.01

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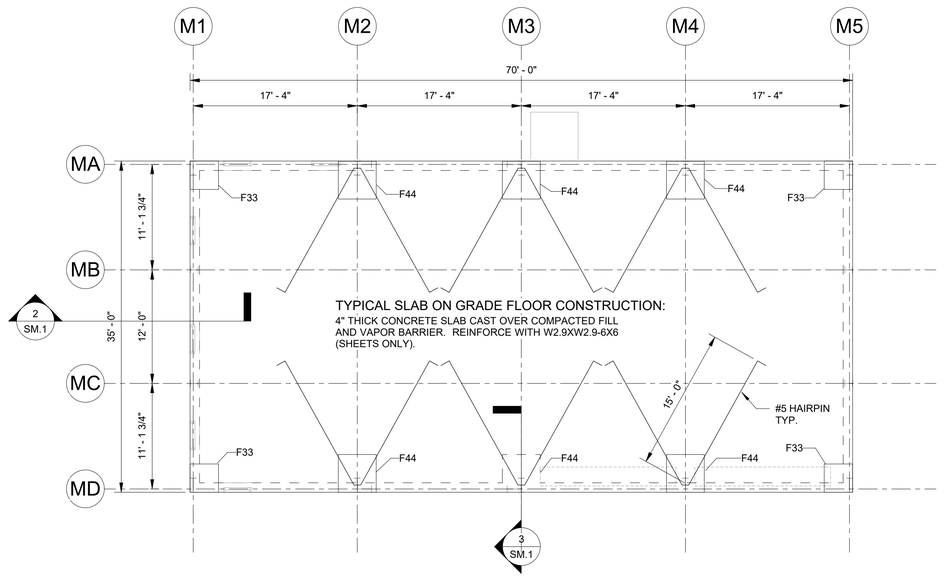
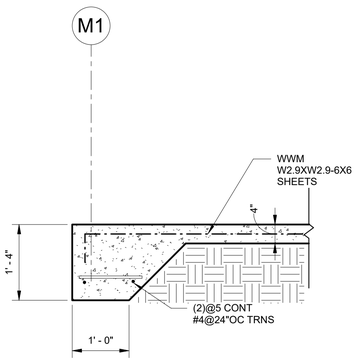
SAW CUT JOINTS; (SCJ)

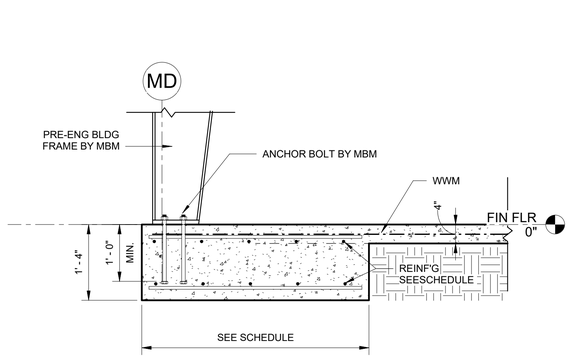
SAWCUT 1/8" WIDE 1" DEEP JOINTS AT NO MORE THAN 12' OC IN ANY DIRECTION. SAWCUTTING SHALL PROCEED AS SOON AS THE SLAB IS FINISHED AND CAN SUPPORT THE SAWCUTTING EQUIPMENT WITHOUT SCARRING THE SURFACE OF THE SLAB. (GREEN SAW METHOD)



1 FOUNDATION PLAN
1/8" = 1'-0"



2 SECTION
3/4" = 1'-0"



3 SECTION
3/4" = 1'-0"

PRE-ENGINEERED STEEL BUILDING

1. CONTRACTOR SHALL SUPPLY THE FINAL REACTIONS TO THE ARCHITECT / ENGINEER FOR REVIEW AS SOON AS THEY BECOME AVAILABLE.

2. THE SHOP DRAWINGS SHALL INDICATE THE DIAMETER AND NUMBER OF ANCHOR BOLTS PER COLUMN. SEE THE CONTRACT DOCUMENTS FOR THE EMBEDMENT REQUIREMENTS.

FOOTING SCHEDULE:

FOOTING ID	SIZE	REINF'G	NOTES
GB-1	1'-4"X1-0" CONT.	SEE SECTION	RUN CONT BARS THRU FOOTING
F33	3'X3'X1'-4"	#5@10"OC E.W.T&B	
F44	4'X4'X1'-4"	#5@10"OC E.W.T&B	

GENERAL NOTES:

1. TO THE BEST OF OUR KNOWLEDGE, THE STRUCTURAL PLANS AND SPECIFICATIONS COMPLY WITH THE APPLICABLE REQUIREMENTS OF THE FLORIDA BUILDING CODE, 2017 6TH EDITION.
2. THE STRUCTURAL DOCUMENTS ARE TO BE USED IN CONJUNCTION WITH THE ARCHITECTURAL DOCUMENTS. USE THESE NOTES IN CONJUNCTION WITH THE SPECIFICATIONS. IF A CONFLICT EXISTS, THE MORE STRINGENT GOVERNS.
3. COMPLY WITH REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE, AND ALL OTHER APPLICABLE FEDERAL STATE, AND LOCAL CODES, STANDARDS, REGULATIONS AND LAWS.
4. ALL REFERENCED STANDARDS REFER TO THE EDITION IN FORCE AT THE TIME THESE PLANS AND SPECIFICATIONS ARE ISSUED FOR BIDDING.
5. REVIEW ALL CONTRACT DOCUMENTS, DIMENSIONS AND SITE CONDITIONS AND COORDINATE WITH FIELD DIMENSIONS AND PROJECT SHOP DRAWINGS PRIOR TO CONSTRUCTION. REPORT ANY DISCREPANCIES IN WRITING TO THE ARCHITECT/ENGINEER. DO NOT CHANGE SIZE OR DIMENSIONS OF STRUCTURAL MEMBERS WITHOUT WRITTEN INSTRUCTIONS FROM THE STRUCTURAL ENGINEER OF RECORD.
6. ANY DISCREPANCIES, OMISSIONS, OR VARIATIONS NOTED ON THE DRAWINGS OR IN THE SPECIFICATIONS DISCOVERED DURING THE BIDDING PERIOD SHALL BE IMMEDIATELY COMMUNICATED IN WRITING TO THE ARCHITECT/ENGINEER.
7. PROTECT EXISTING FACILITIES, STRUCTURES AND UTILITY LINES FROM ALL DAMAGE. EACH CONTRACTOR SHALL PROTECT HIS WORK, ADJACENT PROPERTY AND THE PUBLIC. EACH CONTRACTOR IS SOLELY RESPONSIBLE FOR DAMAGE OR INJURY DUE TO HIS ACT OR NEGLECT.
8. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR JOB SAFETY AND CONSTRUCTION PROCEDURES.
9. DO NOT SCALE DRAWINGS; USE DIMENSIONS.
10. SEE ARCHITECTURAL AND MECHANICAL DRAWINGS FOR SIZE AND LOCATION OF OPENINGS IN STRUCTURE NOT SHOWN ON STRUCTURAL DRAWINGS.
11. DETAILS LABELED "TYPICAL DETAILS" ON THE DRAWINGS APPLY TO ALL SITUATIONS THAT ARE THE SAME OR SIMILAR TO THOSE SPECIFICALLY DETAILED. SUCH DETAILS APPLY WHETHER OR NOT THEY ARE KEYED IN AT EACH LOCATION. QUESTIONS REGARDING APPLICABILITY OF TYPICAL DETAILS SHALL BE RESOLVED BY THE ARCHITECT/ENGINEER.
12. REVISIONS ARE IDENTIFIED BY A REVISION NUMBER WITHIN A TRIANGLE. ALL REVISIONS ISSUED ON A SINGLE DATE WILL BE IDENTIFIED BY THE SAME REVISION NUMBER ISSUED CONSEQUENTLY.
13. CURRENT REVISIONS ARE ENCIRCLED BY AN IRREGULAR "CLOUD", AS WELL AS FLAGGED WITH THE CURRENT REVISION NUMBER. CLOUDS ARE REMOVED FROM PREVIOUSLY ISSUED REVISIONS.

14. DESIGN LOADS AND CRITERIA:

FLOOR LIVE LOAD	40 PSF
PARTITION LOAD	15 PSF
ROOF LIVE LOAD	20 PSF
FLOOR DEAD LOAD	SELF WEIGHT
WIND CRITERIA	ASCE 7-10
ULTIMATE WIND SPEED	160 MPH
RISK CATEGORY	IV
IMPORTANCE FACTOR	1.00
STRUCTURE TYPE	ENCLOSED

SHOP DRAWING SUBMITTALS:

1. THE FOLLOWING REQUIREMENTS IN NO WAY REDUCE OR LIMIT ANY ADDITIONAL REQUIREMENTS OF SPECIFICATIONS.
2. REVIEW OF SUBMITTALS BY THE STRUCTURAL ENGINEER IS FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT AS PRESENTED BY THE CONTRACT DOCUMENTS. NO DETAILED CHECK OF QUANTITIES OR DIMENSIONS WILL BE MADE. ONLY THOSE SHOP DRAWINGS REQUIRED BY THE CONTRACT DOCUMENTS TO BE SUBMITTED WILL BE REVIEWED. ALL OTHERS WILL BE RETURNED WITHOUT COMMENT.
3. IN ACCORDANCE WITH THE SPECIFICATIONS, SUBMIT A COPY OF THE SHOP DRAWING SUBMITTAL REGISTER TO THE STRUCTURAL ENGINEER, SHOWING DATES OF SUBMITTAL FOR EACH SPECIFIC STRUCTURAL SECTION OF THE WORK, CONSISTENT WITH THE FOLLOWING CRITERIA:
   A. ALLOW ADEQUATE TIME FOR TRANSIT AND PROCESSING BEFORE FABRICATION. THE STRUCTURAL ENGINEER WILL REVIEW AN AVERAGE SUBMITTAL WITHIN 10 WORKING DAYS OF RECEIPT BY THEM.
   B. SCHEDULE AND SUBMIT SHOP DRAWINGS FOR SPECIFIC COMPONENTS, SUCH AS COLUMNS FOOTINGS, ETC., IN THEIR ENTIRETY. SHOP DRAWINGS FOR SIMILAR FLOORS SHALL BE SUBMITTED IN THE SAME PACKAGE. C. SUBMIT SHOP DRAWINGS IN A TIMELY MANNER, CONSISTENT WITH THE ABOVE
4. REQUIREMENTS.
   ALL CHANGES AND ADDITIONS MADE ON RESUBMITTALS MUST BE CLEARLY FLAGGED AND NOTED. THE PURPOSE OF THE RESUBMITTALS MUST BE CLEARLY NOTED ON THE LETTER OF TRANSMITTAL. ARCHITECT / ENGINEER REVIEW WILL BE LIMITED TO THE ITEMS CAUSING THE RESUBMITTAL.
5. DO NOT REPRODUCE THE CONTRACT DOCUMENTS FOR USE AS SHOP DRAWINGS.
6. SHOP DRAWINGS NOT MEETING THE ABOVE CRITERIA OR SUBMITTED AFTER FABRICATION WILL NOT BE REVIEWED AND WILL BE RETURNED WITHOUT COMMENT.
7. RESPONSIBILITIES OF DETAILERS AND FABRICATORS:
   A. GENERAL - SUBMIT SHOP DRAWINGS AND ANY OTHER SPECIAL INFORMATION NECESSARY FOR PROPER FABRICATION, ERECTION, AND PLACEMENT OF STRUCTURAL FABRICATIONS. INCLUDE PLANS, ELEVATIONS, AND SECTIONS. CLEARLY SHOW ANCHORAGES, CONNECTIONS, AND ACCESSORY ITEMS.THE DETAILER MUST INTERPRET THE CONTRACT DOCUMENTS AND CLEARLY CONVEY THIS INTERPRETATION TO THE FIELD IN THE FORM OF PLACING OR ERECTION DRAWINGS.
   B. CONCRETE REINFORCING DETAILER - PROVIDE PLACING DRAWINGS FOR FABRICATION AND PLACING OF REINFORCING STEEL. THESE DRAWINGS SHALL INCLUDE, BUT ARE NOT LIMITED TO THE FOLLOWING: BAR LISTS, SCHEDULES, BENDING DETAILS, PLACING DETAILS, PLACING PLANS, AND PLACING ELEVATIONS.
   - CLEARLY SHOW ELEVATIONS OF ALL FOUNDATION WALLS. INDICATE CONTROL JOINTS, EXPANSION JOINTS, LINTELS, CONCRETE BOND BEAMS, AND OPENINGS, DETAILS OF ALL REINFORCING WITH LOCATIONS OF SPLICES, AND HOOKS,
   - CLEARLY SHOW GRADE BEAM ELEVATIONS AND SECTIONS. INDICATE BAR LENGTHS, HOOKS, STIRRUP SPACING, LAP SPLICES, OFFSETS, AND LOCATION OF BARS WITH RESPECT TO ALL SUPPORTS.
   - CLEARLY SHOW COLUMN ELEVATIONS AND SECTIONS. INDICATE DOWELS, OFFSETS, LAP SPLICES, AND TIES. PLAN SECTIONS OF ALL COLUMNS MUST CLEARLY BE SHOWN.
   - CLEARLY SHOW FOUNDATION REINFORCING. INDICATE BAR LENGTHS, LOCATION AND SPLICES OF CONTINUOUS BARS, AND BAR SUPPORTS.
   - CLEARLY SHOW LOCATIONS OF ALL DOWELS ON PLAN. INDICATE FOOTING STEP LOCATIONS AND PROVIDE DETAILS.
8. FOR ADDITIONAL CRITERIA APPLICABLE TO SHOP DRAWINGS REQUIRING ENGINEERING INPUT BY A SPECIALTY ENGINEER, SEE BELOW

SHOP DRAWINGS REQUIRING ENGINEERING INPUT BY SPECIALTLY ENGINEER:

1. SPECIALTY ENGINEER:
   A. DEFINITION - A FLORIDA REGISTERED PROFESSIONAL ENGINEER WHO SPECIALIZES IN AND WHO UNDERTAKES THE DESIGN OF STRUCTURAL COMPONENTS OR STRUCTURAL SYSTEMS INCLUDED IN A SPECIFIC SUBMITTAL PREPARED FOR THIS
   PROJECT. B. SHALL BE:
   1 AN EMPLOYEE OR OFFICER OF A FABRICATOR.
   - AN EMPLOYEE OR OFFICER OF AN ENTITY SUPPLYING COMPONENTS TO A
   2 FABRICATOR. AN INDEPENDENT CONSULTANT RETAINED BY THE FABRICATOR OR HIS
2. THE FOLLOWING SYSTEMS AND COMPONENTS AS A MINIMUM REQUIRE FABRICATION AND ERECTION DRAWINGS WITH INPUT BY A SPECIALTY ENGINEER. PRE-ENGINEERED STEEL BUIDING AND ROOF COMPONENTS
3. THE SPECIALTY ENGINEER OR MANUFACTURER SHALL DESIGN, PROVIDE, AND INSTALL THEIR COMPONENTS AND THE COMPONENT CONNECTIONS TO THE PRIMARY STRUCTURE PER THE WIND CRITERIA STATED IN GENERAL NOTE 14 OR THE CURRENT GOVERNING BUILDING CODES, WHICHEVER IS MORE STRINGENT.
4. SUBMITTALS SHALL CLEARLY IDENTIFY THE SPECIFIC PROJECT AND APPLICABLE CODES, LIST THE DESIGN CRITERIA, AND SHOW ALL DETAILS AND PLANS NECESSARY FOR PROPER FABRICATION AND INSTALLATION. CALCULATIONS AND SHOP DRAWINGS SHALL IDENTIFY SPECIFIC PRODUCT UTILIZED. GENERIC PRODUCTS WILL NOT BE ACCEPTED.
5. SHOP DRAWINGS AND CALCULATIONS MUST BE PREPARED UNDER THE DIRECT SUPERVISION AND CONTROL OF THE SPECIALTY ENGINEER.
6. SHOP DRAWINGS AND CALCULATIONS REQUIRE THE EMBOSSED OR PRINTED SEAL, DATE AND SIGNATURE OF THE SPECIALTY ENGINEER. COMPUTER PRINTOUTS ARE AN ACCEPTABLE SUBSTITUTE FOR MANUAL COMPUTATIONS PROVIDED THEY ARE ACCOMPANIED BY SUFFICIENT DESCRIPTIVE INFORMATION TO PERMIT THEIR PROPER E VALUATION. SUCH DESCRIPTIVE INFORMATION SHALL BEAR THE EMBOSSED SEAL AND SIGNATURE OF THE SPECIALTY ENGINEER AS AN INDICATION THAT HE HAS ACCEPTED RESPONSIBILITY FOR THE RESULTS. THE STRUCTURAL ENGINEER WILL RETAIN ONE SIGNED AND SEALED SET FOR RECORD.
7. CATALOG INFORMATION ON STANDARD PRODUCTS DOES NOT REQUIRE THE SEAL OF A SPECIALTY ENGINEER.
8. REVIEW BY THE STRUCTURAL ENGINEER OF RECORD OF SUBMITTALS IS LIMITED TO VERIFYING THE
   A. LLOVTHAT THE SPECIFIED STRUCTURAL SUBMITTALS HAVE BEEN FURNISHHED.
   B. THAT THE STRUCTURAL SUBMITTALS HAVE BEEN SIGNED AND SEALED BY THE SPECIALTY ENGINEER.
   C. THAT THE SPECIALTY ENGINEER HAS UNDERSTOOD THE DESIGN INTENT AND HAS USED THE SPECIFIED STRUCTURAL CRITERIA. (NO DETAILED CHECK OF CALCULATIONS WILL BE MADE.)
   D. THAT THE CONFIGURATION SET FORTH IN THE STRUCTURAL SUBMITTALS IS CONSISTENT WITH THE CONTRACT DOCUMENTS. (NO DETAILED CHECK OF DIMENSIONS OR QUANTITIES WILL BE MADE.)
9. A LIST SHALL BE PREPARED AND MAINTAINED BY THE CONTRACTOR FOR ALL SHOP DRAWINGS REQUIRING PARTICIPATION OF A SPECIALTY ENGINEER. THE LIST SHALL CONTAIN PROJECT NAME, NAME OF CONTRACTOR, NAME OF SUBCONTRACTOR, NAME OF SPECIALTY ENGINEER, DRAWING NUMBER, DRAWING TITLE AND THE LATEST REVISION NUMBER AND DATE. FOR PARTIAL SUBMITTALS, THE LIST SHALL CONTAIN ALL ANTICIPATED DRAWING NUMBERS AND TITLES REQUIRED TO COMPLETE THE CONTRACT. THE CONTRACTOR IS RESPONSIBLE FOR SUBMITTING THE LATEST UPDATED LIST OF DRAWINGS WITH EACH SUBMITTAL.
10. SUBMITTALS NOT MEETING THE ABOVE CRITERIA WILL NOT BE REVIEWED AND WILL BE RETURNED TO C ONTRACTOR MARKED REVISE AND RESUBMIT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DELAYS WHICH MAY RESULT.

Wind Loads - MWFRS h≤60' (Low-rise Buildings) Enclosed/partially enclosed only

Kz = Kh (case 1) = 0.85
Base pressure (qh) = **47.3 psf**
GCpi = +/-0.18

Edge Strip (a) = 3.0 ft
End Zone (2a) = 6.0 ft
Zone 2 length = 15.0 ft

Ultimate Wind Surface Pressures (psf)

1	29.3	12.2		-12.8	-29.8
2	-24.1	-41.1		-24.1	-41.1
3	-10.5	-27.6		-9.0	-26.0
4	-7.2	-24.2		-12.8	-29.8
5				27.4	10.4
6				-5.2	-22.2
1E	40.0	23.0		-14.2	-31.2
2E	-42.1	-59.1		-42.1	-59.1
3E	-18.8	-35.8		-16.6	-33.6
4E	-14.8	-31.8		-14.2	-31.2
5E				37.4	20.3
6E				-11.8	-28.8

Horizontal MWFRS Simple Diaphragm Pressures (psf)

[1]**Transverse direction (normal to L)**

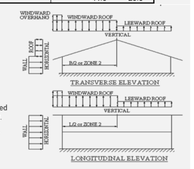
Interior Zone:	Wall	36.4 psf
	Roof	-13.6 psf **
End Zone:	Wall	54.8 psf
	Roof	-23.3 psf **

Longitudinal direction (parallel to L)

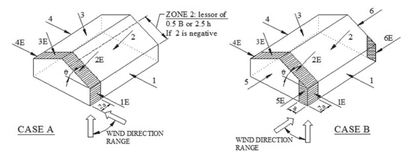
Interior Zone:	Wall	32.6 psf
End Zone:	Wall	49.2 psf

** NOTE: Total horiz force shall not be less than that determined by neglecting roof forces (except for MWFRS moment frames).

The code requires the MWFRS be designed for a min ultimate force of 16 psf multiplied by the wall area plus an 8 psf force applied to the vertical projection of the roof.



Location of MWFRS Wind Pressure Zones



NOTE: Torsional loads are 25% of zones 1 - 6. See code for loading diagram.

ASCE 7 -99 and ASCE 7-10 (& later)

Wind Loads - MWFRS h≤60' (Low-rise Buildings) Enclosed/partially enclosed only

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GCpi = +/-0.18

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End Zone (2a) = 6.0 ft
Zone 2 length = 15.0 ft

Ultimate Wind Surface Pressures (psf)

1	29.3	12.2		-12.8	-29.8
2	-24.1	-41.1		-24.1	-41.1
3	-10.5	-27.6		-9.0	-26.0
4	-7.2	-24.2		-12.8	-29.8
5				27.4	10.4
6				-5.2	-22.2
1E	40.0	23.0		-14.2	-31.2
2E	-42.1	-59.1		-42.1	-59.1
3E	-18.8	-35.8		-16.6	-33.6
4E	-14.8	-31.8		-14.2	-31.2
5E				37.4	20.3
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Horizontal MWFRS Simple Diaphragm Pressures (psf)

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Interior Zone:	Wall	36.4 psf
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Longitudinal direction (parallel to L)

Interior Zone:	Wall	32.6 psf
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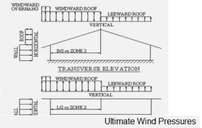
** NOTE: Total horiz force shall not be less than that determined by neglecting roof forces (except for MWFRS moment frames).



Ultimate Wind Pressures

Wind Loads - Components & Cladding : h <= 60'

Kh (case 1) = 0.85
Base pressure (qh) = **47.3 psf**
Minimum parapet ht = 0.0 ft
Roof Angle (θ) = 9.5 deg
Type of roof = Gable

h = 14.0 ft
a = 3.0 ft
GCpi = +/-0.18

Roof

Area	GCp +/- GCpi			Surface Pressure (psf)			User input	
	10 sf	50 sf	100 sf	10 sf	50 sf	100 sf	75 sf	500 sf
Negative Zone 1	-1.08	-1.01	-0.98	-51.1	-47.8	-46.3	-46.9	-46.3
Negative Zone 2	-1.88	-1.53	-1.38	-88.9	-72.4	-65.3	-68.2	-65.3
Negative Zone 3	-2.78	-2.36	-2.18	-131.5	-111.6	-103.1	-106.6	-103.1
Positive All Zones	0.68	0.54	0.48	32.2	25.5	22.7	23.9	22.7
Overhang Zone 2	-2.20	-2.20	-2.20	-104.0	-104.0	-104.0	-104.0	-104.0
Overhang Zone 3	-3.70	-2.86	-2.50	-175.0	-135.3	-118.2	-125.3	-118.2

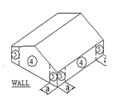
Overhang pressures in the table above assume an internal pressure coefficient (Gcpi) of 0.0
Overhang soffit pressure equals adjacent wall pressure reduced by internal pressure of 8.5 psf

Walls

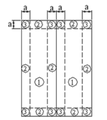
Area	GCp +/- GCpi			Surface Pressure (psf)			User input	
	10 sf	100 sf	500 sf	10 sf	100 sf	500 sf	50 sf	200 sf
Negative Zone 4	-1.17	-1.01	-0.90	-55.3	-47.8	-42.6	-50.1	-45.5
Negative Zone 5	-1.44	-1.12	-0.90	-68.1	-53.1	-42.6	-57.6	-48.5
Positive Zone 4 & 5	1.08	0.92	0.81	51.1	43.6	38.3	45.8	41.3

Note: GCp reduced by 10% due to roof angle <= 10 deg.

Location of C&C Wind Pressure Zones



Walls h ≤ 60'
& alt design h<90'



ROOF DIAGRAM

RAC ENGINEERING, INC.
129 HIGHPOINT DRIVE,
GULF BREEZE, FL 32561
850-712-8290

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

AVCON
TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

jdf+ architecture llc
JDF ARCHITECTURE, LLC
2000 W. NEW HAVEN AVE.
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDC
DRAWN BY:	VMB
CHECKED BY:	TDN
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	AUGUST 21, 2019

SHEET NUMBER
SM.1

APPLICABLE CODES

BUILDING CODE
2017 FLORIDA BUILDING CODE
2017 FLORIDA PLUMBING CODE
2017 FLORIDA MECHANICAL CODE
2015 FLORIDA FIRE PREVENTION CODE
2012 NFPA 1 & NFPA 101

BUILDING AREA

GROSS SQUARE FOOTAGE:	2,450 SQUARE FEET
NET HEATED & COOLED SQUARE FOOTAGE:	1,002 SQUARE FEET
STORAGE:	1,230 SQUARE FEET

SITE INFORMATION

WIND LOAD:	160 MPH FASTEST MILE WIND LOAD
EXPOSURE:	EXPOSURE "B"
RISK CATEGORY:	IV
JURISDICTION:	OKALOOSA COUNTY

CODE ANALYSIS

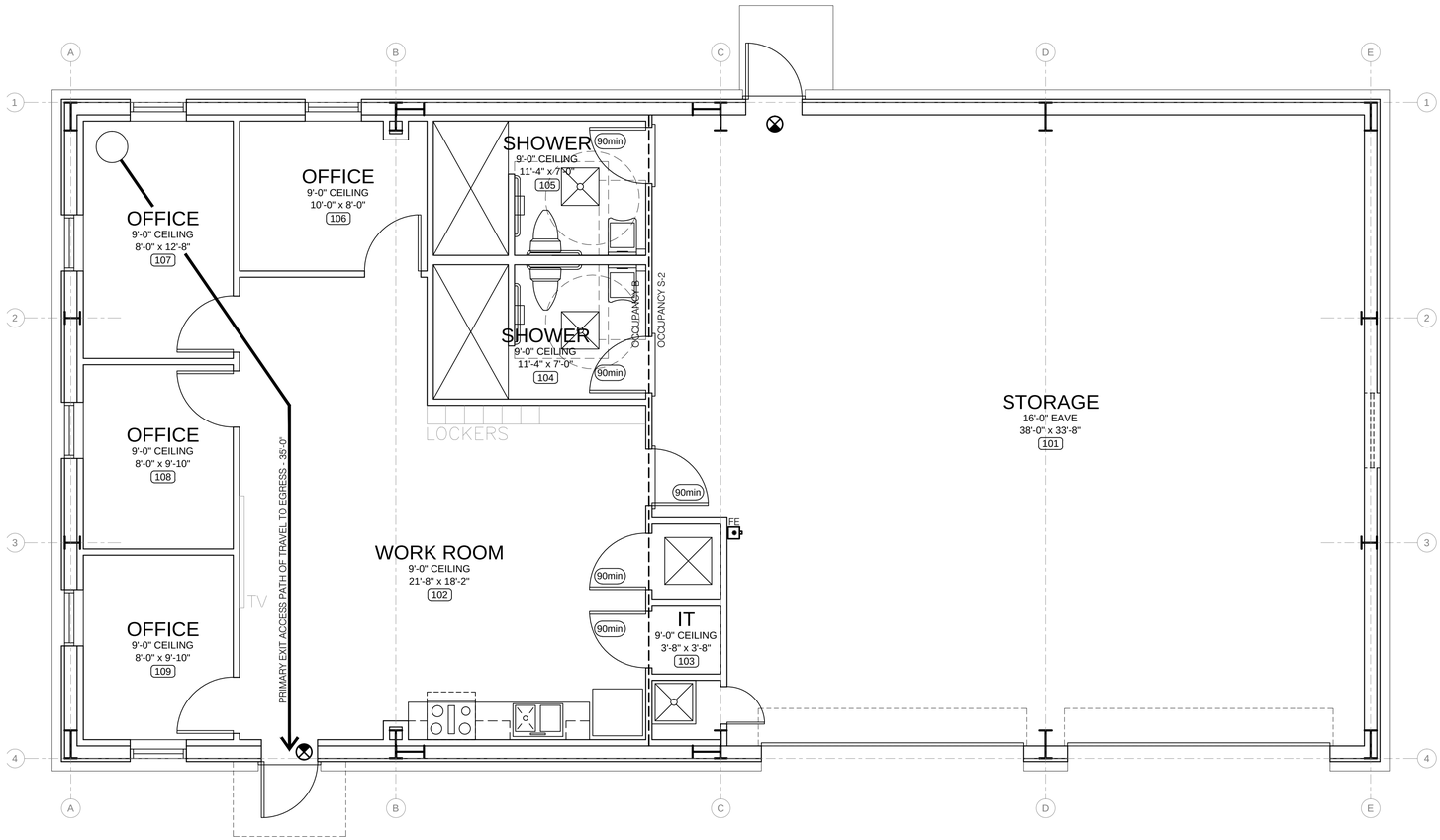
FLORIDA BUILDING CODE 2017

304	B - BUSINESS OCCUPANCY	
311.3	S-2 - LOW HAZARD STORAGE OCCUPANCY	
TABLE 504.3	TYPE II-B - 55' HEIGHT LIMIT	
TABLE 504.4	3 STORY	
TABLE 506.2	26,000 SF LIMIT	
	ACTUAL MAXIMUM HEIGHT = 24'-0"	
	ACTUAL NUMBER OF STORIES = 1	
TABLE 601	CONSTRUCTION TYPE	II-B
	STRUCTURAL FRAME =	0 HOURS
	BEARING WALLS - EXTERIOR =	0 HOURS
	BEARING WALLS - INTERIOR =	0 HOURS
	NON-BEARING WALLS =	0 HOURS
	FLOOR CONSTRUCTION =	0 HOURS
	ROOF CONSTRUCTION =	0 HOURS (NOT REQUIRED FOR ROOF CONSTRUCTION OVER 20' A.F.F.)
TABLE 602	PERIMETER WALLS GREATER THAN 10' and LESS THAN 30' FROM PROPERTY LINE REQUIRES NO FIRE RATING	
TABLE 707.3.10	2 HOUR FIRE BARRIER BETWEEN OCCUPANCY B AND S-2	
TABLE 803.11	NON-SPRINKLERED BUILDING	
	EXIT ENCLOSURES & EXIT PASSAGEWAYS:	CLASS B FINISH
	CORRIDORS:	CLASS B FINISH
	ROOMS & ENCLOSED SPACES:	CLASS C FINISH

903	AUTOMATIC SPRINKLER SYSTEM NOT REQUIRED BY CODE
906	FIRE EXTINGUISHERS REQUIRED THROUGHOUT BUILDING
907.2	MANUAL FIRE ALARM SYSTEM IS REQUIRED
CH. 10	OCCUPANT LOAD (BUSINESS) 13 OCC (STORAGE) 2 OCC
1005.1	EGRESS WIDTH: OTHER COMPONENTS= 0.2"/PERSON
TABLE 1006.2.1	MAXIMUM OCCUPANT LOAD w/ ONE EXIT - 49
	COMMON PATH OF EGRESS TRAVEL: 100 FEET IN GROUP B & S-2
1008	EMERGENCY LIGHTING IS REQUIRED
1010	REQUIRED EGRESS DOORS WILL COMPLY WITH ADA
1013	EXIT SIGNS REQUIRED ALONG THE EGRESS PATH
TABLE 1017.2	EXIT ACCESS TRAVEL DISTANCE: 200FT. (B & S-2)
CH. 11	ACCESSIBILITY: PARKING — CLEAR FLOOR SPACE ACCESSIBLE PATH — ACCESSORY MOUNTING TACTILE SURFACES — HEIGHT THRESHOLD — ELEVATION CLEAR WIDTH — EMERGENCY LIGHTING
CH. 12	INTERIOR ENVIRONMENT- REFER TO MEP
CH. 13	WILL COMPLY WITH FLORIDA ENERGY EFFICIENCY CODE

LIFE SAFETY PLAN SYMBOLS LEGEND

- PRIMARY EXIT ACCESS PATH OF TRAVEL TO EGRESS
- SECONDARY EXIT ACCESS PATH OF TRAVEL TO EGRESS
- 2 HOUR RATED FIRE BARRIER (UL WALL ASSEMBLY U404)
- LOCATION OF EXIT SIGNS (COORDINATE W/ ELECTRICAL DRAWINGS)
- FE — FIRE EXTINGUISHER UNDER CABINET - 5lbs. (VERIFY LOCATIONS WITH LOCAL FIRE MARSHALL)



1 MAINTENANCE BUILDING LIFE SAFETY PLAN

SCALE: 1/4" = 1'-0"

15 MAY 20

AVCON, INC.
ENGINEERS & PLANNERS
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NICEVILLE, FL. 32578-2425
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201 HOLLYWOOD BLVD. NE
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

LIFE SAFETY PLAN

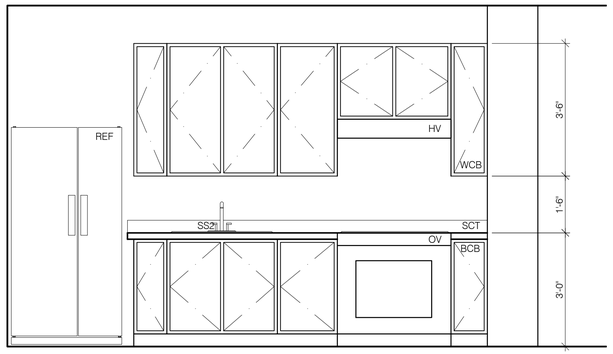
RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

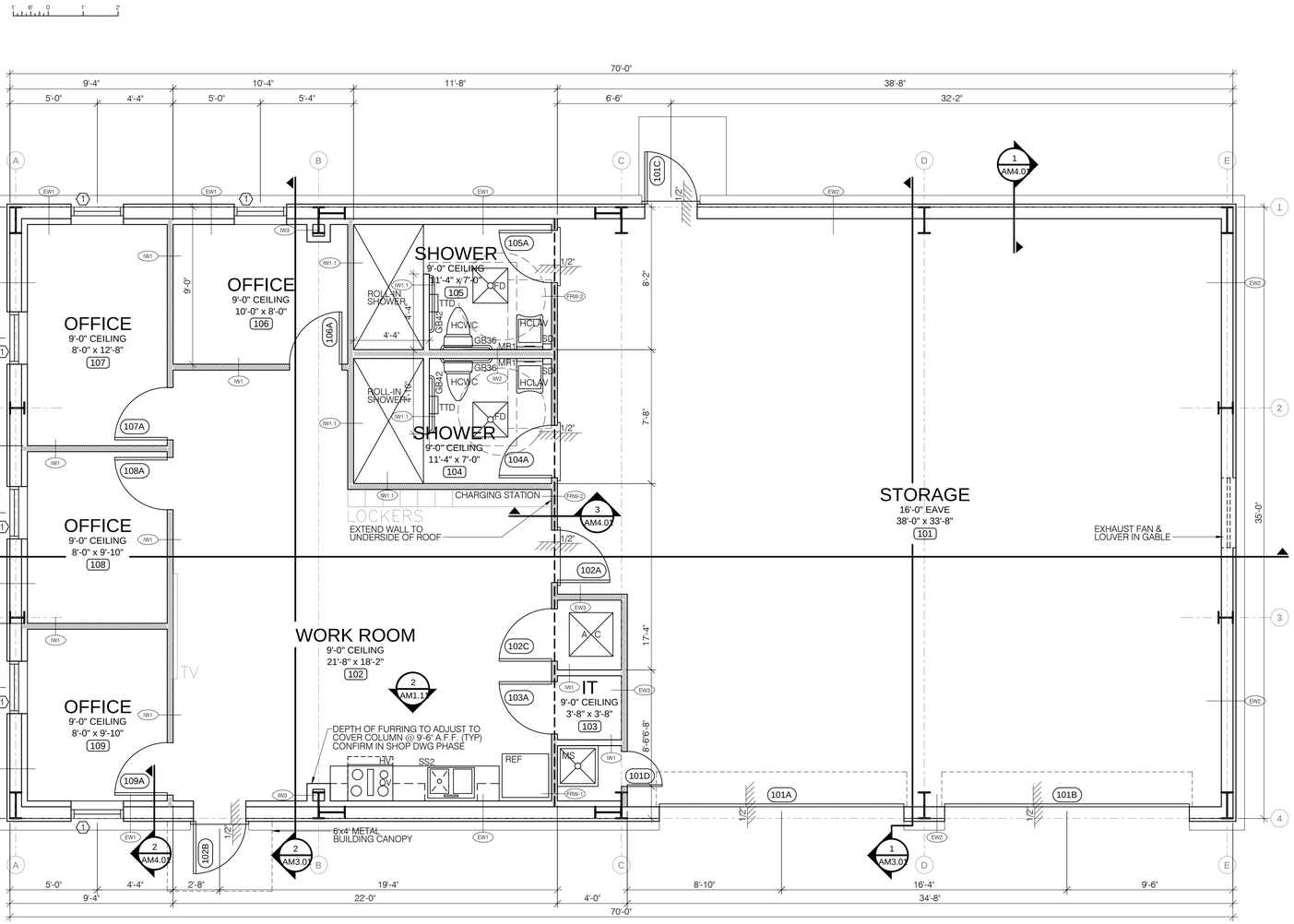
SHEET NUMBER
AM1.01

C:\VSERV\JDF ARCHITECTURE\DOCUMENTS\ - JDF ARCHITECTURE\19018 - OCWS MAINTENANCE BUILDING\03 - CONSTRUCTION DOCUMENTS\02 - DRAWINGS\A1.01 M - LIFE SAFETY PLAN.DWG, 10/8/2020 10:36 AM



2 INTERIOR ELEVATION

SCALE: 1/2" = 1'-0"



1 MAINTENANCE BUILDING FLOOR PLAN

SCALE: 1/4" = 1'-0"

REFERENCE AM6.01 FOR ACCESSORY SCHEDULE

ACCESSORIES

BCB	BASE CABINETS
DF	DRINKING FOUNTAIN
FD	FLOOR DRAIN
GB36	36" ADA HORIZONTAL GRAB BAR
GB42	42" ADA HORIZONTAL GRAB BAR
HCDF	ADA DRINKING FOUNTAIN
HCLAV	ADA WALL MOUNTED SINK
HCWC	ADA WATER CLOSET; FLOOR MOUNTED
HV	HOOD VENT (REF MECHANICAL)
LAV	LAVATORY
MR1	FRAMED MIRROR (1'-6"wX3'h)
MR2	FRAMED MIRROR (3'-0"wX3'h)
MS	MOP SINK (24"X24")
OV	RANGE w/ OVEN
REF	REFRIGERATOR
SCT	SOLID SURFACE COUNTER TOP
SD	SOAP DISPENSER
SWR	ROLL-IN SHOWER w/ TILE FLOOR & WALLS
SS2	STAINLESS STEEL SINK (2 BOWL)
TT2	DOUBLE TOILET TUSSUE DISPENSER
VEND	VENDING MACHINE
WC	WATER CLOSET
WCB	WALL CABINETS

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jdf architecture llc
JDF ARCHITECTURE, LLC
201 HOLLYWOOD BLVD, NE
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

FLOOR PLAN

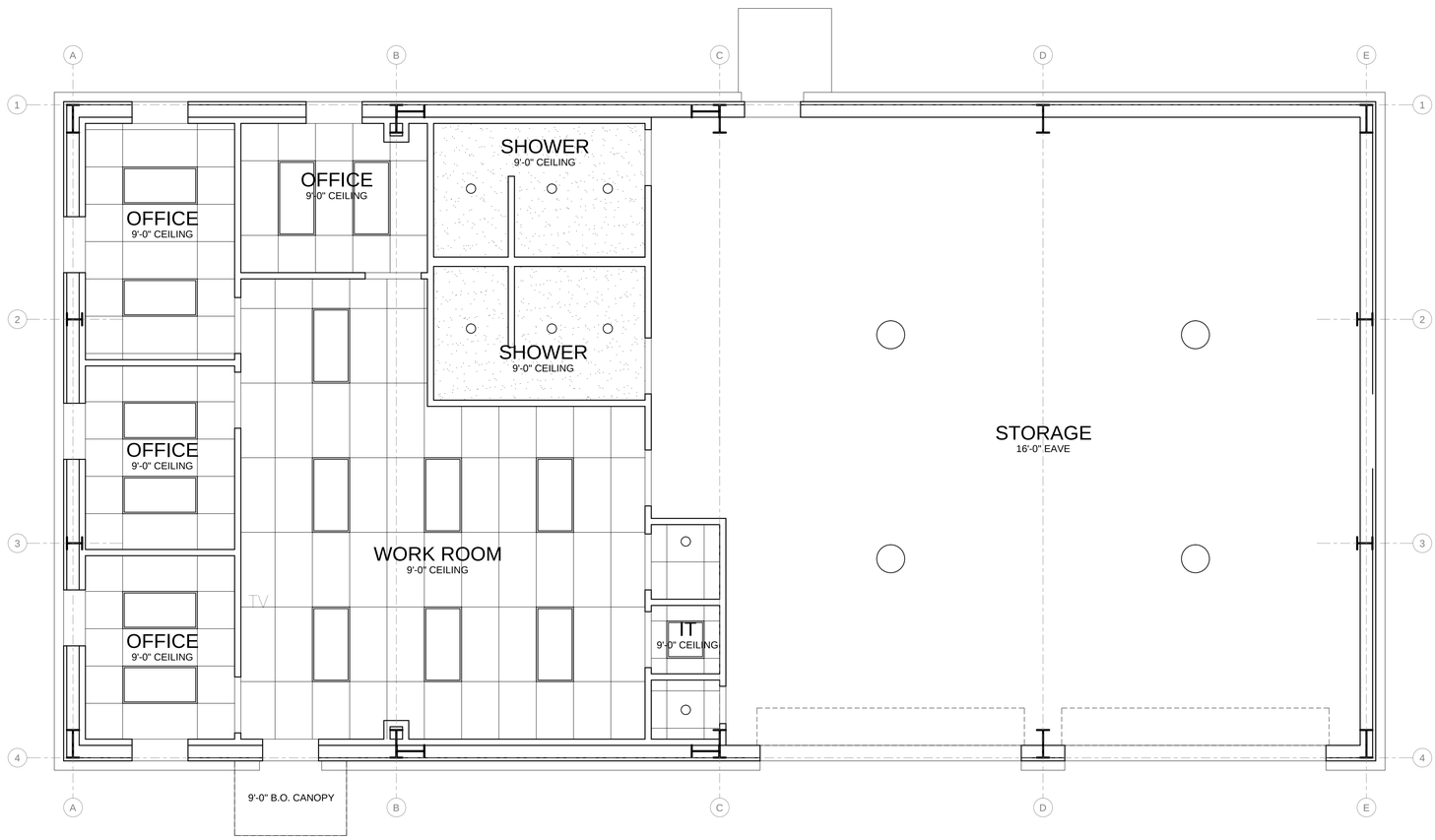
RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
AM1.11

15 MAY 20



1 MAINTENANCE REFLECTED CEILING PLAN

SCALE: 1/4" = 1'-0"

2 1 0 2 4

05 MAY 20

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
www.avconinc.com

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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

jdf+ architecture llc
JDF ARCHITECTURE, LLC
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FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

REFLECTED CEILING PLAN

RELEASE FOR BID

OCWS FIELD OFFICES

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OKALOOSA COUNTY WATER & SEWER

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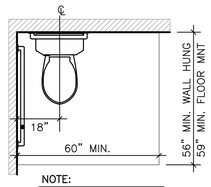
SHEET NUMBER

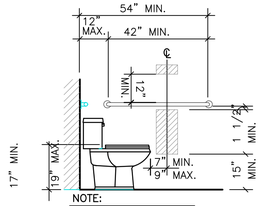
AM1.21

STANDARD CLEARANCES and MOUNTING HEIGHTS



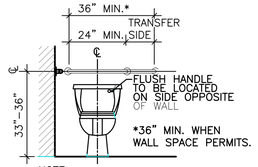
NOTE:
H.C. TOILETS TO COMPLY W/ ANSI 604.

1 H.C. TOILET LOCATION & CLEARANCE ANSI FIG. 604.2 & 604.3.1
SCALE: 3/8"= 1'-0"



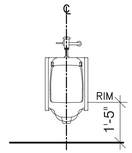
NOTE:
H.C. TOILETS TO COMPLY W/ ANSI 604.

2 SIDE WALL GRAB BAR ANSI FIG. 604, 604.5.1 & 604.7 (A) & (B)
SCALE: 3/8"= 1'-0"

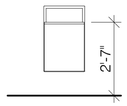


NOTE:
H.C. TOILETS TO COMPLY W/ ANSI 604.

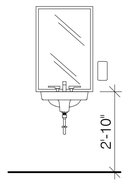
3 REAR GRAB BAR ANSI 604.5.2
SCALE: 3/8"= 1'-0"



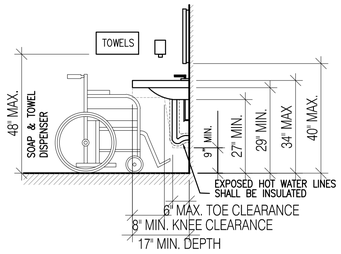
4 H.C. URINAL
SCALE: 3/8"= 1'-0"



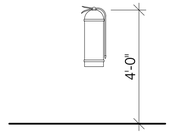
5 PAPER/TRASH DISPOSAL
SCALE: 3/8"= 1'-0"



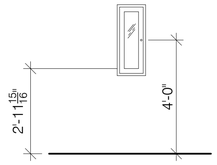
6 H.C. LAV & MIRROR
SCALE: 3/8"= 1'-0"



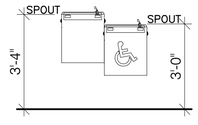
7 LAV MOUNTING HEIGHTS
SCALE: 3/8"= 1'-0"



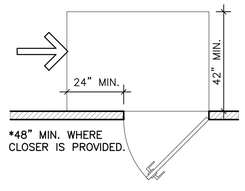
8 FIRE EXT. BRACKET
SCALE: 3/8"= 1'-0"



9 FIRE EXT. CABINET
SCALE: 3/8"= 1'-0"

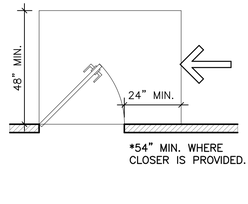


10 H.C. WATER FOUNTAIN
SCALE: 3/8"= 1'-0"



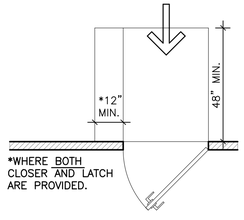
*48" MIN. WHERE CLOSER IS PROVIDED.

11 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (g)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ LATCH APPROACH, PUSH SIDE.



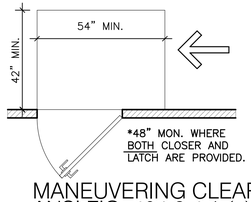
*54" MIN. WHERE CLOSER IS PROVIDED.

12 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (f)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ LATCH APPROACH, PULL SIDE.



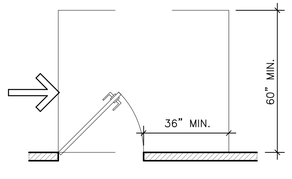
*WHERE BOTH CLOSER AND LATCH ARE PROVIDED.

13 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (b)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ FRONT APPROACH, PUSH SIDE.

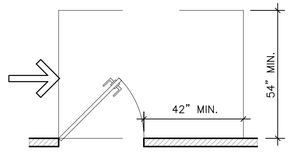


*48" MON. WHERE BOTH CLOSER AND LATCH ARE PROVIDED.

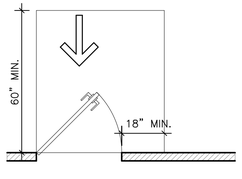
14 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (e)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ HINGE APPROACH, PUSH SIDE.



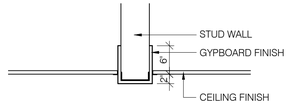
15 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (c)
SCALE: 3/8"= 1'-0"SWINGING DOOR W/ HINGE APPROACH, PULL SIDE.



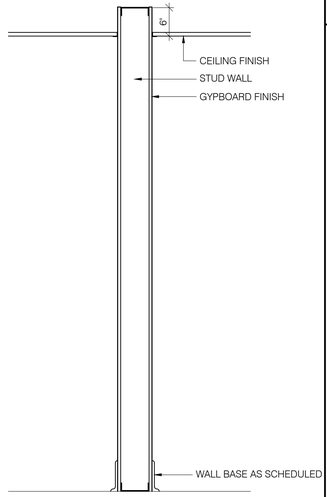
16 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (d)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ HINGE APPROACH, PULL SIDE.



17 MANEUVERING CLEARANCE ANSI FIG. 404.2.4.1 (a)
SCALE: 3/8"= 1'-0" SWINGING DOOR W/ FRONT APPROACH, PULL SIDE.



2 TYPICAL HEADER DETAIL
SCALE: 3/4" = 1'-0"



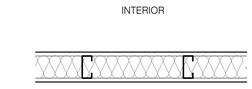
1 TYPICAL WALL DETAIL
SCALE: 3/4" = 1'-0"

WALL TYPE NOTES

1. SEE FLOOR PLANS FOR WALL INSULATION LOCATIONS
2. SEE PARTITION TYPES FOR REQUIRED WALL INSULATION.
3. PROVIDE CEMENT BACKER BOARD FOR ALL WALL TILE INSTALLATION.
4. LOCATE ALL FIRE EXTINGUISHERS PER CODE.
5. USE 5/8" GYP BOARD ON ALL INTERIOR WALLS PARTITIONS.
6. PROVIDE CONTINIOUS FIBERGLASS PAPER BACKED INSULATION & SEALANT FOR ALL BATHROOM AND PLUMBING WALLS AND ABOVE CEILINGS WHERE PLUMBING AND FANS OCCUR. (SEE FLOOR PLANS FOR LOCATIONS)
7. USE 5/8" TYPE "X" DENSGLASS GOLD AS SUBSTRATE AT EXTERIOR WALLS AS REQUIRED (TYP)
8. ALL INTERIOR WALLS TO RECEIVE BASE BOARD AS SCHEDULED.

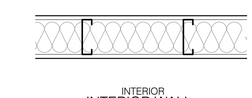
WALL TYPES

INTERIOR WALL TYPES



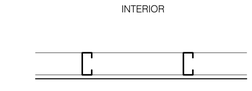
INTERIOR WALL
IW1
IW1.1 MRGB ON SHOWER ROOM SIDE

WALL TYPE IW1
1 LAYER 5/8" GYP. BOARD
3 5/8" METAL STUDS @ 16" O.C.
BATT INSULATION
1 LAYER 5/8" GYP. BOARD



INTERIOR WALL
IW2

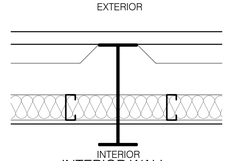
WALL TYPE IW2
1 LAYER 5/8" MOISTURE RESIST. GYP. BOARD
6" METAL STUDS @ 16" O.C.
BATT INSULATION
1 LAYER 5/8" MOISTURE RESIST. GYP. BOARD



INTERIOR WALL
IW3

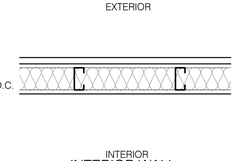
WALL TYPE IW3
3 5/8" METAL STUDS @ 16" O.C.
1 LAYER 5/8" GYP. BOARD

EXTERIOR WALL TYPES



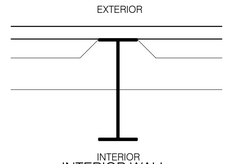
INTERIOR WALL
EW1

WALL TYPE EW1
EXTERIOR FINISH PANEL
METAL BUILDING EXTERIOR WALL INSULATION
8" METAL GIRT
3 5/8" METAL STUDS @ 16" O.C.
R-13 BATT INSULATION
1 LAYER 5/8" GYP. BOARD



INTERIOR WALL
EW3

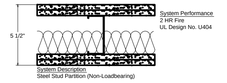
WALL TYPE EW3
EXTERIOR FINISH PANEL
DENSGLASS EXTERIOR SHEATHING or EQUAL
3 5/8" METAL STUDS @ 16" O.C.
R-13 BATT INSULATION
1 LAYER 5/8" GYP. BOARD



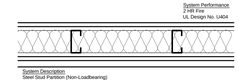
INTERIOR WALL
EW2

WALL TYPE EW2
EXTERIOR FINISH PANEL
METAL BUILDING EXTERIOR WALL INSULATION
8" METAL GIRT

FIRE RATED PARTITION - UL U404



FRW-1



FRW-2

15 MAY 20

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL 32578-2425
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(850) 496-2166

NO.	DATE	REVISION	BY

CLEARANCES and MOUNTING HEIGHTS, WALL TYPES & DETAILS

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

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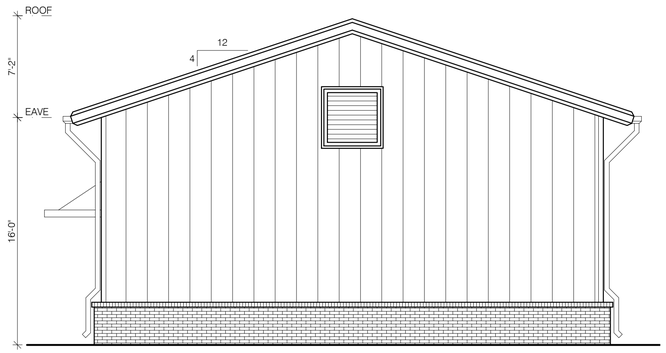
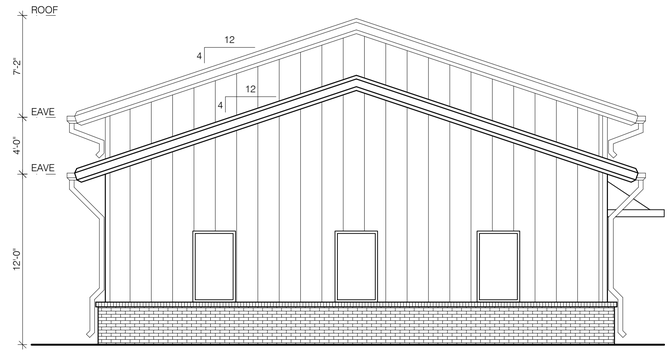
AM1.31



3 FIELD OFFICE SOUTH BUILDING ELEVATION

SCALE: 3/16" = 1'-0"

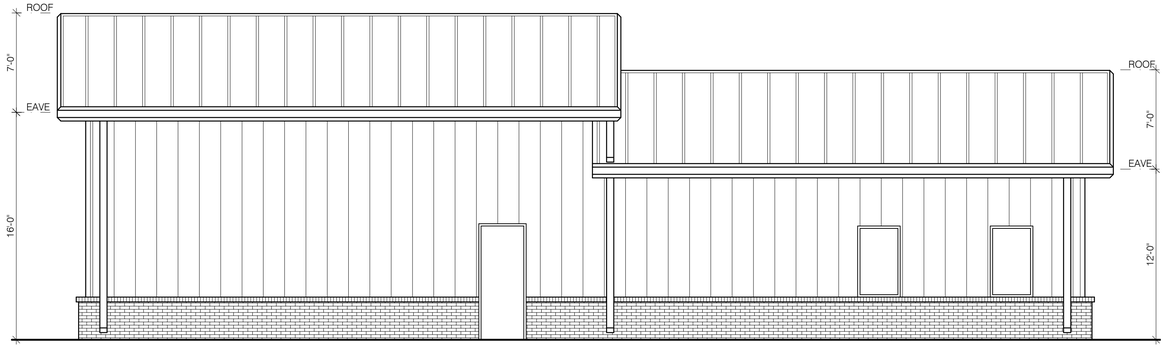


4 FIELD OFFICE NORTH BUILDING ELEVATION

SCALE: 3/16" = 1'-0"

2 FIELD OFFICE WEST BUILDING ELEVATION

SCALE: 3/16" = 1'-0"



1 FIELD OFFICE EAST BUILDING ELEVATION

SCALE: 3/16" = 1'-0"

15 MAY 20

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NO.	DATE	REVISION	BY

ELEVATIONS

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
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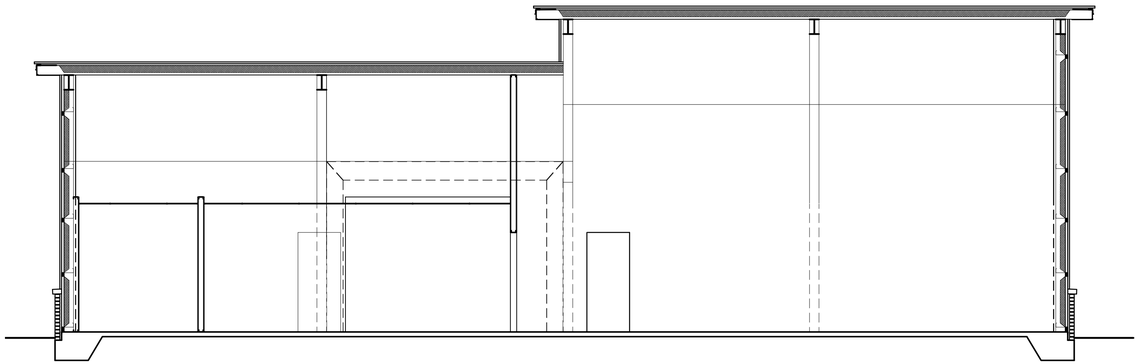
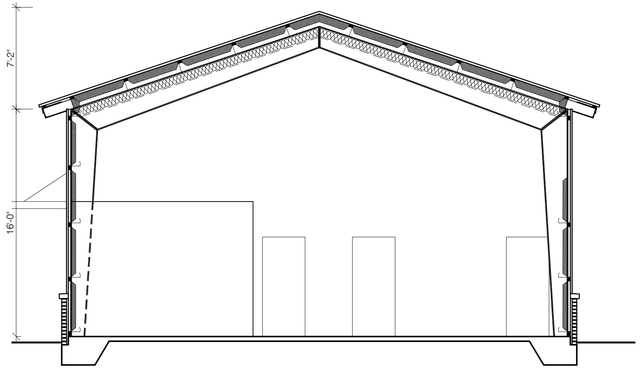
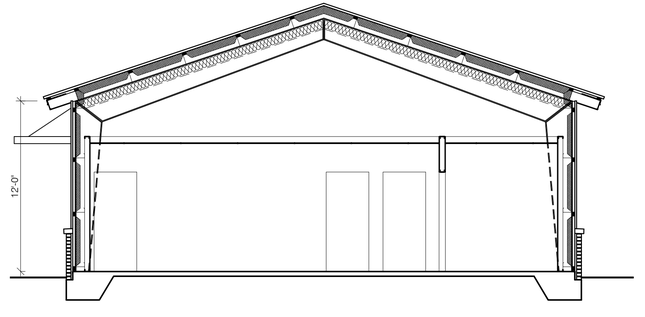
SHEET NUMBER
AM2.01



3 MAINTENANCE BUILDING SECTION
SCALE: 3/16" = 1'-0"



1 MAINTENANCE OFFICE BUILDING SECTION
SCALE: 3/16" = 1'-0"



2 MAINTENANCE OFFICE BUILDING SECTION
SCALE: 3/16" = 1'-0"

15 MAY 20

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FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

BUILDING SECTIONS

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
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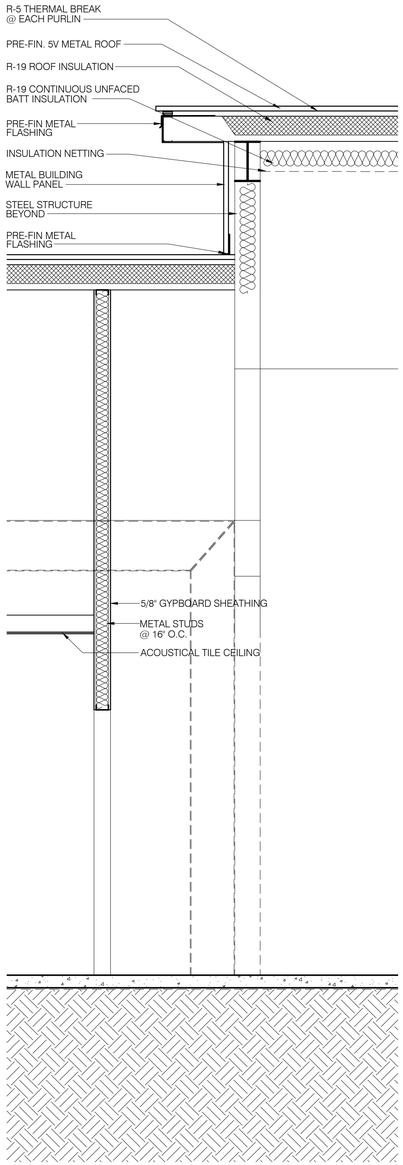
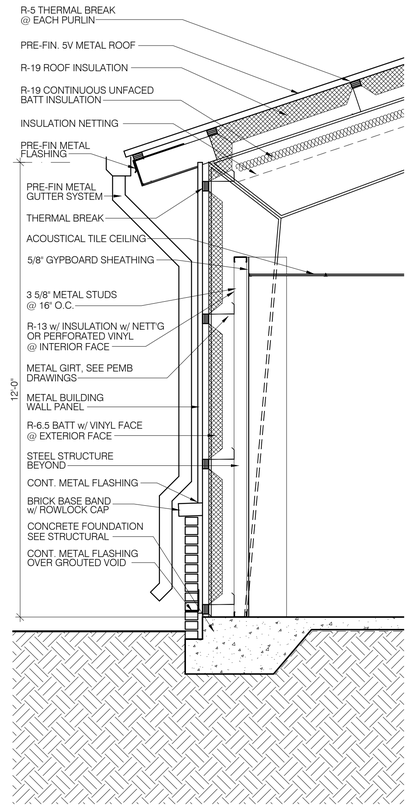
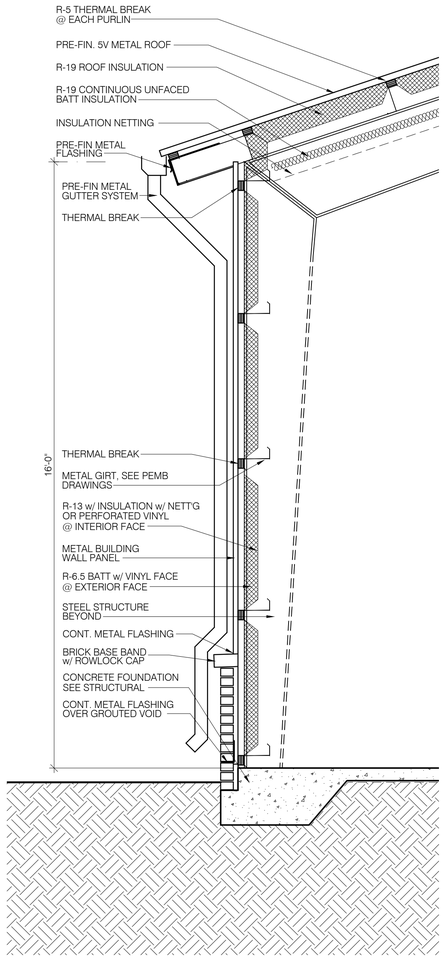
SHEET NUMBER
AM3.01



3 WALL SECTION
SCALE: 1/2" = 1'-0"



2 WALL SECTION
SCALE: 1/2" = 1'-0"



1 WALL SECTION
SCALE: 1/2" = 1'-0"

05 MAY 20

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ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF
AUTHORIZATION NUMBER: 5057
www.avconinc.com

TRANSFORMING TODAY'S IDEAS
INTO TOMORROW'S REALITY

jdf architecture llc
JDF ARCHITECTURE, LLC
201 HOLLYWOOD BLVD. NE
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

BUILDING SECTIONS

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
AM4.01

FINISH SCHEDULE

NO.	ROOM NAME	FLOOR	WALL MAT'L	WALL FINISH	WALL BASE	CEILING FINISH	CEILING HT	REMARKS
101	STORAGE	SC	EXP	-	-	EXP	-	
102	WORK ROOM	SC	GYP	PNT	RB	ACT1	9'-0"	
103	IT CLOSET	SC	GYP	PNT	RB	ACT1	9'-0"	
104	SHOWER	SC	GYP	PNT	RB	GYP	9'-0"	WALL TILE TO 8'-0" AFF IN SHOWER
105	SHOWER	SC	GYP	PNT	RB	GYP	9'-0"	WALL TILE TO 8'-0" AFF IN SHOWER
106	OFFICE	CAR1	GYP	PNT	RB	ACT1	9'-0"	
107	OFFICE	CAR1	GYP	PNT	RB	ACT1	9'-0"	
108	OFFICE	CAR1	GYP	PNT	RB	ACT1	9'-0"	
109	OFFICE	CAR1	GYP	PNT	RB	ACT1	9'-0"	

ABBREVIATIONS

GENERAL

- EXP - EXPOSED
- FD - FLOOR DRAIN
- MFR - MANUFACTURER

FLOORING

- EP - EPOXY FLOOR FINISH
- SC - SEALED CONCRETE
- TILE1 - COMMERCIAL GRADE PORCELAIN TILE
- VCT - VINYL COMPOSITE TILE; SEE DETAIL FOR PATTERN

BASE

- RB - 6" RUBBER BASE

WALLS

- CB - CEMENT BACKER BOARD BEHIND WALL TILE
- GYP - 5/8" TYPE 'X' GYPSUM BOARD
- MRGB - 5/8" MOISTURE RESISTANT GYPSUM BOARD
- PNT - INTERIOR LATEX PAINT
- TL2 - COMMERCIAL GRADE CERAMIC WALL TILE @ +6'-0" A.F.F.

CEILINGS

- ACT1 - LAY-IN ACOUSTICAL CEILING TILE 2'x4'-WHITE
- GYP - 5/8" TYPE 'X' GYPSUM BOARD

DOORS

- ALUM - ALUMINUM STORE FRONT SYSTEM
- HM - HOLLOW METAL FRAME
- MTL - INSULATED METAL DOOR
- WD - SOLID CORE WOOD DOOR

ACCESSORIES

AC	AIR COMPRESSOR
HCDF	ADA DRINKING FOUNTAIN
DF	DRINKING FOUNTAIN
FD	FLOOR DRAIN
FO	FLOOR OUTLET
FS	FLOOR SINK; SEE PLUMBING
GB36	36" ADA HORIZONTAL GRAB BAR
GB42	42" ADA HORIZONTAL GRAB BAR
HCLAV	ADA WALL MOUNTED SINK
HCWC	ADA WATER CLOSET; FLOOR MOUNTED
HWS	HANDWASH SINK
MR1	FRAMED MIRROR (1'-6"wX3'h)
MR2	FRAMED MIRROR (4'-6"wX3'h)
MS	MOP SINK w/ MOP RACK
MW	MICROWAVE
RD	ROOF DRAIN; COORDINATE w/ PLUMBING
REF	REFRIGERATOR
SS1	STAINLESS STEEL SINK (1 BOWL)
SS3	STAINLESS STEEL SINK (3 BOWL)

GENERAL NOTES

1. SEE REFLECTED CEILING PLAN AND DETAILS FOR EXACT CEILING HEIGHT LOCATIONS.
2. ANTI-FRACTURE MAT SHALL BE INSTALLED UNDER ALL FLOOR TILE SURFACES.
3. CONCRETE BACKER BOARD SHALL BE INSTALLED BEHIND ALL WALL TILE.
4. ALL EXPOSED CELIING STRUCTURE SHALL BE PAINTED FLAT BLACK.
5. ALL DIMENSIONS TAKEN AT FLOOR SLAB ELEVATION.
6. ALL EXTERIOR DOORS TO HAVE ½" STEP FROM FINISHED INTERIOR FLOOR SLAB TO EXTERIOR WALKWAY.

DOOR SCHEDULE

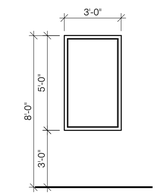
DOOR NO.	DOOR SIZE	DOOR TYPE	DOOR MAT'L	DOOR HDW	FRAME MAT'L	FRAME HEAD	FRAME JAMB	FRAME SILL	FIRE RATING	REMARKS
101A	14'-0" x 14'-0"	C	MTL	MFR	MTL	MFR	MFR	MFR		MANUAL PULL CHAIN DOOR
101B	14'-0" x 14'-0"	C	MTL	MFR	MTL	MFR	MFR	MFR		MANUAL PULL CHAIN DOOR
101C	3'-0" x 8'-0"	D	FG	HW-1	HM	4/AM.611	5/AM.611	6/AM.611		
101D	2'-0" x 8'-0"	D	FG	HW-3	HM	4/AM.611	5/AM.611	6/AM.611		
102A	3'-0" x 7'-0"	D	FG	HW-1	HM	4/AM.611	5/AM.611	6/AM.611	90 MIN	
102B	3'-0" x 7'-0"	A	FG	HW-5	HM	4/AM.611	5/AM.611	6/AM.611		
102C	3'-0" x 7'-0"	D	FG	HW-3	HM	1/AM.611	2/AM.611	3/AM.611	90 MIN	
103A	3'-0" x 7'-0"	D	FG	HW-3	HM	1/AM.611	2/AM.611	3/AM.611	90 MIN	
104A	3'-0" x 7'-0"	D	FG	HW-2	HM	4/AM.611	5/AM.611	6/AM.611	90 MIN	
105A	3'-0" x 7'-0"	D	FG	HW-2	HM	4/AM.611	5/AM.611	6/AM.611	90 MIN	
106A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AM.611	2/AM.611	3/AM.611		
107A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AM.611	2/AM.611	3/AM.611		
108A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AM.611	2/AM.611	3/AM.611		
109A	3'-0" x 7'-0"	B	WD	HW-4	HM	1/AM.611	2/AM.611	3/AM.611		

HARDWARE SCHEDULE

HW-1	ENTRY LOCKSET, DEAD-BOLT, 3 HINGES, LEVER HARDWARE, CLOSER, WEATHERSTRIPPING.
HW-2	3 HINGES, FLOOR STOP, PRIVACY SET.
HW-3	3 HINGES, FLOOR STOP, STORAGE SET.
HW-4	3 HINGES, FLOOR STOP, OFFICE SET.
HW-5	ENTRY LOCKSET, DEAD-BOLT, 3 HINGES, LEVER HARDWARE, CLOSER, WEATHERSTRIPPING. WIRED FOR KEY FOB ACCESS CONTROL, STRIKE PLATE.

WINDOW TYPES

SCALE: 1/4" = 1'-0"

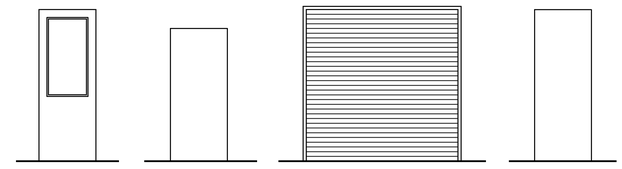


TYPE 1

EXTERIOR
ALUMINUM STOREFRONT
IMPACT RATED GLAZING
INSULATED; LOW-E

DOOR TYPES

SCALE: 1/4" = 1'-0"



TYPE A
FIBERGLASS; PAINTED
IMPACT RATED GLAZING

TYPE B
SOLID CORE WOOD
PRIME & PAINT

TYPE C
PRE-FIN INSULATED METAL
ROLL-UP COILING DOOR
IMPACT RATED

TYPE D
FIBERGLASS; PAINTED

15 MAY 20

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DOOR / WINDOW TYPES and SCHEDULES

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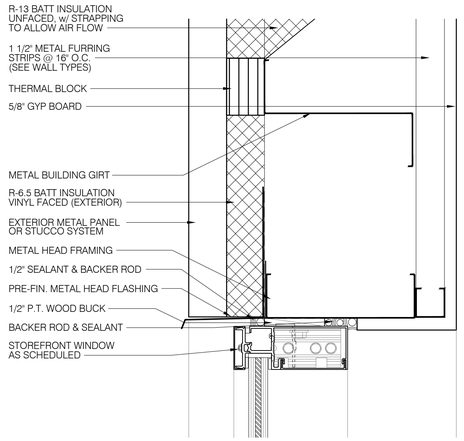
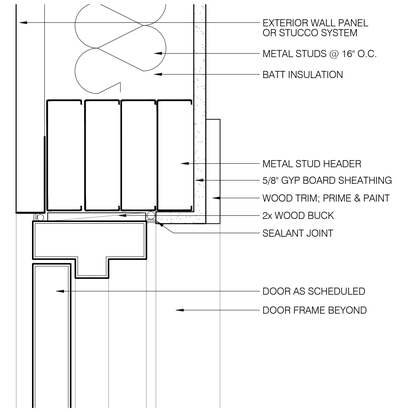


7 HEAD DETAIL
SCALE: 3" = 1'-0"



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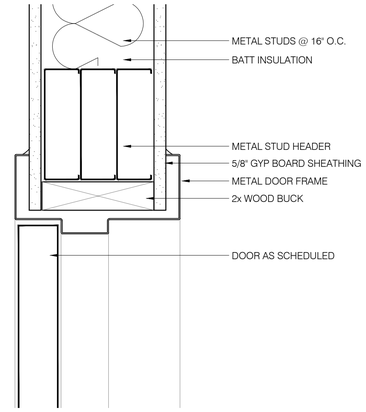

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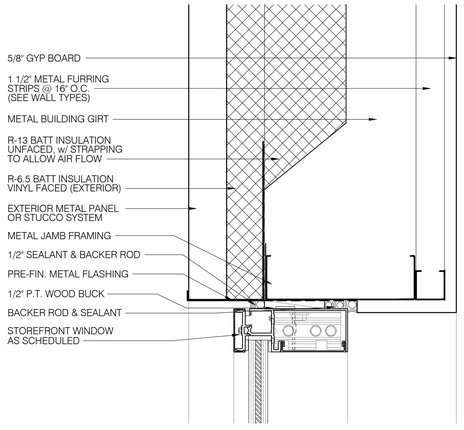
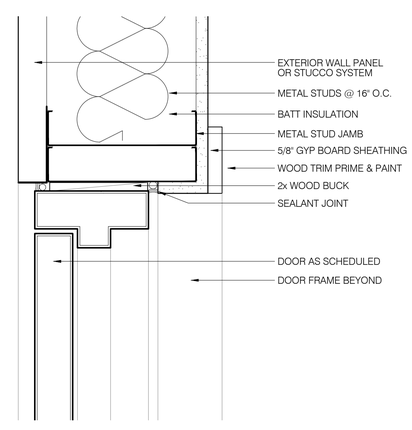


8 JAMB DETAIL
SCALE: 3" = 1'-0"



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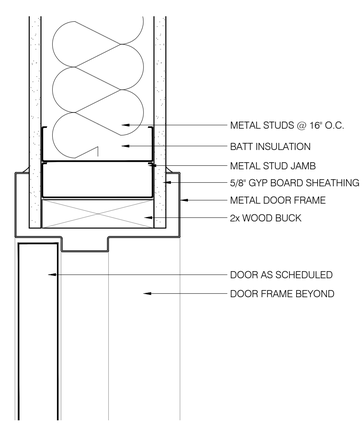
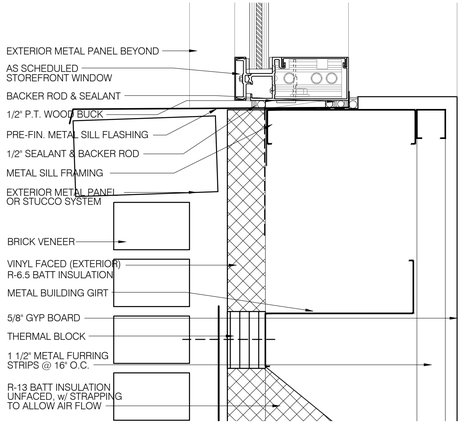
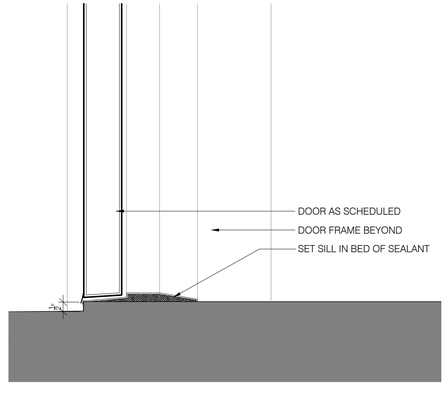


2 JAMB DETAIL
SCALE: 3" = 1'-0"



9 SILL DETAIL
SCALE: 3" = 1'-0"



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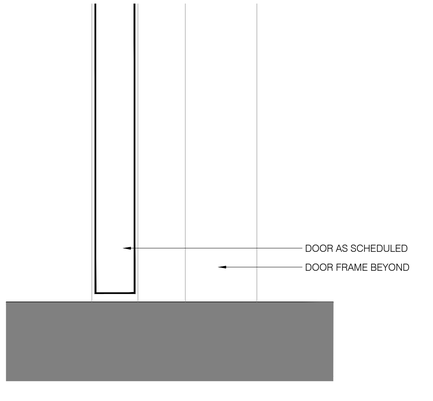

3 SILL DETAIL
SCALE: 3" = 1'-0"

05 MAY 20

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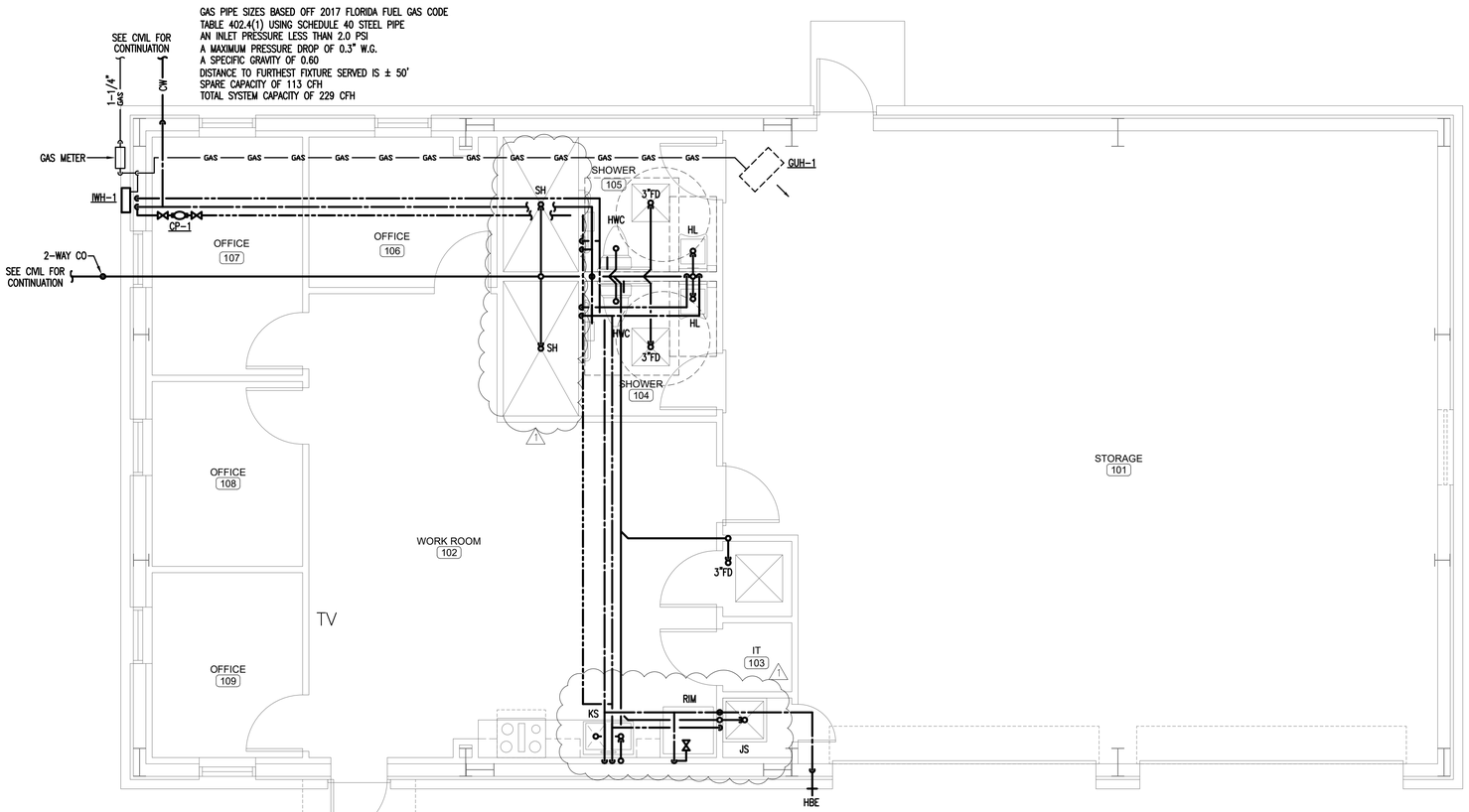
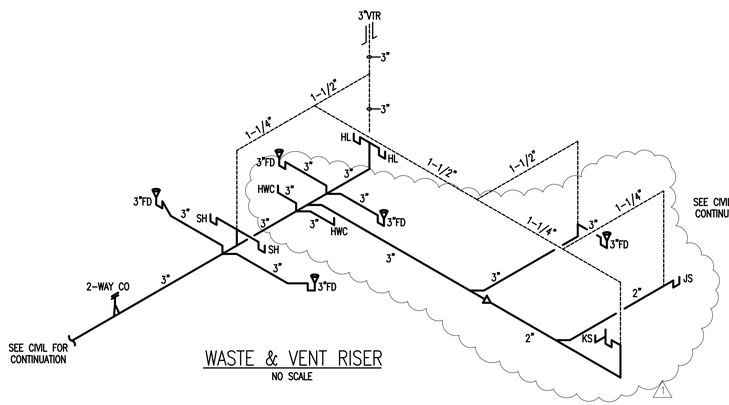


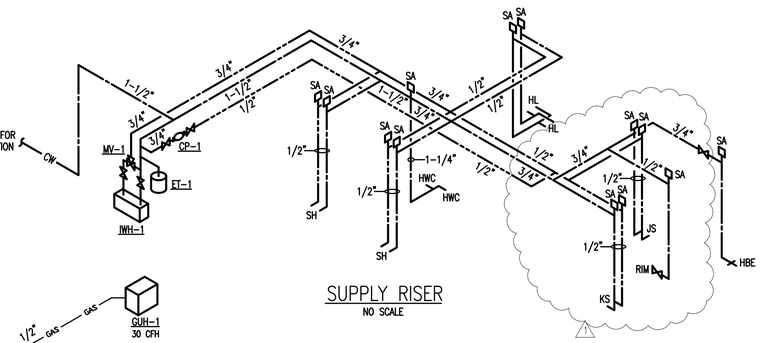
1 MAINTENANCE BUILDING PLUMBING FLOOR PLAN

SCALE: 1/4" = 1'-0"



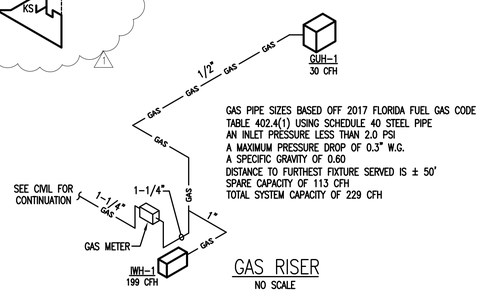
WASTE & VENT RISER

NO SCALE



SUPPLY RISER

NO SCALE



GAS RISER

NO SCALE

GENERAL PLUMBING NOTES

1. FURNISH ALL LABOR, MATERIALS AND EQUIPMENT NEEDED TO PROVIDE A COMPLETE PLUMBING SYSTEM. THIS INCLUDES, BUT IS NOT LIMITED TO, WATER PIPING, WASTE AND VENT PIPING, AND ALL NECESSARY VALVES, TRAPS, AND ACCESSORIES.
2. ALL WORK SHALL BE PERFORMED BY SKILLED AND EXPERIENCE WORKMEN. WORK SHALL COMPLY WITH ALL APPLICABLE STATE AND LOCAL CODES. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED PERMITS, LICENSES, AND INSPECTIONS.
3. ROUGH-INS SHALL BE MADE FROM ARCHITECTURAL DRAWINGS AND FIELD VERIFICATION, NOT FROM PLUMBING DRAWINGS AS THEY ARE ONLY SCHEMATIC. THIS CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS AND TAPS, AND FOR CHECKING ALL ELEVATIONS, GRADES, AND INVERTS BEFORE THE START OF CONSTRUCTION. IF UNSATISFACTORY CONDITIONS EXIST, NOTIFY THE ARCHITECT IMMEDIATELY.
4. THIS CONTRACTOR SHALL COORDINATE ALL WORK WITH THE ELECTRICAL, MECHANICAL, AND FIRE PROTECTION CONTRACTORS TO AVOID CONFLICTS WITH OTHER TRADES. MAKE DEVIATIONS AS NECESSARY FROM THE WORK SHOWN ON THE DRAWINGS TO ENSURE THE WORK FITS THE SPACE(S) PROVIDED. NOTIFY THE ARCHITECT OF ALL NECESSARY DEVIATIONS.
5. IF NEW CONNECTIONS REQUIRE INTERRUPTION OF EXISTING SERVICES, ALL PREPARATORY WORK SHALL BE COMPLETED EARLY TO MINIMIZE TIME. WHERE POSSIBLE, PROVIDE TEMPORARY CONNECTIONS TO MAINTAIN UTILITY SERVICE.
6. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND WITHOUT DEFECTS. SUBMIT SHOP DRAWINGS FOR ALL EQUIPMENT AND MATERIALS. ALL WORK DONE BY THIS CONTRACTOR SHALL BE WARRANTED FOR ONE YEAR FROM THE TIME THE OWNER GIVES ACCEPTANCE OR GAINS BENEFICIAL USE, WHICHEVER IS FIRST.
7. ALL SANITARY AND VENT LINES SHALL BE HUBLESS CAST IRON PIPE CISPI 310-78 STANDARD WEIGHT WITH SPIGOT ENDS FOR COUPLING. HUBLESS CAST IRON JOINTS TO BE CISPI 310 STAINLESS STEEL SHIELD OVER ONE PIECE NEOPRENE SLEEVE. THIS CONTRACTOR MAY USE PVC PIPE AND FITTINGS CONFORMING TO ASTM D-2665 WHERE ALLOWED BY CODE.
8. ROOF PENETRATIONS SHALL BE FLASHED AND MADE WATER-TIGHT IN A MANNER APPROVED BY THE MANUFACTURER OF THE ROOFING MATERIAL AND COMPLYING WITH ARCHITECTURAL REQUIREMENTS.
9. PROVIDE CLEANOUTS WHERE INDICATED ON PLANS AND AS NECESSARY TO COMPLY WITH THE STANDARD PLUMBING CODE. ALL CLEANOUTS SHALL BE IN ACCESSIBLE LOCATIONS.
10. INSULATE ALL DOMESTIC WATER PIPING ABOVE GRADE WITH 3/4" THICK FLEXIBLE CLOSED-CELL POLYETHYLENE INSULATION. SEAL ALL JOINTS AND SEAMS AND INSULATE FITTINGS IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
11. HANGERS FOR EQUIPMENT AND PIPING SHALL BE SECURED TO THE BUILDING STRUCTURE. NO HANGERS SHALL BE ATTACHED TO THE FLOOR OR ROOF DECK MATERIAL, OR CONCRETE DECKS LESS THAN 4" THICK.
12. INSTALL SHOCK ABSORBERS VERTICALLY AT EACH FIXTURE. OFFSET AS NEEDED TO GAIN A MINIMUM HEIGHT OF 18". ALL SHOCK ABSORBERS SHALL BE A MINIMUM OF ONE PIPE SIZE LARGER THAN THE BRANCH BEING SERVED.
13. PROVIDE CHROME PLATED BRASS ESCUTCHEON PLATES AT ALL PENETRATIONS OF WALLS, FLOORS OR CEILINGS IN FINISHED AREAS AND UNDER LAVATORIES. PROVIDE STOPS AND TRAPS FOR ALL FIXTURES. LEAK TEST WATER PIPING, FOR NOT LESS THAN 90 MINUTES AT 100 PSI. FILL SANITARY SEWER SYSTEM TO A MINIMUM HEIGHT OF TEN FEET AND LET STAND FOR AT LEAST 30 MINUTES WITHOUT LEAKAGE. AFTER PRESSURE TESTS HAVE BEEN MADE, THOROUGHLY FLUSH THE ENTIRE DOMESTIC WATER SYSTEM WITH WATER UNTIL ALL ENTRAINED DIRT AND MUD HAVE BEEN REMOVED, AND STERILIZE. THE STERILIZING MATERIAL SHALL BE EITHER LIQUID CHLORINE CONFORMING THE FED. SPEC. BB-C-120, OR HYPOCHLORITE CONFORMING TO FED. SPEC. O-C-114, OR FED. SPEC. O-S-602M. THE CHLORINATING AGENT SHALL PROVIDE A MINIMUM DOSAGE OF 50 PPM AND SHALL BE RETAINED IN THE SYSTEM FOR 90 MIN. THE SYSTEM WILL THEN BE FLUSHED WITH CLEAN POTABLE WATER UNTIL THE RESIDUAL CHLORINE IS REDUCED TO LESS THAN 1.0 PPM. HAVE THREE STATE-APPROVED INDEPENDENT TESTING FACILITIES TAKE SAMPLES AND DELIVER CERTIFICATES OF APPROVAL TO THE OWNER. ANY NEGATIVE RESULTS MUST BE INVESTIGATED, AND IF NECESSARY CORRECTED, BEFORE THE BUILDING MAY BE ACCEPTED.

PLUMBING FIXTURE SCHEDULE

MARK	FIXTURE	SANITARY	C.W.	H.W.
HWC	WATER CLOSET, FLOOR, FLUSH VALVE, ADA COMPLIANT	3"	1-1/4"	–
HL	LAVATORY, WALL HUNG, ADA COMPLIANT	1 1/4"	1/2"	1/2"
SH	SHOWER	2"	1/2"	1/2"
RIM	REFRIGERATOR ICE MAKER CONNECTION	–	1/2"	–
KS	KITCHEN SINK	1 1/2"	1/2"	1/2"
JS	JANITOR'S MOP SINK	2"	1/2"	1/2"
FD	FLOOR DRAIN W/ TRAP PRIMER	ON DWG	–	–
HBE	HOSE BIBB, EXTERIOR	–	3/4"	–
IWH-1	INSTANTANEOUS GAS WATER HEATER, MAX 199 MBH INPUT, MINIMUM			
	15 MBH INPUT, 0.4 GPM TURN ON FLOW, 5.5 GPM @ 70°F RISE, MAX			
	LEAVING WATER TEMP OF 110°F, EQ. RINNIA CU-199e	–	1"	1"
CP-1	CIRCULATION PUMP, ON/OFF WITH AQUASTAT, MIN. 10 GPM FLOW AT			
	10 FOOT HEAD, 1725 RPM, EQ. B&G 2.5_IN	–	–	3/4"
ET-1	DOMESTIC WATER EXPANSION TANK, 2 GALLON, 0.9 GALLON ACCEPTANCE			
	LEAD FREE, EQ. B&G PT-5	–	–	1/2"
MV-1	MIXING VALVE, MIN. 1 GPM FLOW, MAX 5 PSI ΔP, MAX FLOW 26 GPM			
	LOCKING SET POINT, LEAD FREE, EQ. LEONARD VALVE TM-26-LF	–	3/4"	3/4"

PLUMBING LEGEND

	SOIL OR WASTE LINE
	VENT
	COLD WATER (CW)
	HOT WATER (HW)
CW	COLD WATER (EXTERIOR)
G	GAS LINE
	GAS PRESSURE REGULATOR
	GAS SERVICE VALVE
	GATE VALVE
	T & P RELIEF VALVE
	WALL CLEANOUT
CO	FLOOR CLEANOUT
	SHOCK ABSORBER
	VENT THRU ROOF

JOHNSON PEADEN ENGINEERING INC.
329 Brooks Street SE, Fort Walton Beach, FL 32548, 850.244.6189V 850.244.0545F
827 Grace Avenue, Panama City, FL 32401, 850.215.4068V 850.215.4069F
Alabama #CD-2429-E Arkansas #1654 Florida #00009014
Georgia #PEF003983 Mississippi #E-00000862
Texas #F-16637 Missouri #2018035834

JPE Job Number: 1950

OCTOBER 2020

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NO.	DATE	COMMENTS	BY
1	10/9/20	COUNTY COMMENTS	JJ

MAINTENANCE BUILDING PLUMBING FLOOR PLAN

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
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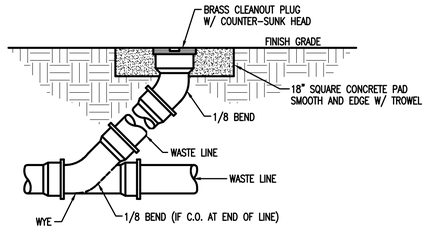
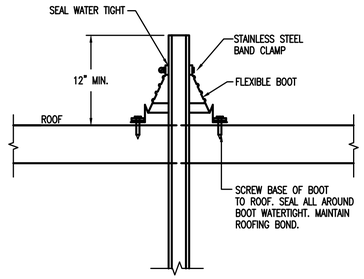
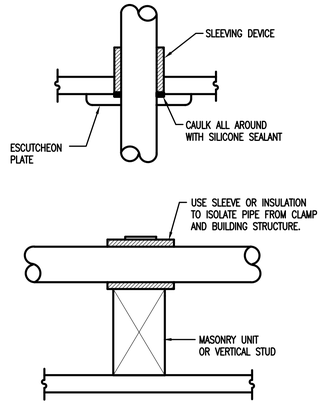
NOTE: IF CLEANOUT IS LOCATED INSIDE BUILDING, SET TOP LEVEL WITH CARPETING OR FLOORING MATERIAL.



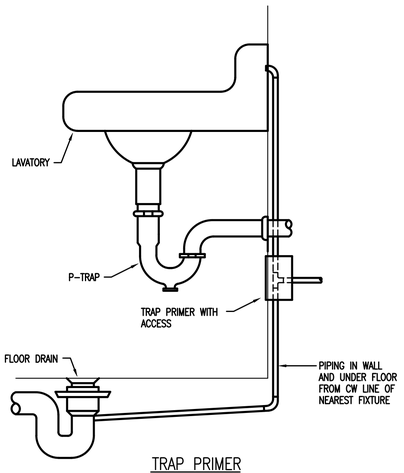
CLEANOUT DETAIL
NOT TO SCALE



VENT THROUGH ROOF DETAIL
NOT TO SCALE



METHODS OF SECURING PIPE PENETRATIONS AND SUPPORTS
NO SCALE



TRAP PRIMER
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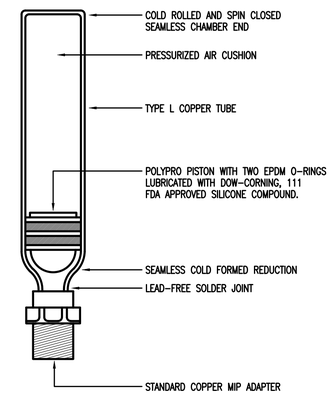
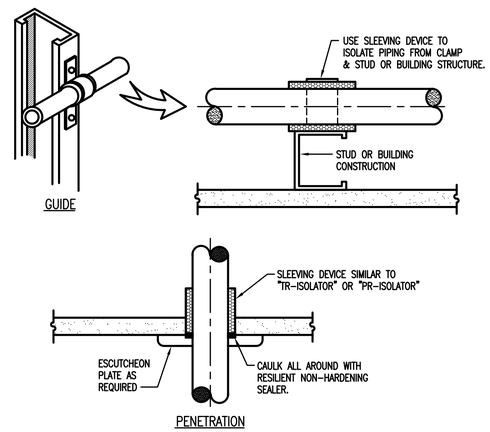


WATER HAMMER ARRESTER
NOT TO SCALE



DETAIL OF CONSTRUCTION PENETRATIONS & GUIDES FOR CONTROL OF PLUMBING NOISE & VIBRATION
NO SCALE

AVCON, INC.
ENGINEERS & PLANNERS
320 BAYSHORE DRIVE, SUITE A
NICEVILLE, FL. 32578-2425
OFFICE: (850) 678-0050
CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

JDF ARCHITECTURE, LLC
204 MIRACLE STRIP BLVD SE
FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

MAINTENANCE BUILDING PLUMBING DETAILS

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	OCTOBER 2020

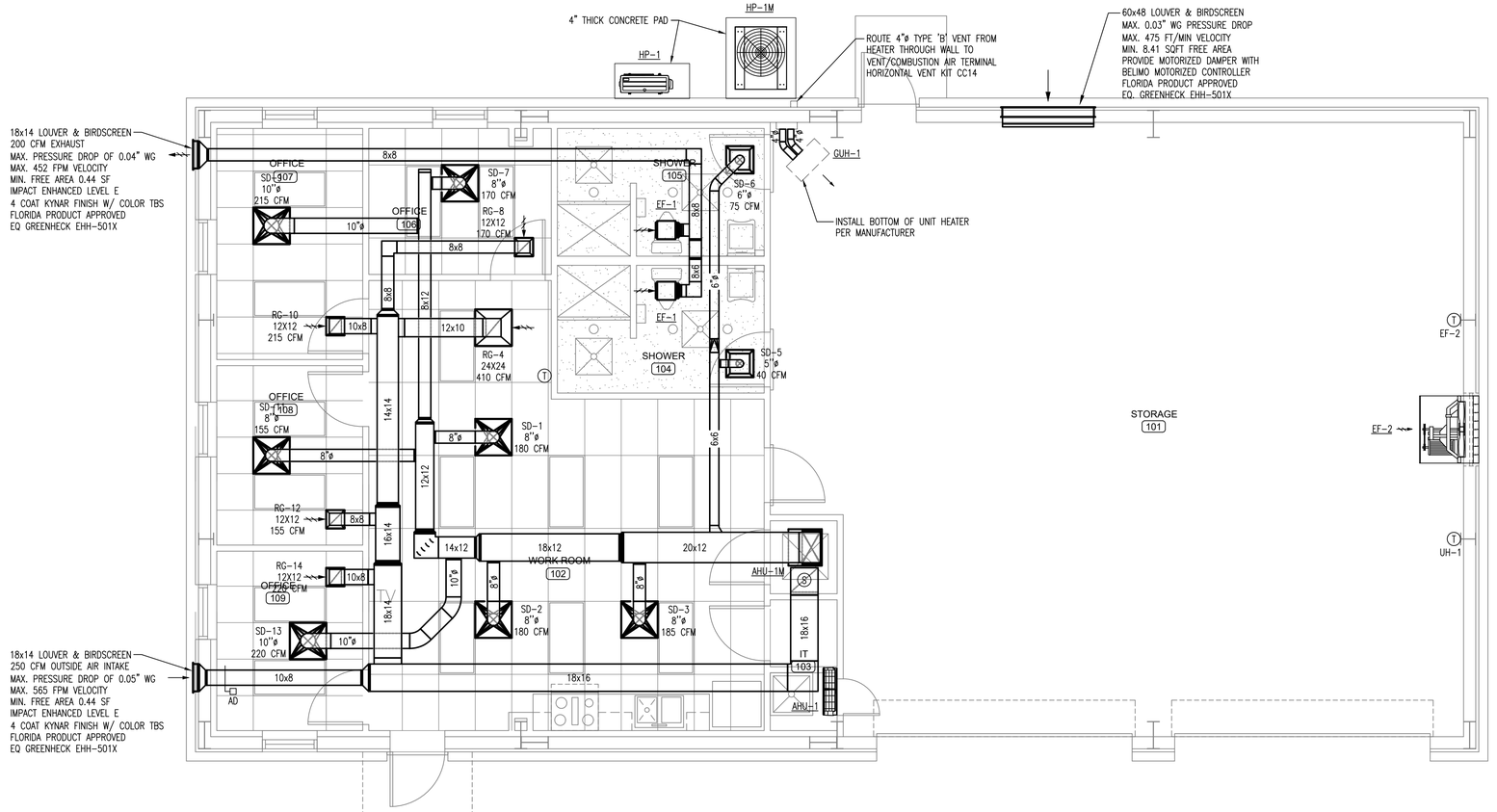
SHEET NUMBER
PM2.11

JOHNSON PEADEN ENGINEERING INC.
329 Brooks Street SE, Fort Walton Beach, FL 32548, 850.244.6189V 850.244.0545F
827 Grace Avenue, Panama City, FL 32401, 850.215.4068V 850.215.4069F
Alabama #CD-2429-E Arkansas #1654 Florida #00009014
Georgia #PEF003983 Mississippi #E-00000862
Texas #F-16637 Missouri #2018035834

JPE Job Number: 1950

OCTOBER 2020

Z:\CAD\JASON FLOYD\OKALOOSA COUNTY WATER & SEWER\P1.11 M.DWG 9/14/2020 2:38 PM



1 MAINTENANCE BUILDING HVAC FLOOR PLAN

SCALE: 1/4" = 1'-0"

MECHANICAL LEGEND

MARK	DESCRIPTION
CFM	CUBIC FEET PER MINUTE
CU	CONDENSING UNIT/HEAT PUMP
CD	SUPPLY DIFFUSER (TITUS TDCA-AAA)
RR	RETURN REGISTER (TITUS 25FL)
OA	OUTSIDE AIR
TG	TRANSFER GRILLE (TITUS 25FL)
WSR	WALL REGISTER (TITUS 300FS)
RTU	ROOFTOP UNIT
EX	EXISTING
	SUPPLY AIR
AD	AUTOMATIC DAMPER (24 VOLT)
	RETURN OR EXHAUST AIR
T	THERMOSTAT/SENSOR
S	SMOKE DETECTOR
WRR	WALL RETURN REGISTER (TITUS 350)
FD	FIRE DAMPER
	TURNING VANES IN DUCT
MD	MANUAL VOLUME DAMPER
	SUPPLY DIFFUSER (TITUS TDCA-AAA)
	SUPPLY OR OUTSIDE AIR DUCT IN SECTION
	EXISTING DUCTWORK
	SUPPLY AIR DUCTWORK
	EXHAUST AIR DUCTWORK
	RETURN AIR DUCTWORK
	OUTSIDE AIR DUCTWORK
	RETURN REGISTER (TITUS 25FL)

GENERAL MECHANICAL NOTES

1. FURNISH ALL LABOR, EQUIPMENT, AND MATERIALS TO PROVIDE A COMPLETE MECHANICAL SYSTEM. DUE TO THE SCHEMATIC NATURE OF THESE PLANS, THE CONTRACTOR SHALL FIELD-VERIFY LOCATIONS FOR EQUIPMENT DUCTWORK, AND ACCESSORIES. IN ADDITION, THIS WORK SHALL BE COORDINATED WITH OTHER TRADES TO AVOID CONFLICTS. THE CONTRACTOR SHALL ALSO REVIEW THE STRUCTURAL DRAWINGS BEFORE FABRICATING AND INSTALLING DUCTWORK OR EQUIPMENT.
2. ALL WORK SHALL BE PERFORMED BY SKILLED AND EXPERIENCED WORKMEN. WORK SHALL COMPLY WITH ALL APPLICABLE STATE AND LOCAL CODES. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED PERMITS, LICENSES, AND INSPECTIONS.
3. ALL MATERIALS SHALL BE NEW AND WITHOUT DEFECTS. SUBMIT SHOP DRAWINGS FOR ALL MATERIALS AND EQUIPMENT. ALL WORK DONE BY THIS CONTRACTOR SHALL BE WARRANTED FOR ONE YEAR FROM THE TIME THE OWNER GIVES ACCEPTANCE OR GAINS BENEFICIAL USE, WHICHEVER IS FIRST. ALL EQUIPMENT SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
4. DUCT SIZES ON DRAWINGS ARE INSIDE CLEAR DIMENSIONS. DUCT SHALL BE OF LOW-PRESSURE (2.0" w.g.) CONSTRUCTION AS CLASSIFIED BY SMACNA UNLESS OTHERWISE NOTED. ALL DUCT SHALL HAVE MINIMUM 2" EXTERNAL WRAP (MINIMUM R-6.0). LINER MAY ONLY BE USED WHERE REQUIRED FOR SOUND ATTENUATION. DUCTBOARD SHALL NOT BE USED.
5. FLEXIBLE DUCT MAY BE INSTALLED ONLY WHERE SHOWN ON THE DRAWINGS. DUCT SHALL BE EXTERNALLY-INSULATED CORRUGATED METAL WITH A MAXIMUM LENGTH OF 6'-0". FOR TAKE-OFFS LONGER THAN 6'-0", THE REMAINDER OF THE DISTANCE SHALL BE EXTERNALLY-WRAPPED SINGLE-WALL ROUND DUCT WITH A SPIN-IN STYLE TAP AT THE MAIN DUCT.
6. HANGERS FOR EQUIPMENT AND PIPING SHALL BE SECURED TO THE BUILDING STRUCTURE. NO HANGERS SHALL BE ATTACHED TO THE FLOOR OR ROOF DECK MATERIAL, OR CONCRETE DECKS LESS THAN 4" THICK.
7. ALL RETURN AND EXHAUST GRILLES SHALL HAVE OPPOSED-BLADE DAMPERS. ALL SUPPLY-SIDE TAKE-OFFS SHALL HAVE A BALANCING DAMPER.
8. FIRE DAMPERS AND FIRE-STOPPING SHALL BE PROVIDED FOR ANY PENETRATIONS OF FIRE-RATED PARTITIONS. VERIFY LOCATIONS OF ALL FIRE-STOPPING ON THE ARCHITECTURAL DRAWINGS.
9. ALL GRILLES AND REGISTERS SHALL BE EQUAL TO TITUS WITH ALUMINUM CONSTRUCTION. SUPPLY GRILLES SHALL BE EQUAL TO MODEL TDC. SUPPLY REGISTERS SHALL BE EQUAL TO MODEL 301. RETURN, EXHAUST AND TRANSFER GRILLES SHALL BE EQUAL TO MODEL 355 WITH OPPOSED-BLADE DAMPERS. GRILLE FINISH SHALL BE APPROVED BY THE OWNER AND THE ARCHITECT.
10. EQUIPMENT INSTALLED UNDER THIS CONTRACT SHALL BE ABLE TO PROVIDE THE REQUIRED CAPACITIES IN THE MIDDLE OF IT'S PERFORMANCE RANGE. ALL COMPRESSORS SHALL HAVE A MINIMUM 5-YEAR WARRANTY UNLESS OTHERWISE NOTED. THE EQUIPMENT SHALL HAVE ALL THE NECESSARY CONTROLS AND ACCESSORIES TO ALLOW FOR FULL OPERATION. IF EQUIPMENT HAS COMPONENTS OF A VIBRATIVE NATURE, THE CONTRACTOR SHALL PROVIDE THE NECESSARY VIBRATION CONTROLS.
11. REFRIGERANT PIPING SHALL BE HARD-DRAWN TYPE K OR L COPPER WITH COPPER SOLDER FITTINGS. PIPING SHALL BE SOLDERED WITH SILVER SOLDER AND INSULATED WITH 1/2" THICK THERMAL TUBULAR JACKETING. SEAL INSULATION JOINTS WITH TAPE AND CEMENT OR PER MANUFACTURER'S INSTRUCTIONS. PRE-INSULATED AND PRE-CHARGED REFRIGERANT LINES MAY BE USED AS PROVIDED BY THE EQUIPMENT MANUFACTURER. WHERE INSULATION IS EXPOSED TO WEATHER PROTECT LINES WITH AN ALUMINUM COVER AND PAINT TO MATCH EXTERIOR FINISH.
12. CONDENSATE DRAINS SHALL BE FULL-SIZE (1" MINIMUM) COPPER OR SCHEDULE 40 PVC. DRAINS SHALL BE INSULATED IN THE SAME MANNER AS REFRIGERANT LINES. DISCHARGE AS SHOWN ON THE DRAWINGS.
13. CONTROLS SHALL BE EQUAL TO MANUFACTURER'S CONTROLS. OUTDOOR UNITS SHALL HAVE FACTORY-WIRED TIME DELAYS, PRESSURE SWITCHES, LOW-AMBIENT CONTROLS AND DEFROST CONTROLS. THERMOSTATS SHALL BE DIGITAL AND PROGRAMMABLE WITH BATTERY BACK-UP. SETPOINTS SHALL FOLLOW DESIGN CONDITIONS OR BE AS DIRECTED BY THE OWNER. MOUNT ALL THERMOSTATS AND TEMPERATURE SENSORS 60" A.F.F.
14. THE HVAC SYSTEM SHALL BE TESTED AND BALANCED ACCORDING TO AABC STANDARDS. THE CONTRACTOR SHALL PROVIDE THE ARCHITECT WITH A COPY OF THE TEST AND BALANCE REPORT AND THE OWNER WITH A LETTER STATING THAT THE SYSTEM(S) HAVE BEEN BALANCED TO WITHIN 10% OF DESIGN PARAMETERS.

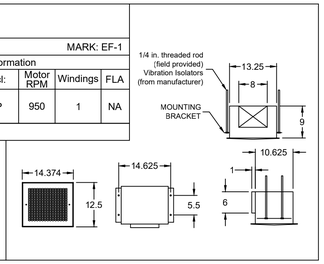
EQUIPMENT SCHEDULE

Ceiling Exhaust Fan — MARK: EF-1

Qty	Greenheck Model	Volume (CFM)	External SP Total SP (in wg)	FRPM	Operating Power (hp)	Weight (Lb.)	Motor Information: Size (hp)	V/C/P	Encl:	Motor RPM	Windings	FLA
1	SP-A110	100	0.25 0.238	950	0.01	20	NA	115/60/1	OP	950	1	NA

OPTIONS AND ACCESSORIES

UL/cUL 507 Listed - Electric Fan
Solid State Speed Control, 6 Amp, Shipped Loose
Aluminum Grille with White Enamel Finish, (PN: 504878)
Isolation Kit, (PN: VI KIT-SP/CSP), Shipped Loose
Aluminum Wheel Material
Energy Star Rated
Can Be Used to Comply with: ASHRAE 62.2, California Title 24, and Washington State Energy Code interlock with AHU-1M



HEAT PUMP SCHEDULE

UNIT NO.	TOTAL COOLING (MBH)	SENSIBLE COOLING (MBH)	LATENT COOLING (MBH)	MIN. SEER	OUTDOOR TEMP-COOLING	TOTAL HEATING (MBH)	MIN. HSPF	MIN. COP	OUTDOOR TEMP-HEATING	MCA	MOCP	VOLT/PHASE	REMARKS
HP-1M	48.48	33.93	14.55	16.0	95°FDB	22.80	9.00	4.00	28.0°FDB	28.9	30	208-230/1	1

REMARKS
1. UNIT SHALL BE EQUIPPED WITH DDC CONTROLS, VARIABLE SPEED COMPRESSOR OR INVERTER, ANTI-SHORT-CYCLE TIMER & LOW AMBIENT COOLING.

AIR HANDLER SCHEDULE

UNIT NO.	AIR CFM	APPROX. E.S.P."W.G.	FAN H.P.	COOLING ENT AIR TEMP	COOLING LVG TEMP	OUTSIDE AIR CFM	OUTDOOR TEMP-COOLING	ELEC HEAT (240V-1ø)	MCA	MOCP	VOLT/PHASE	REMARKS
AHU-1M	1420	1.0	0.5	77.9°FDB/66.1°FWB	55.6°FDB/54.6°FWB	250	95°FDB/80°FWB	10.0 kW	48.0	50	208/1	1

REMARKS
1. UNIT SHALL BE WIRED FOR SINGLE POINT CONNECTION.

UNIT HEATER SCHEDULE

MARK	MFR./ MODEL	AREA SERVED	CFM	TYPE	INPUT (MBH)	OUTPUT (MBH)	VOLT/ PHASE	MOCP	FAN MOTOR HP	FLA	GAS CONNECTION	VENT CONNECTION	COMBUSTION AIR INLET	WEIGHT	NOTES
GUH-1	REZNOR UDAS	STORAGE 101	456	NAT GAS	30	24.6	115/1	15	0.06	1.9	1/2"	4"	4"	96	1,2,3,4

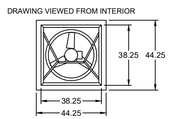
NOTES:
1. PROVIDE VIBRATION ISOLATION GROMMETS.
2. PROVIDE 4" CLASS "B" VENT
3. MAINTAIN MFR'S MINIMUM CLEARANCE.
4. PROVIDE LOW VOLTAGE THERMOSTAT AND CONTROL TRANSFORMER.

Sidewall Direct Drive Fan

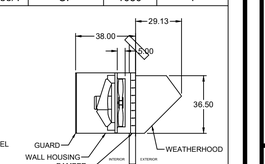
MARK INFORMATION: QTY	MARK	MODEL	FAN INFORMATION: VOLUME (CFM)	TOTAL EXTERNAL SP (IN WG)	FAN RPM	OPERATING POWER (HP)	WEIGHT (LB.)	MOTOR INFORMATION: SIZE (HP)	V/C/P	ENCLOSURE	MOTOR RPM	WINDINGS
1	EF-2	AER-E30C-310-VG	4,000	0.245	988	0.31	313	0.75	208/60/1	OP	1050	1

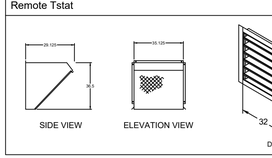
EF-2 : SELECTED OPTIONS AND ACCESSORIES

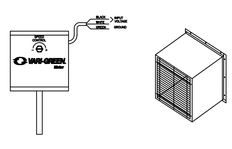
UL/cUL 705 Listed - "Power Ventilators"
Airflow Direction: Exhaust
Damper Mounted, WD-320-PB-32X32, Gravity Operated, Coated
Short Wall Hsg, Flush Exterior, w/ OSHA Grd., Ctd with Baked Enamel, Desert Sand (033)
Motor Access: From Int. of Bldg.
Switch, NEMA-1, T.O., Toggle, Shipped with Unit
Closure Angles
Weatherhood, Aluminum 45 deg. with Bird Screen Ctd Baked Enamel, Desert Sand (033)
Coated with Baked Enamel, Desert Sand (033), Fan And Attached Acc
Remote Tstat

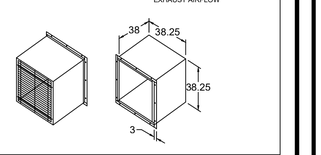


END VIEW DIMENSIONS ARE FOR HOUSING NOT FAN PANEL
WALL OPENING 39.25 SQ.
MOTOR IS ACCESSIBLE FROM INTERIOR OF BUILDING
THIS IS AN EXHAUST FAN DUE TO MOTOR ORIENTATION









IT ROOM MINISPLIT AIR HANDLER SCHEDULE

Mark	Air Flow	EAT CLG	LAT CLG	EAT HTG	LAT HTG	Max Sound Pressure Level	Full Load Ampacity	Minimum Circuit Ampacity	Voltage/Phase
AHU-1	425	76.7°FDB/67.0°FWB	59.3°F	70.0°F	N/A	43	0.33 A	1 A	208 V / 1Ø
PROVIDE WIRELESS THERMOSTAT FOR INDOOR UNIT, INTEGRAL FILTER, PIPE CONDENSATE TO SPLASH BLOCK OUTSIDE									

IT ROOM CONDENSING UNIT SCHEDULE

Mark	Total Cooling Capacity	Sensible Cooling Capacity	Heating Capacity	SEER	IEER	Minimum Circuit Ampacity	Maximum Overcurrent Protection	Voltage/Phase
HP-1	11,786 Btu/h	8,416 Btu/h	13,491 Btu/h	15.2	10.1	13 A	15 A	208 V / 1ø
PROVIDE INVERTER DUTY COMPRESSOR & COIL GUARD. OUTDOOR UNIT SHALL POWER INDOOR UNIT.								

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NO.	DATE	REVISION	BY

MAINTENANCE BUILDING HVAC FLOOR PLAN

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
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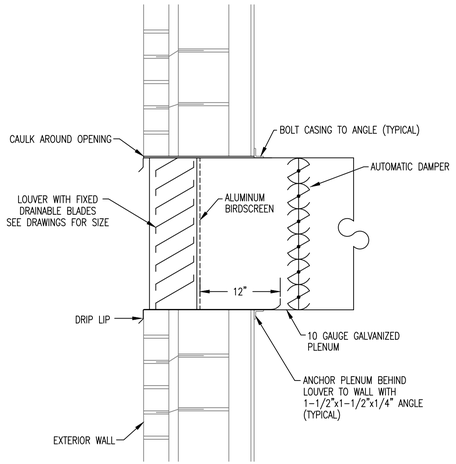
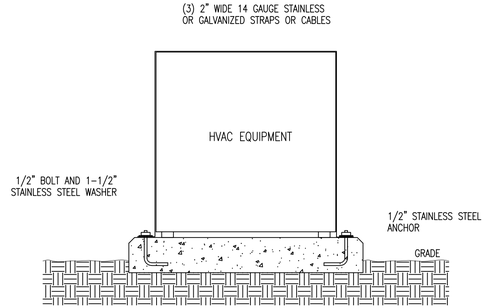


LOUVER THROUGH WALL W/ AD

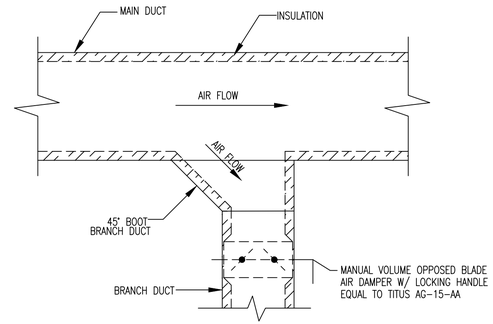
NOT TO SCALE

NOTES:
1. ALL PADS SHALL BE 6" THICK MINIMUM. EXTERIOR PADS SHALL HAVE AT LEAST 2" BELOW GRADE AND AT LEAST 4" ABOVE GRADE.
2. ANCHORS SHALL EXTEND INTO SLAB MINIMUM 3".
3. SECURE STRAPS AND CABLES TIGHT TO EQUIPMENT WITH MINIMUM 1/8" THICK RUBBERS STRIPS BETWEEN STRAPS/CABLES AND EQUIPMENT.



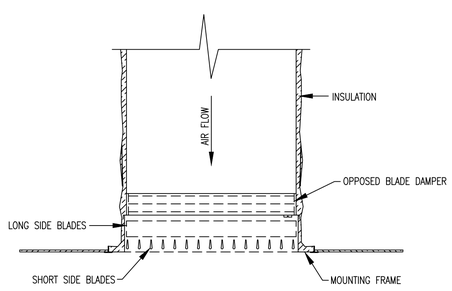
EXTERIOR CONCRETE EQUIPMENT PAD

NOT TO SCALE



BRANCH DUCT TAP FROM MAIN

NOT TO SCALE



NOTES:
1. ALL REGISTERS SHALL BE DOUBLE DEFLECTION TYPE ALL ALUMINUM CONSTRUCTION.
2. BLADES SHALL BE NO FURTHER THAN 3/4" SPACING OR LESS THAN 1/2" SPACING.
3. CENTER REGISTER IN CEILING GRID.
4. IF DUCT IS INTERNALLY INSULATED, DIFFUSER SHALL BE WRAPPED WITH R-6 INSULATION AROUND ALL EXPOSED PARTS ABOVE CEILING.
5. REGISTER BASED UPON TITUS MODEL 300FS.

REGISTER DETAIL

NOT TO SCALE

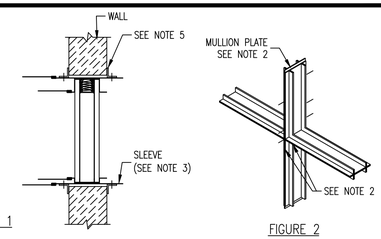
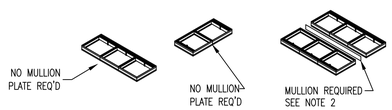


FIGURE 1

FIGURE 2



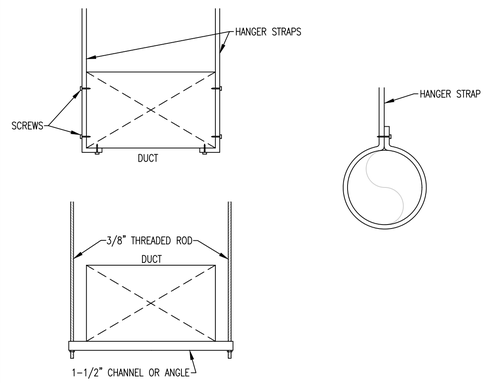
VERTICAL INSTALLATION

INSTALLATION DETAIL NOTES:

1. Opening in wall or floor shall be larger than damper/sleeve. See manufacturer's requirements.
2. For multiple sections and assembly refer to manufacturer's requirements to maintain UL rating and integrity.
3. Sleeves to dampers must be equal or thicker than duct connecting to the damper.
4. Follow 'Air Flow' and 'Mount with Arrow Up' labels for correct orientation for Dynamic dampers.
5. Do not weld of fasten angles together at corners of dampers. Use manufacturer's mounting angles and fasteners.
6. Duct/Sleeve connections must be made to allow the duct to break away from the dampers. See manufacturer's approved methods to seal duct to dampers.
7. The dampers must be installed so it is square and free from racking. All dampers require UL 555 and NFPA 90A approval at minimum.

FIRE DAMPER DETAIL

NOT TO SCALE



TYPICAL LOW-PRESSURE DUCT HANGERS

NOT TO SCALE

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NO.	DATE	REVISION	BY

MAINTENANCE BUILDING HVAC DETAILS

RELEASE FOR BID

CONSTRUCT OCWS FIELD OFFICES

PREPARED FOR

OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	JDF
DRAWN BY:	JDF
CHECKED BY:	JDF
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
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Texas #F-16637 Missouri #2018035834

JPE Job Number: 1950

OCTOBER 2020

MANUFACTURERS CONSIDERED EQUAL MUST SUBMIT TO ENGINEER 10 DAYS PRIOR TO BID FOR APPROVAL

LIGHTING FIXTURE SCHEDULE

MARK	MANUFACTURER AND CATALOG No. (or approved equal)	LAMPS No.	LAMPS TYPE	MOUNTING	REMARKS
DL	H.E. WILLIAMS 6DR-L20-835-DIM-UNV-O-W-OF-CS-N	19W LED ARRAY	2000 LUMEN/3500K	CEILING RECESSED	6" ROUND LED DOWNLIGHT, WIDE DISTRIBUTION, 120V
DLE	H.E. WILLIAMS 6DR-L20-835-DIM-UNV-O-W-OF-CS-N-EM/10W	19W LED ARRAY	2000 LUMEN/3500K	CEILING RECESSED	6" ROUND LED DOWNLIGHT, WIDE DISTRIBUTION, EMERGENCY UNIT BATTERY PACK, 120V
LI	H.E. WILLIAMS EGL-4-L107-840-HIAFR-(OPTIONS)-DIM-UNV	89W LED ARRAY	10000 LUMEN/4000K	CEILING SURFACE	4' LINEAR LED ENCLOSED AND GASKETED, INDUSTRIAL FIXTURE 120V
LIE	H.E. WILLIAMS EGL-4-L107-840-HIAFR-(OPTIONS)-DIM-UNV-EM/10W	89W LED ARRAY	10000 LUMEN/4000K	CEILING SURFACE	4' LINEAR LED ENCLOSED AND GASKETED, INDUSTRIAL FIXTURE, EMERGENCY UNIT BATTERY PACK, 120V
LT	H.E. WILLIAMS LT-24-L52-835-AF-DIM-UNV	37W LED ARRAY	5200 LUMEN/3500K	CEILING RECESSED	2' X 4' RECESSED LED TROFFER, 120V
LTE	H.E. WILLIAMS LT-24-L52-835-AF-DIM-UNV-EM/10W	37W LED ARRAY	5200 LUMEN/3500K	CEILING RECESSED	2' X 4' RECESSED LED TROFFER, EMERGENCY UNIT BATTERY PACK, 120V
SHE	H.E. WILLIAMS 6DR-L20-835-DIM-UNV-S-W-OF-CS-AD-WET/CC-N-F1-EM/10W	19W LED ARRAY	2000 LUMEN/3500K	CEILING RECESSED	6" ROUND LED SHOWER DOWNLIGHT, WIDE DISTRIBUTION, 120V
WB	H.E. WILLIAMS VWPH-L30/740-T3-SDGL-DIM-UNV	36W LED ARRAY	3000 LUMEN/4000K	WALL @ 8'-0" AFF	WALL MOUNTED AREA LIGHT WITH TYPE III DISTRIBUTION, FINISH SELECTED BY ARCHITECT, 120V
WBE	H.E. WILLIAMS VWPH-L30/740-T3-SDGL-DIM-UNV-EM/10WC	36W LED ARRAY	3000 LUMEN/4000K	WALL @ 8'-0" AFF	WALL MOUNTED AREA LIGHT WITH TYPE III DISTRIBUTION, FINISH SELECTED BY ARCHITECT, EMERGENCY UNIT BATTERY PACK, 120V
X	WILLIAMS EXIT-R-EM-WHT-SDT	LED		WALL ABOVE DOOR	LED EXIT LIGHT WITH THERMOPLASTIC HOUSING, EMERGENCY BATTERY BACKUP, PROVIDE DIRECTIONAL ARROWS AS INDICATED, 120V

1/2" LETTERS

PANEL LA

208Y/120 VOLTS
3 PHASE 4 WIRE
SERVED FROM PANEL MP
IN ELEC RM
10,000 AIC RATING

1/4" LETTERS

TYPICAL ELECTRICAL EQUIPMENT IDENTIFICATION DETAIL

NOT TO SCALE

ELECTRICAL EQUIPMENT IDENTIFICATION DETAIL NOTES:

1. MECHANICALLY AFFIX NAMEPLATE TO PANELBOARDS, CONTROL PANELS, MOTOR CONTROL CENTERS, DISCONNECTS, STARTERS OR SIMILAR DEVICES.
2. LETTERS SHALL BE WHITE ON BLACK BACKGROUND; SIZE OF LETTERS INDICATED ON DETAIL.
3. INFORMATION IN LABEL IS A GENERIC EXAMPLE – DESIGNATE EQUIPMENT IN A SIMILAR WAY USING RELEVANT INFORMATION (NAME OF PANEL, VOLTS, PHASE, LOCATION, AIC RATING ETC.) ACCORDING TO EACH INDIVIDUAL LOCATION OF EQUIPMENT.

WARNING

Arc Flash Hazard
Appropriate PPE Required

Do not operate controls or open covers without appropriate personal protection equipment.
Failure to comply may result in injury or death!

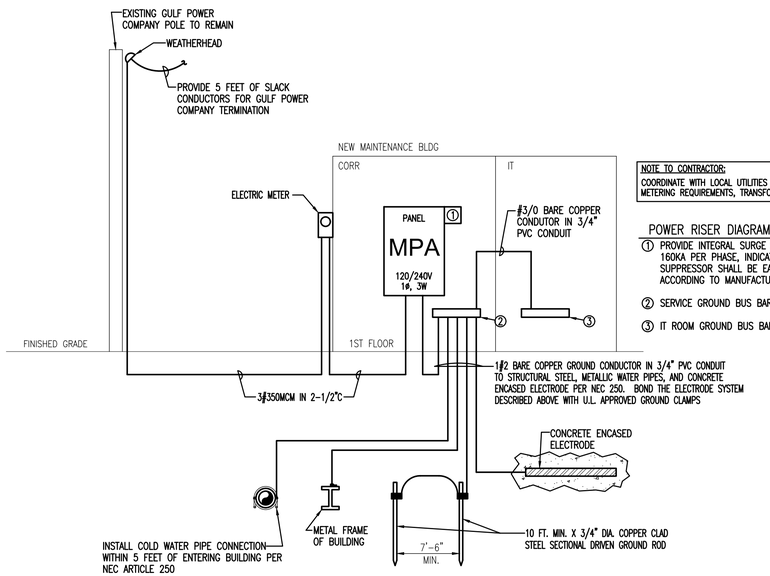
REFER TO NFPA 70E FOR MINIMUM PPE REQUIREMENTS

TYPICAL ARC FLASH HAZARD LABEL DETAIL

NOT TO SCALE

ARC FLASH LABEL DETAIL NOTES:

1. PROVIDE SELF-ADHESIVE VINYL LABEL TO AFFIX TO ALL PANEL AND SWITCHBOARDS IN ACCORDANCE WITH NEC 110.16 AND NFPA 70E.
2. LABELING MAY BE COMPLETED BY EQUIPMENT MANUFACTURER, VENDOR, OR CONTRACTOR. THE CONTRACTOR SHALL VERIFY ALL PANELS AND SWITCHBOARDS ARE LABELED IN THE FIELD.
3. THE LABEL SHALL BE LOCATED ON THE EQUIPMENT TO BE CLEARLY VISIBLE TO QUALIFIED PERSONS BEFORE EXAMINATION, ADJUSTMENT, SERVICING, OR MAINTENANCE OF THE EQUIPMENT.



MAINTENANCE BUILDING POWER RISER DIAGRAM

NOT TO SCALE

NOTE TO CONTRACTOR:
COORDINATE WITH LOCAL UTILITIES BEFORE BIDDING TO VERIFY METERING REQUIREMENTS, TRANSFORMER LOCATION, ETC...

POWER RISER DIAGRAM KEYNOTES:

① PROVIDE INTEGRAL SURGE SUPPRESSOR DEVICE IN PANEL WITH 80KA PER MODE/ 160KA PER PHASE, INDICATING LIGHTS AND ALARM SURGE COUNTER. SURGE SUPPRESSOR SHALL BE EATON SPC SERIES, VERIFY VOLTAGE AND PHASES. INSTALL ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

② SERVICE GROUND BUS BAR; SEE TYPICAL GROUND BUS BAR DETAIL

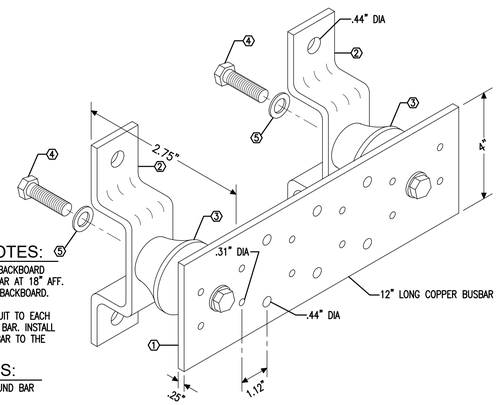
③ IT ROOM GROUND BUS BAR; SEE TYPICAL GROUND BUS BAR DETAIL

GROUND BAR GENERAL NOTES:

1. INSTALL GROUND BUS BAR ON COMMUNICATIONS BACKBOARD IN EACH COMMUNICATIONS ROOM. MOUNT BUS BAR AT 18" AFF. REFER TO FLOOR PLAN FOR EXACT LOCATION AT BACKBOARD.
2. INSTALL 1#3/0 COPPER CONDUCTOR IN 1" CONDUIT TO EACH GROUND BUS BAR FROM THE MAIN GROUND BUS BAR. INSTALL A #3/0 COPPER GROUND FROM THE MAIN BUS BAR TO THE ELECTRICAL SERVICE GROUND.

GROUND BAR MATERIALS:

① TIN PLATED HIGH CONDUCTIVE COPPER GROUND BAR
② WALL MOUNTING BRACKET
③ INSULATORS
④ 3/8" CAP SCREWS
⑤ 3/8" LOCKWASHERS



TYPICAL GROUND BUS BAR DETAIL

NOT TO SCALE

ELECTRICAL LEGEND

CEILING OUTLETS

"A" — RECESSED 2' X 2' LED FIXTURE MARK "A"
INDICATES FIXTURE WITH INTEGRAL EMERGENCY UNIT BATTERY PACK
RECESSED OR SURFACE MOUNTED LED FIXTURE
J — JUNCTION BOX
CEILING RECESSED MOUNTED LIGHTING FIXTURE
CEILING SURFACE MOUNTED EMERGENCY EXIT LIGHT WITH REMOTE BATTERY
EF — EXHAUST FAN

WALL OUTLETS

DUPLEX RECEPTACLE – 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
QUADRAPLEX RECEPTACLE – 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
G — DUPLEX RECEPTACLE – 20 AMP, 125 VOLT, GFI, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE
C — DUPLEX RECEPTACLE – 20 AMP, 125 VOLT, GFI, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 6" ABOVE COUNTER
WP — DUPLEX RECEPTACLE – 20 AMP, 125 VOLT, GFI, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA GF-5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE; PROVIDE WEATHERPROOF BOX FOR RECEPTACLE
DUPLEX RECEPTACLE CONTROLLED BY TIMER/CONTACTOR – 20 AMP, 125 VOLT, 2 POLE, 3 WIRE GROUNDED TYPE, NEMA 5-20R. MOUNT 18" A.F.F. UNLESS NOTED OTHERWISE; MARK IN ACCORDANCE WITH 2014 NEC 406.3(E)
250V RECEPTACLE; 4 WIRE; MT 14" AFF TO C/L; NEMA 10-50R; HUBBELL SERIES 7962
JUNCTION BOX WITH BLANK SCREW COVER AND FLEXIBLE CONDUIT CONNECTION

WALL SWITCHES (UNLESS OTHERWISE NOTED, MOUNT 48" A.F.F.)

S — A.C. TYPE, SINGLE POLE, 20 AMP, 120/277 VOLT
S_R — WALL MOUNTED OCCUPANCY SENSOR; INFRARED TYPE TECHNOLOGY; MOUNT 48" AFF TO C/L; EQUAL TO WATTSTOPPER PW-100
S_{RD} — WALL MOUNTED OCCUPANCY SENSOR; DUAL TYPE (INFRARED AND ULTRASONIC) TECHNOLOGY; MOUNT 48" AFF TO C/L; EQUAL TO WATTSTOPPER DW-100

TELEPHONE & TV SYSTEM

TELECOMMUNICATIONS OUTLET AT 18" AFF; STUB 1"C WITH PULLSTRING TO ABOVE ACCESSIBLE CEILING
C — WALL MOUNTED TELECOMMUNICATIONS OUTLET MOUNTED 6" ABOVE COUNTER; STUB 1"C WITH PULLSTRING TO ABOVE ACCESSIBLE CEILING

PANELS AND POWER

120/240 VOLT FLUSH MOUNTED PANELBOARD
NON-FUSIBLE DISCONNECT SWITCH; XX/YY/ZZ WHERE X INDICATES AMPERAGE, Y INDICATES # OF POLES, AND Z INDICATES NEMA RATING; SS INDICATES ENCLOSURE SHALL BE STAINLESS STEEL

BRANCH CIRCUITING

RUN CONCEALED UNDER FLOOR OR IN GRADE
RUN CONCEALED IN CEILING OR WALLS
LA-1 — HOMERUN TO PANEL. ANY CIRCUIT WITHOUT FURTHER IDENTIFICATION INDICATES 2 #12, 1 #12 GROUND – 1/2" C; 3 #12, 1 #12 GROUND – 1/2" C; 4 #12, 1 #12 GROUND – 3/4" C, ETC. AS PER NEC. LETTERS AND NUMERALS INDICATE PANEL AND CIRCUIT NUMBER.
LIQUID-TIGHT FLEXIBLE CONDUIT CONNECTION
SURFACE MOUNTED CONDUIT; RUN PARALLEL OR PERPINDICULAR TO BUILDING LINES

MISCELLANEOUS

A.F.F. — ABOVE FINISH FLOOR
WP — WEATHERPROOF
U.N.O. — UNLESS NOTED OTHERWISE

OCCUPANCY SENSORS AND RELAYS

360° CEILING MOUNTED OCCUPANCY SENSOR WITH DUAL TECHNOLOGY (INFRARED AND ULTRASONIC) WATTSTOPPER DT-300-1
P — POWER PACK RELAY EQUAL TO WATTSTOPPER BZ50; INSTALL IN ACCESSIBLE LOCATION FOR MAINTENANCE PURPOSES

ELECTRICAL GENERAL NOTES

1. CONTRACTOR SHALL COORDINATE ALL WORK WITH OTHER TRADES PRIOR TO INSTALLATION. REFER TO MECHANICAL AND PLUMBING DRAWINGS FOR EXACT SIZE AND LOCATION OF EQUIPMENT WHICH IS FURNISHED BY OTHERS AND CONNECTED BY ELECTRICAL.
2. RECEPTACLES, SWITCHES AND COVERPLATES COLOR SHALL BE SELECTED BY THE ARCHITECT FROM STANDARD COLORS.
3. LOCATION OF LIGHTING FIXTURES, DISCONNECT SWITCHES, ETC. FOR MECHANICAL EQUIPMENT/ROOM SHALL BE COORDINATED WITH FINAL MECHANICAL EQUIPMENT LOCATION TO PROVIDE NATIONAL ELECTRIC CODE REQUIRED ACCESS SPACE.
4. FINAL CONNECTION TO ALL MOTORS SHALL BE WITH FLEXIBLE CONDUIT CONNECTION.
5. ALL EXIT AND EMERGENCY FIXTURES SHALL BE CONNECTED TO LIGHT CIRCUIT AHEAD OF LOCAL SWITCH.
6. ALL PANELBOARDS, BACKBOARDS, TERMINAL CABINETS, DISCONNECTS, ETC SHALL HAVE CUSTOM ENGRAVED MICARTA NAMEPLATE MECHANICALLY AFFIXED IDENTIFYING SYSTEM.
7. GENERAL CONTRACTOR SHALL FIELD-VERIFY ALL EXISTING CONDITIONS PRIOR TO BEGINNING ANY WORK, AND SHALL IMMEDIATELY NOTIFY THE ARCHITECT OF ANY DISCREPANCIES. FAILURE TO DO SO INDICATES THAT THE CONTRACTOR ACCEPTS THE CONDITIONS AS THEY EXIST, AND SHALL PERFORM THE WORK REQUIRED AS SHOWN AND SPECIFIED.
8. THE ELECTRICAL CONTRACTOR SHALL OBTAIN AND REVIEW THE MECHANICAL AND SPECIAL EQUIPMENT SUBMITTALS PRIOR TO SUBMITTING THE ELECTRICAL SUBMITTALS. ANY ELECTRICAL EQUIPMENT, CONDUIT, AND WIRE SIZE CHANGES RESULTING FROM THIS REVIEW SHALL ALSO BE SUBMITTED FOR APPROVAL.
9. FURNISH ALL EQUIPMENT AND LABOR, PERFORM ALL LABOR WITH SUPERVISION, BEAR ALL EXPENSES, AS NECESSARY FOR THE SATISFACTORY COMPLETION OF ALL WORK READY FOR OPERATION.
10. COMPLY WITH ALL LOCAL CODE, LAWS, AND ORDINANCES APPLICABLE TO ELECTRICAL WORK, THE STATE BUILDING CODE AND THE NATIONAL ELECTRIC CODE. OBTAIN ALL PERMITS REQUIRED BY LOCAL ORDINANCES.
11. OBTAIN ARCHITECTS APPROVAL OF ALL LIGHT FIXTURES, SWITCHES, RECEPTACLES, PANELBOARDS, ETC. PRIOR TO PURCHASING.
12. THE GENERAL CONTRACTOR SHALL NOTIFY THE ARCHITECT IMMEDIATELY OF ANY CONFLICTS/DISCREPANCIES BETWEEN DISCIPLINES BEFORE ORDERING EQUIPMENT/MATERIALS.
13. DECORATIVE COVER PLATES FOR RECEPTACLE OUTLETS, SWITCHES, ETC. SHALL BE STAINLESS STEEL; REFER TO ELECTRICAL SPECIFICATIONS
14. INSTALL OCCUPANCY SENSORS AND ACCESSORIES PER MANUFACTURER'S RECOMMENDATIONS. ALL CONDUCTORS (INCLUDING CONTROLS) ASSOCIATED WITH OCCUPANCY SENSORS AND POWER PACKS SHALL BE INSTALLED IN 1/2" CONDUIT MINIMUM.
15. ELECTRICAL CONTRACTOR SHALL PAINT AND LABEL ALL JUNCTION BOXES TO IDENTIFY PANEL AND CIRCUIT; SEE ELECTRICAL SPECIFICATIONS.
16. ALL CONDUCTORS INDICATED ON PLAN SHALL BE COPPER.
17. EQUIPMENT GROUNDING CONDUCTOR SHALL BE PULLED IN ALL BRANCH CIRCUIT WIRING. CONDUIT GROUND SHALL NOT BE ACCEPTABLE.
18. THE ELECTRICAL WORK SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER. ALL NOT SO INSTALLED SHALL BE REMOVED AND REPLACED AT NO COST TO THE OWNER.
19. ALL CONDUCTORS LESS THAN 100A. SHALL BE COPPER #12 & #10 SOLID, #8 AND LARGER STRANDED, #6 AND SMALLER TO BE TYPE TW, 600 VOLT INSULATION AND TYPE THW FOR #4 AND LARGER.

120/240 VOLT 1ø 3W
300 AMP MAIN BREAKER

CIRCUIT BREAKER PANEL SCHEDULE PANEL MPA

SURFACE MOUNTED

CKT	LOAD DESCRIPTION	BREAKER POLE	BREAKER AMP	LOAD KVA		BREAKER AMP	BREAKER POLE	LOAD DESCRIPTION	CKT
1	LTS-STORAGE RM	1	20	.90	.54	20	1	REC-GARAGE	2
3	LTS-WORK RM,OFFICES,SHOWERS	1	20	1.35	.54	20	1	REC-GARAGE	4
5	LTS-WORK RM,OFFICES,SHOWERS	1	20	.40	.72	20	1	REC-GARAGE	6
7	IWH-1	1	20	.50	.18	20	1	REC-SHOWER	8
9	CIRC PUMP CP-1	1	20	.50	.18	20	1	REC-SHOWER	10
11	SPARE	1	20		.18	20	1	REC-CHARGING STATIONS	12
13	SPARE	1	20		.36	20	1	REC-IT RM	14
15	SPARE	1	20		.36	20	1	REC-IT RM	16
17	SPARE	1	20		.36	20	1	REC-IT RM	18
19	SPARE	1	20			20	1	SPARE	20
21	SPARE	1	20		.36	20	1	REFRIGERATOR-WORK RM	22
23	SPARE	1	20		.36	20	1	REC-WORM RM COUNTER TOP	24
25	SPACE	1	---		.36	20	1	REC-WORM RM COUNTER TOP	26
27	RANGE	2	50	8.0	.72	20	1	REC-OFFICES	28
29	↑	↑	↑		.72	20	1	REC-OFFICES	30
31	AHU-1M	2	50①	11.02	1.08	20	1	REC-OFFICES,WORK RM	32
33	↓	↓	↓		1.08	20	1	REC-OFFICES,WORK RM	34
35	HP-1	2	15①	2.50	1.18	20	1	GARAGE DOOR OPENER	36
37	↓	↓	↓		1.18	20	1	GARAGE DOOR OPENER	38
39	HP-1M	2	30①	5.55		100	2	SPARE	40
41	↓	↓	↓			↑	↓		42

TOTAL CONNECTED LOAD: 41.18 KVA
MINIMUM INTERRUPTING CAPACITY: 10,000 AMPS SYMMETRICAL

① HACR RATED BREAKER; VERIFY SIZE REQUIRED FOR EQUIPMENT FURNISHED

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FBPE Authorization No. 30242
Phone: (850)512-9579
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15 MAY 20

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CORPORATE CERTIFICATE OF AUTHORIZATION NUMBER: 5057
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TRANSFORMING TODAY'S IDEAS INTO TOMORROW'S REALITY

jdf+ architecture llc
JDF ARCHITECTURE, LLC
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FT WALTON BEACH, FLORIDA 32548
(850) 496-2166

NO.	DATE	REVISION	BY

MAINTENANCE BLDG
ELECTRICAL LEGEND, NOTES AND DETAILS

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY
WATER & SEWER

DESIGNED BY: RQY
DRAWN BY: RQY
CHECKED BY: RQY
APPROVED BY: VCL
PROJECT NO: 18.0125.02
DATE: MAY 15, 2020

SHEET NUMBER
EM0.01

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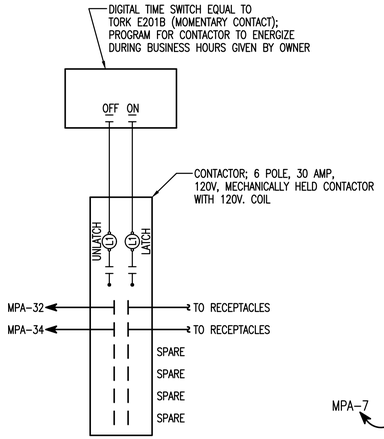
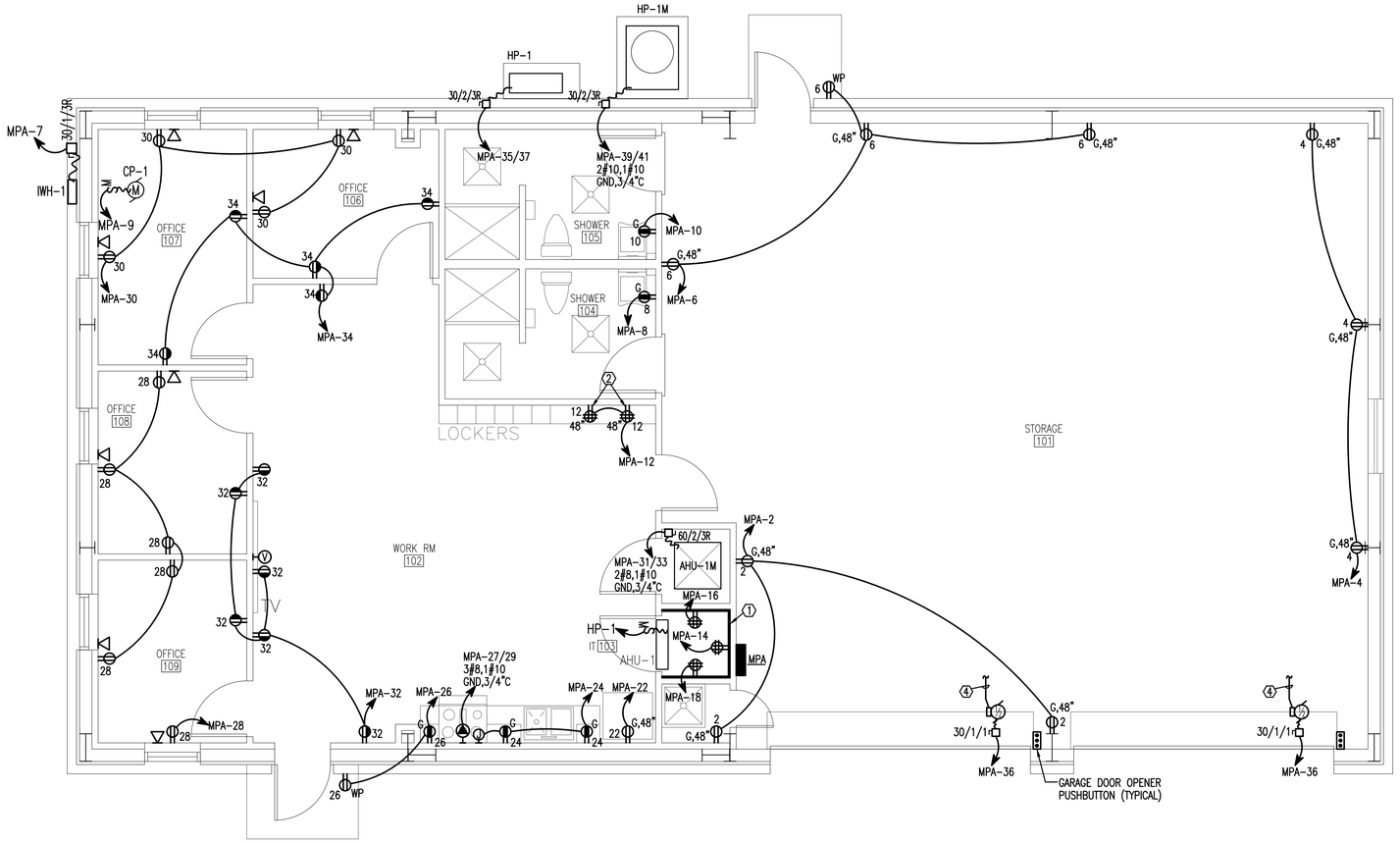


RECEPTACLE CONTROL DIAGRAM

NOT TO SCALE



MAINTENANCE BUILDING POWER & SIGNAL PLAN

SCALE: 1/4" = 1'-0"

KEYNOTES:

1. TELEPHONE BACKBOARD, WIDTH OF ROOM INDICATED X 4 FT. HIGH X 3/4" EXTERIOR PLYWOOD. PAINT TWO COATS FIRE RETARDANT PAINT. INSTALL ONE No. 3/0 COPPER GROUND CONDUCTOR IN 3/4" CONDUIT TO BUILDING GROUND, LEAVE 4 FT. SLACK CONDUCTOR AT BACKBOARD.
2. RECEPTACLES FOR CHARGING STATIONS; COORDINATE OUTLET LOCATION WITH CASEWORK INSTALLER PRIOR TO ROUGH-IN
3. ROUTE RECEPTACLES THROUGH CONTACTOR FOR CONTROLS; SEE RECEPTACLE CONTROL DIAGRAM
4. INSTALL DOOR CONTROLLER CONDUCTORS IN CONDUIT TO DOOR CONTROLLER
5. JUNCTION BOX FOR RANGE HOOD

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15 MAY 20

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NO.	DATE	REVISION	BY

MAINTENANCE BLDG
POWER & SIGNAL PLAN

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	RQY
DRAWN BY:	RQY
CHECKED BY:	RQY
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
EM1.00

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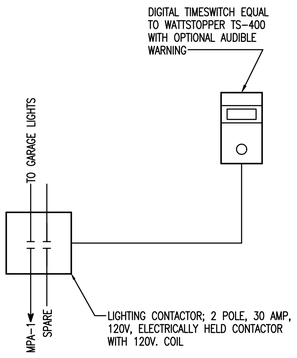
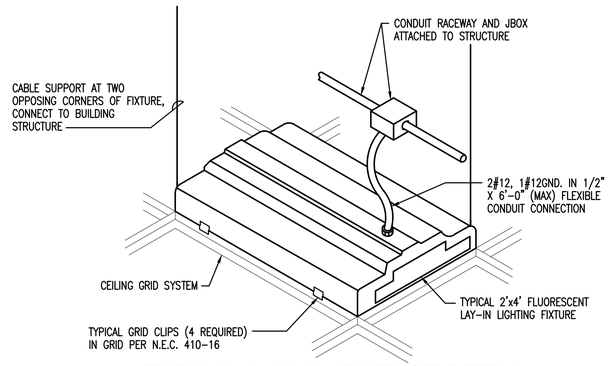


NOTE:
CONTRACTOR SHALL PROGRAM THE TIME-OUT DELAY ACCORDING TO OWNER'S RECOMMENDATIONS

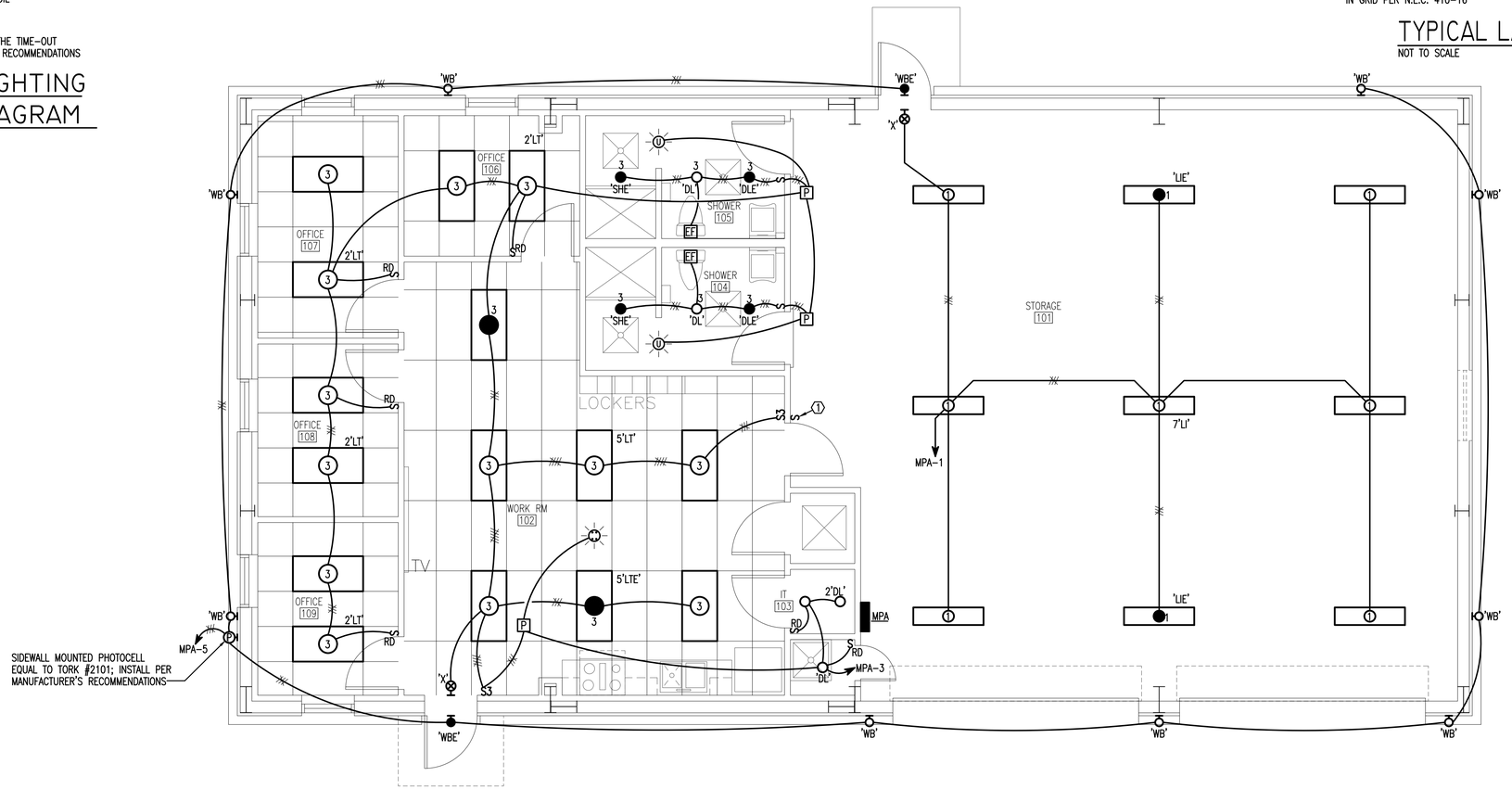
STORAGE LIGHTING CONTROL DIAGRAM

NOT TO SCALE



TYPICAL LAY-IN FIXTURE DETAIL

NOT TO SCALE



MAINTENANCE BUILDING LIGHTING PLAN

SCALE: 1/4" = 1'-0"

KEYNOTES:

① DIGITAL TIME SWITCH EQUAL TO WATTSTOPPER TS-400; SEE STORAGE LIGHTING CONTROL DIAGRAM

15 MAY 20

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NO.	DATE	REVISION	BY

MAINTENANCE BLDG LIGHTING PLAN

RELEASE FOR BID

OCWS FIELD OFFICES
PREPARED FOR
OKALOOSA COUNTY WATER & SEWER

DESIGNED BY:	RQY
DRAWN BY:	RQY
CHECKED BY:	RQY
APPROVED BY:	VCL
PROJECT NO:	18.0125.02
DATE:	MAY 15, 2020

SHEET NUMBER
EM1.01

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