



**STANDARD SPECIFICATIONS  
FOR  
CONSTRUCTION  
OF  
STREETS, STORMWATER,  
TRAFFIC, WATER  
AND SEWER  
INFRASTRUCTURE**

**August 2021**

**Office of the City Engineer**



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**STANDARD GENERAL CONDITIONS OF THE  
CONSTRUCTION CONTRACT**

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## ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

### 1.1 Defined Terms

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
  2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
  3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
  4. *As Approved*—The words “as approved”, unless otherwise qualified, shall be understood to be followed by the words “by the Owner in conformance with the Contract Documents.”
  5. *As Shown, As Indicated* – The words “as shown” and “as indicated” shall be understood to be followed by the words “on the Drawings”.
  6. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
  7. *Bidder*—An individual or entity that submits a Bid to Owner.
  8. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
  9. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
  10. *Bonds* – Performance and payment bonds and other instruments of security.
  11. ~~*Change Order* – A document 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, or other revision to the Contract, issued on or after the Effective Date of the Contract. If unsigned, a *Change Order* may also consist of a written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract. A *Change Order* shall not be deemed effective unless and until approved by Engineer and executed pursuant to Section 11, below.~~
  12. *City* – City of Ocala, Marion County, Florida. The term “City” and “Owner” are interchangeable and shall have the same meaning in the Contract Documents.
  13. *City Council* – The governing body of the City of Ocala.

14. *City Engineer* – Florida registered professional engineer who is the head of the City of Ocala Engineering Department and is authorized to manage construction, execute bid documents and administer contract Work Change Directive to construction contracts.
15. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer’s decision regarding a Change Order; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer’s decision regarding a Change Order; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.
16. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
17. *Consultant Construction Engineering Inspection (CCEI)* – Consulting firm under contract to the City of Ocala for administration of construction engineering and inspection services.
18. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
19. *Contract Completion* – The date the City accepts the entire work as being in compliance with the Contract Documents, or formally waives non-conforming work to the extent of non-conformity, and issues the final payment in accordance with the requirements set forth.
20. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
21. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
22. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
23. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
24. *Cost of the Work*—See Paragraph 13.01 for definition.
25. *Drawings*—The detailed construction plans and details of the Contract Documents that graphically show the scope, extent, and character of the Work to be performed by Contractor.

26. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
27. *Engineer*—The City Engineer or his appointed representative, including City Staff Engineer, Project Manager, Project Inspector, or engineering consultant under contract with the City to provide Resident Project Management Representative (RPR) services, or Consultant Construction Engineering Inspection (CCEI) services for the construction project. The City Engineer has been given authority to manage the construction projects and represents the Owner, City of Ocala. Therefore, the term Owner and Engineer are synonymous for the purposes of the Contract Documents.
28. *Final Completion* - The time at which the Work, in the opinion of Engineer, is complete, in accordance with the Contract Documents, and there are no remaining Punch List items. At Final Completion, the Contractor is eligible for Final Payment including payment of all retainage.
29. *Final Payment* – Final payment of all payments due to the Contractor for the project, including all retainage.
30. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
31. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
32. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
33. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
34. *Modification* – (a) A written amendment to the Contract Documents signed by both parties, (b) a Change Order or Work Change Directive, (c) a written clarification or interpretation issued by the Owner (d) a written order for a minor change or alteration in the work issued by the Owner. A modification may only be issued after execution of the Contract.
35. *Notice* – The term “notice” or the requirement to notify, as used in the Contract Documents or applicable state or federal statutes, shall signify a written communication delivered by Certified or Registered Mail to the individual, or to a member of the firm, or to an officer of the corporation as indicated in the Contract Documents.
36. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
37. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
38. *Owner*—The City of Ocala, Marion County, Florida with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract. The City Engineer or

his appointee shall act on behalf and shall be synonymous with the Owner as used in this document.

39. *Partial Utilization* – Use by the Owner of a substantially completed part of the Work for the purpose of which it is intended (or related purpose) prior to Substantial Completion of all the Work.
40. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor’s plan to accomplish the Work within the Contract Times.
41. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
42. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
43. *Proposal* – The terms “Proposal” and “Bid” are interchangeable and shall have the same meaning in the Contract Documents.
44. *Punch List* – Items requiring correction before Project is at Final Completion. Punch list items shall be completed prior to Contract completion date. Liquidated damages will apply to items not completed by Contract completion date.
45. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
46. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
47. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
48. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
49. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
50. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
51. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
52. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

53. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
54. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
55. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
56. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
57. *Surety* – Any person, firm, or corporation that has executed, as Surety, and of the Contractor’s bonds securing the performance of the Contract.
58. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
59. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
60. *Unit Price Work*—Work to be paid for on the basis of unit prices.
61. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
62. *Work Change Directive*—A written order to Contractor issued on or after the Effective Date of the Contract, issued by Engineer, which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

## 1.2 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*
  1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional

judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the 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 is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
  - a. does not conform to the Contract Documents; or
  - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
  - c. 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 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
  2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
  3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
  4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## ARTICLE 2 – PRELIMINARY MATTERS

### 2.1 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds:* When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

- B. *Evidence of Contractor's Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner's Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

## 2.2 *Copies of Documents*

- A. Owner shall furnish to Contractor one copy of the Contract Documents in electronic portable document format (PDF) or a website address, whereby the Contract Documents, in PDF format, can be viewed, printed or downloaded by the Contractor.

## 2.3 *Starting the Work*

- A. Contractor shall start to perform the work on the date when the Contract Times commence to run. Now Work shall be done at the Site prior to the date on which the Contract Times commence to run.

## 2.4 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
  - 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;
  - 2. a preliminary Schedule of Submittals; and
  - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

## 2.5 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Within 20 days, unless specified differently in the Special Provisions, after the Contract Times start to run, but before any Work at the Site 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 2.04.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

## 2.6 *Initial Acceptance of Schedules*

- A. At least 10 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 2.04.A.



Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

### *2.7 Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

## **ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE**

### *3.1 Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. 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.
- C. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- D. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

### *3.2 Reference Standards*

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

2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

### 3.3 *Reporting and Resolving Discrepancies*

#### A. *Reporting Discrepancies:*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
3. 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 had actual or constructive knowledge thereof.

#### B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
  - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
  - b. the provisions of any 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).

### 3.4 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or

relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Order, or by filing a Claim.

### *3.5 Amending and Supplementing Contract Documents*

- A. 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: (i) a Written Amendment; (ii) a Work Change Directive; or (iii) a Change Order.
- B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, by one or more of the following ways: (i) a Work Change Directive; (ii) Engineer's approval of a shop drawing or sample; or (iii) Engineer's written interpretation or clarification.

### *3.6 Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
  - 1. 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 its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
  - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

## **ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK**

### *4.1 Commencement of Contract Times; Notice to Proceed*

- A. The Engineer will issue a Notice to Proceed after the Effective Date of the Contract. The Contract Times will commence to run on the day indicated in the Notice to Proceed.

### *4.2 Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

### *4.3 Reference Points*

- A. 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 property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument 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 or property monuments by professionally qualified personnel.

#### *4.4 Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.06 as it may be adjusted from time to time as provided below.
  - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.06) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
  - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. 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, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

#### *4.5 Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
  - 1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
  - 2. abnormal weather conditions;
  - 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
  - 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.
- G. Contractor must submit any Change Order seeking an **adjustment in Contract Price or Contract Times** under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

## **ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS**

### *5.1 Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

### *5.2 Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*
  - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
  - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to 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 directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the

Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* 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 structures or land to stresses or pressures that will endanger them.

### 5.3 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
  - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
  - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
  - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
  - 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
  - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
  - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

### 5.4 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
  - 1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
  - 2. is of such a nature as to require a change in the Drawings or Specifications; or
  - 3. differs materially from that shown or indicated in the Contract Documents; or

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 after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review and Statement to Contractor Regarding Site Condition:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and shall issue a written statement to Contractor regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition and indicating whether any change in the Drawings or Specifications will be made.
- C. *Possible Price and Times Adjustments:*
  1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
    - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
    - b. 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 Paragraph 13.03; and,
    - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
  2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
    - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
    - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
    - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of **any adjustment in the Contract Price or Contract Times**, or both, then any such adjustment shall be set forth in a Change Order.
4. Contractor may submit a Change Order regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

#### 5.5 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
  1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
  2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
    - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
    - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
    - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
    - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then 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 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.
- C. *Engineer's Review and Statement to Contractor Regarding Underground Facility:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare any direction regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and issue a written statement to Contractor regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility and indicating whether any change in the Drawings or Specifications will be made. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Possible Price and Times Adjustments:*
  1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was



not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
  - b. 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 Paragraph 13.03;
  - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
  - d. Contractor gave the notice required in Paragraph 5.05.B.
2. If Engineer and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
  3. Contractor may submit a Change Order regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

#### **5.6 Hazardous Environmental Conditions at Site**

##### **A. Reports and Drawings:** The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
2. Technical Data contained in such reports and drawings.

##### **B. Reliance by Contractor on Technical Data Authorized:** Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

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
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

##### **C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.**

- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly 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 condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Order, or Owner may impose a set-off.
- H. If after receipt of such 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 the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors 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 arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

## **ARTICLE 6 – BONDS AND INSURANCE**

### **6.1     *Performance, Payment, and Other Bonds***

- A. Contractor shall refer to the specific provisions of the Contract for Performance, Payment and other bonds that may be required.

### **6.2     *Insurance—General Provisions***

- A. Contractor shall obtain and maintain insurance as required in the Contract.

## **ARTICLE 7 – CONTRACTOR’S RESPONSIBILITIES**

### **7.1     *Supervision and Superintendence***

- A. 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.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

### **7.2     *Labor; Working Hours***

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. 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 stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Regular working hours shall be between 7:00 am to within 30 minutes before Sunset (Not to exceed 10 hours per day). Contractor will not perform Work on a Saturday, Sunday, or any City observed holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or City observed holidays only with Engineer’s written consent, which will not be unreasonably withheld.
- C. If the Contractor desires to work outside the regular working hours as stated above, the Contractor must make advance application to, and obtain written approval from, the Engineer, (allowing at least 48 hours prior to the time of such work) to enable satisfactory arrangements to be made for inspecting the work in progress and coordination with other City departments (However, emergency work may be done without prior permission).
- D. Night Work, with permission of the Engineer, may be performed, by the Contractor at no additional cost to the Owner, unless contract documents include a line item cost for night work. The Engineer’s permission, however, may be revoked at any time by the Engineer, if the Contractor fails to maintain adequate equipment and supervision for the proper execution and control of the Work at night.

### **7.3     *Services, Materials, and Equipment***

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, 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 performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required 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 source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 7.4 “Or Equals”

- A. 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 Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or “or equal” item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
  - 1. If Engineer in its sole discretion determines that 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, Engineer shall deem it an “or equal” item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
    - a. in the exercise of reasonable judgment Engineer determines that:
      - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
      - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
      - 3) it has a proven record of performance and availability of responsive service; and
      - 4) it is not objectionable to Owner.
    - b. Contractor certifies that, if approved and incorporated into the Work:
      - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
      - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor’s Expense:* Contractor shall provide all data in support of any proposed “or equal” item at Contractor’s expense.
- C. *Engineer’s Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each “or-equal” request. Engineer may require Contractor to furnish additional data about the proposed “or-equal” item. Engineer will be the sole judge of acceptability. No “or-equal” item will be ordered, furnished, installed, or utilized until Engineer’s review is complete and Engineer determines that the proposed item is an “or-equal”, which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.
- D. *Effect of Engineer’s Determination:* Neither approval nor denial of an “or-equal” request shall result in any change in Contract Price. The Engineer’s denial of an “or-equal” request shall be

final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an “or-equal” item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph 7.05.

## 7.5 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
  2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
  3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
    - a. shall certify that the proposed substitute item will:
      - 1) perform adequately the functions and achieve the results called for by the general design,
      - 2) be similar in substance to that specified, and
      - 3) be suited to the same use as that specified.
    - b. will state:
      - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
      - 2) whether use of the proposed substitute item 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 other work on the Project) to adapt the design to the proposed substitute item, and
      - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
    - c. will identify:
      - 1) all variations of the proposed substitute item from that specified, and
      - 2) available engineering, sales, maintenance, repair, and replacement services.
    - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer’s Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer

will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Change Order or a Work Change Directive accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Order.

#### 7.6 Concerning Subcontractors, Suppliers, and Others

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Order for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. 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.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
  - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
  - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

#### *7.7 Patent Fees and Royalties*

- A. 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.

- B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors 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 arbitration or other dispute resolution costs) arising out of or relating to 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.

#### 7.8 *Permits*

- A. Contractor shall be responsible to obtain and pay for any permits and licenses referenced in the Bidding Documents.

#### 7.9 *Taxes*

- A. 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.

#### 7.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the 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.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors 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 arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Order, or Owner may initiate a Claim. The provisions of this paragraph shall not apply to any changes to prevailing wage rates. Changes to wage rates during the life of the Contract shall be the responsibility of the Contractor and shall not be eligible for claims for changes to the Contract Price.

#### 7.11 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record



documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

#### 7.12 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
  - 1. all persons on the Site or who may be affected by the Work;
  - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
  - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer 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 individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and protection 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 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
- G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.
- H. Work in Confined Spaces shall follow the provisions of 29 CFR Section 1910.146, "Permit-Required Confined Spaces". The Owner has established a confined-space entry program for

its own use, and will be responsible for enforcement of the program for the Owner's personnel only. The Contractor is hereby notified that manholes and other structures included under the confined-space definition of 29 CFR 1910.146, shall be considered as hazardous atmospheric conditions. The structures may contain methane, hydrogen sulfide, carbon dioxide, and other gases which are dangerous to life or health. The Contractor shall allow its personnel or subcontractors to enter these confined spaces only through compliance with an entry permit program as specified herein. The Contractor shall establish and maintain a confined space entry program appropriate to the structures and conditions encountered. The program shall meet the requirements of 29 CFR 1910.146 and shall specifically address the provisions of Paragraph (d) therein. The Contractor shall enforce the requirements of Paragraphs (e) and (f), shall establish and conduct a training program in accordance with Paragraph (g), and shall comply with all other applicable requirements of the referenced regulation.

#### *7.13 Safety Representative*

- A. 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.

#### *7.14 Hazard Communication Programs*

- A. 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.

#### *7.15 Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor 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 or are required as a result thereof. 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 Change Order or Work Change Directive will be issued.

#### *7.16 Shop Drawings, Samples, and Other Submittals*

##### *A. Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
  - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
  - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
  - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
  - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
1. *Shop Drawings:*
    - a. Contractor shall submit the number of copies required in the Specifications.
    - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.
  2. *Samples:*
    - a. Contractor shall submit the number of Samples required in the Specifications.
    - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
  3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, 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.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. 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.
  2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
  3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
  4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Work Change Directive.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures:*

1. 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.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
  1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
  2. normal wear and tear under normal usage.
- C. 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:
  1. observations by Engineer;
  2. recommendation by Engineer or payment by Owner of any progress or final payment;
  3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
  4. use or occupancy of the Work or any part thereof by Owner;
  5. any review and approval of a Shop Drawing or Sample submittal;

6. the issuance of a notice of acceptability by Engineer;
  7. any inspection, test, or approval by others; or
  8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

#### *7.18 Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors 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 arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage 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 but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A 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 individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, Work Change Directives, designs, or Specifications; or
  2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

#### *7.19 Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must

satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

## **ARTICLE 8 – OTHER WORK AT THE SITE**

### **8.1 Other Work**

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, 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 to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

### **8.2 Coordination**

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange

to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
  2. an itemization of the specific matters to be covered by such authority and responsibility; and
  3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

### 8.3 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Order seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold

harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

## **ARTICLE 9 – OWNER’S RESPONSIBILITIES**

### *9.1 Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

### *9.2 Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer’s status under the Contract Documents shall be that of the former Engineer.

### *9.3 Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

### *9.4 Pay When Due*

- A. Owner shall make payments to Contractor when they are due as set forth in Article 15.

### *9.5 Lands and Easements; Reports, Tests, and Drawings*

- A. Owner’s duties with respect to providing lands and easements are set forth in Paragraph 5.01.
- B. Owner’s duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
- C. Article 5 refers to Owner’s identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

### *9.6 Insurance*

- A. Owner’s responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

### *9.7 Change Orders or Work Change Directives*

- A. Owner’s responsibilities with respect to Change Orders or Work Change Directives are set forth in Article 11.

### *9.8 Inspections, Tests, and Approvals*

- A. Owner’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

### *9.9 Limitations on Owner’s Responsibilities*

- A. 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 performance of the Work. Owner will not be responsible for Contractor’s failure to perform the Work in accordance with the Contract Documents.



*9.10 Undisclosed Hazardous Environmental Condition*

- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

*9.11 Evidence of Financial Arrangements*

- A. If and to the extent the Owner has agreed to furnish the Contractor reasonable evidence that financial arrangements have been made to satisfy the Owner's obligations under the Contract Documents, the Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

*9.12 Safety Programs*

- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
- B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

**ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION**

*10.1 Owner's Representative*

- A. 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 will not be changed without written consent of the Owner and the Engineer.

*10.2 Visits to Site*

- A. 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, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site 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 observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's 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 performance of the Work.

*10.3 Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. 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 individual or entity will be as provided in the Supplementary Conditions.

*10.4 Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

*10.5 Shop Drawings, Change Orders, Work Change Directives and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders and Work Change Directives is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

*10.6 Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

*10.7 Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Orders, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

*10.8 Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, 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 in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.
- B. 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 performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A 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 Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

#### *10.9 Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

### **ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK**

#### *11.1 Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order or a Work Change Directive.
  - 1. *Change Orders*: If an amendment or supplement to the Contract Documents includes a **change in the Contract Price or the Contract Times**, such amendment or supplement **must be set forth in a Change Order**. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
  - 2. *Work Change Directives*: Engineer may order or authorize changes in the Work if the changes **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. Such changes will be accomplished by a Work Change Directive and will be binding on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Work Change Directive justifies an adjustment in the Contract Price or Contract Times, or both, then Contractor shall submit a Change Order as provided herein. Following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Order seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive.

#### *11.2 Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner through the City Engineer, may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

#### *11.3 Unauthorized Changes in the Work*

- A. 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, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

#### 11.4 *Change of Contract Price*

- A. The **Contract Price** may **only** be changed by a **Change Order**. Any Change Order for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
  - 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
  - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
  - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
- C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
  - 1. a mutually acceptable fixed fee; or
  - 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:
    - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
    - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
    - c. 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 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
    - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
    - e. 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
    - f. 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 11.04.C.2.a through 11.04.C.2.e, inclusive.

### 11.5 *Change of Contract Times*

- A. The **Contract Times** may only be changed by a **Change Order**. Any Change Order for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

### 11.6 *Change Orders*

- A. Contractor shall submit a **Change Order to Engineer to request an adjustment in the Contract Times or Contract Price**; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Order shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.
  - 1. *Procedures*: Contractor shall submit each Change Order to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer within 15 days after the submittal of the Change Order. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.
  - 2. *Engineer's Action*: Engineer will review each Change Order and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Order in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Contractor. If Engineer does not take action on the Change Order within 30 days, then Contractor may at any time thereafter submit a letter to the Engineer indicating that as a result of Engineer's inaction the Change Order is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
  - 3. *Binding Decision*: Engineer's decision will be final and binding upon the Contractor, unless Contractor appeals the decision by filing a Claim under Article 12.

### 11.7 *Execution of Change Orders*

- A. Engineer and Contractor shall execute appropriate Change Orders covering:
  - 1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Change Order;
  - 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
  - 3. changes in the Work which are: (a) ordered by Engineer pursuant to Paragraph 11.02, (b) required because of Engineer's acceptance of defective Work under Paragraph 14.04 or Engineer's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties; and
  - 4. changes to the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.
- B. If Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

## 11.8 Notification to Surety

- A. If the provisions of any bond require notice to be given to a surety 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), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

## ARTICLE 12 – CLAIMS

### 12.1 Claims

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article, which, together with Article 17 herein, shall serve as the formal dispute resolution procedure prescribed in the construction contract pursuant to Section 218.735(4), Florida Statutes:
  - 1. Appeals by Contractor of Engineer's decisions regarding Change Orders;
  - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
  - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to the Engineer and other party to the contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless the Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 11.04. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 11.05. Each Claim shall be accompanied by claimant's statement certifying that the Claim is made in good faith that the supporting data are accurate and complete, and that to the best of claimant's knowledge and belief that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to the Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless the Engineer allows additional time).
- C. *Review and Resolution:* The Engineer will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. The Engineer's written decision on such Claim, dispute, or other matter will be final and binding upon the Owner and the Contractor unless a written notice of intention to appeal from the Engineer's written decision as set forth in Article 17 is delivered by the Contractor to the Engineer within 30 days after the date of such decision, and, if applicable, providing pre-suit notice to Owner of Contractor's intent to file a cause of action in Circuit Court in Marion County, Florida. Contractor shall be entitled to an appeal by filing a formal proceeding instituted by the appealing party in Circuit Court, Marion County, Florida, within 30 days of Contractor's notice to owner described above, 60 days after the date of the Engineer's written decision, or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by the Engineer and the Contractor), to exercise such rights of remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable laws and regulations.

- D. *No Decision*: If the Engineer does not render a formal decision in writing with the time stated in 12.01.C, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.
- E. *Partial Approval*: If the Engineer approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order or Work Change Directive to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

## ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

### 13.1 *Cost of the Work*

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
  - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
  - 2. To determine the **value** of a Work Change Directive, Change Order, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
  - 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 on the Work. 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, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
  - 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.

3. Payments made by Contractor to Subcontractors for Work performed 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 acceptable. 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 this Paragraph 13.01.
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.
5. Supplemental costs including the following:
  - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
  - b. 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.
  - c. 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, assembly, dismantling, and removal thereof. All such costs shall be 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.
  - d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
  - e. 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.
  - f. 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 of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages 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.
  - g. The cost of utilities, fuel, and sanitary facilities at the Site.
  - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.



- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:
  1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
  2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
  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.
  4. 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.
  5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee:* When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Work Change Directive, Change Order, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.
- E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

### 13.2 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:* Contractor agrees that:
  1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
  2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance:* Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

### *13.3 Unit Price Work*

- A. 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 unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. 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. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. 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.
- D. 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 (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Order, or Engineer may file a Claim, seeking an adjustment in the Contract Price if:
  - 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;
  - 2. there is no corresponding adjustment with respect to any other item of Work; and
  - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Engineer 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 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK**

### *14.1 Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

### *14.2 Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Engineer on behalf of Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform quality assurance inspections and tests expressly required by the Contract Documents to be furnished and paid

for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

- C. Contractor may, for Contractor's benefit, order and pay at their expense any additional testing which Contractor deems necessary to meet construction specifications.
- D. 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.
- E. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
  - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
  - 2. to attain Engineer's acceptance of materials or equipment to be incorporated in the Work;
  - 3. by manufacturers of equipment furnished under the Contract Documents;
  - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
  - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Engineer. Results of all required testing and inspections shall be submitted to the Engineer.

- F. If the Contract Documents require the Work (or part thereof) to be approved by Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- G. 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, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

#### 14.3 Defective Work

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising

out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

#### *14.4 Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). 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), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

#### *14.5 Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then 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, and provide all necessary labor, material, and equipment.
  - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to 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 pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
  - 2. If the uncovered 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 both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Order within 30 days of the determination that the Work is not defective.

#### *14.6 Engineer May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers, provide safe working environment, or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Engineer may order Contractor to stop the Work, or any portion thereof, until the cause for such order has

been eliminated; however, this right of Engineer to stop the Work shall not give rise to any duty on the part of Engineer to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### **14.7 Owner May Correct Defective Work**

- A. 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 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, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or 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, 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 Engineer, Owner, Owner's representatives, 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.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. 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.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

### **ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD**

#### **15.1 Progress Payments**

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 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 during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
  - 1. At least 20 days before the date established in the Agreement 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,

a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or within 20 days (25 days if Engineer is a consultant to the City Engineer providing construction management services), as required by Florida Statute 218.735, 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.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's 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:
  - a. the Work has progressed to the point indicated;
  - b. 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, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
  - c. 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.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
  - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer; or
  - b. there may be other matters or issues that might entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
  - a. to supervise, direct, or control the Work, or
  - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
  - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

- d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
  - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
5. 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 stated in Paragraph 15.01.C.2.
  6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
    - a. the Work is defective, requiring correction or replacement;
    - b. the Contract Price has been reduced by Change Orders;
    - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
    - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
    - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

**D. *Payment Becomes Due:***

1. Payment of an Application for Payment approved as per Paragraph 15.01.C. will become due twenty days after presentation of the Application for Payment to the Engineer (twenty-five days if Engineer is a consultant providing construction management services to the City Engineer), as required by Florida Statute 218.735.
2. Payment of a revised Application for Payment previously rejected per Paragraph 15.01.C. and then subsequently corrected by the Contractor and approved as per Paragraph 15.01.C, will be due ten days after presentation of the revised Application for Payment to the Engineer, as required by Florida Statute 218.735

**E. *Reductions in Payment by Owner:***

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
  - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
  - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
  - c. Contractor has failed to provide and maintain required bonds or insurance;
  - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
  - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

- f. the Work is defective, requiring correction or replacement;
  - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
  - h. the Contract Price has been reduced by Change Orders;
  - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
  - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
  - k. 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;
  - l. there are other items entitling Owner to a set off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Order contesting the reduction.
  3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1.

#### *15.2 Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

#### *15.3 Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, 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 therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Contractor a certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment.
- D. At the time of receipt of the certificate of Substantial Completion, Engineer and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Engineer and Contractor agree otherwise in writing,



Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion, the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

#### *15.4 Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which 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, subject to the following conditions:
  - 1. At any time Engineer may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
  - 2. At any time, Contractor may notify Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
  - 3. Within a reasonable time after either such request, 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 Contractor in writing giving the reasons therefore. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 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.
  - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

#### *15.5 Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### *15.6 Final Payment*

- A. *Application for Payment:*
  - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record

documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
  - a. all documentation called for in the Contract Documents;
  - b. consent of the surety, (signed by an agent, accompanied by a certified copy of such agent's authority to act for the surety), if any, to final payment;
  - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
  - d. a list of all disputes that Contractor believes are unsettled; and
  - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, 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, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

**B. *Engineer's Review of Application and Acceptance:***

1. 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 have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, within 20 days (25 days if Engineer is a consultant to the City Engineer providing construction management services), as required by Florida Statute 218.735, Engineer will return the Application for Payment 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 for Payment.

- C. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.
- D. *Payment Becomes Due:* Once it is approved, Twenty days (twenty-five days if Engineer is a consultant providing construction management services to the City Engineer), as required by Florida Statute 218.735, after the presentation to Engineer of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limited

to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

#### *15.7 Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

#### *15.8 Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed 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, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Engineer's written instructions:
  - 1. correct the defective repairs to the Site or such other adjacent areas;
  - 2. correct such defective Work;
  - 3. if the defective Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective, and
  - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Engineer's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay 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 arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- C. 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.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, 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.
- E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

## ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

### 16.1 *Owner or Engineer May Suspend Work*

- A. At any time and without cause, Owner or Engineer may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Order seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

### 16.2 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
  - 1. Contractor's persistent failure 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);
  - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
  - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
  - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
  - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
  - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, 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 complete the Work as Owner may deem expedient.
- D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
- E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds 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. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
- F. 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, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

#### *16.3 Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
  - 1. 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;
  - 2. 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; and
  - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

#### *16.4 Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 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 contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Order for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

### **ARTICLE 17 – FINAL RESOLUTION OF DISPUTES**

#### *17.1 Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this Article, which serves as the formal dispute resolution procedure prescribed in the construction contract pursuant to Section 218.735(4), Florida Statutes:
  - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
- B. *Final Resolution of Disputes:* Neither mediation nor arbitration will be acceptable as a means for settling claims, disputes, or other matters. Claims and disputes between the Owner and the Contractor which cannot be resolved to the satisfaction of both parties, shall be filed in the Circuit Court, Marion County, Florida.

## ARTICLE 18 – MISCELLANEOUS

### 18.1 *Giving Notice*

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
  1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
  2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

### 18.2 *Computation of Times*

- A. When any period of time is referred to in the Contract 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.

### 18.3 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto 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. 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.

### 18.4 *Limitation of Damages*

- A. With respect to any and all Change Orders, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall 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.

### 18.5 *No Waiver*

- A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

### 18.6 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

### 18.7 *Controlling Law*

- A. This Contract is to be governed by the law of the state of Florida.

18.8 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

## SECTION 01 10 00

### SUMMARY

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. The Work specified herein shall include construction of all streets, stormwater, traffic, water, sanitary sewer, and reclaimed water systems in the City of Ocala, City Limits or Service Area, as well as all modifications, rehabilitation of or connection to existing City of Ocala streets, stormwater, traffic, water, sanitary sewer, and reclaimed water systems.
- B. Section Includes:
  - 1. Contract description.
  - 2. Work by Owner or other Work at the Site.
  - 3. Owner-furnished products.
  - 4. Contractor's use of Site and premises.
  - 5. Future work.
  - 6. Work sequence.
  - 7. Owner occupancy.
  - 8. Permits.
  - 9. Specification conventions.

##### 1.2 CONTRACT DESCRIPTION

- A. Work of the Project includes construction, rehabilitation, and modifications to streets, stormwater, traffic control, traffic management, potable water, sanitary sewer, and reclaimed water systems.
- B. Perform Work of each Contract under provisions of the Contract with Owner according to Conditions of Contract.

##### 1.3 WORK BY OWNER OR OTHERS

- A. If work performed by the Owner or under Owner-awarded contracts interfere with each other due to work being performed at the same time or at the same Site, Owner will determine the sequence of work under all contracts according to "Work Sequence" and "Contractor's Use of Site and Premises" Articles in this Section.
- B. Coordinate Work with utilities of Owner and public or private agencies.
- C. Work under this Contract includes:
  - 1. Work as indicated on Drawings and defined herein.
- D. Items noted NIC (Not in Contract), will be furnished and installed by Owner.



#### 1.4 OWNER-FURNISHED PRODUCTS (IF APPLICABLE)

- A. Owner's Responsibilities:
  - 1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples to Contractor.
  - 2. Arrange and pay for delivery to Site.
  - 3. Upon delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
  - 1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
  - 2. Receive and unload products at Site; inspect for completeness or damage jointly with Owner.
  - 3. Handle, store, install, and finish products.
  - 4. Repair or replace items damaged after receipt.

#### 1.5 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of Site and premises to allow:
  - 1. Owner occupancy.
  - 2. Work by Owner.
  - 3. Work by Others as directed by the Owner.
  - 4. Use of Site and premises by the public as directed by the Owner.
- B. Construction Operations: Limited to areas indicated on Drawings or as described herein.
  - 1. Noisy and Disruptive Operations (such as Use of Jack Hammers and Other Noisy Equipment): Not allowed in close proximity to existing buildings during regular hours of operation. Coordinate and schedule such operations with Owner to minimize disruptions.
- C. Time Restrictions for Performing Work:
  - 1. Working Hours shall be in accordance with the General Conditions.
  - 2. Some Work including, but not limited to, abandonments existing piping systems, as well as connections, replacements, extensions thereto and thereof may necessitate work being done after or before normal work hours, said decision resting solely with the Engineer.
    - a. Normally such extended hours will be required only to maintain service to existing customers or to minimize inconvenience to those customers or members of the public.
    - b. This shall be considered incidental to the construction and no additional compensation shall be allowed therefore.
- D. Utility Outages and Shutdown:
  - 1. Coordinate and schedule electrical and other utility outages with Owner.
  - 2. Outages: Allowed only at previously agreed upon times.

3. At least one week before scheduled outage, submit Outage Request Plan to Owner itemizing the dates, times, and duration of each requested outage.

- E. Sound Level Restrictions: Sound pressure level measured at boundary of Site shall not exceed 40 dBA.

#### 1.6 WORK SEQUENCE

- A. Construct Work in order to accommodate Owner's occupancy requirements during construction period. Coordinate construction schedule and operations with Owner.
- B. Sequencing of Construction Plan: Before start of construction, if required by the Engineer, submit three (3) hard copies and one (1) electronic copy of construction plan regarding phasing of all Work for acceptance by Owner. After acceptance of plan, construction sequencing shall comply with accepted plan unless deviations are accepted by Owner in writing.

#### 1.7 OWNER OCCUPANCY

- A. Owner will occupy Site for conduct of normal operations.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

#### 1.8 PERMITS

- A. The Owner will obtain all permits required for work within State, County, and Railroad Rights-of-Way.
  1. The Contractor shall verify the existence of the approved permit prior to commencing any work.
- B. Work within State of Florida Rights-of-Way:
  1. All work related to State rights-of-way or property shall be in full compliance with all requirements of the permit and to the satisfaction of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  2. Work within the rights-of-way of public thoroughfares, which are not under the jurisdiction of the State of Florida Department of Transportation, shall conform to the requirements of the agency having jurisdiction.
  3. Installation shall include all the required work and necessary signs to provide the required traffic control, detours, and any other work to maintain traffic.
  4. The Contractor shall notify the local Florida Department of Transportation Maintenance Engineer at least 48 hours prior to commencing work within the State rights-of-way and shall pay for any additional tests the State may require.
  5. All work related to construction within the State rights-of-way shall be in full compliance with the terms of the permit and in accordance with the State of Florida Department of Transportation "Utility Accommodations Guide".

6. In the event of conflict between the requirements of Contract Documents and those of the State of Florida Department of Transportation, the more stringent requirements as determined by the Engineer, shall govern.
7. The costs of any and all items of work required by the State of Florida, payment for which is not specifically provided by bid items in the proposal, shall be included in the prices of bid items to which said items of work are related, incidental, or appurtenant. No additional compensation shall be allowed therefore.
8. The Contractor shall furnish copies of written approval or acceptance of the work by the Florida Department of Transportation to the Engineer along with the particular Periodic Estimate for Partial Payment on which payment for the State highway crossing item is requested. Final approval of the Project will not be issued until such approval has been furnished.

C. Work within Marion County Rights-of-Way:

1. All work in County rights-of-way or property shall be in full compliance with all requirements of the permit, current service area agreement and to the satisfaction of Marion County. Work within the rights-of-way of public thoroughfares which are not under the jurisdiction of Marion County shall conform to the requirements of the agency having jurisdiction. Installation shall include all the required work and necessary signs to provide the required traffic control, detours, and any other work to maintain traffic.
2. The Contractor shall notify the Marion County Public Works Department and County Engineer's Office at least 24 hours prior to commencing work within the County rights-of-way, and shall pay for any additional tests that the County may require.
3. All work related to the County highway crossings and within County highway rights-of-way shall be in full compliance with the terms of the permit and in accordance with the Marion County Public Works Manual.
4. In the event of conflict between the requirements of these Specifications and Details and those of Marion County, the more stringent requirements as determined by the Engineer, shall govern.
5. The costs of any and all items of work required by Marion County, payment for which is not specifically provided by bid items in the Proposal, shall be included in the prices of bid items to which said items of work are related, incidental, or appurtenant. No additional compensation shall be allowed therefore.
6. The Contractor shall furnish copies of written approval or acceptance of the work by Marion County to the Engineer along with the particular Periodic Estimate for Partial Payment on which payment for the work is requested. Final approval of the Project will not be issued until such approval has been furnished.

D. Work within Railroad Rights-of-Way:

1. All work within railroad rights-of-way shall be in full compliance with all requirements of the permit and to the satisfaction of the railroad. Installation shall include all the required work and necessary signs to provide the required traffic control, detours, and any other work to maintain traffic.

2. The Contractor shall notify the Railroad Company seven (7) days prior to commencing work on Railroad property, and shall pay all charges for supervision by the Railroad Company during installation of the line work across or within said property.
3. All work related to the railroad crossings and within railroad rights-of-way shall be in full compliance with the terms of the permit and in accordance with all requirements of the Railroad Company.
4. The costs of any and all items of work required by the railroad, payment for which is not specifically provided by bid items in the proposal, shall be included in the prices of bid items to which said items of work are related, incidental, or appurtenant. No additional compensation shall be allowed therefore.
5. In the event of conflict between the requirements of the railroad and these Contract Documents, the more stringent requirements as determined by the Engineer, shall govern.
6. The Contractor shall furnish copies of written approval or acceptance of the work by the Railroad to the Engineer along with the particular Periodic Estimate for Partial Payment on which payment for the Railroad related item is requested. Final approval of the Project will not be issued until such approval has been furnished.

#### 1.9 SPECIFICATION CONVENTIONS

- A. These Specifications are written in imperative mood and streamlined form. This imperative language is directed to Contractor unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

## SECTION 01 22 00

### MEASUREMENT AND PAYMENT

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. General:

1. This Section includes the requirements for water, sanitary sewer, reclaimed water, stormwater, and associated road and Right-of-Way improvements measurement and payment for pay items required to complete the Work and as shown and specified in the Contract Documents.
2. Items listed in this Section correspond with the pay items on the Bid Form.
3. All pay items identified in this Section may not be represented on the Bid Form. The Contractor shall coordinate the pay items on the Bid Form with the corresponding paragraphs located herein.
4. The omission of reference to any item shall not alter the intent of the Bid Form or relieve the Contractor of the necessity of constructing a complete project under this Contract.
5. Payment shall be made for the items listed on the Bid Form on the basis of the Work actually performed and completed in strict accordance with the Contract Documents, such Work including but not limited to, the furnishing of all necessary labor, materials, equipment, tools, testing, transportation, delivery, disposal of waste and surplus material, restoration, and all other incidentals and appurtenances to complete the construction and installation of the Work as shown and specified.
6. No additional payment shall be made for clean-up work. The cost thereof shall be included in the price for related items as set forth in the Proposal.
7. The Contractor shall not be allowed additional payment or compensation for removing and replacing, relocating or otherwise protecting or adjusting existing culverts or other existing storm drainage facilities shown on the plans which may be affected by the construction. The cost thereof shall be included in the cost of bid items to which they are required or appurtenant.
8. The Contractor shall be responsible for any debris and foreign matter which is allowed to enter any system as a result of construction and shall be solely responsible for any damage resulting therefrom.
9. Except those items outlined in the Schedule of Prices Bid, the Contractor shall not be allowed additional payment or compensation for removing and replacing, shoring or bracing, relocating, or otherwise protecting or adjusting any and all utilities which may be affected by the construction. Specifically, the Contractor shall adjust all valve boxes, valve covers, manhole frames, and manhole covers to required grades. All methods of adjusting utilities shall be subject to the approval of the Engineer. The cost

of items described herein shall be included in the cost of bid items to which they are incidental or appurtenant.

10. Unless provided by specific bid items in the Schedule of Prices Bid, the following shall be considered incidental or appurtenant and no measurement or payment will be made:
  - a. Erosion and sediment control.
  - b. Clearing and grubbing.
  - c. Excavation and backfill.
  - d. Dewatering.
  - e. Trench boxes.
  - f. Installation and/or removal of sheeting and shoring.
  - g. Seeding and sodding.
  - h. Connections to existing pipes and facilities.

## 1.2 RELATED SECTIONS

- A. General Conditions.
- B. Agreement.
- C. Section 01 30 00 - Administrative Requirements.

## 1.3 ESTIMATE OF QUANTITIES

- A. The quantities set forth in the Bid Form are approximate and are given to establish a uniform basis for the comparison of bids. The Owner reserves the right to increase or decrease the quantity of any item or portion of the Work during the progress of construction in accordance with the terms of the Contract. The Bid Form shall serve as a basis of developing additive or deductive Change Orders.

## 1.4 MEASUREMENT OF QUANTITIES

- A. Unless otherwise provided in the specifications for the particular items involved, all measurements shall be taken from "finished grades and elevations" for vertical measurements and from pipe end to pipe end horizontally for lineal measurements. The method or combination of methods or measurements shall be those which will reflect with reasonable accuracy the actual areas of the finished Work as determined by the Engineer.
- B. The term "finished grade" as used herein shall mean the final elevation of the accepted Work as approved by the Engineer and when located in Florida Department of Transportation (F.D.O.T.) rights-of-way shall be the elevation required and approved by F.D.O.T. to conform to its Work as proposed or later modified. It shall be the Contractor's responsibility to determine the finished grade at any point as required by the Engineer or F.D.O.T.

- C. For those pay items which were not included in the Schedule of Prices Bid, it shall be mutually understood that all items for payment shall be made from the master list of pay items set forth below. Items that are not specifically listed hereafter shall utilize the basic numbering system set forth.
- D. Pay Items that indicate multiple measurement methods shall be paid at the method included in the Schedule of Prices Bid.

## 1.5 GENERAL CONSTRUCTION

### G-01. Mobilization:

- 1. Method of Measurement:
  - a. Lump Sum: The Lump Sum (LS) price for Mobilization shall be full compensation for mobilization and demobilization activities required for all Work as shown and specified.
  - b. Per Project: The Per Project unit price for Mobilization shall be full compensation for all mobilization and demobilization activities required for completion of the Work as shown and specified for each project.
- 2. Payments shall include all costs for mobilizing, general conditions for project divided by months to complete field office, temporary facilities, and all incidentals and appurtenances required to complete the project. Bonds shall be paid per project.

### G-02. Bonds:

- 1. Method of Measurement:
  - a. Lump Sum: The Lump Sum (LS) price for Bonds shall be full compensation for acquisition of all bonds specified in the Contract Documents.
  - b. Per Project: The Per Project price for Bonds shall be full compensation for acquisition of all bonds specified in the Contract Documents for each project.
- 2. Payment for Bonds will be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for all costs associated with acquiring and maintaining all bonds specified in the Contract Documents.

### G-03. Project Sign:

- 1. Method of Measurement:
  - a. Each (EA): The quantity to be paid under this unit cost shall be for the for each Project Sign complete in place.
- 2. Payment for Project Sign will be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for all costs associated with furnishing and installing Project Sign as shown and specified in the Contract Documents.

G-04. Call Out:

1. Method of Measurement:
  - a. Hour (HR): The quantity to be paid shall be the actual number of night time and weekend hours worked. Call Out time shall be defined as Monday through Friday, 7:00 PM to 7:00 AM, and any time Saturday and Sunday.
2. Payment for Call Out will be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for all labor and equipment costs for one (1) four (4) person crew to perform Work during Call Out as shown and specified in the Contract Documents.

G-05. Maintenance of Traffic:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Maintenance of Traffic in accordance with the Contract Documents.
  - b. Day: The quantity to be paid shall be the actual number of days that Maintenance of Traffic is complete in place during actual Contractor on-site work days.
  - c. Each (EA): The quantity to be paid under this unit cost shall be for the duration of Work at each site that Maintenance of Traffic is complete in place during actual Contractor on-site work days.
  - d. Hour (HR): The quantity to be paid shall be the actual number of hours that Maintenance of Traffic is complete in place during actual Contractor on-site work days.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for traffic control, road closures, detours, and all incidentals and appurtenances required by the Engineer and F.D.O.T., and other items required to provide the required Maintenance of Traffic, except for any items designated to be paid for separately or to be specifically included in the costs of other Work under the Contract.

G-06. Silt Fence and Sediment Control:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Silt Fence and Sediment Control in accordance with the Contract Documents.
  - b. Foot (FT): The quantity to be paid shall be the actual number of feet of Silt Fence and Sediment Control furnished and installed.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all labor, materials, equipment, incidentals, and appurtenances required for silt fence



installation, protection of inlets and pipes, and other costs associated with runoff water protection and sediment control as shown and specified.

G-07. Tree Protection/Construction Fence:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Tree Protection/Construction Fence in accordance with the Contract Documents.
  - b. Foot (FT): The quantity to be paid shall be the actual number of feet of Tree Protection/Construction Fence furnished and installed in accordance with the Contract Documents.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all labor, materials, equipment, incidentals, and appurtenances required for tree protection and construction fencing as shown and specified.

G-08. Remove and Relocate Existing Mailboxes:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid under this unit cost shall be for each existing mail box removed and relocated.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all labor, materials, equipment, incidentals, and appurtenances required for removal and relocation of existing mail boxes as shown and specified.

G-09. Clearing and Grubbing - Light:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Clearing and Grubbing – Light in accordance with the Contract Documents.
  - b. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Clearing and Grubbing - Light performed.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for clearing and grubbing, disposal of materials, and all incidentals and appurtenances required to complete the clearing and grubbing as shown and specified.

G-10. Clearing and Grubbing - Heavy:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Clearing and Grubbing – Heavy in accordance with the Contract Documents.
  - b. Square Yard (SY): The quantity to be paid shall be the actual number of square yards within the drip line of trees over 6-inch diameter cleared and grubbed in accordance with the Contract Documents.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for clearing and grubbing of trees over 6-inch diameter, disposal of materials, and all incidentals and appurtenances required to complete the clearing and grubbing as shown and specified.

G-11. Excavation:

1. Method of Measurement:
  - a. Cubic Yard (CY): The quantity to be paid shall be the number of cubic yards of Excavation calculated from the dimensions shown on the Drawings.
  - b. Square Yard (SY): The quantity to be paid shall be the number of square yards of excavation, at the depth shown, calculated from the dimensions shown on the Drawings.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, on-site hauling, dewatering, and all incidentals and appurtenances required to complete the excavation as shown and specified. Payment will not be made for over-excavated Work. Consider all materials excavated as unclassified regardless of material encountered. When performing trench excavation in excess of 5-feet in depth, comply with OSHA requirements for trench safety standards, 29 CFR 1926, subpart b, and all subsequent revisions or updates adopted by the Department of Labor. Submission of bid and subsequent execution of 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.

G-12. Imported Backfill Material:

1. Method of Measurement:
  - a. Cubic Yard (CY): The quantity to be paid shall be the number of cubic yards of Imported Backfill Material calculated from the dimensions shown on the Drawings.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the

Contract Documents. Payment shall include, but is not limited to, all costs for backfill, grading, ditch work, compaction, hauling, dewatering, and all incidentals and appurtenances required to complete the earth work as shown and specified. Payment will not be made for replacement materials due to over-excavated Work.

G-13. Ditch Excavation:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Ditch Excavation performed in accordance with the Contract Documents.
  - b. Cubic Yard (CY): The quantity to be paid shall be the number of cubic yards of Ditch Excavation calculated from the dimensions shown on the Drawings.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, on-site hauling, dewatering, and all incidentals and appurtenances required to complete the ditch excavation as specified. Payment will not be made for over-excavated Work. Consider all materials excavated as unclassified regardless of material encountered. When performing trench excavation in excess of 5-feet in depth, comply with OSHA requirements for trench safety standards, 29 CFR 1926, subpart b, and all subsequent revisions or updates adopted by the Department of Labor. Submission of bid and subsequent execution of 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.

G-14. Construct Berm:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of berm constructed in accordance with the Contract Documents.
  - b. Cubic Yard (CY): The quantity to be paid shall be the number of cubic yards of berm constructed calculated from the dimensions shown on the Drawings.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for backfill, grading, compaction, ditch work, hauling, dewatering, and all incidentals and appurtenances required to complete the Work as shown and specified.

G-15. Grading:

1. Method of Measurement:
  - a. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Grading performed in accordance with the Contract Documents.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for grading, compaction, and all incidentals and appurtenances required to complete the Work as shown and specified.

G-16. Dewatering:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Dewatering in accordance with the Contract Documents.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for dewatering, proper disposal of water, and all incidentals and appurtenances required to complete the Work as shown and specified.

G-17. Remove and Replace Unsuitable Material:

1. Method of Measurement:
  - a. Cubic Yard (CY): The quantity to be paid shall be the number of cubic yards of unsuitable material removed and replaced calculated from field measurements of unsuitable material removed and replaced in excess of the limits of excavation shown on the Drawings.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, hauling, dewatering, fill, compaction, and all incidentals and appurtenances required to complete the Work as shown and specified. Payment will not be made for over-excavated Work nor for backfilling of over-excavated Work. When performing trench excavation in excess of 5-feet in depth, comply with OSHA requirements for trench safety standards, 29 CFR 1926, subpart b, and all subsequent revisions or updates adopted by the Department of Labor. Submission of bid and subsequent execution of 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.
3. The Owner's Representative shall make the final determination of the excavation to be classified as Unsuitable Material.

G-18. Stabilized Subgrade and Sub-Base:

1. Method of Measurement:
  - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Stabilized Subgrade and Sub-Base installed in accordance with the Contract Documents.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, installation, mixing, grading, compaction, and all incidentals and appurtenances required to stabilize the road subgrade as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-19. Lime Rock Base:

1. Method of Measurement:
  - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Lime Rock Base in place in accordance with the Contract Documents.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, installation, grading, compaction, prime, sand, and all incidentals and appurtenances required to complete the Lime Rock Base installation specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-20. No. 57 Stone:

1. Method of Measurement:
  - a Cubic Yard (CY): The quantity to be paid shall be the actual number of cubic yards of No. 57 Stone in place in accordance with the Contract Documents.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, installation, grading, compaction, and all incidentals and appurtenances required to complete installation of No. 57 Stone as shown and specified.

G-21. Removal of Existing Concrete Sidewalks and Driveways:

1. Method of Measurement:
  - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of existing concrete sidewalks and driveways removed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in

the Contract Documents. Payment shall include, but is not limited to, all costs for saw cutting, concrete removal, disposal, and all incidentals and appurtenances required to complete the Removal of Existing Concrete Sidewalks and Driveways as shown and specified.

G-22. Removal of Existing Concrete Curb and Gutter:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of existing concrete curb and gutter removed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for concrete curb and gutter removal, disposal, and all incidentals and appurtenances required to complete the Removal of Existing Concrete Curb and Gutter as shown and specified.

G-23. Concrete Fill:

1. Method of Measurement:
  - a. Cubic Yard (CY): The quantity to be paid shall be the number of cubic yards of Concrete Fill as calculated from the dimensions shown on the Drawings.
2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, grading, concrete fill, hauling, dewatering, testing, and all incidentals and appurtenances required to complete the Concrete Fill as shown and specified.

G-24. Asphalt Pavement Removal:

1. Method of Measurement:
  - a. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Asphalt Pavement Removal in place in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for asphalt removal and disposal, and all incidentals and appurtenances required to complete the asphalt pavement replacements as shown and specified.

G-25. Temporary Asphalt Milling:

1. Method of Measurement:
  - a Cubic Yard (CY): The quantity to be paid shall be the actual number of cubic yards of Temporary Asphalt Milling in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for furnishing, installing, and removing temporary asphalt milling, and all incidentals and appurtenances required to complete Temporary Asphalt Milling as shown and specified.

G-26. Asphalt Milling:

1. Method of Measurement:
  - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Asphalt Milling at the depths shown and specified in the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for asphalt milling, removal, hauling and stockpiling at location specified by the Owner, and all incidentals and appurtenances required to complete Asphalt Milling as shown and specified. All milled asphalt shall remain the property of the Owner.

G-27. Compacted Roadway Subbase:

1. Method of Measurement:
  - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Compacted Roadway Subbase in place as shown and specified in the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, grading, fill, compaction, and all incidentals and appurtenances required to complete Compacted Roadway Subbase as shown and specified.

G-28. Reclaimed Asphalt Pavement Base:

1. Method of Measurement:
  - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Reclaimed Asphalt Pavement Base at the depths shown and specified in the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all

costs for excavation, grading, furnishing, installing, and compacting reclaimed asphalt base, and all incidentals and appurtenances required to complete Reclaimed Asphalt Pavement Base as shown and specified.

G-29. Asphalt Pavement:

1. Method of Measurement:
  - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Asphalt Pavement in place in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for lime rock installation, grading, priming, asphalt installation, and all incidentals and appurtenances required to complete the Asphalt Pavement as shown and specified.

G-30. Asphalt Milling and Replacement:

1. Method of Measurement:
  - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of asphalt milled and replaced in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for milling, removal of asphalt from the Site, priming, asphalt installation, disposal, and all incidentals and appurtenances required to complete the asphalt pavement replacements as shown and specified.

G-31. Asphalt:

1. Method of Measurement:
  - a Ton: The quantity to be paid shall be the actual number of tons of Asphalt furnished and installed in accordance with the Contract Documents.
2. Payment for these bid items shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for asphalt installation, compaction, prime and tack coats, and all incidentals and appurtenances required to complete the asphalt installation as shown and specified.

G-32. Roadway Guardrail:

1. Method of Measurement:
  - a Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Roadway Guardrail furnished and installed in accordance with the Contract Documents.



2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for site preparation, erection of standard W-beam of their beam metal guiderail on timber or steel posts, anchorages, offset and anchor blocks, reflectors, and all incidentals and appurtenances required for complete installation of Roadway Guardrail in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-33. Object Markers:

1. Method of Measurement:
  - a Each (EA): The quantity to be paid shall be the actual number Object Markers furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, and all incidentals and appurtenances required to complete the installation of Object Markers as shown and specified.

G-34. Delineators:

1. Method of Measurement:
  - a Each (EA): The quantity to be paid shall be the actual number Delineators furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, and all incidentals and appurtenances required to complete the installation of Delineators as shown and specified.

G-35. Rumble Strips:

1. Method of Measurement:
  - a Per Set (PS): The quantity of Rumble Strips to be paid shall be the Plan quantity per set in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all equipment, labor, materials, and all incidentals and appurtenances required for complete installation of Rumble Strips in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-36. Grounding Electrode:

1. Method of Measurement:
  - a. Foot (FT): The quantity to be paid shall be the number of feet of Grounding Electrode furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all equipment, labor, materials, and all incidentals and appurtenances required for complete installation of Grounding Electrode in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-37. Signal Conduit:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Signal Conduit furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all excavation, bedding, backfill, dewatering, shoring and bracing, conduit, installation, restoration, and all incidentals and appurtenances required for complete installation of Signal Conduit in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-38. Span Wire Assembly:

1. Method of Measurement:
  - a. Per Intersection (PI): The quantity to be paid shall be for Span Wire Assembly furnished and installed for each intersection in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all labor, equipment, materials, and all incidentals and appurtenances required for complete installation of Span Wire Assembly in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-39. Pull and Junction Box, Furnish and Install:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number pull and junction boxes furnished and installed in accordance with the Contract Documents.

2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, excavation, backfill, compaction, dewatering, restoration, and all incidentals and appurtenances required to complete the installation of the pull and junction boxes in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-40. Pull and Junction Box, Install:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number pull and junction boxes installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, excavation, backfill, compaction, dewatering, restoration, and all incidentals and appurtenances required to complete the installation of the pull and junction boxes in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-41. Pull and Junction Box, Relocate:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number pull and junction boxes relocated in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, excavation, backfill, compaction, dewatering, removal of existing pull and junction box, reinstallation of existing pull and junction box, restoration, and all incidentals and appurtenances required to complete the installation of the pull and junction boxes in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-42. Stormwater Manholes:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number Stormwater Manholes furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, dewatering, shoring and bracing, installation of structures, compaction, backfill, and all incidentals and appurtenances

required to complete the installation of the structures as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-43. Remove and Replace Stormwater Manhole:

1. Method of Measurement:
  - a Each (EA): The quantity to be paid shall be the actual number stormwater manholes removed and replaced in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, dewatering, shoring and bracing, removal and disposal of existing manholes, installation of structures, compaction, backfill, and all incidentals and appurtenances required to complete the installation of the structures as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-44. Stormwater Manhole Cover Adjustments:

1. Method of Measurement:
  - a Each (EA): The quantity to be paid shall be the actual number of stormwater manhole covers adjusted in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for removal of stormwater manhole covers, reinstallation of manhole covers, adjusting rings, grout, restoration, and all incidentals and appurtenances required to complete the installation as shown and specified.

G-45. Stormwater Piping:

1. Method of Measurement:
  - a Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of stormwater piping furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, installation of pipe, backfill, dewatering, shoring and bracing, compaction, pipe connections to new or existing structures and all incidentals and appurtenances required to complete the installation of the drainage pipe as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-46. Clean Existing Storm Drain Pipes:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of existing stormwater piping cleaned in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, cleaning, removal and disposal of debris, and all incidentals and appurtenances required to complete the cleaning of the existing storm drain piping as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-47. Clean Existing Storm Drain Inlets:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of existing stormwater inlets cleaned in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, cleaning, removal and disposal of debris, and all incidentals and appurtenances required to complete the cleaning of the existing storm drain inlets as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-48. Concrete Mitered End:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Concrete Mitered Ends furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, formwork, rebar, concrete, grading, backfill, compaction, and all incidentals and appurtenances required to complete the installation of the concrete mitered ends as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-49. Concrete Flumes:

1. Method of Measurement:
  - a. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Concrete Flume furnished and installed in accordance with the Contract Documents.

2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, formwork, rebar, concrete, and all incidentals and appurtenances required to complete the concrete flume as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-50. Underdrain:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Underdrain furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, dewatering, installation of underdrain piping, gravel and/or fabric, backfill, compaction, and all incidentals and appurtenances required to complete the underdrain installation as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-51. Construction Survey:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for Construction Survey in accordance with the Contract Documents.
  - b. Hour (HR): The quantity to be paid shall be for the actual number of hours of Construction Survey performed.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for survey layout, markers, and all incidentals and appurtenances required to complete the survey requirements as shown and specified.

G-52. As-Built Drawings:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for As-Built Drawings in accordance with the Contract Documents.
  - b. Hour (HR): The quantity to be paid shall be for the actual number of hours of As-Built Drawing services performed.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, surveying, locating, backfill, compaction, data processing,

drawing preparation, and all incidentals and appurtenances required to complete the As-Built Drawings as specified.

G-53. Pipe Handrail:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Pipe Handrail furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for equipment, labor, materials, and all incidentals and appurtenances required to complete Pipe Handrail as shown and specified.

G-54. Bollards:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of bollards furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, pipe, concrete, installations, coatings/paint, backfill, compaction, and all incidentals and appurtenances required to complete bollards as shown and specified.

G-55. Concrete Curb, Gutter, Valley and Drop Curb

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Concrete Curb, Gutter, Valley and Drop Curb furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for grading, formwork, rebar, concrete, saw cuts, expansion joint material, curing compounds, excavation, backfill, compaction, and all incidentals and appurtenances required to complete the concrete curbs specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-56. Concrete Curb, Gutter, Valley and Drop Curb Removal and Replacement

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Concrete Curb, Gutter, Valley and Drop

Curb furnished and installed in accordance with the Contract Documents.

2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for removal, disposal, grading, formwork, rebar, concrete, saw cuts, expansion joint material, curing compounds, excavation, backfill, compaction, and all incidentals and appurtenances required to complete the concrete curbs as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-57. Concrete:

1. Method of Measurement:
  - a. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Concrete furnished and installed in accordance with the Contract Documents.
  - b. Cubic Yard (CY): The quantity to be paid shall be the actual number of cubic yards of Concrete furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, grading, formwork, rebar, concrete, saw cuts, expansion joint material, curing compounds, installations, backfill, compaction, and all incidentals and appurtenances required to complete the miscellaneous concrete installations as shown and specified.

G-58. Patterned/Textured Pavement, Vehicular Areas for Crosswalk:

1. Method of Measurement:
  - a. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Patterned/Textured Pavement, Vehicular Areas for Crosswalk furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for brick colored coating texturized to simulate a brick pattern, saw cuts, curing compounds, installations, and all incidentals and appurtenances required to complete Patterned/Textured Pavement, Vehicular Areas for Crosswalk as shown and specified.



G-59. Architectural Pavers:

1. Method of Measurement:
  - a. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Architectural Pavers furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for base preparation, pavers, and all incidentals and appurtenances required to complete installation of Architectural Pavers as shown and specified.

G-60. Concrete Curb Ramps with Detectable Warning Surface:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Concrete Curb Ramps with Detectable Warning Surface furnished and installed in accordance with the Contract Documents and City Standard Detail T-17.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, grading, formwork, rebar, concrete, detectable warning surface, saw cuts, expansion joint material, curing compounds, installations, backfill, compaction, and all incidentals and appurtenances required to complete Concrete Curb Ramps with Detectable Warning Surface as shown and specified.

G-61. Detectable Warning on Existing Walking Surface, Retrofit:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be for each Detectable Warning on Existing Walking Surface retrofitted, furnished, and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for equipment, labor, materials, and all incidentals and appurtenances required to complete installation of Detectable Warning on Existing Walking Surface, Retrofit as shown and specified.

G-62. Roof Drain Assembly:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Roof Drain Assemblies furnished and installed in accordance with the Contract Documents.

2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for pipes, trench drains, connections to existing piping, and all incidentals and appurtenances required to complete Roof Drain Assemblies within sidewalks as shown and specified.

G-63. Ditch Blocks:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Ditch Blocks furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, formwork, rebar, concrete, installations, backfill, compaction, and all incidentals and appurtenances required to complete the ditch blocks installations as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-64. Ditch Blocks Removal and Replacement:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of ditch blocks removed and replaced in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, removal, disposal, formwork, rebar, concrete, installations, backfill, compaction, and all incidentals and appurtenances required to complete the ditch blocks installations as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-65. Rip Rap

1. Method of Measurement:
  - a. Cubic Yard (CY): The quantity to be paid shall be the actual number of cubic yards of Rip Rap furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for rip rap, excavation, installation, backfill, compaction, and all incidentals and appurtenances required to complete the installations as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-66. Concrete Rubble (2-FT Thick):

1. Method of Measurement:
  - a. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Concrete Rubble (2-FT Thick) furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for concrete rubble, excavation, installation, backfill, compaction, and all incidentals and appurtenances required to complete the installations as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-67. Remove and Replace End Walls:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for removal and replacement of end walls in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for removal, disposal, excavation, installation, backfill, compaction, reinforcing steel, formwork, and all incidentals and appurtenances required to complete the installations as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-68. Remove and Reinstall Culvert Pipe:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for removal and reinstallation of culvert pipe in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for removal, excavation, reinstallation of existing culvert pipe, backfill, compaction, and all incidentals and appurtenances required to complete the installations as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-69. Remove and Replace Culvert Pipe:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for removal and replacement of culvert pipe in accordance with the Contract Documents.

2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for removal, excavation, installation of new culvert pipe, backfill, compaction, and all incidentals and appurtenances required to complete the installations as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-70. Abandonment of Stormwater Force Main:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for Abandonment of Stormwater Force Main in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, removal, capping, grouting of old pipe, backfill, compaction, and all incidentals and appurtenances required to complete the abandonments as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-71. Remove and Abandon Stormwater Pump Station:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for removal and abandonment of stormwater pump stations in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, removal, capping, backfill, compaction, and all incidentals and appurtenances required to complete the abandonments as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-72. Farm Fencing:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Farm Fencing furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for barb wire, posts, grading, concrete, and all incidentals and appurtenances required to complete the installations as shown and specified.

G-73. Farm Fencing Gates:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Farm Fencing Gates furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for barb wire, gates, posts, grading, concrete, and all incidentals and appurtenances required to complete the installations as shown and specified.

G-74. Farm Fencing Removal and Replacement:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of farm fencing removed and replaced in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for barb wire, gates, posts, grading, concrete, and all incidentals and appurtenances required to complete the installations as shown and specified.

G-75. Chain Link Fencing:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Chain Link Fencing furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for fencing, posts, grading, concrete, and all incidentals and appurtenances required to complete the installations as shown and specified.

G-76. Chain Link Fence Gates:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Chain Link Fence Gates furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for gates, posts, grading, concrete, and all incidentals and appurtenances required to complete installations as shown and specified.

G-77. Chain Link Fencing Removal and Replacement:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of chain link fencing removed and replaced in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for fencing, gates, posts, grading, concrete, and all incidentals and appurtenances required to complete the installations as shown and specified.

G-78. Seed and Mulch:

1. Method of Measurement:
  - a. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Seed and Mulch furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for grading, installations, seeding, mulching, watering for a minimum of sixty (60) days, fertilizer, and all incidentals and appurtenances required to complete the seed and mulch as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-79. Sod:

1. Method of Measurement:
  - a. Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Sod furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for grading, installations, sod, watering for a minimum of sixty (60) days, fertilizer, and all incidentals and appurtenances required to complete the Work as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-80. TMS Vehicle Sensor, Class II, Type 1 (6-FT):

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of TMS Vehicle Sensors, Class II, Type 1 (6-FT) furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the

Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, incidentals, and appurtenances required for complete TMS Vehicle Sensor, Class II, Type 1 (6-FT) installation as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-81. TMS Vehicle Speed/Class Unit, 9 Electronics Unit with Equipment Cable:

1. Method of Measurement:
  - a. Per Assembly (AS): The quantity to be paid shall be the actual number of TMS Vehicle Speed/Class Unit, 9 Electronics Unit with Equipment Cable assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, incidentals, and appurtenances required for complete TMS Vehicle Speed/Class Unit, 9 Electronics Unit with Equipment Cable installation as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-82. TMS Solar Power Unit, New Pole:

1. Method of Measurement:
  - a. Per Assembly (AS): The quantity to be paid shall be the actual number of TMS Solar Power Unit, New Pole assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, incidentals, and appurtenances required for complete TMS Solar Power Unit, New Pole installation as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-83. TMS Inductive Loop Assembly:

1. Method of Measurement:
  - a. Per Assembly (AS): The quantity to be paid shall be the actual number of TMS Inductive Loop Assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, incidentals, and appurtenances required for complete TMS Inductive Loop Assembly installation as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-84. TMS Cabinet, Pole Mount:

1. Method of Measurement:
  - a. Per Assembly (AS): The quantity to be paid shall be the actual number of pole mounted TMS cabinet assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, incidentals, and appurtenances required for complete TMS Cabinet, Pole Mount installation as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-85. ITS Wireless Communication Device, Master Radio:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Master Radio ITS Wireless Communication Device assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, incidentals, and appurtenances required for complete Master Radio ITS Wireless Communication Device installation as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-86. ITS Wireless Communication Device, Ethernet Subscriber:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Ethernet Subscriber ITS Wireless Communication Device assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, incidentals, and appurtenances required for complete Ethernet Subscriber ITS Wireless Communication Device installation as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-87. Traffic Loops:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Traffic Loops furnished and installed in accordance with the Contract Documents.



2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for removal, repair, replacement, traffic loop installation, loop home runs, and all incidentals and appurtenances required to complete the traffic control signs, loops and arrow board installations as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-88. Traffic Control Sign Assembly:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of traffic control sign assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for traffic control sign, post, installation and all incidentals and appurtenances required to complete the installation as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-89. Traffic Control Sign Assembly Removal and Relocation:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of traffic control sign assemblies removed and relocated in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for sign and post removal, relocation, reinstallation of existing post and sign, and all incidentals and appurtenances required to complete the installation as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-90. Reflective Pavement Markers:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reflective Pavement Marker furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for reflective pavement marker, installation, and all incidentals and appurtenances required to complete the installation as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-91. Standard Wheel Stops:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Standard Wheel Stops furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for wheel stop, installation, and all incidentals and appurtenances required to complete the requirements as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-92. Temporary Striping:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of gross linear feet of Temporary Striping furnished and installed in accordance with the Contract Documents.
  - b. Square Foot (SF): The quantity to be paid shall be the actual number of square feet of Temporary Striping furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for layout, application of striping, removal of temporary striping, and all incidentals and appurtenances required to complete temporary striping as shown and specified.

G-93. Thermoplastic Striping:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of gross linear feet of Thermoplastic Striping furnished and installed in accordance with the Contract Documents.
  - b. Square Foot (SF): The quantity to be paid shall be the actual number of square feet of Thermoplastic Striping furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for layout and application of striping and all incidentals and appurtenances required to complete the thermoplastic striping as shown and specified.

G-94. Thermoplastic Pavement Markings:

1. Method of Measurement:

- a. Each (EA): The quantity to be paid shall be the actual number of Thermoplastic Pavement Markings furnished and installed in accordance with the Contract Documents.
- 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for layout and application of thermoplastic pavement markings and all incidentals and appurtenances required to complete Thermoplastic Pavement Markings as shown and specified.

G-95. Painted Pavement Markings:

- 1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Painted Pavement Markings furnished and installed in accordance with the Contract Documents.
  - b. Square Foot (SF): The quantity to be paid shall be the actual number of square feet of Painted Pavement Markings furnished and installed in accordance with the Contract Documents.
- 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for layout and application of pavement markings, and all incidentals and appurtenances required to complete Painted Pavement Markings as shown and specified.

G-96. Arrow Boards:

- 1. Method of Measurement:
  - a. Day: The quantity to be paid shall be the actual number of days that Arrow Board is in place in accordance with the Contract Documents.
- 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs per 24-hour period for arrow board as shown and specified.

G-97. Miscellaneous Utility Locates:

- 1. Method of Measurement:
  - a. Hour (HR): The quantity to be paid shall be the actual number of hours of Miscellaneous Utility Locate services provided in accordance with the Contract Documents.
- 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for Miscellaneous Utility Locates as shown and specified.

## 1.6 WATER SYSTEM CONSTRUCTION

### W-01. Water Main:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Water Main furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction of backfill, over excavation for pipe bedding, trench shoring, support of existing utilities, pipe, pipe installation, locate wires, wire splice clamps, zip ties, tape, identification tape, equipment installation, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

### W-02. Backflow Preventer:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Backflow Preventers furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, pipe installation, locate wires, wire splice clamps, zip ties, id tape, soil compaction of backfill, over excavation for pipe bedding, trench shoring, support existing utilities, equipment installation, pipe insulation, bollards, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

### W-03. Water Fittings:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Water Fittings furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, shoring and bracing, fittings, fitting installation, joint restraint, support of existing utilities, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-04. Pipe Joint Restraint:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Pipe Joint Restraints furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, dewatering, pipe restraint, installation, backfill, compaction, and all incidentals and appurtenances required to complete the pipe joint restraints as shown and specified.

W-05. Water Valves:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Water Valves furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, compaction, dewatering, shoring and bracing, valve, joint restraints, support, valve box, installation, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-06. Flowmeters:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Flow Meters furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, material, flowmeter, installation, supports, disinfection, testing, electrical, commissioning, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-07. Air Release Valve Assemblies:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Air Release Valve Assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the

Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, material, air release valve, concrete vault with cover and hatch, installation, supports, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-08. Line Stops:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Line Stops furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, valve, piping, line stop, installation, accessories, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-09. Fire Hydrants:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Fire Hydrants furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, hydrant, installation, joint restraint, painting, reflective pavement marker, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-10. Remove and Replace Existing Fire Hydrants:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of fire hydrants removed and replaced in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, existing hydrant removal, hydrant, installation, joint restraint, painting, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-11. Remove and Relocate Existing Fire Hydrants:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of fire hydrants removed and relocated in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, hydrant removal, hydrant reinstallation, joint restraint, painting, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-12. Fire Hydrant Extensions:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Fire Hydrant Extensions furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, hydrant removal, fire hydrant extension, installation, hydrant reinstallation, joint restraint, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-13. Pipe Supports:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Pipe Supports furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for furnishing and installing pipe supports and all incidentals and appurtenances required to complete the installation as shown and specified.

W-14. Water Services:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Water Services furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs

- for excavation, bedding, backfilling, dewatering, compaction, pipe, fittings, valves, piping and casing installation, and all incidentals and appurtenances required to complete the installation as shown and specified.
3. All long services under pavement require casings. The preferred method of install is missile or bore. Open cut installation across pavement shall only be allowed if approved by the Engineer.

W-15. Remove and Replace Existing Water Services:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of water services removed and replaced in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, removal of existing water service, pipe, fittings, valves, piping and casing installation, and all incidentals and appurtenances required to complete the installation as shown and specified.
3. All long services under pavement require casings. The preferred method of install is missile or bore. Open cut installation across pavement shall only be allowed if approved by the Engineer.

W-16. Water Taps on Existing Water Mains:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of water taps performed on existing water mains in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, thrust blocks (for size on size taps only), tapping sleeve, tapping valve, tap installation, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-17. Boring and Jacking:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the number of linear feet of pipe furnished and installed by jack and bore as measured from beginning station(s) to ending station(s) on the Drawings.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs



for excavation, backfilling, dewatering, shoring and bracing, pipe, casing installation, carrier pipe installation, casing spacers, casing pipe end seals, and all incidentals and appurtenances required to complete the bore and jack installation as shown and specified.

W-18. Directional Bore:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the number of linear feet of pipe furnished and installed by directional bore as measured from beginning station(s) to ending station(s) on the Drawings.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, locating existing utilities, backfilling, dewatering, shoring and bracing, directional bore, proper disposal of drill fluids, butt welding of joints and mechanical joint fittings, pipe installation, tracer wire, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-19. Blow-Off Assemblies:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Blow-Off Assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, compaction, shoring and bracing, blow-off assembly materials and installation, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-20. Adjustments:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of adjustments made to existing water valve boxes, existing water meter boxes, or existing fire hydrants in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all material costs, excavation, backfill, dewatering, compaction, shoring and bracing, installation of all adjustments to achieve final grade, and all incidentals and appurtenances required to complete the installation as shown and specified.

W-21. Temporary Jumper Connections:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Temporary Jumper Connections furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, backflow prevention equipment, piping, valves, installation, and all incidentals and appurtenances required to complete temporary assembly installation as shown and specified.

W-22. Abandonments:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for Abandonments in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, cutting of pipe, removal of pipe, valves, and fittings, removal of valve boxes, caps, plugs, grouting in place as required, and all incidentals and appurtenances required to complete the installation as shown and specified.

## 1.7 SANITARY SEWER SYSTEM

### S-01. Gravity Sewer:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Gravity Sewer furnished and installed in accordance with the Contract Documents. Measurement of the pipe depth shall be the distance from the pipe crown to finished grade as measured on the Drawings.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, shoring and bracing, compaction, pipe, installation, cleaning, mandrel testing, CCTV inspection, low pressure testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

### S-02. Gravity Sewer Manholes:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Gravity Sewer Manholes furnished and installed in accordance with the Contract Documents. Measurement of the manhole depth shall be the distance from the manhole invert to the bottom of the precast adjusting ring.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, compaction, shoring and bracing, manhole, gravel, structure installation, pipe connections, lining, coating, leak testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

### S-03. Remove and Replace Existing Manhole Covers:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of existing manhole covers removed and replaced in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for removal of existing manhole covers, manhole covers, installation, adjusting rings, grout, restoration, and all incidentals and appurtenances required to complete the installation as shown and specified.

S-04. Remove and Replace Manhole Rings and Covers with Hinged Manhole Rings and Covers:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of manhole rings and covers removed and replaced with hinged manhole rings and covers in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for removal of existing manhole rings and covers, hinged manhole rings and covers, installation, adjusting rings, grout, restoration, and all incidentals and appurtenances required to complete the installation as shown and specified.

S-05. Raise Existing Manhole Cover to Grade:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of existing manhole covers raised to grade in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for removal of manhole covers, reinstallation of manhole covers, adjusting rings, grout, restoration, and all incidentals and appurtenances required to complete the installation as shown and specified.

S-06. Sanitary Sewer Manhole Drop Connections:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Sanitary Sewer Manhole Drop Connections furnished and installed in accordance with the Contract Documents. Measurement of the sewer service drop connection depth shall be the distance from the manhole invert to the gravity sewer invert.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, compaction, shoring and bracing, pipe, fittings, manhole penetrations, pipe connections to manhole, concrete, repair of existing lining and coating, installation, leak testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

S-07. Resurface Existing Sanitary Sewer Structures:

1. Method of Measurement:
  - a. Vertical Foot (VFT): The quantity to be paid shall be the actual number of feet, measured vertically, of interior surfaces of sanitary sewer structures resurfaced in accordance with the Contract Documents.
  - b. Square Foot (SF): The quantity to be paid shall be the actual number of square feet of interior surfaces of sanitary sewer structures resurfaced in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for cleaning, removal of debris, removal of old coatings to solid clean surface, application of new coatings, testing, and all incidentals and appurtenances required to complete the resurfacing of existing sanitary sewer structures as shown and specified.

S-08. Line Existing Sanitary Sewer Piping:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of existing sanitary sewer piping lined in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for cleaning, excavation, removal of debris, removal of old coatings, application of new lining, reinstatement of existing connections, cleaning, testing, and all incidentals and appurtenances required to complete the lining of existing sanitary sewer piping as shown and specified.

S-09. Two-Way Cleanouts:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Two-Way Cleanouts furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, pipe, fittings, installation, testing, cleaning, and all incidentals and appurtenances required to complete the service installation as shown and specified.

S-10. PVC Wye and Bend:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of PVC Wye and Bend assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, fittings, installation, testing, cleaning, and all incidentals and appurtenances required to complete the service installation as shown and specified.

S-11. Sanitary Sewer Services:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Sanitary Sewer Services furnished and installed in accordance with the Contract Documents.
  - b. Each (EA): The quantity to be paid shall be the actual number of Sanitary Sewer Services furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, pipe, fittings, cleanouts, installation, cleaning, and all incidentals and appurtenances required to complete the service installation as shown and specified.

S-12. Television Inspection:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of television inspected pipe in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for television inspection of pipe, inspection report preparation, transfer of inspection video to the Owner, and all incidentals and appurtenances required to complete television inspection as shown and specified.

S-13. Pig and Clean Sewer Force Mains:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of force mains pigged and cleaned in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for temporary pipe connections, valves, backflow preventers, pigs, equipment, pigging, disposal of water and material removed during pigging and cleaning, and all incidentals and appurtenances required to pig and clean sewer force mains as shown and specified.

S-14. Sewer Main Cleaning:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of sewer main cleaned in accordance with the Contract Documents.
2. Payment for these bid items shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include all costs for cleaning pipe, flushing pipe, vacuuming pipe clean, disposal of sewer and material removed from pipe, and all incidentals and appurtenances required to perform sewer main cleaning as shown and specified.

S-15. Sewer Point Repairs:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for Sewer Point Repairs in accordance with the Contract Documents. Sewer Point Repairs shall include up to fourteen (14) linear feet of pipe under the lump sum price.
  - b. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of sewer main repaired in excess of fourteen (14) linear feet in accordance with the Contract Documents.
2. Payment for these bid items shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include all costs for excavation, bedding, backfilling, dewatering, shoring and bracing, compaction, couplings, pipe, repair sleeves, installation, and all incidentals and appurtenances required to perform sewer point repairs as shown and specified.

S-16. Bypass Pumping:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for Bypass Pumping in accordance with the Contract Documents.
  - b. Day: The quantity to be paid shall be the actual number of days of Bypass Pumping in accordance with the Contract Documents.
2. Payment for these bid items shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include all costs for temporary piping, valves, fittings, plugs, pumps, pump operation, fuel or electricity, and all incidentals and appurtenances required to perform bypasspumping as shown and specified.

S-17. Boring and Jacking:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of pipe furnished and installed by boring and jacking in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, shoring and bracing, pipe, casing installation, carrier pipe installation, casing spacers, casing pipe end seals, and all incidentals and appurtenances required to complete the bore and jack installation as shown and specified.

S-18. Directional Bore:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of pipe furnished and installed by directional drill in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, locating existing utilities, backfilling, dewatering, shoring and bracing, directional bore, proper disposal of drill fluids, butt welding of joints and mechanical joint fittings, pipe installation, tracer wire, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.



S-19. Abandonments:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for Abandonments in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, shoring and bracing, compaction, cutting of pipe, removal of pipe, caps, plugs, grouting in place as required, cleaning, coating, restoration, and all incidentals and appurtenances required to complete the abandonments as shown and specified.

S-20. Sanitary Sewer Lift Stations:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for Sanitary Sewer Lift Stations in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, grading, dewatering, shoring and bracing, compaction, wet well, access hatches, pump rail system, pumps, piping, valves, fittings, pipe connections, electrical, instrumentation, controls, SCADA, installation, testing, programming, commissioning, restoration, testing, and all incidentals and appurtenances required to complete Sanitary Sewer Lift Station installation as shown and specified.

S-21. HDPE Riser Pipe Replacement at Lift Station:

3. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of HDPE riser pipes replaced in accordance with the Contract Documents.
4. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for bypass pumping, wet well dewatering and disposal, piping, flange hardware and gaskets, removal of existing riser pipes, installation of HDPE riser pipes, installation of vertical pipe supports as required, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

S-22. Sewer Force Main:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Sewer Force Main furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction of backfill, over excavation for pipe bedding, trench shoring, support of existing utilities, pipe, joint restraint, pipe installation, locate wires, wire splice clamps, zip ties, identification tape, equipment installation, cleaning, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

S-23. Force Main Fittings:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Force Main Fittings furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, shoring and bracing, fitting, fitting installation, joint restraint, support of existing utilities, testing, and all incidentals and appurtenances required to complete the installation of force main fittings as shown and specified.

S-24. Pipe Supports:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Pipe Supports furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for furnishing and installing pipe supports and all incidentals and appurtenances required to complete the installation as shown and specified.

S-25. Sewer Force Main Valves:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Sewer Force Main Valves furnished and installed in accordance with the Contract Documents.

2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, compaction, dewatering, shoring and bracing, valve, joint restraints, support, valve box, installation, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

S-26. Sewer Flowmeters:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Sewer Flow Meters furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, material, flowmeter, supports, installation, electrical, commissioning, and all incidentals and appurtenances required to complete the sewer flowmeter installation as shown and specified.

S-27. Sewer Air Release Valve Assemblies:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Sewer Air Release Valve Assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, material, air release valve, concrete valve vault with cover and hatch, supports, installation, and all incidentals and appurtenances required to complete the sewer air release valve assembly installation as shown and specified.

S-28. Sewage Tanker Pumping:

1. Method of Measurement:
  - a. Hour (HR): The quantity to be paid shall be the actual number of hours of Sewage Tanker Pumping provided in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for labor, equipment, materials, sewage pumping, sewage disposal, and all

incidentals and appurtenances required to complete the Sewage Tanker Pumping as shown and specified.

S-29. Manhole Coring:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Manhole Coring provided in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payments shall include, but is not limited to, all costs for labor, equipment, materials, repair of existing lining and coating, grout, restoration, testing, cleaning, and all incidentals and appurtenances required to complete the Manhole Coring as shown and specified.

S-30. Line Existing Sanitary Sewer Manhole:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of sanitary sewer manholes lined in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for cleaning, excavation, removal of debris, removal of old coatings, application of new lining, reinstatement of existing connections, cleaning, testing, and all incidentals and appurtenances required to complete the lining of existing sanitary sewer manholes as shown and specified.

## 1.8 RECLAIMED WATER SYSTEM CONSTRUCTION

### R-01. Reclaimed Water Main:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of Reclaimed Water Main furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction of backfill, over excavation for pipe bedding, trench shoring, support of existing utilities, pipe, joint restraint, pipe installation, locate wires, wire splice clamps, zip ties, identification tape, cleaning, testing, equipment installation and all incidentals and appurtenances required to complete the installation as shown and specified.

### R-02. Reclaimed Water Backflow Preventer:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Backflow Preventers furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, pipe and materials, locate wires, wire splice clamps, zip ties, id tape, soil compaction of backfill, over excavation for pipe bedding, trench shoring, support existing utilities, installation, pipe insulation, bollards, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

### R-03. Reclaimed Water Fittings:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Fittings furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, shoring and bracing, fittings, fitting installation, joint restraint, support of existing utilities, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-04. Reclaimed Water Pipe Joint Restraint:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Pipe Joint Restraints furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfill, shoring and bracing, dewatering, materials, installation, backfill, compaction, and all incidentals and appurtenances required to complete the pipe joint restraints as shown and specified.

R-05. Reclaimed Water Valves:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Valves furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, compaction, dewatering, shoring and bracing, valve, joint restraints, support, valve box, installation, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-06. Reclaimed Water Flowmeters:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Flow Meters furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, materials, flowmeter, supports, installation, electrical, commissioning, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-07. Reclaimed Water Air Release Valve Assemblies:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Air Release Valve Assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the

Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, material, air release valve, concrete vault with cover and hatch, supports, installation, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-08. Reclaimed Water Line Stops:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Line Stops furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, valves, fittings, piping, line stop, accessories, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-09. Reclaimed Water Fire Hydrants:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Fire Hydrants furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, hydrant, installation, joint restraint, painting, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-10. Remove and Replace Existing Reclaimed Water Fire Hydrants:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of fire hydrants removed and replaced in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, existing hydrant removal, hydrant, installation, joint restraint, painting, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-11. Remove and Relocate Existing Reclaimed Water Fire Hydrants:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of fire hydrants removed and relocated in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, hydrant removal, hydrant reinstallation, joint restraint, painting, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-12. Reclaimed Water Fire Hydrant Extensions:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Fire Hydrant Extensions furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, hydrant removal, fire hydrant extension, hydrant reinstallation, joint restraint, disinfection, testing, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-13. Pipe Supports:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Pipe Supports furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for furnishing and installing pipe supports and all incidentals and appurtenances required to complete the installation as shown and specified.

R-14. Reclaimed Water Services:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Water Services furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs



- for excavation, bedding, backfilling, dewatering, compaction, pipe, fittings, valves, piping and casing installation, and all incidentals and appurtenances required to complete the installation as shown and specified.
3. All long services under pavement require casings. The preferred method of install is missile or bore. Open cut installation across pavement shall only be allowed if approved by the Engineer.

R-15. Remove and Replace Existing Reclaimed Water Meter and Meter Box:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of reclaimed water meter and meter boxes removed and replaced in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, removal of existing water service meter and meter box, new raw water service meter and meter box, installation, piping connections, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-16. Water Taps on Existing Reclaimed Water Mains:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of reclaimed water main taps performed on existing water mains in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, bedding, backfilling, dewatering, compaction, shoring and bracing, thrust blocks (for size on size taps only), tapping sleeve, tapping valve, tap installation, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-17. Boring and Jacking:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the number of linear feet of pipe furnished and installed by jack and bore as measured from beginning station(s) to ending station(s) on the Drawings.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, shoring and bracing, pipe, casing installation, carrier pipe installation, casing spacers, casing pipe end seals,

and all incidentals and appurtenances required to complete the bore and jack installation as shown and specified.

R-18. Directional Bore:

1. Method of Measurement:
  - a. Linear Foot (LF): The quantity to be paid shall be the number of linear feet of pipe furnished and installed by directional bore as measured from beginning station(s) to ending station(s) on the Drawings.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, locating existing utilities, backfilling, dewatering, shoring and bracing, directional bore, proper disposal of drill fluids, butt welding of joints and mechanical joint fittings, pipe installation, tracer wire, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-19. Reclaimed Water Blow-Off Assemblies:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Reclaimed Water Blow-Off Assemblies furnished and installed in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, compaction, shoring and bracing, materials, blow-off assembly installation, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-20. Adjustments:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of adjustments made to existing reclaimed water valve boxes, existing reclaimed water meter boxes, or existing reclaimed water fire hydrants in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all material costs, excavation, backfill, dewatering, compaction, shoring and bracing, installation of all adjustments to achieve final grade, and all incidentals and appurtenances required to complete the installation as shown and specified.

R-21. Temporary Jumper Connections:

1. Method of Measurement:
  - a. Each (EA): The quantity to be paid shall be the actual number of Temporary Jumper Connections furnished and installed in accordance with the Contract Documents.
2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, backflow prevention equipment, piping, valves, and all incidentals and appurtenances required to complete temporary assembly installation as shown and specified.

R-22. Abandonments:

1. Method of Measurement:
  - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for Abandonments in accordance with the Contract Documents.
2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, backfilling, dewatering, cutting of pipe, removal of pipe, valves, and fittings, removal of valve boxes, caps, plugs, and all incidentals and appurtenances required to complete the installation as shown and specified.

END OF SECTION

SECTION 01 25 00  
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance.
- B. Product options.
- C. Product substitution procedures.

1.2 QUALITY ASSURANCE

- A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.
- B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.
- C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Engineer.

1.3 PRODUCT OPTIONS

- A. See Section 01 60 00 - Product Requirements.

1.4 PRODUCT SUBSTITUTION PROCEDURES

- A. Engineer will consider requests for substitutions only within 30 days after date established in Notice to Proceed.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
  - 1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.

2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
  3. Reference to Article and Paragraph numbers in Specification Section.
  4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
  5. Changes required in other Work.
  6. Availability of maintenance service and source of replacement parts as applicable.
  7. Certified test data to show compliance with performance characteristics specified.
  8. Samples when applicable or requested.
  9. Other information as necessary to assist Architect/Engineer's evaluation.
- D. A request constitutes a representation that Contractor:
1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
  2. Will provide same warranty for substitution as for specified product.
  3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
  4. Waives claims for additional costs or time extension that may subsequently become apparent.
  5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
  6. Will reimburse Owner and Engineer for review or redesign services associated with reapproval by authorities having jurisdiction.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.
- F. Substitution Submittal Procedure:
1. Submit requests for substitutions to the Engineer in writing.
  2. Submit three copies of Request for Substitution for consideration. Limit each request to one proposed substitution.
  3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
  4. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

## SECTION 01 30 00

### ADMINISTRATIVE REQUIREMENTS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Coordination and Project conditions.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Preinstallation meetings.
- E. Closeout meeting.

##### 1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with existing utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment in service.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
  - 1. Coordination Drawings: Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.
- D. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.
- E. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

- F. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.
- G. After Owner's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

### 1.3 PRECONSTRUCTION MEETING

- A. Owner will schedule and preside over meeting after Notice of Award.
- B. Attendance Required: Per General Conditions.
- C. Minimum Agenda:
  - 1. Distribution of Contract Documents.
  - 2. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule.
  - 3. Designation of personnel representing parties in Contract.
  - 4. Communication procedures.
  - 5. Procedures and processing of requests for interpretations, field decisions, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
  - 6. Scheduling.
  - 7. Critical Work sequencing.
  - 8. Status of required permits.

### 1.4 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Engineer, and Owner, as appropriate to agenda topics for each meeting.
- D. Minimum Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems impeding planned progress.
  - 5. Review of submittal schedule and status of submittals.
  - 6. Review of off-Site fabrication and delivery schedules.

7. Maintenance of Progress Schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on Progress Schedule and coordination.
13. Other business relating to Work.

- E. Contractor: Record minutes and distribute copies to participants and those affected by decisions made within two (2) days after meeting.

#### 1.5 PREINSTALLATION MEETINGS

- A. When required in individual Specification Sections, convene preinstallation meetings at Project Site before starting Work of specific Section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific Section.
- C. Notify Engineer five (5) days in advance of meeting date.
- D. Prepare agenda and preside over meeting:
  1. Review conditions of installation, preparation, and installation procedures.
  2. Review coordination with related Work.
- E. Record minutes and distribute copies to participants and those affected by decisions made within two (2) days after meeting.

#### 1.6 CLOSEOUT MEETING

- A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.
- B. Attendance Required: Contractor, major Subcontractors, Engineer, Owner, and others appropriate to agenda.
- C. Notify Engineer five (5) days in advance of meeting date.
- D. Minimum Agenda:
  1. Start-up of facilities and systems.
  2. Operations and maintenance manuals.
  3. Testing, adjusting, and balancing.
  4. System demonstration and observation.
  5. Operation and maintenance instructions for Owner's personnel.
  6. Contractor's inspection of Work.
  7. Contractor's preparation of an initial "punch list."



8. Procedure to request Engineer inspection to determine date of Substantial Completion.
  9. Completion time for correcting deficiencies.
  10. Inspections by authorities having jurisdiction.
  11. Certificate of Occupancy, if required, and transfer of insurance responsibilities.
  12. Final cleaning.
  13. Preparation for final inspection.
  14. Closeout Submittals:
    - a. Project record documents.
    - b. Operating and maintenance documents.
    - c. Operating and maintenance materials.
    - d. Affidavits.
  15. Final Application for Payment.
  16. Contractor's demobilization of Site.
  17. Maintenance.
- E. Record minutes and distribute copies to participants and those affected by decisions made within two (2) days after meeting.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION

SECTION 01 32 16  
CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Submittals.
- B. Bar chart schedules.
- C. Review and evaluation.
- D. Updating schedules.
- E. Distribution.

1.2 SUBMITTALS

- A. Submit preliminary progress schedule in accordance with the General Conditions.
- B. Schedule Updates:
  - 1. Overall percent complete, projected and actual.
  - 2. Completion progress by listed activity and sub-activity, to within five (5) working days prior to submittal.
  - 3. Changes in Work scope and activities modified since submittal.
  - 4. Delays in submittals or resubmittals, deliveries, or Work.
  - 5. Adjusted or modified sequences of Work.
  - 6. Other identifiable changes.
  - 7. Revised projections of progress and completion.

1.3 BAR CHART SCHEDULES

- A. Format: Bar chart Schedule, to include at least:
  - 1. Identification and listing in chronological order of those activities reasonably required to complete the Work, including:
    - a. Subcontract Work.
    - b. Major equipment design, fabrication, factory testing, and delivery dates including required lead times.
    - c. Move-in and other preliminary activities.
    - d. Equipment and equipment system test and startup activities.
    - e. Project closeout and cleanup.
    - f. Work sequences, constraints, and milestones.
  - 2. Listings identified by Specification Section number.

3. Identification of the following:
  - a. Horizontal time frame by year, month, and week.
  - b. Duration, early start, and completion for each activity and sub-activity.
  - c. Critical activities and Project float.
  - d. Sub-schedules to further define critical portions of Work.

B. Sheet Size: 11 inches high x 17 inches wide.

#### 1.4 REVIEW AND EVALUATION

- A. Participate in joint review and evaluation of schedules with Engineer at each submittal.
- B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.
- C. After review, revise schedules incorporating results of review, and resubmit within five (5) days.

#### 1.5 UPDATING SCHEDULES

- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update schedules to depict current status of Work.
- C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- D. Upon approval of a Change Order, include the change in the next schedule submittal.
- E. Indicate changes required to maintain Date of Substantial Completion.
- F. Submit sorts as required to support recommended changes.
- G. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect.

#### 1.6 DISTRIBUTION

- A. Following joint review, distribute copies of updated schedules to Contractor's Project site file, to Subcontractors, suppliers, Engineer, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

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SECTION 01 33 00  
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Definitions.
- B. Submittal procedures.
- C. Construction progress schedules.
- D. Proposed product list.
- E. Product data.
- F. Electronic CAD files of Project Drawings.
- G. Shop Drawings.
- H. Samples.
- I. Other submittals.
- J. Test reports.
- K. Certificates.
- L. Manufacturer's instructions.
- M. Manufacturer's field reports.
- N. Erection Drawings.
- O. Construction photographs.
- P. Contractor review.
- Q. Engineer review.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

- B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

### 1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer-accepted form.
- B. In addition to the specified number of hard copies, one (1) electronic copy of each submittal shall be transmitted to the Engineer. The electronic copy shall be in Portable Document Format (.pdf) unless otherwise specified.
- C. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
- D. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.
- E. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.
- F. Schedule submittals to expedite Project, and deliver to Engineer. Coordinate submission of related items.
- G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.
- H. Allow space on submittals for Contractor and Engineer review stamps.
- I. When revised for resubmission, identify changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- K. Submittals not requested will not be recognized nor processed.
- L. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

### 1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Comply with General Conditions and Section 01 32 16 - Construction Progress Schedule.

## 1.5 PROPOSED PRODUCT LIST

- A. Within fifteen (15) days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

## 1.6 PRODUCT DATA

- A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Submit number of copies Contractor requires, plus three (3) copies Engineer will retain.
  - C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

## 1.7 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

- A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.
- B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:
  - 1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
  - 2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
  - 3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.

4. Receiver shall not hold Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
6. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

#### 1.8 SHOP DRAWINGS

- A. Shop Drawings: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a Professional Engineer licensed in the State of Florida responsible for designing components shown on Shop Drawings.
  1. Include signed and sealed calculations to support design.
  2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
  3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit number of opaque reproductions Contractor requires, plus three (3) copies Engineer will retain.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

#### 1.9 SAMPLES

- A. Samples: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Samples for Selection as Specified in Product Sections:
  1. Submit to Engineer for aesthetic, color, and finish selection.
  2. Submit Samples of finishes, textures, and patterns for Engineer selection.
- C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.

- D. Include identification on each Sample, with full Project information.
- E. Submit number of Samples specified in individual Specification Sections; Engineer will retain one (1) Sample.
- F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.
- G. Samples will not be used for testing purposes unless specifically stated in Specification Section.
- H. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

#### 1.10 OTHER SUBMITTALS

- A. Closeout Submittals: Comply with Section 01 70 00 - Execution and Closeout Requirements.
- B. Informational Submittal: Submit data for Engineer's knowledge as Contract administrator or for Owner.
- C. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.11 TEST REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.12 CERTIFICATES

- A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.



1.13 MANUFACTURER'S INSTRUCTIONS

- A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.
- C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.14 MANUFACTURER'S FIELD REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit report in duplicate within five (5) days of observation to Engineer for information.
- C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.15 ERECTION DRAWINGS

- A. Informational Submittal: Submit Drawings for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.16 CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs of Site and construction throughout progress of Work produced by an experienced photographer acceptable to Engineer.
- B. Each month submit photographs with Application for Payment.
- C. The quantity of photographs taken shall be sufficient to document progress of Work.
- D. Digital Images: Deliver complete set of digital image electronic files on CD-ROM to Owner with Project record documents. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as sensor, uncropped.
  - 1. Digital Images: Uncompressed TIFF format, produced by digital camera with minimum sensor size of 4.0 megapixels, and image resolution of not less than 1600 by 1200 pixels.

- 2 Date and Time: Include date and time in filename for each image.

#### 1.17 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer.
- B. Contractor shall be Responsible for:
  1. Determination and verification of materials including manufacturer's catalog numbers.
  2. Determination and verification of field measurements and field construction criteria.
  3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
  4. Determination of accuracy and completeness of dimensions and quantities.
  5. Confirmation and coordination of dimensions and field conditions at Site.
  6. Construction means, techniques, sequences, and procedures.
  7. Safety precautions.
  8. Coordination and performance of Work of all trades.
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.
- D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

#### 1.18 ENGINEER REVIEW

- A. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 20 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.
- B. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.
- C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.
- D. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order.
- E. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00  
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality control.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Testing and inspection services.
- F. Manufacturers' field services.

1.2 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Perform Work using persons qualified to produce required and specified quality.
- D. Products, materials, and equipment may be subject to inspection by Engineer and Owner at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.
- E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

#### 1.4 REFERENCES

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current as of date of Contract Documents except where specific date is established by code.
- C. Obtain copies of standards and maintain on Site when required by product Specification Sections.
- D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference in reference documents.

#### 1.5 LABELING

- A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
  - 1. Model number.
  - 2. Serial number.
  - 3. Performance characteristics.
- C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

#### 1.6 TESTING AND INSPECTION SERVICES

- A. Contractor shall employ and pay for specified services of an independent firm to perform all testing and inspection.
- B. Independent firm will perform tests, inspections, and other services specified in individual Specification Sections and as required by Engineer.

- C. Testing, inspections, and source quality control may occur on or off Project Site. Perform off-Site testing as required by Engineer or Owner.
- D. Reports shall be submitted by independent firm to Engineer, Contractor, and authorities having jurisdiction, in duplicate, indicating observations and results of tests and compliance or noncompliance with Contract Documents.
  - 1. Submit final report indicating correction of Work previously reported as noncompliant.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
  - 1. Notify Engineer and independent firm 48 hours before expected time for operations requiring services.
  - 2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.
- F. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.
- G. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Engineer.
- H. Agency Responsibilities:
  - 1. Test Samples of mixes submitted by Contractor.
  - 2. Provide qualified personnel at Site. Cooperate with Engineer and Contractor in performance of services.
  - 3. Perform indicated sampling and testing of products according to specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.
  - 6. Perform additional tests required by Engineer.
  - 7. Attend preconstruction meetings and progress meetings.
- I. Agency Reports: After each test, promptly submit two (2) copies of report to Engineer, Contractor, and authorities having jurisdiction. When requested by Engineer, provide interpretation of test results. Include the following:
  - 1. Date issued.
  - 2. Project title and number.
  - 3. Name of inspector.
  - 4. Date and time of sampling or inspection.
  - 5. Identification of product and Specification Section.
  - 6. Location in Project.
  - 7. Type of inspection or test.

8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

J. Limits on Testing Authority:

1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume duties of Contractor.
4. Agency or laboratory has no authority to stop the Work.

1.7 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment, and commissioning as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer thirty (30) days in advance of required observations. Observer is subject to approval of Engineer.
- C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Refer to Section 01 33 00 - Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

## SECTION 01 50 00

### TEMPORARY FACILITIES AND CONTROLS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Temporary Utilities:
  - 1. Temporary electricity.
  - 2. Temporary lighting for construction purposes.
  - 3. Temporary heating.
  - 4. Temporary cooling.
  - 5. Temporary ventilation.
  - 6. Temporary water service.
  - 7. Temporary sanitary facilities.
- B. Construction Facilities:
  - 1. Vehicular access.
  - 2. Parking.
  - 3. Progress cleaning and waste removal.
  - 4. Project identification.
  - 5. Traffic regulation.
  - 6. Fire-prevention facilities.
- C. Temporary Controls:
  - 1. Barriers.
  - 2. Enclosures and fencing.
  - 3. Security.
  - 4. Water control.
  - 5. Dust control.
  - 6. Erosion and sediment control.
  - 7. Noise control.
  - 8. Pest and rodent control.
  - 9. Pollution control.
- D. Removal of utilities, facilities, and controls.

##### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.



3. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

### 1.3 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required from utility source as needed for construction operation.
- B. Provide temporary electric feeder from existing building electrical service, if applicable, at location as directed by Owner. Do not disrupt Owner's use of service.
- C. Power Service Characteristics: as required for construction operations.
- D. Provide power outlets with branch wiring and distribution boxes located as required for construction operations. Provide suitable, flexible power cords as required for portable construction tools and equipment.
- E. Provide main service disconnect and overcurrent protection at location meeting all applicable codes and regulations.
- F. Permanent convenience receptacles may be used during construction.

### 1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting necessary for safe and functional construction operations.
- B. Provide and maintain one (1) watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide and maintain 0.25 watt/sq ft HID lighting to interior work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, lamps, and the like, for specified lighting levels.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may be used upon written permission from the Owner during construction, if applicable.

### 1.5 TEMPORARY HEATING

- A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Contractor shall be responsible for all operation and maintenance costs associated with temporary heating.

- C. Maintain minimum ambient temperature as required in individual Sections of the Contract Documents.

#### 1.6 TEMPORARY COOLING

- A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.
- B. Contractor shall be responsible for all operation and maintenance costs associated with temporary heating.
- C. Maintain maximum ambient temperature as required in individual Sections of the Contract Documents.

#### 1.7 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

#### 1.8 TEMPORARY WATER SERVICE

- A. Provide suitable quality water service as needed to maintain specified conditions for construction operations.
- B. Contractor shall be responsible for coordination, cost of temporary connection(s), and cost of temporary water.
- C. Extend branch piping with outlets located so that water is available by hoses with threaded connections.

#### 1.9 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization.

#### 1.10 VEHICULAR ACCESS

- A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load-bearing capacity to accommodate unimpeded traffic for construction purposes.
- B. All temporary vehicular access crossing public rights-of-way, property, or easements shall be coordinated with the authority having jurisdiction and comply with all applicable regulations.
- C. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

- D. Extend and relocate vehicular access as Work progress requires and provide detours as necessary for unimpeded traffic flow.
- E. Locate as indicated on Drawings or approved by Engineer.
- F. Provide unimpeded access for emergency vehicles. Maintain twenty (20) foot-wide driveways with turning space between and around combustible materials.
- G. Provide and maintain access to fire hydrants and control valves free of obstructions.
- H. Provide means of removing mud from vehicle wheels before entering streets.
- I. Use designated existing on-Site roads for construction traffic upon written approval from the Owner.

#### 1.11 PARKING

- A. Provide temporary parking areas to accommodate construction personnel.
- B. Locate as indicated on Drawings or approved by Engineer.
- C. Off-Site Parking:
  - 1. If Site space is not adequate, provide additional off-Site parking.
  - 2. The Contractor shall provide to the Engineer written permission or executed permit from property owner prior to utilizing off-Site parking that is not on City property.
- D. Use of designated areas of existing on-Site streets and driveways used for construction traffic is not permitted. Tracked vehicles are not allowed on paved areas.
- E. Use of designated areas of existing parking facilities used by construction personnel is permitted upon written approval from the Owner.
- F. Do not allow heavy vehicles or construction equipment in parking areas.
- G. Do not allow vehicle parking on existing pavement.
- H. Designate two (2) parking space for Engineer.
- I. Permanent Pavements and Parking Facilities:
  - 1. Bases for permanent roads and parking areas may be used for construction traffic.
  - 2. Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.
  - 3. Use of permanent parking structures is not permitted.
- J. Maintenance:
  - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.

2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

K. Removal, Repair:

1. Remove temporary materials and construction before Substantial Completion.
2. Remove underground Work and compacted materials to depth of two (2) feet; fill and grade Site as indicated.
3. Repair existing facilities damaged by use, to original condition.

- L. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.12 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, before enclosing spaces.
- C. Broom and vacuum clean interior areas before starting surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and rubbish from Site and dispose of off-Site as required to maintain a safe, neat, and orderly Site.
- E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.13 PROJECT IDENTIFICATION

A. Project Identification Sign:

1. Project Identification Sign shall comply with Owner standards.
2. Main signage boards shall be ¾-inch pressure treated plywood mounted on a two-inch (2") x four-inch (4") pressure treated wood frame painted on all sides.
3. Sign portability:
  - a. Each sign shall consist of two of the above described plywood sheets and frames hinged together at the top to form a two-sided sign that folds together for transportation from location to location, transportation provided by the Contractor.
  - b. When installed at the site, the hinged connection will allow the bottom portion to move outward forming a triangle with the ground, allowing the sign to stand on its own.
  - c. The sign faces shall be positioned so that oncoming traffic from both directions can read one side.

4. Lettering shall be black intermediate grade vinyl or approved equal.
  5. Border Line shall be black, a minimum of one half inch (1/2") wide, and inset one inch (1") from the board edge.
- B. Project Informational Signs:
1. Painted informational signs of same colors and lettering as Project identification sign or standard products; size lettering for legibility at 100-foot distance.
  2. Provide sign at each field office and storage shed, and provide directional signs to direct traffic into and within Site. Relocate as Work progress requires.
  3. Provide directional traffic signs to and within Site as required by the agency having jurisdiction.
  4. No other signs are allowed without Owner's permission except those required by law.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.
- D. Show content, layout, lettering, color, foundation, structure, sizes, and grades of members.
- E. Sign Materials:
1. Structure and Framing: New wood or metal, structurally adequate.
  2. Sign Surfaces: Exterior grade plywood with medium-density overlay, minimum of 3/4 inches thick, standard large sizes to minimize joints.
  3. Rough Hardware: Galvanized.
  4. Paint and Primers: Exterior quality, two (2) coats; sign background of color as selected.
  5. Lettering: Exterior quality paint or precut vinyl self-adhesive products, colors as selected.
- F. Installation:
1. Install Project identification sign within fifteen (15) days after date established by Notice to Proceed.
  2. Erect at location of high public visibility adjacent to main entrance to Site.
  3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
  4. Install sign surface plumb and level, with butt joints. Anchor securely.
  5. Paint exposed surfaces of sign, supports, and framing.
- G. Maintenance: Maintain clean signs and supports; repair deterioration and damage.
- H. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

#### 1.14 TRAFFIC REGULATION

- A. Signs, Signals, and Devices:
  - 1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
  - 2. Traffic Control Signals: As approved by local jurisdictions.
  - 3. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
  - 4. Flag Person Equipment: As required by authorities having jurisdiction.
- B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
- C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- D. Haul Routes:
  - 1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.
  - 2. Confine construction traffic to designated haul routes.
  - 3. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.
- E. Traffic Signs and Signals:
  - 1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
  - 2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.
  - 3. Relocate signs and signals as Work progresses, to maintain effective traffic control.
- F. Removal:
  - 1. Remove equipment and devices when no longer required.
  - 2. Repair damage caused by installation.
  - 3. Remove post settings completely.

#### 1.15 FIRE-PREVENTION FACILITIES

- A. Prohibit smoking within buildings under construction and demolition. Designate area on Site where smoking is permitted. Provide approved ashtrays in designated smoking areas.
- B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.
- C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.

1. Provide minimum of one (1) fire extinguisher in every construction trailer and storage shed.
- D. Provide fire extinguishers for construction equipment as required by applicable federal, state, and local codes.

#### 1.16 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of Site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing building.
- C. Tree and Plant Protection: Preserve and protect existing trees and plants designated to remain.
  1. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
  2. Provide 6-foot-high barriers around drip line, with access for maintenance.
  3. Replace trees and plants damaged by construction operations.
- D. Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.

#### 1.17 ENCLOSURES AND FENCING

- A. Construction: Commercial-grade chain-link fence unless otherwise shown or specified.
- B. Provide 6-foot-high fence around construction Site and storage area(s); equip with vehicular and pedestrian gates with locks.
- C. Exterior Enclosures:
  1. Provide temporary weathertight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating, cooling, and maintenance of required ambient temperatures identified in individual Specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

#### 1.18 SECURITY

- A. Security Program:
  1. Protect Work on existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
  2. Initiate program in coordination with Owner's existing security system at Project mobilization.
  3. Maintain program throughout construction period until directed by Engineer.

- B. Entry Control:
  - 1. Restrict entrance of persons and vehicles to Project Site and existing facilities.
  - 2. Allow entrance only to authorized persons with proper identification.
  - 3. Maintain log of workers and visitors and make available to Owner on request.
  - 4. Coordinate access of Owner's personnel to Site in coordination with Owner's security forces.
- C. Personnel Identification:
  - 1. Provide identification badge for each person authorized to enter premises.
  - 2. Badge to Include: Personal photograph, name, expiration date, and employer.
  - 3. Maintain list of accredited persons and submit copy to Owner on request.
  - 4. Require return of badges at expiration of employment on the Work.

#### 1.19 WATER CONTROL

- A. Grade Site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.
- B. Protect Site from puddles or running water. Provide water barriers as required to protect Site from soil erosion.

#### 1.20 DUST CONTROL

- A. Execute Work by methods that minimize raising dust from construction operations.
- B. Provide positive means to prevent airborne dust from dispersing into atmosphere.

#### 1.21 EROSION AND SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize surface area of bare soil exposed at one time.
- C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.

#### 1.22 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.



1.23 PEST AND RODENT CONTROL

- A. Provide methods, means, and facilities to prevent pests and insects from damaging the Work.
- B. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.24 POLLUTION CONTROL

- A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.
- B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

1.25 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials before Substantial Completion inspection.
- B. Remove underground installations to minimum depth of two (2) feet.
- C. Clean and repair damage caused by installation or use of temporary Work.
- D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 60 00  
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Equipment electrical characteristics and components.

1.2 PRODUCTS

- A. At minimum, comply with specified requirements and reference standards.
- B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.
- C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.
- D. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.
- E. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products according to manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

#### 1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products according to manufacturer's instructions.
- B. Store products with seals and labels intact and legible.
- C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.
- D. For exterior storage of fabricated products, place products on sloped supports aboveground.
- E. Provide off-Site storage and protection when Site does not permit on-Site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

#### 1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 01 25 00 - Substitution Procedures.

### PART 2 - PRODUCTS

#### 2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.

- B. Cord and Plug: Furnish minimum 6-foot long cord and plug including grounding connector for connection to electric wiring system. Cord of longer length may be specified in individual Specification Sections.

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 70 00  
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Field engineering.
- B. Closeout procedures.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Project record documents.
- F. Operation and maintenance data.
- G. Manual for materials and finishes.
- H. Manual for equipment and systems.
- I. Spare parts and maintenance products.
- J. Product warranties and product bonds.
- K. Examination.
- L. Preparation.
- M. Execution.
- N. Cutting and patching.
- O. Protecting installed construction.
- P. Final cleaning.

1.2 FIELD ENGINEERING

- A. Employ land surveyor registered in State of Florida and acceptable to Engineer.
- B. Locate and protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.

- C. Control datum for survey is indicated on Drawings.
- D. Prior to beginning Work, verify and establish floor elevations of existing facilities to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.
- E. Verify setbacks and easements; confirm Drawing dimensions and elevations.
- F. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.
- G. Submit copy of Site drawing and certificate signed by land surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- H. Maintain complete and accurate log of control and survey Work as Work progresses.
- I. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.
- J. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- K. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.
- L. Final Survey: Prior to Substantial Completion, prepare final survey illustrating locations, dimensions, angles, and elevations of all Work and the relationship to permanent bench marks and property lines.
  - 1. All elevations shall be referenced to N.A.V.D 88.
  - 2. All drawings shall have their boundaries tied into the City of Ocala GPS horizontal control network with a minimum of two corners at each end of one boundary line identified by state plane coordinates.
  - 3. Include certification, signed by surveyor, that the survey meets State of Florida applicable standards of practice for As-Built/Record Surveys.

### 1.3 CLOSEOUT PROCEDURES

- A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
  - 1. Submit maintenance manuals, Project record documents, digital images of construction photographs, and other similar final record data in compliance with this Section.
  - 2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
  - 3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be

completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.

4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
6. Make final change-over of locks and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
8. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:

1. When Contractor considers Work to be substantially complete, submit to Engineer:
  - a. Written certificate that Work, or designated portion, is substantially complete.
  - b. List of items to be completed or corrected (initial punch list).
2. Within seven (7) days after receipt of request for Substantial Completion, Engineer will make inspection to determine whether Work or designated portion is substantially complete.
3. Should Engineer determine that Work is not substantially complete:
  - a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
  - b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
  - c. Engineer will reinspect Work.
  - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.
4. When Engineer finds that Work is substantially complete, Engineer will:
  - a. Prepare Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
  - b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
5. After Work is substantially complete, Contractor shall:
  - a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
  - b. Complete Work listed for completion or correction within time period stipulated.

- C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
  - 1. When Contractor considers Work to be complete, submit written certification that:
    - a. Contract Documents have been reviewed.
    - b. Work has been examined for compliance with Contract Documents.
    - c. Work has been completed according to Contract Documents.
    - d. Work is completed and ready for final inspection.
  - 2. Submittals: Submit following:
    - a. Final punch list indicating all items have been completed or corrected.
    - b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
    - c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
    - d. Accounting statement for final changes to Contract Sum.
    - e. Contractor's affidavit of payment of debts and claims.
    - f. Contractor affidavit of release of liens.
    - g. Consent of surety to final payment.
  - 3. Perform final cleaning for Contractor-soiled areas according to this Section.
- D. Final Completion Inspection:
  - 1. Within seven (7) days after receipt of request for final inspection, Engineer will make inspection to determine whether Work or designated portion is complete.
  - 2. Should Engineer consider Work to be incomplete or defective:
    - a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
    - b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.
    - c. Engineer will reinspect Work.
    - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.

#### 1.4 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of various equipment and systems.
- B. Notify Engineer seven (7) days prior to startup of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.



- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.
- G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.
- H. Submit a written report according to Section 01 33 00 - Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

#### 1.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two (2) weeks prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instruct in classroom environment at a location determined by the Owner and instructed by authorized manufacturer's representative who is knowledgeable about the Project.
- C. Video Recordings: If required by the Engineer, provide high-quality color video recordings of demonstration and instructional sessions. Engage commercial videographer to record sessions. Include classroom instructions, demonstrations, board diagrams, and other visual aids. Include menu navigation.
- D. For equipment or systems requiring seasonal operation, perform demonstration for other season within six (6) months.
- E. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- H. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

## 1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, product data, and Samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates used.
  - 3. Changes made by Addenda and modifications.
- F. As-Built Drawings:
  - 1. As-Built Drawings shall be prepared, signed, and sealed by a Professional Mapper and Surveyor (PMS), licensed to practice in the State of Florida. If the project was designed by an Engineer hired by the Developer, the As-Built drawings shall also be sealed by the Professional Engineer registered in the State of Florida and submitted on CD or DVD using state plane coordinates.
  - 2. The following information is required on all As-Built Drawings. The Contractor shall note that additional information may be required by the Engineer when deemed necessary.
    - a. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and Change Orders.
    - b. Unless otherwise specified, the original construction plans, with as-built information shown, will be accepted for those projects contracted by the City.
    - c. The drawings shall be revised (redrawn) to scale to indicate final as-built data (true to scale) and in accordance to all construction changes. Only changing a station and off-set note or just adding notes is not acceptable for horizontal changes. In making changes to the drawings, utility lines or other features to be changed shall be erased before new lines are drawn, notations to be changed shall be reworded as required.
    - d. Items that were not installed as shown shall be so indicated by placing a "revision cloud" around the as-built information and a note shall be placed on

the sheet near the lower right-hand corner in bold marking indicating that the information contained within the cloud is as-built. The as-built date shall also be shown.

- e. Items that were constructed exactly per plan shall be shown by placing an asterisk adjacent to the as-built information indicating that it was built per plan with no changes.
- f. Subdivisions:
  - 1) As-Built subdivision construction plans shall not be accepted as as-builts unless specifically authorized by the Engineer. Subdivision as-builts shall be prepared on 24" x 36" plan sheets. Each sheet shall show only right-of-way, lot lines, lot numbers, street names, lot dimensions. Separate sheets shall be prepared for street, water, and sewer construction.
  - 2) The Owner will provide locate services on newly installed water and sewer lines after approval of final As-Built Drawings and valve tie sheets. Should locates be requested before approval is received, the system will be considered private and will be the responsibility of the Contractor to locate.
- g. Water, Sewer, and Reclaim As-Built Drawings:
  - 1) Pipe location and depth.
  - 2) Pipes shall be referenced to power poles (identify power pole number) or other permanent structures such as inlets, sidewalks, edge of pavement, or right-of-way lines. Where no permanent above grade structure exists, pipes shall be referenced to rights-of-way lines and edge of pavement every one hundred feet.
  - 3) Fittings shall be referenced on the drawings. At least two (2) above ground, visible reference distances shall be shown for each fitting. Insets may be used to decrease drawing scale and increase detail. Where water mains are adjusted vertically, fittings and their elevations must be shown on As-Builts. Provide a cross-section detail showing the fittings and measurements.
  - 4) Where service lines are installed, the services shall be shown in their relative position. Services shall be clearly identified as to single or double services. Where services vary more than two feet (2') from the property corner, the distance from the service to the property corner shall be shown. Show the size and type of service pipe. This may be noted in a legend.
  - 5) Reference all valves two inches (2") in diameter and larger. Valves shall be referenced on Valve Tie Sheets. Valves shall be shown in their relative positions to one another and shall clearly indicate which lines they control. Sheet numbers of Valve Tie Sheets shall be shown on the As-Built Drawings for easy referencing.
  - 6) Reference all existing valves within fifty feet of the Site.

- 7) Where pipes are stubbed out, the end of the main shall be referenced by the distance from the end of the pipe to the nearest upstream valve or fitting plus one additional reference.
  - 8) Under general notes, the name of the manufacturer and model number shall be shown for all valves referenced.
  - 9) All As-Built Drawings shall be prepared by using the Owner's Standard Legend and Abbreviations.
  - 10) The size and type of water mains shall be indicated between all valves and tees.
  - 11) The following items shall be located by Global Positioning System (GPS) equipment: valve boxes, meter boxes, fire hydrants, fittings, casings and points of connection to the existing system. Depending on the type of project there may be other features that require GPS location.
3. Procedure for Submitting As-Built Drawings:
- a. Original Submittal: Three (3) copies of all required As-Built materials, including Valve Tie Sheets, shall be submitted to the Engineer. No originals or certified copies shall be submitted in the Original Submittal. Submittals must be furnished with a cover sheet or letter of transmittal. As-Built submitted without cover sheets will not be accepted. In lieu of paper submittals, As-Built can be submitted electronically until the final submittal.
  - b. As-Built Review: The Original Submittal shall be reviewed for content and compliance to the specified requirements. If the As-Built are found to be incomplete, one set will be returned with comments marked in red. The Contractor shall correct the As-Built as indicated.
  - c. Resubmittal: After corrections, additions, or deletions are complete, the As-Built shall be resubmitted. Three (3) sets of those items that were returned for corrections along with the red lined set shall be resubmitted. Resubmittal without the red lined set will be refused. No resubmittals will be accepted without a cover sheet. No originals or certified copies shall be submitted with the Resubmittal.
  - d. Final Submittal: After all As-Built have been reviewed and comply with all specified requirements, the Engineer shall notify the Contractor to submit final As-Built. Final As-Built shall include a cover letter, two copies of the As-Built signed, sealed and dated by a professional mapper and surveyor, and one electronic file with one reproducible original. The Final Submittal shall also include As-Built Drawings in AutoCAD .dwg format. The Contractor shall verify the version of AutoCAD utilized by the Owner to prevent file compatibility issues.

## 1.7 OPERATION AND MAINTENANCE DATA

- A. Submit in PDF composite electronic indexed file.

- B. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable plastic covers.
- C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.
- D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment and systems.
    - f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
    - g. Safety precautions to be taken when operating and maintaining or working near equipment.
  - 3. Part 3: Project documents and certificates, including the following:
    - a. Shop Drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.
    - d. Photo copies of warranties.

## 1.8 MANUAL FOR MATERIALS AND FINISHES

- A. Submit two (2) copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one (1) copy with comments.
- B. For equipment or component parts of equipment put into service during construction and operated by Owner, submit documents within ten (10) days after acceptance.

- C. Submit one copy of completed volumes before Substantial Completion. Draft copy to be reviewed and returned after Substantial Completion, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit three (3) sets of revised final volumes within ten (10) days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual within ten (10) days after final inspection.
- F. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom-manufactured products.
- G. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- H. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.
- I. Additional Requirements: As specified in individual product Specification Sections.
- J. Include listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

#### 1.9 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two (2) copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one (1) copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten (10) days after acceptance.
- C. Submit one copy of completed volumes before Substantial Completion. Draft copy will be reviewed and returned after Substantial Completion, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit three (3) sets of revised final volumes within ten (10) days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual within ten (10) days after final inspection.
- F. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

- G. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
  - H. Include color-coded wiring diagrams as installed.
  - I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.
  - J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
  - K. Include servicing and lubrication schedule and list of lubricants required.
  - L. Include manufacturer's printed operation and maintenance instructions.
  - M. Include sequence of operation by controls manufacturer.
  - N. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
  - O. Include control diagrams by controls manufacturer as installed.
  - P. Include Contractor's coordination drawings with color-coded piping diagrams as installed.
  - Q. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
  - R. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
  - S. Include test and balancing reports as specified in Section 01 40 00 - Quality Requirements.
  - T. Additional Requirements: As specified in individual product Specification Sections.
  - U. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.
- 1.10 SPARE PARTS AND MAINTENANCE PRODUCTS
- A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.

- B. Deliver to Project Site and place in location as directed by Owner; obtain receipt prior to final payment.

#### 1.11 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten (10) days after completion of applicable item of Work.
- B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form, contain full information, and are notarized.
- D. Co-execute submittals when required.
- E. Include table of contents and assemble in three D side ring binder with durable plastic cover.
- F. Submit prior to final Application for Payment.
- G. Time of Submittals:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten (10) days after acceptance.
  - 2. Make other submittals within ten (10) days after date of Substantial Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten (10) days after acceptance, listing date of acceptance as beginning of warranty or bond period.

#### PART 2 - PRODUCTS - Not Used

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.



- D. Verify that utility services are available with correct characteristics and in correct locations.

### 3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

### 3.3 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
  - 1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
  - 2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
  - 3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Engineer for final decision.
- E. Allow for expansion of materials and movement of structures.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
  - 1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
  - 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.
  - 1. Refer questionable mounting heights choices to Engineer for final decision.

2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.

H. Adjust operating products and equipment to ensure smooth and unhindered operation.

I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

### 3.4 CUTTING AND PATCHING

A. Employ skilled and experienced installers to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements affecting:

1. Structural integrity of element.
2. Integrity of weather-exposed or moisture-resistant elements.
3. Efficiency, maintenance, or safety of element.
4. Visual qualities of sight-exposed elements.
5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:

1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install or correct ill-timed Work.
3. Remove and replace defective and nonconforming Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore Work with new products according to requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

J. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

### 3.5 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.
- C. Prohibit traffic from landscaped areas.

### 3.6 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment.
  - 1. Employ experienced personnel or professional cleaning firm.
- B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces.
- C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.
- D. Replace filters of operating equipment.
- E. Clean debris from drainage systems.
- F. Clean Site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION

## SECTION 02 41 19

### DEMOLITION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Preparation.
  - 2. Salvage requirements.
  - 3. Demolition.

##### 1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Demolition Schedule: Indicate overall schedule and interruptions required for utility and building services.
- C. Shop Drawings:
  - 1. Indicate demolition and removal sequence.
  - 2. Indicate location of items designated for reuse and Owner's retention.
  - 3. Indicate location and construction of temporary work.

##### 1.3 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions.

##### 1.4 QUALITY ASSURANCE

- A. Conform to applicable codes and regulations for demolition work, dust control, and products requiring electrical disconnection and re-connection.
- B. Conform to applicable codes and regulations for procedures when hazardous or contaminated materials are discovered.
- C. Obtain required permits from authorities having jurisdiction.
- D. Perform Work in accordance with federal, state, and local regulations.

## 1.5 SEQUENCING

- A. Section 01 10 00 - Summary: Requirements for sequencing.
- B. Owner may conduct salvage operations before demolition begins to remove materials Owner chooses to retain.

## 1.6 SCHEDULING

- A. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.
- B. Schedule Work to coincide with new construction.
- C. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operation in adjoining spaces.
- D. Coordinate utility and building service interruptions with Owner.
  - 1. Do not disable or disrupt building fire or life safety systems without five (5) days prior written notice to Owner.
  - 2. Schedule tie-ins to existing systems to minimize disruption.

## 1.7 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent facilities.
- B. Cease operations immediately if structure appears to be in danger and notify Engineer. Do not resume operations until directed.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Notify affected utility companies before starting work and comply with applicable requirements.
- B. Mark location and termination of utilities.
- C. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.

- D. Layout cuts in post tensioned concrete elements to avoid cutting concrete within 12 inches of any stressing tendon. Notify Engineer five (5) days in advance of cutting post-tensioned concrete.
- E. Erect and maintain weatherproof closures for exterior openings.
- F. Provide and maintain temporary measures to prevent spread of dust, odors, and noise.
- G. Prevent movement of existing structures, utilities, or other facilities pertaining or adjacent to demolition activities; provide temporary bracing and shoring required.
- H. Do not close or obstruct building egress path.

### 3.2 SALVAGE REQUIREMENTS

- A. Coordinate with Owner to identify components and equipment required to be removed and delivered to Owner.
- B. Tag components and equipment Owner designates for salvage.
- C. Protect designated salvage items from demolition operations until items can be removed.
- D. Carefully remove components and equipment indicated to be salvaged.
- E. Disassemble as required to permit removal.
- F. Package small and loose parts to avoid loss.
- G. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
- H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item.
- I. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

### 3.3 DEMOLITION

- A. Conduct demolition and/or removal operations, and the removal of equipment and debris to ensure minimum interference with roadways, walkways, and parking areas both onsite and offsite, and to ensure minimum interference with occupied or used facilities.
- B. Coordinate demolition activities to minimize impacts with Owner's operations.

- C. Maintain protected egress from and access to adjacent existing buildings and parking areas at all times.
- D. Do not close or obstruct roadways, driveways, parking areas, or sidewalks without prior written approval from the Engineer.
- E. Cease operations immediately when any structure or facility appears to be in danger and notify Engineer.
- F. Partial demolition of existing concrete structures and slabs shall include saw cutting in neat, orderly lines.
- G. Disconnect and remove designated utilities within demolition areas.
- H. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.
- I. Demolish in orderly and careful manner. Protect existing improvements and facilities.
- J. Carefully remove components indicated to be reused.
  - 1. Disassemble components as required to permit removal.
  - 2. Package small and loose parts to avoid loss.
  - 3. Mark components and packaged parts to permit reinstallation.
  - 4. Store components, protected from construction operations, until reinstalled.
- K. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- L. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
- M. Remove temporary Work.

END OF SECTION

## SECTION 09 90 00

### PAINTING AND COATING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Surface preparation and field application of paints and other coatings.

##### 1.2 DEFINITIONS

- A. Refer to ASTM D16 for definitions of terms used in this Section.

##### 1.3 REFERENCE STANDARDS

- A. ASTM International:
  - 1. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
  - 2. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
  - 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. American Water Works Association:
  - 1. AWWA/ANSI C104/A21.4 – Cement Mortar Lining for Ductile Iron Pipe and Fittings.
- C. Green Seal:
  - 1. GS-03 - Anti-Corrosive Paints.
  - 2. GS-11 - Paints and Coatings.
- D. Master Painters Institute:
  - 1. MPI - Approved Products List.
  - 2. MPI - Architectural Painting Manual.
- E. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1113 - Architectural Coatings.

##### 1.4 SEQUENCING

- A. Section 01 10 00 - Summary: Requirements for sequencing.
- B. Do not apply finish coats until paintable sealant is applied.



## 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
  - 1. Submit manufacturer data on all painting and coating products specified herein.
  - 2. Include MPI - Approved Products Lists with proposed products highlighted.
- C. Samples:
  - 1. Submit two (2) copies of the manufacturer's complete color charts for each coating.
  - 2. Painted Samples:
    - a. Submit two (2) painted samples, illustrating selected colors and textures for each selected color and system with specified coats cascaded.
- D. Manufacturer's Certificate:
  - 1. Certify that products meet or exceed specified requirements.
  - 2. Certify that coating and lining products are appropriate for the intended service.
- E. Applicator's Certificate:
  - 1. The applicator shall supply a "Certificate of Application" attesting that the specified lining systems are supplied and applied as specified.
- F. Manufacturer Instructions: Submit special surface preparation procedures and substrate conditions requiring special attention for each coating system.
- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- H. Qualifications Statements:
  - 1. Submit qualifications for manufacturer and applicator.
  - 2. Submit manufacturer's approval of applicator.

## 1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Operation and Maintenance Data: Submit information on cleaning, touchup, and repair of painted, coated, and lined surfaces.
  - 1. Furnish product number for recommend repair compounds for each coating and lining system supplied.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance materials.

- B. Extra Stock Materials:
  - 1. Furnish 1 gal. of each color and type of coating provided for Project.
  - 2. Label each container with manufacturer's label, color, type, texture, and Site location.
  - 3. Store where directed by Engineer.

## 1.8 QUALITY ASSURANCE

- A. MPI Standards:
  - 1. Comply with indicated MPI standards.
  - 2. Products: Listed in MPI - Approved Products List.
- B. Surface Burning Characteristics:
  - 1. Fire-Retardant Finishes: Maximum 25/450 flame-spread/smoke-developed index when tested according to ASTM E84.

## 1.9 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
- B. Applicator: Company specializing in performing Work of this Section with minimum five (5) years of documented experience and approved by manufacturer.

## 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Container Labeling: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Inspection:
  - 1. Accept materials on Site in manufacturer's sealed and labeled containers.
  - 2. Inspect for damage and to verify acceptability.
- D. Store materials in ventilated area and otherwise according to manufacturer instructions.
- E. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

## 1.11 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Storage Conditions:
  - 1. Minimum Ambient Temperature: 45 degrees F.
  - 2. Maximum Ambient Temperature: 90 degrees F
- C. Application Conditions:
  - 1. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by coating manufacturer.
  - 2. Do not apply exterior coatings during rain or snow, when relative humidity is outside humidity ranges, or when moisture content of surfaces exceeds those required by paint manufacturer.
  - 3. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors and 50 degrees F for exteriors, unless otherwise indicated by manufacturer instructions.

## 1.12 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five-year manufacturer's warranty for paint and coatings.

## PART 2 - PRODUCTS

### 2.1 PAINTS AND COATING SYSTEMS

- A. Cement Mortar Pipe Lining:
  - 1. Cement mortar pipe lining shall conform to AWWA/ANSIC104/A21.4.
  - 2. All potable water main pipe lining materials shall conform to NSF 61 and NSF 372 requirements.
- B. Amine Cured Novalac Cured Epoxy:
  - 1. Description: Two component amine cured novalac epoxy for interior sewer pipe lining.
  - 2. Minimum Solids Content: 87%.
  - 3. Minimum Ceramic Quartz Content: 20%.
  - 4. Minimum Dry Film Thickness: 40 mils.
  - 5. Permeability:
    - a. The ceramic epoxy shall have a permeability rating of zero permeance when a film of at least 40 mils is tested according to ASTM D1653-79.
    - b. A permeability rating of 0.0 perms shall be achieved when measured using method A of ASTM E66-96 with a test duration of 42 days.

6. Manufacturers:
    - a. Fast Fabricators, SP-2000W
    - b. Induron, Protecto 401,
    - c. Environmental MD, Permax-CTF.
- C. Bituminous Coating:
1. Description: Bituminous coating for concrete and pipe in mildly corrosive environments.
  2. Number of Coats: Two (2).
  3. Dry Film Thickness per Coat: Twelve (12) mils.
  4. Application Method: Brush or Spray.
  5. Each coat shall be applied at a rate of one (1) gallon per one hundred (100) square feet.
  6. Manufacturers:
    - a. Koppers, Bitumastic No. 300,
    - b. Tnemec, 46H-413,
    - c. or approve equal.
- D. Polyamide Anti-Corrosive Coating – Moderately Corrosive Environment:
1. Description: Polyamide anti-corrosive coating for exposed metal and piping in moderately corrosive environments as shown and specified.
  2. Polyamide, anti-corrosive epoxy primer:
    - a. Number of Coats: One (1).
    - b. Minimum Thickness per Coat: Three (3) mils.
  3. Polyurethane Enamel:
    - a. Number of Coats: Two (2).
    - b. Minimum Thickness per Coat: Three (3) mils.
  4. Manufacturers:
    - a. Tnemec:
      - 1) Epoxy Primer: Series 66HS Hi-Build Epoxoline.
      - 2) Finish Coat: Series 72 Endura-Shield.
    - b. Sherwin Williams
      - 1) Epoxy Primer: Macropoxy 646FC Polyamide Epoxy.
      - 2) Finish Coat: Macropoxy 646FC Polyamide Epoxy.
- E. Polyamide Anti-Corrosive Coating – Highly Corrosive Environment:
1. Description: Polyamide anti-corrosive coating for exposed metal and piping in highly corrosive environments as shown and specified.
  2. Polyamide, anti-corrosive epoxy primer:
    - a. Number of Coats: One (1).
    - b. Minimum Thickness per Coat: Three (3) mils.
  3. Polyamide Epoxy-Coal Tar:
    - a. Number of Coats: Two (2).
    - b. Minimum Thickness per Coat: Eight (8) mils.

4. Manufacturers:
    - a. Tnemec:
      - 1) Epoxy Primer: Series N69F Hi-Build Epoxoline.
      - 2) Finish Coat: Series 435 Perma-Shield.
    - b. Sherwin Williams
      - 1) Epoxy Primer: Cor-Cote SC Epoxy High Build Amine Cured Epoxy.
      - 2) Finish Coat: Cor-Cote SC Epoxy High Build Amine Cured Epoxy.
- F. Coal Tar Epoxy:
1. Description: Polyamide, epoxy-coal tar for application in moderately corrosive environments as shown or specified.
  2. Exposure: Moderate.
  3. Minimum Solids Content: 100-percent by volume.
  4. Number of Coats: Two (2).
  5. Minimum Dry Film Thickness Per Coat: Eight (8) mils.
  6. Coating Systems:
    - a. Tnemec:
      - 1) Epoxy Primer: Series N69F Hi-Build Epoxoline.
      - 2) Finish Coat: Series 446 Perma-Shield.
    - b. Sherwin Williams:
      - 1) Epoxy Primer: Cor-Cote SC Epoxy High Build Amine Cured Epoxy.
      - 2) Finish Coat: Cor-Cote SC Epoxy High Build Amine Cured Epoxy.
- G. Epoxy Coating for Concrete Coating for Highly Corrosive Environments:
1. Description: Multi-component aggregate-filled epoxy for application in highly corrosive environments as shown or specified.
  2. Exposure: Severe.
  3. Substrate Repair Material:
    - a. Number of Coats: One (1).
    - b. Minimum Thickness: 125 mil.
    - c. Application Method: Trowel.
  4. Aggregate-Filled Epoxy Sealer:
    - a. Number of Coats: One (1).
    - b. Minimum Thickness: 125 mil.
    - c. Application Method: Spray or Trowel.
  5. Minimum Solids Content: 100-percent by volume.
  6. Manufacturers:
    - a. Sauereisen, SewerGard No. 210,
    - b. Tnemec, Series 434 Perma-Shield H2S,
    - c. Sherwin Williams, SherFlex Polyurethane Elastomer.
- H. Coating for Aluminum in Contact with Dissimilar Materials:
1. Coat all surfaces of aluminum in contact with dissimilar materials such as concrete, masonry, and steel with the following:
    - a. Two component polyamidoamine or polyamine epoxy.

- b. Minimum Solids: 100-percent by volume.
- c. Number of Coats: Two (2).
- d. Minimum Thickness: 8 mil DFT per coat.
- e. Manufacturers:
  - 1) Tnemec, Series 165 Epoxoline 100,
  - 2) Sherwin Williams, Dura-Plate UHS,
  - 3) or approved equal.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application examination.
- B. Verify that surfaces are ready to receive Work as recommended by product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of Work and report conditions capable of affecting proper application to Engineer.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Moisture Content:
  - 1. Measure moisture content of surfaces using electronic moisture meter.
  - 2. Do not apply finishes unless moisture content of surfaces are below following maximums:
    - a. Masonry, Concrete, and Concrete Unit Masonry: 15 percent.
    - b. Concrete Floors: 8 percent.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application preparation.
- B. Surface preparation, curing times, number of coats, and the application methods shall be as contained in the lining and/or coating material manufacturer's published literature.
- C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- D. Defects:
  - 1. Correct defects and clean surfaces capable of affecting Work of this Section.
  - 2. Remove or repair existing coatings exhibiting surface defects.
- E. Impervious Surfaces:
  - 1. Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach.

2. Rinse with clean water and allow surface to dry.
- F. Aluminum Surfaces Scheduled for Paint Finish:
1. Remove surface contamination by steam or high-pressure water.
  2. Remove oxidation with acid etch and solvent washing.
  3. Apply etching primer immediately following cleaning.
- G. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish:
1. Remove foreign particles to permit adhesion of finishing materials.
  2. Apply compatible sealer or primer.
- H. Insulated Coverings:
1. Remove dirt, grease, and oil from canvas and cotton.
- I. Concrete Floors:
1. Remove contamination, acid etch, and rinse floors with clear water.
  2. Verify that required acid-alkali balance is achieved.
  3. Allow to dry.
- J. Copper Surfaces Scheduled for Paint Finish:
1. Remove contamination by steam, high-pressure water, or solvent washing.
  2. Apply vinyl-etch primer immediately following cleaning.
- K. Gypsum Board Surfaces:
1. Fill minor defects with filler compound.
  2. Spot-prime defects after repair.
- L. Galvanized Surfaces:
1. Remove surface contamination and oils, and wash with solvent.
  2. Apply coat of etching primer.
- M. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish:
1. Concrete Manhole and Wet Well:
  2. Sandblast according to Specification SSPC-SP-7 ("Brush Off Blast Cleaning") with 60-80 mesh sand and air pressure of 50-60 psi to remove all cement glaze and residue of form release agents and provide a uniform surface profile of approximately one (1) mil.
  3. Vacuum clean or air blast surface prior to coating. Apply coating to a dry surface (less than [15%] moisture-free as measured by a moisture meter) only.
- N. Metal, Non-Submerged:
1. Clean all metal surfaces according to Specification SSPC- SP6 ("Commercial Blast Cleaning").
- O. Shop-Primed Steel Surfaces:
1. Sand and scrape to remove loose primer and rust.

2. Feather edges to make touch-up patches inconspicuous.
3. Clean surfaces with solvent.
4. Prime bare steel surfaces.

P. Metal Doors Scheduled for Painting:

1. Prime metal door at top and bottom edge surfaces.

Q. Existing Work:

1. Extend existing paint and coatings installations using materials and methods compatible with existing installations and as specified.

### 3.3 APPLICATION

A. Ductile Iron Pipe:

1. Ductile iron pipe interior and exterior coatings shall be checked for thickness using a magnetic film thickness gauge.
2. Thickness testing shall be done using the method outlined in SSPC-PA-2 film thickness testing.
3. The lining material shall not be applied above the thickness per coat as recommended in the manufacturer's printed literature.
4. Each pipe joint and fitting shall be marked with the date of the application of the lining system and with its numerical sequence of application on that date.

B. Concrete Manhole and Wet Well:

1. Apply liner and coatings to uniform thickness and in strict accordance with manufacturer's instructions and these requirements.
2. After pre-cast sections have been assembled seal all joints with a minimum six (6) inch overlap at each joint.

C. Metal, Non-Submerged:

1. Paint all exposed steel that is not stainless steel, exposed pipe work (except PVC), fittings, motors, and all mechanical equipment.
2. Touch up all shop-primed metal work as required in the field with epoxy primers and final coatings.

D. Comply with MPI - Architectural Painting Manual.

E. Do not apply finishes to surfaces that are not dry.

F. Apply each coat to uniform appearance.

G. Apply each coat of paint slightly darker than preceding coat, unless specified otherwise.

H. Sand metal surfaces lightly between coats to achieve required finish.

I. Cleaning:

1. Vacuum surfaces to remove loose particles.



2. Use tack cloth to remove dust and particles just prior to applying next coat.

J. Finishing Mechanical and Electrical Equipment:

1. Paint shop-primed equipment.
2. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components, and paint separately.
3. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars, and supports, except where these items are shop finished.
4. Paint interior surfaces of air ducts visible through grilles and louvers with one coat of flat black paint to visible surfaces.
5. Paint dampers exposed behind louvers and grilles to match face panels.
6. Paint exposed conduit and electrical equipment installed in finished areas.
7. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
8. Color-Coding:
  - a. Color-code equipment, piping, conduit, and exposed duct work according to indicated requirements.
  - b. Color band and identify with flow arrows, names, and numbering as shown and specified.
9. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings that were removed prior to finishing.

3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Inspecting and Testing: Comply with MPI - Architectural Painting Manual.

3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Collect waste material that may constitute fire hazards, place in closed metal containers, and remove daily from Site.

3.6 ATTACHMENTS

- A. Schedule: Finishes shall be as shown on the Drawings.

END OF SECTION

## SECTION 10 14 53

### TRAFFIC SIGNAGE

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. General: This Section includes requirements for furnishing and installing trafficsignage.
- B. All traffic sign related products and/or materials used in the construction of traffic infrastructure improvements shall comply with the following:
  - 1. Manual on Uniform Traffic Control Devices (MUTCD).
  - 2. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 3. Florida Department of Transportation Design Standards.
  - 4. Florida Building Code 'Chapter 11 – Florida Accessibility Code for Building Construction'.
  - 5. The City-Approved Site Development Plans.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
  - 1. AASHTO M 268 – Standard Specification for Retroreflective Sheeting for Flat and Vertical Traffic Control Applications.
  - 2. AASHTO LTS – Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
- B. ASTM International
  - 1. ASTM A1011 - Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
  - 2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - 3. ASTM A320 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service.
  - 4. ASTM A36 - Standard Specification for Carbon Structural Steel.
  - 5. ASTM A499 - Standard Specification for Steel Bars and Shapes, Carbon Rolled from "T" Rails.
  - 6. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 7. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
  - 8. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

9. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
10. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
11. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
12. ASTM D4956 - Standard Specification for Retroreflective Sheeting for Traffic Control.
13. ASTM F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch and Metric Dimensions.
14. ASTM F436 - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.

C. Federal Highway Administration

1. FHWA SHS - Standard Highway Signs.
2. MUTCD – Manual on Uniform Traffic Control Devices.

### 1.3 PREINSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.
- B. Convene minimum one week prior to commencing Work of this Section.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information regarding all materials to be furnished under this Section as required for completion of the Work.
- C. The Contractor shall submit certificates of inspection from the manufacturer that the materials to be supplied have been inspected at the plant and meet the requirements of the Contract Documents. These certificates shall be submitted prior to beginning Work.
- D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- E. Qualifications Statements:
  1. Submit qualifications for manufacturer and installer.
- F. Shop Drawings:
  1. Include plans, elevations, sections, and mounting details.
  2. Include details of assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  3. Detail fabrication and assembly of equipment.

## 1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of all traffic signs.
- C. Identify and describe unexpected variations to the Contract Documents.

## 1.6 QUALITY ASSURANCE

- A. All construction and installation of traffic signs for both public and private infrastructure improvements shall comply with the following:
  - 1. Manual on Uniform Traffic Control Devices (MUTCD).
  - 2. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 3. Florida Department of Transportation Design Standards.
  - 4. City-Approved Site Development Plans.
- B. All materials and equipment shall be free from defects impairing strength, durability, and operation and be of the best commercial quality for the purpose specified.
- C. Manufacturer: Company specializing in manufacturing products specified in this Section with a minimum five (5) years of documented experience.
- D. Installer: Company specializing in performing Work of this Section with a minimum five (5) years of documented experience in installation of liner materials.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
  - 1. Store materials according to manufacturer instructions.
  - 2. Do not place materials on private property or in areas obstructing pedestrian or vehicle traffic.
- D. Protection:
  - 1. Provide protection according to manufacturer instructions.

## 1.8 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

## PART 2 - PRODUCTS

### 2.1 TRAFFIC SIGNS

#### A. Street Name Signs:

1. General: The City is divided into four sections designated as northeast (NE), northwest (NW), southeast (SE) and southwest (SW). Silver Springs Boulevard and Fort King Street represents the north/south dividing line. Magnolia Avenue represents the east/west dividing line.
2. Sizing and Location:
  - a. Two Lane Roadway: Standard size sign shall be 30" x 9" or 36" x 9" in accordance with section 2D.43 of the MUTCD. Street name signs shall include ½" border that contrasts with the background color. Street name signs shall be double bladed, bolted on both ends and mounted on a 2" square perforated steel tube inserted between the sign blanks. Refer to City Standard Detail T-3 & T-5.
  - b. Four and Six Lane Roadways: Standard size sign shall be 30" x 12", 36" x 12", or 42" x 12", per section 2D.43 of the MUTCD. The major street name sign shall be mounted below the minor street name sign. Refer to City Standard Detail T-3 & T-5.
  - c. Advance Street Name Signing: Advance street name signs shall be installed on roadways in advance of major streets providing the street meets the following conditions:
    - 1) Posted speed limit on the roadway of the Advance sign to be installed is 35 miles per hour or greater.
    - 2) The intersection roadway is dedicated to public use and maintained by a government agency.
    - 3) The intersecting roadway to be signed has an annual average daily traffic volume of 9,000 or more.
3. Public Roads:
  - a. Street name signs for public roads shall be green background with white legend or, for the historic districts, brown background with white legend in accordance with section 2D.43 of the MUTCD and City Standard Detail T-3 & T-5.
4. Private Roads:
  - a. Street name signs for private roads shall be white background with green legend in accordance with section 2D.43 of the MUTCD and City Standard Detail T-3.

#### B. Overhead Signs:

1. Overhead signs shall consist of a single 60" x 18" or 72" x 24" blank in accordance with City Standard Detail T-4.

#### C. Stop and Speed Limit Signs:

1. Stop Signs: thirty inches (30") "STOP" signs shall be required at every two-lane street intersection (un-signalized) and thirty-six inch (36") at intersections with four

and six-lane roadways. All-way stop intersections shall have 36" stop signs installed on all approaches, with all-way plates measuring 18" x 6" as appropriate.

- a. Sign Placement: STOP sign shall be placed in accordance with section 2B.10 of the MUTCD.
  - b. Stop Ahead Sign: A "STOP AHEAD" sign is intended for use on approaches to STOP signs that are not visible for a sufficient distance to permit the driver to bring his vehicle to a stop at the stop bar. Stop Ahead Signs shall be:
    - 1) 30" "Stop Ahead Symbol" sign (W3-1).
    - 2) Placed in accordance with MUTCD Table 2C-4.
2. Speed Limit Signs: Speed limit signs in residential areas in the City of Ocala shall be 30 miles per hour. The speed limit on local streets may be reduced to 25 miles per hour after an investigation determines that such a limit is reasonable. Refer to section 2B.13 of the MUTCD.

D. School Signs:

1. School signs shall be in accordance with part 7 of the MUTCD, FDOT Manual on Speed Zoning for Highways, Roads and Streets in Florida and Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Index 711-001. All school warning signs and supplemental plaques shall be reflective with fluorescent yellow-green background, black letters or symbols.

E. Historic District Signs:

1. All signs, posts, finials, decorative bases, and bracket assemblies shall be powder coated satin black. Posts shall be round 2-3/8" outside diameter (OD). Finials shall be standard acorn sign post cap. Decorative short base, 4-1/2" tall x 7" wide at the base, shall be installed for any sign assembly installed in concrete or asphalt. Back of signs shall be powder coated satin black. For street name signs, appropriate vector graphic for each respective historic district shall be installed on the left-hand side of each sign face. All historic district street name signs shall be high intensity diamond grade VIP reflective sheeting with brown background and vector graphic with white letters. Refer to City Standard Detail T-6.

F. Downtown District Decorative Signs:

1. All signs, posts, finials, decorative bases, and bracket assemblies shall be powder coated satin black. Posts shall be round 2-3/8" outside diameter (OD). Finials shall be standard acorn sign post cap. Decorative short base, 4-1/2" tall x 7" wide at the base, shall be installed for any sign assembly installed in concrete or asphalt. Back of signs shall be powder coated satin black. Refer to City Standard Detail T-6.

G. Horizontal Alignment Warning Signs:

1. Horizontal alignment warning signs shall conform to section 2C.06 of the MUTCD. Advisory Speed Plaques (W13-1P) should supplement Turn signs (W1-1R or W1-1L) and Curve signs (W1-2R or W1-2L).
2. Advisory speed shall be based on a safe curve speed study in accordance with FDOT's Manual on Uniform Traffic Studies.

- H. Date of Birth Stickers:
1. Street name signs shall have the month and year the sign was fabricated embedded in the lower right corner of the sign legend.
  2. All other signs shall have a City standard date of birth sticker affixed to the lower right corner on the back of the sign. Refer to City Standard Detail T-7.

## 2.2 RETROREFLECTIVE SHEETING

- A. Reflective sheeting material shall consist of the following 3M® Brand pressure sensitive adhesive and liner brand materials.
1. Type IV – High Intensity Grade Prismatic Reflective Sheeting Series 3930
  2. Type XI – Diamond Grade DG3 Reflective Sheeting Series 4000
- B. The type of sheeting to be used per sign application is listed in the table below.

SIGN APPLICATION	TYPE OF SHEETING	
	IV	XI
Regulatory Signs		X
Guide Signs (Green, Blue, or Brown)		X
Orange Fluorescent Maintenance Signs		X
Orange Fluorescent Maintenance Rollup Signs	X	
Barricades & Other Work Zone Devices	X	
Object Markers & Delineators	X	
Adopt-A-Street & Memorial Signs	X	
Destination & Facilities Signs	X	
Miscellaneous Information Signs	X	
Warning Signs		X
Stop Signs		X
School & Pedestrian Signs (Fluorescent Yellow-Green)	X	

## 2.3 SIGN BLANK

- A. Sign blanks shall be aluminum alloy 6061-T6 sheet, 0.080 gauge in accordance with section 700 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. All corners shall be rounded with a 1-1/2-inch or ¾-inch radius and shall be provided with standard perforated holes.

## 2.4 SIGN POSTS

- A. Square Post shall be/have: (Refer to City Standard Detail T-5)
  - 1. Manufactured from high-tensile steel with a yield strength of 50,000 psi (min.) and a tensile strength of 55,000 psi (min.).
  - 2. Galvanized both inside and outside per ASTM Standard A-123. Final finish by aluminum oxide dip (gloss).
  - 3. 2" x 2" square, 14 gauge section.
  - 4. Wall thickness: 0.065 inch.
  - 5. A minimum of 1.64 pounds per lineal foot.
  - 6. A minimum of thirty-two (32) 3/8-inch holes, one-inch-on-center.
  - 7. Fully perforated.
- B. Round (Tubular) Post, if approved by the City Traffic Engineer, shall be/have:
  - 1. Manufactured from high-tensile steel with a minimum yield strength of 50,000 psi and a minimum tensile strength of 55,000 psi.
  - 2. Galvanized both inside and outside per ASTM Standard A-123. Final finish by aluminum oxide dip (gloss).
  - 3. Outside diameter: 2-3/8 inches.
  - 4. Wall thickness: 0.065 inch.
  - 5. A minimum weight of 1.605 pounds per lineal foot.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.

### 3.2 PREPARATION

- A. Contractor shall examine the Site to determine if any conflicts exist between proposed signage location(s) and any existing utility or feature.
  - 1. Contractor shall notify Engineer immediately if conflicts exist that require alternate signage location.

### 3.3 INSTALLATION

- A. All traffic sign installations shall comply with the following:
  - 1. Manual on Uniform Traffic Control Devices (MUTCD).
  - 2. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)



3. Florida Department of Transportation Design Standards.
  4. Florida Building Code 'Chapter 11 – Florida Accessibility Code for Building Construction'.
  5. The City-Approved Site Development Plans.
- B. Post shall be installed a minimum of three feet (3') in the ground.
  - C. If sign post is to be installed in concrete, Contractor shall cut an eight-inch (8") round hole large enough to fit a standard pair of post hole diggers.
  - D. Mounting height shall be in accordance with section 2A.18 of the MUTCD.
  - E. All signs shall be mounted using a minimum of two bolts in accordance with City Standard Detail T-3.
- 3.4 FIELD QUALITY CONTROL
- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
  - B. Remove and replace any sign, post, or hardware damaged during execution of the Work.

END OF SECTION

## SECTION 27 13 43

### COMMUNICATIONS SERVICES CABLING (CITY OF OCALA BUILDINGS ONLY)

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Arrangement with City of Ocala Fiber Network for telecommunication service.
  - 2. Backboards, Cabinets, Termination Devices, Outlets, and Premises wiring.

##### 1.2 REFERENCES STANDARDS:

- A. Telecommunications Industry Association/Electronic Industries Alliance:
  - 1. TIA/EIA 568 - Commercial Building Telecommunications Cabling Standard.
  - 2. TIA/EIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces.
- B. Underwriters Laboratories, Inc.:
  - 1. UL 2043 – Fire Test for Heat and Visible Smoke Release for Discrete Products and their Accessories Installed in Air-Handling Spaces.

##### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with City of Ocala Fiber Network.

##### 1.4 SYSTEM DESCRIPTION

- A. Backbone Pathway: Conform to TIA/EIA 569 using conduit, sleeves, and slots as indicated on Drawings.
- B. Horizontal Pathway: Conform to TIA/EIA 569, using raceway, backboards, and cabinets as indicated on Drawings.
- C. Entrance Wiring: To be completed by the Telephone Utility Company.
- D. Backbone Wiring: To be completed by the Telephone Utility Company. Complete from entrance equipment (as directed) to each telecommunications closet using unshielded backbone cables.
- E. Horizontal Wiring: To be completed by the Telephone Utility Company. Complete from telecommunications closet (as directed) to each outlet using unshielded horizontal cables.

## 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit catalog data for each termination device, cable, and outlet device.
- C. Test Reports: Indicate procedures and results for specified field testing and inspection.

## 1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations and sizes of pathways and outlets.

## 1.7 QUALITY ASSURANCE

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.
- B. Provide combustible electrical equipment exposed within plenums with peak rate of heat release not greater than 100 kW, peak optical density not greater than 0.5, and average optical density not greater than 0.15 when tested in accordance with UL 2043.
- C. Perform Work in accordance with of TIA/EIA standards.
- D. Maintain one copy of each document on site.

## 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in installing products specified in this section with minimum three years documented experience.
- C. Testing Agency: Company must be a member of International Electrical Testing Association and specializing in testing products specified in this section with minimum three (3) years documented experience.

## 1.9 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

## 1.10 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish 3-port Data/telephone outlet jacks.
- C. All wall phone outlet jacks must be 60 inches on-center off the floor.

## 1.11 COORDINATION

- A. Coordinate with utility company, relocation of overhead or underground lines interfering with construction. Where power lines are to be relocated, bill utility costs directly to Owner.
- B. Contact utility company regarding charges related to service installation. Include utility charges in this contract.
- C. Utility charges for service installation paid by Owner and are not part of this contract.

## PART 2 - PRODUCTS

### 2.1 TELEPHONE TERMINATION BACKBOARDS

- A. Material: Plywood.
- B. Size: 4' x 8' (feet), ¾ inch thick or as indicated on Drawings.

### 2.2 TELEPHONE TERMINATION CABINETS

- A. Manufacturers:
  - 1. Must be approved by City of Ocala Fiber Network.
- B. Product Description: Galvanized steel box with removable end walls, size as needed. Furnish plywood backboard inside cabinet for mounting telephone termination devices.
- C. Cabinet Fronts: Steel, flush surface type with concealed trim clamps, screw cover front, concealed hinge, double doors, and flush lock keyed to match branch circuit panelboard.
- D. Finish: Gray baked enamel.

### 2.3 CROSS-CONNECT

- A. Manufacturers:
  - 1. Must be approved by City of Ocala Fiber Network.

- B. Product Description: TIA/EIA 568, wall-mounted or rack-mounted assembly of terminals with adequate capacity for active and spare circuits.

#### 2.4 PATCH PANEL

- A. Manufacturers:
  - 1. Must be approved by City of Ocala Fiber Network.
- B. Product Description: TIA/EIA 568, wall-mounted or rack-mounted assembly of terminals and accessory patch cords, with adequate capacity for active and spare circuits.

#### 2.5 TELEPHONE & DATA OUTLET JACKS

- A. Manufacturers:
  - 1. Must be approved by City of Ocala Fiber Network.
- B. Product Description: Conform to TIA/EIA 568 requirements for cable connectors for specific cable types. All terminations shall be TIA 568B pattern.
- C. Each location shall have (3) CAT5 E cables. Exceptions will be T.V.s, Cameras, Wi-Fi access points, door access connections or as directed by the city Telecom rep.
- D. Each location shall be labeled as 1A,1B,1C 2A,2B,2C etc. at the outlet & patch panel.

#### 2.6 UNSHIELDED BACKBONE CABLE

- A. Manufacturers:
  - 1. Must be approved by City of Ocala Fiber Network.
- B. Product Description: TIA/EIA 568, 100-ohm, unshielded twisted pair plenum rated noncombustible cable with 100 /50/25 pairs. As needed for the install. 24 AWG copper conductor.

#### 2.7 SHIELDED BACKBONE CABLE

- A. Manufacturers:
  - 1. Must be approved by City of Ocala Fiber Network.
- B. Product Description: TIA/EIA 568, 150-ohm shielded, twisted-pair plenum rated noncombustible cable with 4 pairs, 24 AWG copper conductor.

#### 2.8 COAXIAL BACKBONE CABLE

- A. Manufacturers:
  - 1. Must be approved by City of Ocala Fiber Network.
- B. Product Description: TIA/EIA 568, 50-ohm coaxial plenum rated noncombustible cable.

## 2.9 UNSHIELDED HORIZONTAL CABLE

- A. Manufacturers:
  - 1. Must be approved by City of Ocala Fiber Network.
- B. Product Description: TIA/EIA 568, 100-ohm, unshielded twisted pair plenum rated noncombustible cable with 4 pairs, 24 AWG copper conductor.

## 2.10 SHIELDED HORIZONTAL CABLE

- A. Manufacturers:
  - 1. Must be approved by City of Ocala Fiber Network.
- B. Product Description: TIA/EIA 568, 150-ohm shielded, twisted-pair plenum rated noncombustible cable with 2 pairs, 24 AWG copper conductor.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install pathways in accordance with TIA/EIA 569.
- B. Install wire and cable in accordance with TIA/EIA 568.
- C. Finish paint termination backboards with durable white enamel prior to installation of telephone equipment.
- D. Install termination backboards and cabinets plumb and attach securely to building wall at each corner. Install cabinet trim plumb.
- E. Install recessed cabinets flush with wall finishes, and stub five empty 1-inch conduits to accessible location above ceiling below floor at each location.
- F. Install pull wire and polyethylene pulling string in each empty telephone conduit over 10-feet in length or containing bends.
- G. Install labeled plastic nameplates in accordance with State Standards. Mark backboards and cabinets with legend "Data jack #."
- H. Ground and bond pathways, cable shields, and equipment in accordance with Section 27 05 26.

## 3.2 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

- B. Inspect and test copper cables and terminations in accordance with TIA/EIA 568.
- C. Submit certified results to city Telecom Rep.

END OF SECTION

SECTION 31 05 13  
SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Subsoil materials.
  - 2. Granular materials.
  - 3. Topsoil materials.
- B. Related Requirements:
  - 1. Section 31 23 16 - Excavation.
  - 2. Section 31 23 23 - Fill.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg Rammer and a 457-mm Drop.
- B. ASTM International:
  - 1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>).
  - 2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>).
  - 3. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
  - 4. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit name of imported materials source.
- C. Samples: Submit, in airtight containers, 10-lb. sample of each type of fill to testing laboratory.
- D. Supplier's Certificate: Certify that products meet or exceed specified requirements.



- E. Source Quality-Control Submittals: Indicate results of testing data demonstrating compliance with the Contract Documents.

#### 1.4 QUALITY ASSURANCE

- A. Furnish each subsoil material from single source throughout Work.
- B. Perform Work according to Florida Department of Transportation standards.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Subsoil:
  - 1. Type S1 - Select Fill:
    - a. Type S1 Select Fill shall be AASHTO M 145 Class A-1 or A-3 and as specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 2. Type S2 – Excavated Onsite Fill:
    - a. Excavated onsite fill may be used upon approval of the Engineer.
    - b. Excavated onsite fill shall be free of lumps larger than 3 inches, rocks larger than 2 inches, debris, and organic matter.
    - c. Liquid Limit < 45.
    - d. Plasticity Index < 25.
- B. Granular Fill:
  - 1. Type S3 Granular Fill shall comply with Section 204 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- C. Topsoil:
  - 1. Type S4 – Imported Topsoil: Comply with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 2. Type S5 – Onsite Topsoil:
    - a. Excavated and reused onsite topsoil material may be used upon approval by the Engineer.
    - b. If approved, onsite topsoil shall be stockpiled with appropriate erosion and sediment control measures.
    - c. Onsite topsoil shall be graded and single screened.
    - d. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.

#### 2.2 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

- B. Testing and Analysis:
  - 1. Subsoil Material: Comply with AASHTO T 180.
  - 2. Topsoil Material: Comply with AASHTO T 180.
  - 3. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Owner Inspection:
  - 1. Make subsoil and topsoil available for inspection at source prior to packaging for shipment.
  - 2. Notify Owner at least seven days before inspection is allowed.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Excavation:
  - 1. Excavate subsoil and topsoil from designated areas.
  - 2. Strip topsoil to full depth of topsoil in designated areas.
  - 3. Remove excess excavated materials, subsoil, and topsoil not intended for reuse from Site.
  - 4. Remove excavated materials not meeting requirements for subsoil and topsoil materials from Site.
- B. Stockpiling:
  - 1. Stockpile excavated material meeting requirements for subsoil and topsoil materials.
  - 2. Stockpile materials on Site only in locations where they will not interfere with the progress of the work. Offsite stockpiling, if necessary, shall be the responsibility of the Contractor.
  - 3. Stockpile in sufficient quantities to meet Project schedule and requirements.
  - 4. Separate differing materials with dividers or stockpile apart to prevent intermixing of soil types or contamination.
  - 5. Stockpile topsoil maximum 8 feet high.
  - 6. Direct surface water away from stockpile to prevent erosion or deterioration of materials.

### 3.2 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Stockpile:
  - 1. Remove stockpile and leave area in clean and neat condition.
  - 2. Grade Site surface to prevent freestanding surface water.

END OF SECTION

## SECTION 31 10 00

### SITE CLEARING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Removing surface debris.
  - 2. Removing designated paving, curbs, sidewalks, and other existing features.
  - 3. Removing designated trees, shrubs, and other plant life.
  - 4. Removing abandoned utilities.
  - 5. Excavating topsoil.

##### 1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

##### 1.3 QUALITY ASSURANCE

- A. Conform to applicable code for environmental requirements and disposal of debris.
- B. Perform Work in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and as shown and specified herein.

#### PART 2 - PRODUCTS (NOT USED)

#### PART 3 - EXECUTION

##### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.
- C. Identify waste area and salvage area for placing removed materials.

### 3.2 PREPARATION

- A. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.

### 3.3 PROTECTION

- A. Locate, identify, and protect utilities indicated to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

### 3.4 CLEARING

- A. Remove trees and shrubs within the clearing limits shown. Remove stumps and main root ball.
- B. Clear undergrowth and deadwood, without disturbing subsoil.
- C. Apply herbicide to remaining stumps to inhibit growth.

### 3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from Site.
- B. Remove paving, curbs, sidewalks, and other existing features as indicated on Drawings. Neatly saw cut concrete edges at right angle to surface.
- C. Remove abandoned utilities as shown. Indicated removal termination point for underground utilities on Record Documents.
- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- . Do not burn or bury materials on site. Leave site in clean condition.

### 3.6 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas as shown to be further excavated, landscaped, or regraded, without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.

- C. Stockpile topsoil in storage piles in areas shown, or where otherwise approved by Engineer. Construct storage piles to freely drain surface water. Cover storage piles to prevent windblown dust.
- D. Remove excess topsoil not intended for reuse from Site.

END OF SECTION

## SECTION 31 23 16

### EXCAVATION

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes general requirements for excavation activities as shown and specified.
- B. Related Requirements:
  - 1. Section 31 23 23 - Fill.

##### 1.2 REFERENCE STANDARDS

- A. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

##### 1.3 DEFINITIONS

- A. Rock: Material encountered in excavation that cannot be dislodged by a track-type hydraulic excavator, equipped with a 42-inch wide short-tip radius rock bucket, rated at not less than 120 horsepower flywheel power with bucket-curling force of not less than 25,000 lbs. and stick-crowd force of not less than 18,000 lbs.
  - 1. Rock shall not include materials such as hardpan, loose rock, concrete or other materials that can be removed by means other than drilling, but which for reasons of economy in excavating the Contractor chooses to remove by drilling or other means.

##### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
  - 1. Excavation Protection Plan:
    - a. Describe sheeting, shoring, and bracing materials and installation, as required, to protect excavations and adjacent structures and property.
    - b. Submit signed and sealed Shop Drawings with design calculations and assumptions to support plan.
- C. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- D. Qualifications Statement:
  - 1. Submit qualifications for licensed professional.

## 1.5 QUALITY ASSURANCE

- A. Perform Work according to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 1.6 QUALIFICATIONS

- A. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of Florida.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Utility Service Locator:
  - 1. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.
  - 2. Request that underground utilities be located and marked within and immediately surrounding construction areas.
  - 3. Identify required lines, levels, contours, and data.
  - 4. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
  - 5. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility Owner immediately for directions. Coordinate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility Owner.
- C. Existing Utilities:
  - 1. Notify utility companies and coordinate protection or relocation of utilities.
  - 2. Protect from damage utilities not indicated to be removed.
  - 3. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
  - 4. Provide minimum of 48-hour notice to Engineer, and receive written notice to proceed before interrupting any utility.
  - 5. Demolish and completely remove from site existing under-ground utilities indicated to be removed. Coordinate with utility Owner for shut-off of services if lines are active.

- 6. In the event that an existing utility is broken Contractor shall contact utility owner, Owner, and Engineer immediately. Coordinate repair with utility owner at their direction. The Contractor shall be responsible for all costs associated with damaged utilities.
  - 7. Utility Poles: Contractor shall communicate directly with utility companies when performing work around utility poles. Contractor shall bear all costs associated with work, including expense of temporarily supporting poles.
- D. When performing trench excavation in excess of 5-feet in depth, comply with OSHA requirements for trench safety standards, 29 CFR 1926, subpart b, and all subsequent revisions or updates adopted by the Department of Labor. Submission of bid and subsequent execution of Contract will serve as certification that all excavation in excess of 5-feet in depth will be in compliance with section 553. 62, Florida Statutes.
- . Use of explosives is not allowed.
- F. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
- . Protect plant life, lawns, and other features designated to remain as portion of final landscaping.
  - . Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, curbs, and other existing facilities and objects from excavating equipment and vehicular traffic.
  - . Do not close or obstruct driveways, roadways, sidewalks, or hydrants without permits.
  - . Erect and maintain temporary barriers and security devices, including warning signs, warning lights, and similar measures, for protection of public, Owner, and existing improvements indicated to remain.
    - 1. Temporary barriers shall be installed and maintained in compliance with authorities having jurisdiction.

### 3.2 EXCAVATION

- A. Underpin adjacent structures which may be damaged by excavation Work.
- B. Excavate subsoil to accommodate slabs on grade, paving, Site structures, and construction operations.
- C. Compact disturbed load-bearing soil in direct contact with foundations to original bearing capacity, as specified in Section 31 23 23 - Fill.
- D. Slope banks with machine to angle of repose or less until shored.



- E. . Do not interfere with 45-degree bearing splay of foundations.
- F. . Grade top perimeter of excavation to prevent surface water from draining into excavation.
- G. . Trim excavation and remove loose matter.
- H. . Removal of Deleterious (harmful or damaging) Materials: All coarse aggregates shall be reasonably free of clay lumps, soft and friable particles, salt, alkali, organic matter, adherent coatings, and other substances not defined which may possess undesirable characteristics. The weight of deleterious substances shall not exceed the following percentages:

Coal and lignite (AASHTO T 113) .....	1.00
Soft and friable particles (AASHTO T 112).....	2.00*
Clay lumps (AASHTO T 112).....	2.00*
Plant root matter (visual inspection in AASHTO T 27) .....	0.005****
Wood and wood matter (visual inspection in AASHTO T 27) .....	0.005****
Cinders and clinkers .....	0.50
Free shell.....	1.00**
Total Material passing the No. 200 sieve (FM 1-T 011) At Source with Los Angeles Abrasion less than or equal to 30 .....	2.50
At Source with Los Angeles Abrasion greater than 30. ....	1.75
At Point of Use .....	3.75
Fine-Grained Organic Matter (AASHTO 194).....	0.03
Chert (less than 2.40 specific gravity SSD) (AASHTO T-113).....	3.00***

\*The maximum percent by weight of soft and friable particles and clay lumps together shall not exceed 3.00.

\*\*Aggregates to be used in asphalt concrete may contain up to 5% free shell. Free shell is defined as that portion of the coarse aggregate retained on the No. 4 sieve consisting of loose, whole, or broken shell, or the external skeletal remains of other marine life, having a ratio of the maximum length of the particle to the shell wall thickness exceeding five to one. Coral, molds, or casts of other shells, and crushed clam and oyster shell indigenous to the formation will not be considered as free shell.

\*\*\*This limitation applies only to coarse aggregates in which chert appears as an impurity. It is not applicable to aggregates which are predominantly chert.

\*\*\*\*Plant root matter, and wood and wood matter shall be considered deleterious when any piece exceeds two inches in length or 1/2 inch in width.

- I. . Remove excess and unsuitable material from Site.
- J. . Notify Engineer of unexpected subsurface conditions.
- K. . No payment will be made for correction of unauthorized excavation. Correct over-excavated areas as directed by Engineer.

- L. . Remove excavated material from Site.
- M. . Stockpile excavated material in area designated on Site as specified in Section 31 05 13 Soils for Earthwork.
- N. . Repair or replace items indicated to remain that have been damaged by excavation.
- O. . Except where otherwise authorized, shown or specified, all materials excavated below the bottom of concrete walls, footings, slabs on grade and foundations shall be replaced by, and at the expense of, the Contractor, with concrete placed at the same time and monolithic with the concrete above.

### 3.3 ROCK REMOVAL

- A. Excavate and remove rock by mechanical method.
  - 1. Drill holes and use expansive tools or wedges to fracture rock.
- B. Cut away rock at bottom of excavation to form level bearing.
- C. Remove shaled layers to provide sound and unshattered base.
- D. In utility trenches, excavate to twelve (12) inches below invert elevation of pipe and twenty-four (24) inches wider than pipe diameter.
- E. Remove excavated materials from site.
- F. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 23 unless otherwise directed by the Engineer. No payment will be made for unauthorized rock removal or correction thereof

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Inspecting: Request visual inspection of bearing surfaces by Engineer before installing subsequent Work.

### 3.5 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Prevent displacement or loose soil from falling into excavation, and maintain soil stability.

- C. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

END OF SECTION

SECTION 31 23 19  
DRAINAGE AND DEWATERING:

1. Contractor shall provide and maintain adequate drainage and dewatering equipment to remove and dispose of all surface water and groundwater entering excavations, or other parts of the Work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the pipe or structure to be built, therein is inspected by the Engineer and backfill operations have been completed and approved.
  - a. The different working areas on the Site shall be kept free of surface water at all times. Contractor shall install drainage ditches and dikes and shall perform all pumping and other Work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations and fill areas. The diversion and removal of surface water shall be performed in a manner that will prevent the accumulation of water behind temporary structures or at any other locations within the construction area where it may be detrimental.
  - b. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the water downstream of the point of discharge, shall not be directly discharged. Such waters shall be diverted through a settling basin or filter before being discharged.
  - c. Contractor will be held responsible for the condition of any pipe, conduit, or channel used for drainage purposes and all such pipes, conduits, or channels shall be left clean and free of sediment.
  - d. Remove water from excavations as fast as it collects.
2. Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose, piping, well points, deep wells, etc., necessary to depress and maintain the ground water level below the base of the excavations during all stages of construction operations. The groundwater table shall be lowered in advance of excavation, for a sufficient period of time to permit dewatering of fine grain soils, and maintained two feet below the lowest subgrade excavation made until the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.
  - a. Design of dewatering system, including both drawings and calculations, shall be performed by a Registered Professional Engineer in the State of Florida and shall be employed by Contractor. Dewatering system shall be designed to avoid settlement or damage to existing structures and utilities.
  - b. The system shall be operated on a 24-hour basis and standby pumping facilities and personnel shall be provided to maintain the continued effectiveness of the system.
  - c. If, in the opinion of the Engineer, the water levels are not being lowered or maintained as required, Contractor shall install additional or alternate dewatering devices as necessary, at no additional cost to the Owner.
  - d. Elements of the system shall be located to allow a continuous dewatering operation without interfering with the construction of the permanent Work. Where portions of the dewatering system are located in the area of permanent

construction, Contractor shall submit details of the methods proposed to construct the permanent Work in this location for the approval of the Engineer.

- e. Controls of groundwater shall continue until the permanent construction provides sufficient dead load to withstand the hydrostatic uplift of the normal groundwater, until concrete has attained sufficient strength to withstand earth and hydrostatic loads, and until all waterproofing Work has been completed.
- f. Dispose of all water removed from the excavation in a manner that does not endanger any portion of the Work under construction or completed.
- g. Disposal of water removed shall comply with all State and Federal regulations.
- h. Before discontinuing dewatering operations or permanently permitting the rise of the ground water level, computations shall be made to show that any structure affected by the water level rise is protected by backfill or other means to sustain uplift. Use a safety factor of 1.25 when making these computations.
- i. Dewatering operations shall not be discontinued without the prior authorization of the Engineer.

END OF SECTION

## SECTION 31 23 23.00

### FILL

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes general requirements for backfill activities as shown and specified.
- B. Related Requirements:
  - 1. Section 31 05 13 - Soils for Earthwork.
  - 2. Section 31 23 16 - Excavation.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg Rammer and a 457-mm Drop.
- B. ASTM International:
  - 1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>).
  - 2. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
  - 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>).
  - 4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
  - 5. ASTM D6031/D6031M - Standard Test Method for Logging In Situ Moisture Content and Density of Soil and Rock by the Nuclear Method in Horizontal, Slanted, and Vertical Access Tubes.
  - 6. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

##### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information for geotextile fabric, indicating fabric and construction.
- C. Samples: Submit, in airtight containers, one 10-lb. sample of each type of fill to testing laboratory.

- D. Materials Source: Submit name of imported materials suppliers.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

#### 1.4 QUALITY ASSURANCE

- A. Perform Work according to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Select Fill: Type S1, as specified in Section 31 05 13 - Soils for Earthwork.
- B. Granular Fill: Type S3, as specified in Section 31 05 13 – Soils for Earthwork.
- C. Concrete:
  - 1. Description:
    - a. Structural, as specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
    - b. Compressive Strength: 4,000 psi.

#### 2.2 ACCESSORIES

- A. Geotextile Fabric: As specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that sub-drainage, damp-proofing, and waterproofing installations have been inspected.
- C. Verify that underground structures are properly anchored to avoid flotation after backfilling.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Compact subgrade to specified density requirements for subsequent backfill materials.
- C. Soft Subgrade:
  - 1. Cut out soft areas of subgrade not capable of compaction in place.
  - 2. Backfill with granular fill and compact to density equal to or greater than specified requirements for subsequent fill material.
- D. Scarify subgrade surface to depth of 6 inches.

### 3.3 BACKFILLING

- A. Backfill areas to contours and elevations.
- B. Systematically backfill to allow maximum time for natural settlement.
- C. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces, and do not backfill with frozen materials.
- D. Geotextile: Place geotextile fabric prior to placing subsequent fill materials.
- E. Maximum Compacted Depths:
  - 1. Place material in continuous layers to following depths:
    - a. Subsoil Fill: 6 inches.
    - b. Granular Fill: 6 inches.
  - 2. The Engineer may grant permission to increase lift depth to 12 inches upon proof of successful compaction to the specified densities at the lift depths specified.
- F. Compaction:
  - 1. Pipe Trench Backfill:
    - a. Lowest Zone: Undercuts to within 4 inches of pipe bottom, compact to match soil in trench.
    - b. Bedding Zone: Above Lowest Zone, usually 4 inches below pipe.
      - 1) No Undercut: Loosen soil.
      - 2) Undercut: Leave loose below middle third of pipe and compact outside portions to 100% T99 Standard Proctor Density
    - c. Cover Zone: Extends from Bedding Zone to 12 inches above top of pipe. Compact to 95% T99 Standard Proctor Density
    - d. Top Zone: Extends from Cover Zone to base or final grade. Compact to 100% T99 Standard Proctor Density.
  - 2. Embankment: Compact to 100% Florida Method-1 (FM-1) T99 Standard Proctor Density, Method C.
  - 3. Subgrade: Compact to 98% FM-1 T180 Modified Proctor Density, Method D.



4. Rock Base:
  - a. Roadways: Compact to 98% FM-1 T180 Modified Proctor Density.
  - b. Shoulders, Bike Paths, and Shared Use Paths: Compact to 95% FM-1 T180 Modified Proctor Density.
- G. Use placement method that does not disturb or damage foundation perimeter drainage or utilities in trench.
- H. Maintain optimum moisture content of fill materials to attain required compaction density.
- I. Structures:
  1. Backfill against supported foundation walls.
  2. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
  3. Slope grade away from building minimum 5 percent slope for minimum distance of 10 feet.
- J. Make gradual grade changes and blend slope into level areas.
- K. Remove surplus backfill materials from Site.
- L. Leave fill material stockpile areas free of excess fill materials.

### 3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Top Surface of Backfilling under Paved Areas: Plus or minus 1 inch from required elevations.
- C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Inspecting: Request visual inspection of bearing surfaces by Engineer before installing subsequent Work.
- C. Testing:
  1. Laboratory Material Testing: Comply with AASHTO T99 and FM-1 T180 as specified.
  2. In-Place Compaction Testing:
    - a. Density Tests: Comply with ASTM D6938.
    - b. Moisture Tests: Comply with ASTM D6031/D6031M.

3. If tests indicate that Work does not meet specified requirements, remove Work, replace, compact, and retest.
  4. Testing Frequency:
    - a. Roadway: Minimum of one (1) moisture and one (1) density test per lift for each 500 feet along the alignment shown or as specified by the Engineer.
    - b. Utility Trench: Minimum of two (2) moisture and two (2) density tests per lift per run of pipe spaced as shown on the detailed drawings or as specified by the Engineer.
    - c. Area Fill: As specified by the Engineer.
  5. Proof-roll compacted fill surfaces under slabs on grade and paving.
- D. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the General Conditions.
- E. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Engineer or Owner.
- 3.6 PROTECTION
- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Reshape and recompact fills subjected to vehicular traffic during construction.

END OF SECTION

## SECTION 31 23 23.33

### FLOWABLE FILL

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes furnishing and installing Flowable and Non-Flowable Fill.
- B. Related Requirements:
  - 1. Section 31 23 16 - Excavation.
  - 2. Section 31 23 23 - Fill.
  - 3. Section 33 14 13 - Public Water Utility Distribution Piping
  - 4. Section 33 15 00 - Reclaimed Water Distribution Piping
  - 5. Section 33 31 11 - Public Sanitary Sewerage Gravity Piping
  - 6. Section 33 31 23 - Sanitary Sewerage Force Main Piping

##### 1.2 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, manhole, tank, or cable.
- B. Excavatable Flowable Fill: Lean cement concrete fill used where future excavation may be required, such as fill for utility trenches, bridge abutments, and culverts.
- C. Non-excavatable Flowable Fill: Lean cement concrete fill used where future excavation is not anticipated, such as fill below structure foundations and filling abandoned utilities.

##### 1.3 REFERENCE STANDARDS

- A. ASTM International:
  - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 2. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
  - 3. ASTM C150 - Standard Specification for Portland Cement.
  - 4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
  - 5. ASTM C403 - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.
  - 6. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
  - 7. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
  - 8. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - 9. ASTM C1040 - Standard Test Methods for Density of Unhardened and Hardened Concrete in Place By Nuclear Methods.
  - 10. ASTM D4832 - Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.

#### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Manufacturer's Certificate: Certify that materials meet or exceed specified requirements.
- C. Field Quality-Control Submittals:
  - 1. Mix Design:
    - a. Furnish flowable fill mix design for each specified strength.
    - b. Furnish separate mix designs when admixtures are required for the following:
      - 1) Flowable fill Work during hot and cold weather.
      - 2) Air entrained flowable fill Work.
    - c. Identify design mix ingredients, proportions, properties, admixtures, and tests.
  - 2. Furnish test results to certify flowable fill mix design properties meet or exceed specified requirements.
- D. Delivery Tickets:
  - 1. Furnish duplicate delivery tickets indicating actual materials delivered to Project Site.
- E. Qualifications Statements:
  - 1. Submit qualifications for supplier.

#### 1.5 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Transportation standards.

#### 1.6 QUALIFICATIONS

- A. Supplier:
  - 1. Company specializing in supplying products specified in this Section with minimum five (5) years of documented experience.
  - 2. Product source approved by authority having jurisdiction.

#### 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 50 00 - Temporary Facilities and Controls specifies ambient condition control facilities for product storage and installation.
- B. Minimum Conditions: Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees F.

#### 1.8 FIELD MEASUREMENTS

- A. Verify field measurements before installing flowable fill to establish quantities required to complete the Work.

## PART 2 - PRODUCTS

### 2.1 FLOWABLE FILL

- A. Furnish materials according to Florida Department of Transportation standards.
- B. Flowable Fill: Excavatable type and non-excavatable type.

### 2.2 MATERIALS

- A. Materials shall be in conformance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Water: Clean and not detrimental to concrete.

### 2.3 ADMIXTURES

- A. Admixtures shall be in conformance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

### 2.4 MIXES

- A. Excavatable and Non-Excavatable Flowable Fill Mixes shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

### 2.5 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Test and analyze properties of flowable fill design mix and certify results for the following:
  - 1. Design mix proportions by weight of each material.
  - 2. Aggregate: ASTM C33 for material properties and gradation.
  - 3. Properties of plastic flowable fill design mix including:
    - a. Temperature.
    - b. Slump.
    - c. Air entrainment.
    - d. Wet unit weight.
    - e. Yield.
    - f. Amount of Cement.
  - 4. Properties of hardened flowable fill design mix including:
    - a. Compressive strength at 1 day, 7 days, and 28 days. Report compressive strength of each specimen and average specimen compressive strength.
    - b. Unit weight for each sample and average sample unit weight at time of compressive strength testing.
- C. Prepare delivery tickets containing the following information:

1. Project designation.
2. Date.
3. Time.
4. Class and quantity of flowable fill.
5. Actual batch proportions.
6. Free moisture content of aggregate.
7. Quantity of water withheld.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting Work.
- B. Verify excavation shown and specified is complete.
- C. Verify utility installation is complete and tested before placing flowable fill.
- D. Verify excavation is dry.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.
- C. Protect structures and utilities from damage caused by hydraulic pressure of flowable fill before fill hardens.
- D. Protect utilities and foundation drains to prevent intrusion of flowable fill.

### 3.3 INSTALLATION - FILL, BEDDING, AND BACKFILL

- A. Place flowable fill by chute, pumping or other methods approved by Engineer.
  1. When required, place flowable fill under water using a tremie.
  2. Do not place flowable fill through flowing water.
- B. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.
- C. Place flowable fill evenly on both sides of utilities to maintain alignment.
- D. Place flowable fill to elevations indicated on Drawings without vibration or other means of compaction.

### 3.4 INSTALLATION - FILLING ABANDONED UTILITIES

- A. Verify pipes and conduits are not clogged and are sufficiently empty to permit gravity installation of flowable fill for entire length indicated to be filled.
- B. Seal lower end of pipes and conduits to contain flowable fill and to vent trapped air caused by filling operations.
- C. Use the following methods placing flowable fill to ensure there are no voids.
  - 1. Fill pipes and conduits from high end.
  - 2. Fill manholes, tanks, and other structures from grade level access points.
- D. After filling pipes and conduits seal both ends.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Perform inspection and testing according to ASTM C94/C94M.
  - 1. Take samples for tests for every 150 cu yd of flowable fill, or fraction thereof, installed each day.
  - 2. Sample, prepare, and test four compressive strength test cylinders according to ASTM D4832. Test one specimen at 3 days, one at 7 days, and two at 28 days.
  - 3. Measure temperature at point of delivery when samples are prepared.
- C. Perform in-place density tests using nuclear test device according to ASTM C1040.
  - 1. Perform tests at locations as directed by Engineer.
- D. Defective Flowable Fill: Fill failing to meet the following test requirements or fill delivered without the following documentation.
  - 1. Test Requirements:
    - a. Minimum temperature at point of delivery.
    - b. Compressive strength requirements for each type of fill.
  - 2. Documentation: Duplicate delivery tickets.

### 3.6 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove spilled and excess flowable fill from Project Site.
- C. Restore facilities and Site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION

## SECTION 31 25 00

### EROSION AND SEDIMENTATION CONTROLS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes requirements for furnishing and installing erosion and sedimentation controls.
- B. Related Sections:
  - 1. Section 31 23 23 – Fill.
  - 2. Section 33 05 61 – Concrete Manholes.
  - 3. Section 33 14 13 – Public Water Utility Distribution Piping.
  - 4. Section 33 15 00 – Reclaimed Water Distribution System.
  - 5. Section 33 31 11 – Public Sanitary Sewerage Gravity Piping.
  - 6. Section 33 31 23 – Sanitary Sewerage Force Main Piping.
  - 7. Section 33 32 11 – Field-Erected Wastewater Pumping Stations.

##### 1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
  - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
- C. ASTM International:
  - 1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
  - 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>).
  - 3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>).
  - 4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

##### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.



- B. Product Data: Submit data on geotextile.
- C. Samples:
  - 1. Submit two samples of rock, minimum 5 tons each or one half total project quantity, whichever is smaller. Provide one sample in place at construction site and provide other sample at quarry. Construction site sample may be incorporated into the Work. Samples will be used as reference for judging size, and graduation of rock supplied and placed.
- D. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

#### 1.5 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Transportation and Florida Department of Environmental Protection standards.

#### 1.6 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one (1) week prior to commencing work of this section.

#### 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not place grout when air temperature is below freezing.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

### PART 2 - PRODUCTS

#### 2.1 ROCK AND GEOTEXTILE MATERIALS

- A. Furnish rock and geotextile materials according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.2 CONCRETE MATERIALS AND REINFORCEMENT

- A. Furnish cement, aggregate, admixtures, and reinforcement in per Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Water: Clean and not detrimental to concrete.

## 2.3 BLOCK, STONE, AGGREGATE, AND SOIL MATERIALS

- A. Furnish block, stone, aggregate, and soil materials according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.4 PLANTING MATERIALS

- A. Seeding, Soil Supplements, and Mulch: Furnish according to Florida Department of Transportation standards.

## 2.5 PIPE MATERIALS

- A. Pipe: Furnish according to Florida Department of Transportation standards.

## 2.6 ACCESSORIES

- A. Furnish the following accessories in accordance with Florida Department of Transportation standards:
  - 1. Joint Sealers.
  - 2. Joint Fillers.
  - 3. Building Paper.
  - 4. Grout.
  - 5. Steel Plate Vortex Device.
  - 6. Welding Material.
  - 7. Anti-Seep Collar.
  - 8. Trash Racks.

## 2.7 MIXES

- A. Concrete: Furnish according to Florida Department of Transportation standards.

## 2.8 SOURCE QUALITY CONTROL (AND TESTS)

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.
- C. Test samples in accordance with ACI 301.

- D. Make rock available for inspection at producer's facility prior to shipment. Notify Engineer at least seven days before inspection is allowed.
- E. Allow witnessing of inspections and test at manufacturer's test facility. Notify Engineer at least seven days before inspections and tests are scheduled

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- . Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- . Verify compacted material is acceptable and ready to support devices and imposed loads.
- . Verify gradients and elevations of base or foundation for other work are correct.

### 3.2 INSTALLATION OF EROSION AND SEDIMENT CONTROL

#### A. Erosion Control:

1. All erosion and sediment controls shall be installed as shown and in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
2. In general, the construction procedures outlined herein shall be implemented to assure minimum damage to the environment during construction. Contractor shall take any and all additional measures required to conform to the requirements of applicable codes and regulations.
3. Whenever possible, access and temporary roads shall be located and constructed to avoid environmental damage. Provisions shall be made to regulate drainage, avoid erosion, and minimize damage to vegetation.
4. Where areas must be cleared for storage of materials or temporary structures, provisions shall be made for regulating drainage and controlling erosion, subject to the Engineer's approval.
5. Temporary measures shall be applied to control erosion and to minimize the silting of the existing waterways, and natural ponding areas. Such measures shall include, but are not limited to, the use of berms, silt barriers, gravel or crushed stone, mulch, slope drains and other methods. These temporary measures shall be applied to erodible materials exposed by any activities associated with the Work.
  - a. Special care shall be taken to eliminate depressions that could serve as mosquito pools.
  - b. Temporary measures shall be coordinated with the construction of permanent drainage facilities and other Work to the extent practicable to assure economical, effective, and continuous erosion and silt control.
  - c. Contractor shall provide special care in areas with steep slopes. Disturbance of vegetation shall be kept to a minimum to maintain stability.

6. Remove only those shrubs and grasses that must be removed for construction. Protect the remainder to preserve their erosion-control value.
7. Install erosion and sediment control practices where shown on the Drawings and according to applicable standards, codes, and specifications. The practices shall be maintained in effective working condition during construction and until the drainage area has been permanently stabilized.
8. After stabilization, remove all silt barriers, debris, etc., from the Site.
9. In the event of any temporary Work stoppage, Contractor shall take steps to stabilize the Site and prevent erosion.
10. In the event Contractor repeatedly fails to satisfactorily control erosion and siltation, the Owner reserves the right to employ outside assistance or to use its own forces to provide the corrective measures indicated. The Contractor shall be responsible for all costs associated with such corrective measures.
11. Contractor shall prevent blowing and movement of dust from exposed soil surfaces and access roads to reduce on and off-site damage and health hazards. Control may be achieved by irrigation in which the Site shall be sprinkled with water until the surface is moist. The process shall be repeated, as required.

### 3.3 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize, and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2: 1 or flatter.
- D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
  1. During non-germinating periods, apply mulch at recommended rates.
  2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year with temporary seeding.
  3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year with permanent seeding and/or sodding as shown and specified.
- E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

### 3.4 FIELD QUALITY CONTROL

- A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- B. Field test concrete in accordance with Florida Department of Transportation standards.

- C. Compaction Testing: As specified in Section 31 23 23 - Fill.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Frequency of Compaction Testing: As specified in Section 31 23 23 - Fill.

### 3.5 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.
- C. Do not damage structure or device during cleaning operations.
- D. Do not permit sediment to erode into construction or site areas or natural waterways.
- E. Clean channels when depth of sediment reaches approximately one half channel depth.

### 3.6 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- C. Do not permit construction traffic over paving until 75 percent design strength of concrete has been achieved.
- D. Protect paving from elements, flowing water, or other disturbance until curing is completed.

END OF SECTION

## SECTION 32 12 16

### ASPHALT PAVING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section general requirements for asphalt paving.
- B. Related Requirement:
  - 1. Section 31 23 16 – Excavation.
  - 2. Section 31 23 23 – Fill.
  - 3. Section 33 05 13 – Manholes.
  - 4. Section 32 17 13 – Parking Bumpers
  - 5. Section 32 17 23 – Pavement Markings

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M17 - Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
  - 2. AASHTO M29 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
  - 3. AASHTO M140 - Standard Specification for Emulsified Asphalt.
  - 4. AASHTO M208 - Standard Specification for Cationic Emulsified Asphalt.
  - 5. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
  - 6. AASHTO M320 - Standard Specification for Performance-Graded Asphalt Binder.
  - 7. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
  - 8. AASHTO MP1a - Standard Specification for Performance-Graded Asphalt Binder.
- B. ASTM International:
  - 1. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
  - 2. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
  - 3. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.
  - 4. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
  - 5. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
  - 6. ASTM D977 - Standard Specification for Emulsified Asphalt.

7. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
8. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
9. ASTM D2027 - Standard Specification for Cutback Asphalt (Medium-Curing Type).
10. ASTM D2397 - Standard Specification for Cationic Emulsified Asphalt.
11. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
12. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
13. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
14. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
15. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
16. ASTM D3910 - Standard Practices for Design, Testing, and Construction of Slurry Seal.
17. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
18. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
19. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
20. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
21. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
  1. Submit data for milling and paving equipment to be used.
  2. Submit product information for asphalt and aggregate materials.
  3. Submit mix design with laboratory test results supporting design.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

### 1.4 QUALITY ASSURANCE

- A. Mixing Plant: Certified by Florida Department of Transportation.
- B. Obtain materials from same source throughout.

- C. Perform Work in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 1.5 QUALIFICATIONS

- A. Installer: Company specializing in performing Work of this section with minimum five (5) years of documented experience.

## 1.6 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
- B. Do not place asphalt mixture when ambient air or base surface temperature is less than Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) requirements.

# PART 2 - PRODUCTS

## 2.1 ASPHALT PAVING

- A. Performance / Design Criteria:
  - 1. Pavement Design: Superpave Type SP-9.5 or Type SP-12.5 as shown or specified and in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Asphalt Materials:
  - 1. Materials for asphalt paving shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.2 MIXES

- A. Asphalt Paving Mixtures:
  - 1. Asphalt Paving Mixtures shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Use dry material to avoid foaming. Mix uniformly.

## 2.3 ACCESSORIES

- A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

## 2.4 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Submit proposed mix design of each class of mix for review prior to beginning of Work.



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.
- C. Verify compacted subbase is dry and ready to support paving and imposed loads.
  - 1. Proof roll subbase with a vibratory roller weighing a minimum of eight (8) tons or a sheepsfoot roller, where appropriate, exerting a compression of at least 250 pounds psi on the tamper foot for at least five (5) passes in minimum two (2) perpendicular passes to identify soft spots.
  - 2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23.
- D. Verify gradients and elevations of base are correct.
- E. Verify manhole frames and drainage structures are installed in correct position and elevation.

### 3.2 PREPARATION

- A. Prepare subbase in accordance with Florida Department of Transportation standards.

### 3.3 DEMOLITION

- A. Saw cut and notch existing paving as indicted on Drawings.
- B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.
- C. Repair surface defects in existing paving to provide uniform surface to receive new paving.
- D. Remove demolished asphalt from Site and dispose of properly.

### 3.4 MILLING OF EXISTING ASPHALT PAVEMENT

- A. Perform all milling operations in accordance with Florida Department of Transportation standards.
- B. Remove existing raised pavement markers prior to milling.
- C. Do not disfigure adjacent Work.

- D. Provide a milling machine capable of maintaining a depth of cut and cross slope that will achieve the results specified in the Contract Documents.
  - 1. Milling machine shall have a minimum overall length (out to out measurement excluding the conveyor) of eighteen (18) feet and a minimum cutting width of six (6) feet.
  - 2. Milling machine shall be equipped with a built-in automatic grade control system that can control the transverse slope and the longitudinal profile to produce the specified results.
  - 3. The Engineer will approve any commercially manufactured milling machine that meets the above requirements. If it becomes evident after starting milling that the milling machine cannot consistently produce the specified results, the Engineer will reject the milling machine for further use.
  - 4. The Contractor may use a smaller milling machine when milling to lower the grade adjacent to existing curb or other areas where it is impractical to use the above described equipment.
  - 5. Milling machine shall be equipped with means to effectively limit the amount of dust escaping during the removal operation.
  - 6. For complete pavement removal, the Engineer may approve the use of alternate removal and crushing equipment.
- E. Execute removal to depth not less than the depth(s) shown on the Drawing(s) at each point across full width of surface without detrimental aggregate degradation.
- F. Remove milled asphalt from Site and dispose of properly.

### 3.5 INSTALLATION

- A. Subbase: Prepare subbase in accordance with Florida Department of Transportation standards.
- B. Prime Coat and Tack Coat: Install in accordance with Florida Department of Transportation standards.
- C. Single Course Asphalt Paving:
  - 1. Install Work in accordance with Florida Department of Transportation standards.
  - 2. Place asphalt within 24 hours of applying primer or tack coat.
  - 3. Place asphalt wearing course to thickness indicated on Drawings.
  - 4. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
  - 5. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
- D. Double Course Asphalt Paving:
  - 1. Install Work in accordance with Florida Department of Transportation standards.
  - 2. Place asphalt binder course within 24 hours of applying primer or tack coat.
  - 3. Place binder course to thickness indicated on Drawings.

4. Place wearing course within 24 hours of placing and compacting binder course.
5. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
6. Place wearing course to thickness indicated on Drawings.
7. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
8. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

E. Asphalt Paving Overlay

1. Install Work in accordance with Florida Department of Transportation standards.
2. Apply tack coat to existing paving surface at rate recommended by geotextile fabric manufacturer.
3. Place wearing course to thickness indicated on Drawings.
4. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
5. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

F. Place asphalt mixture when temperature is not more than 15 degrees F less than initial mixing temperature.

G. Curbs

1. Install extruded asphalt curbs of profile as indicated on Drawings.

### 3.6 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Flatness: Maximum variation of 1/4 inch measured with 10-foot straight edge.
- C. Scheduled Compacted Thickness: Within 3/16 inch.
- D. Variation from Indicated Elevation: Within 1/2 inch.

### 3.7 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Asphalt Paving Mix Temperature: Measure temperature at time of placement.
- C. Asphalt Paving Thickness: ASTM D3549; test one core sample from every 1,000 square yards compacted paving.

- D. Asphalt Paving Density: Monitor the roadway density per Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.) with either 6- inch diameter roadway cores, a nuclear density gauge, or other density measuring device, at a minimum frequency of once per 1,500 feet of pavement.

### 3.8 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Immediately after placement, protect paving from mechanical injury until surface temperature is less than 160 degrees F.
- C. Keep sections of newly compacted asphalt concrete, which are to be covered by additional courses, clean until the successive course is laid.
- D. Do not dump embankment or base material directly on the pavement. Dress shoulders before placing the friction course on adjacent pavement.

END OF SECTION

SECTION 32 13 13  
CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Aggregate subbase.
  - 2. Concrete paving for:
    - a. Concrete sidewalks.
    - b. Concrete integral curbs and gutters.
    - c. Concrete parking areas and roads.
  - 3. Brick roads.
- B. Related Requirements:
  - 1. Section 31 23 23 - Fill.
  - 2. Section 32 12 16 - Asphalt Paving.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M324 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- B. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- C. ASTM International:
  - 1. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
  - 2. ASTM A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
  - 3. ASTM A497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
  - 4. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 5. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
  - 6. ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
  - 7. ASTM A775 - S Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

8. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
9. ASTM A934 - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
10. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
11. ASTM C33 - Standard Specification for Concrete Aggregates.
12. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
13. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
14. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
15. ASTM C150 - Standard Specification for Portland Cement.
16. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
17. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
18. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
19. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
20. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
21. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
22. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
23. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
24. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
25. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
26. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
27. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
28. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
29. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
30. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
31. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
32. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
33. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

34. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
35. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
36. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
37. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
38. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

### 1.3 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
  1. Submit data on concrete materials, joint filler, admixtures, and curing compounds.
- C. Design Data:
  1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
    - a. Hot and cold weather concrete work.
  2. Identify mix ingredients and proportions, including admixtures.
  3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.
- D. Source Quality Control Submittals: Indicate results of factory tests and inspections.

### 1.5 QUALITY ASSURANCE

- A. Perform Work according to Perform Work according to ACI 325.9R (supplemented by sections 11r through 19r) and in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition). In case of conflict follow Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- B. Obtain cementitious materials from same source throughout. If material shortage occurs alternate materials may be used in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).

### 1.6

#### QUALIFICATIONS

- A. Manufacturer: Producer/Contractor specializing in manufacturing Products specified in this section with minimum five (5) years documented experience.

- B. Installer: Company specializing in performing work of this section with minimum five (5) years documented experience.

#### 1.7 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
- B. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

### PART 2 - PRODUCTS

#### 2.1 AGGREGATE SUBBASE

- A. Aggregate Subbase: As specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).

#### 2.2 CONCRETE PAVING

- A. Performance / Design Criteria:
  - 1. Pavement shall be designed for the intended service as shown on the Drawings in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- B. All concrete, reinforcement, and formwork shall conform to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- C. Brick roadways shall comply with the requirements of the City Standard Detail T-18.

#### 2.3 FABRICATION

- A. Fabricate reinforcing according to Florida Department of Transportation standards.
- B. Form standard hooks for 180-degree bends, 90-degree bend, and seismic hooks as indicated on Drawings.



## 2.4 MIXES

1. Concrete mix shall be in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).

## 2.5 CONCRETE CURB AND GUTTER

- A. Concrete curb and gutter shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).

## 2.6 CONCRETE MATERIALS

### A. Concrete:

1. All concrete shall be Class I (Pavement) as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 346, "Portland Cement Concrete".

### B. Forms:

1. Description: Forms shall be either wood or metal.
2. Forms shall be straight, free from warps or bends, and of sufficient strength and rigidity to resist the pressure of the concrete without distortion.
3. Height: Equal to full depth of finished sidewalk.
4. Flexible forms shall be used for all headers constructed on a radius.

### C. Steel Reinforcement:

1. Deformed Reinforcing:
  - a. Steel: Comply with ASTM A615/A615M.
  - b. Yield Grade: 60 ksi.
  - c. Billet Bars: Deformed.
  - d. Finish: Uncoated.
2. Deformed Bar Mats:
  - a. Description: Steel bars.
  - b. Comply with ASTM A184/A184M.
  - c. Fabrication: Comply with ASTM A615 or ASTM A706.
  - d. Yield Strength: 60 ksi.
  - e. Finish: Uncoated.
3. Welded Plain-Wire Fabric:
  - a. Comply with ASTM A1064/A1064M.
  - b. Finish: Uncoated.
4. Dowels:
  - a. Description: Plain steel bars.
  - b. Comply with ASTM A615.
  - c. Yield Strength: 60 ksi.
  - d. Length: As indicated on Drawings.
  - e. Ends: Square, with burrs removed.
  - f. Finish: Uncoated.

- 5. Tie Wire:
  - a. Type: Annealed.
  - b. Minimum Size: 16 gauge.
  - c. Finish: Uncoated.

D. Glass-Fiber Reinforcement:

- 1. Description: Alkali-resistant, glass-fiber rovings specifically formulated for use in concrete.
- 2. Length: Varying from 1-1/2 to 2 inches.

2.7 ACCESSORIES

- A. Joint materials, curing compounds, liquid surface sealers, surface retarders, and joint sealers shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

2.8 SOURCE QUALITY CONTROL

- A. Section 014000 - Quality Requirements: Testing and Inspection Services.
- B. Submit all proposed mix designs to appointed firm for review prior to commencement of Work.
- C. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.
- D. Test samples according to ACI 301.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify compacted subbase is dry and ready to support paving and imposed loads.
- C. Verify gradients and elevations of base are correct.

3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Moisten (wet slightly) substrate to minimize absorption of water from fresh concrete.

- C. Coat surfaces of manhole, catch basin, and inlet frames with any oil to prevent bond with concrete paving.
- D. Notify Engineer minimum 48 hours prior to commencement of concreting operations.

### 3.3 INSTALLATION

- A. Base Course:
  - 1. Prepare base course according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Forms:
  - 1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
  - 2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Reinforcement:
  - 1. Place reinforcing as indicated on Drawings.
  - 2. Interrupt reinforcing at expansion joints.
  - 3. Place dowels to achieve paving and curb alignment as detailed.
  - 4. Provide doveled joints as shown on the Drawings
  - 5. Repair damaged reinforcement finish to match shop finish.
- D. Placing Concrete:
  - 1. Place concrete according to Section 350 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
  - 2. Ensure reinforcing, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
  - 3. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
  - 4. Place concrete to pattern indicated.
- E. Joints
  - 1. Place expansion joints at 20 foot intervals unless otherwise shown. Align curb, gutter, and sidewalk joints.
  - 2. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4 inch for sealant installation.
  - 3. Provide scored joints at 3 feet intervals between sidewalks and curbs, and between curbs and paving.
  - 4. Provide keyed joints as indicated.
  - 5. Seal joints as indicated on Drawings.
- F. Exposed Aggregate:
  - 1. Apply surface retarder where exposed aggregate finish is required.

2. Wash exposed aggregate surface with clean water and scrub with stiff bristle brush exposing aggregate.

G. Finishing:

1. Concrete finish shall be as shown on the Drawings.

H. Curing and Protection

1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- C. Maximum Variation from True Position: 1/4 inch.

3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.
- B. Perform field inspection and testing according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- C. Inspect reinforcing placement for size, spacing, location, support.
- D. Testing firm will take cylinders and perform slump, temperature, and air entrainment tests according to ACI301.
- E. Strength Test Samples:
  1. Sampling Procedures: ASTM C172.
  2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
  3. Sample concrete and make one set of three cylinders for every 50 cu yds or less of each class of concrete placed each day and for every 2,000 sf of surface area paving, as applicable.
  4. Make one additional cylinder during cold weather concreting, and field cure.
- F. Field Testing:
  1. Slump Test Method: ASTM C143.
  2. Air Content Test Method: ASTM C173/.
  3. Temperature Test Method: ASTM C1064.
  4. Measure slump and temperature for each compressive strength concrete sample.
  5. Measure air content in air entrained concrete for each compressive strength concrete sample.

- G. Cylinder Compressive Strength Testing:
  - 1. Test Method: ASTM C39.
  - 2. Test Acceptance: Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
  - 3. Test one (1) cylinder at 7 days.
  - 4. Test three (3) cylinders at 28 days.
  - 5. Dispose remaining cylinders when testing is not required.
- H. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

### 3.6 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- C. Do not permit traffic over paving until 75 percent design strength of concrete has been achieved.

END OF SECTION

## SECTION 32 14 13

### PRECAST CONCRETE UNIT PAVING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Concrete paver units.
2. Detectable warning pavers.
3. Sand bed and sand joint.
4. Edging.

###### B. Related Sections:

1. Section 31 23 23 - Fill.
2. Section 32 12 16 - Asphalt Paving.
3. Section 32 13 13 - Concrete Paving.
4. Section 32 17 13 - Parking Bumpers.
5. Section 33 05 13 - Manholes.

##### 1.2 REFERENCES

###### A. ASTM International:

1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
3. ASTM C936 - Standard Specification for Solid Concrete Interlocking Paving Units.
4. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
5. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
6. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
7. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
8. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
9. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

##### 1.3 SYSTEM DESCRIPTION

- ###### A. Paving and Setting Bed:
- To accommodate vehicular loads and/or pedestrian traffic as shown on the Drawings.

#### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate on shop drawings, layout of pavers, control joints, expansion joints, elevations, and affected adjacent construction.
- C. Product Data: Submit characteristics of paver unit, detectable warning pavers, dimensions, and special shapes.
- D. Samples: Submit two samples of each paver size, illustrating style, size, color range and surface texture of units being provided.
- E. Manufacturer's Installation Instructions: Submit substrate requirements and installation methods.

#### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

#### 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five (5) years of documented experience.

#### 1.7 MOCKUP

- A. Section 01 40 00 - Quality Requirements: Requirements for mockup.
- B. Construct mockup, 100 sq. ft, including setting bed, pavers, edging, joint sealers, control joint, expansion joint, and accessories to pattern indicated.
- C. Locate where directed by Engineer.
- D. Remove mockup when directed by Engineer.

#### 1.8 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Supply fifty (50) of each paver unit installed.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Precast Concrete Unit Pavers shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Detectable Warning Pavers shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- C. Sand for Setting Bedding and Joints shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- D. A suitable grout, in thickness specified by the manufacturer and approved for use by the paver manufacturer, maybe substituted for either bedding sand, joint sand, or both when approved by the Engineer.
- E. Edging: Cut pavers or edge architectural pavers.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify that substrate is level or to correct gradient, smooth, capable of supporting pavers and imposed loads, and ready to receive Work of this section.
- C. Verify gradients and elevations of substrate are correct.

### 3.2 PREPARATION

- A. Treat soil with herbicide to retard plant growth.

### 3.3 INSTALLATION

- A. Precast concrete unit paving shall be installed in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Spread sand evenly over prepared substrate surface to thickness shown on the Drawings.
- C. Dampen and roller compact sand to level and even surface.
- D. Screed and scarify top 1/2 inch of sand.



- E. Place paver units in pattern shown on the Drawings.
- F. Place edging units at edge and interruptions. Maintain evenly spaced joints.
  - 1. Joint Width: 1/16 to 3/16 inches.
- G. Sprinkle sand over surface and sweep into joints. Moisten joints and recover with additional sand until firm joints are achieved. Remove excess sand.
- H. Tamp and level paver units with mechanical vibrator until units are firmly bedded, level, and to correct elevation and gradients. Do not tamp unrestrained edges.
- I. Recover with additional sand, sweep into joints and hollow areas of pavers. Remove excess sand.

END OF SECTION

## SECTION 32 14 16

### BRICK UNIT PAVING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Clay brick pavers.
  - 2. Sand setting bed.
  - 3. Sand joints.
  - 4. Curbs and borders.
  - 5. Control and expansion joints.
- B. Related Sections:
  - 1. Section 31 23 23 - Fill.
  - 2. Section 32 12 16 - Asphalt Paving.
  - 3. Section 32 13 13 - Concrete Paving.
  - 4. Section 33 05 13 - Manholes.

##### 1.2 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI A118.4 - Latex-Portland Cement Mortar.
- B. ASTM International:
  - 1. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
  - 2. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 3. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
  - 4. ASTM C150 - Standard Specification for Portland Cement.
  - 5. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
  - 6. ASTM C797 - Standard Terminology for Use of Oil- and Resin-Based Putty and Glazing Compounds.
  - 7. ASTM C902 - Standard Specification for Pedestrian and Light Traffic Paving Brick.
  - 8. ASTM C1272 - Standard Specification for Heavy Vehicular Paving Brick.
  - 9. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
  - 10. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
  - 11. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.

12. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
13. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
14. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
15. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
16. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

### 1.3 SYSTEM DESCRIPTION

- A. Paving and Setting Bed: To accommodate vehicular loading and/or pedestrian traffic as shown on the Drawings.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate on shop drawings, layout of pavers, control joints, expansion joints, elevations, and affected adjacent construction.
- C. Product Data: Submit data on characteristics of paver unit, curbs and border, special shapes, dimensions, mortar, setting and grouting materials.
- D. Samples: Submit five sample pavers, curb, and border units illustrating color, surface finish, and texture.

### 1.5 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

### 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five (5) years of documented experience.

### 1.7 MOCKUP

- A. Section 01 40 00 - Quality Requirements: Requirements for mockup.

- B. Construct mockup, 100 sq. ft, including sand setting bed, brick pavers, curbs and border, joint sealers, control joint, expansion joint, and accessories to pattern indicated.
- C. Locate where directed by Engineer.
- D. Remove mockup when directed by Engineer.

#### 1.8 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install mortar when surrounding air or substrate surface temperature is below 50 degrees F prior to, during, and 48 hours after completion of Work.
- C. Do not install mortar when surrounding air or substrate surface temperature is above 90 degrees F during and 48 hours after completion of the Work.
- D. Do not install mortar when wind velocity exceeds 15 mph
- E. At end of working day, or during rainy weather, cover work exposed to weather with waterproof coverings, securely anchored.

### PART 2 - PRODUCTS

#### 2.1 PAVER MATERIALS

- A. Brick Paving Units shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

#### 2.2 SAND MATERIALS

- A. Sand for Setting Bed and Joint Filler shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. A suitable grout, in thickness specified by the manufacturer and approved for use by the paver manufacturer, may be substituted for either bedding sand, joint sand, or both when approved by the Engineer.

#### 2.3 ACCESSORIES

- A. Edging: Cut pavers or edge architectural pavers .
- B. Cleaning Solution: Type recommended by paver manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify substrate is ready to support pavers and imposed loads.
- C. Verify gradients and elevations of substrate are correct.

### 3.2 INSTALLATION

- A. Screed sand evenly over prepared substrate surface to 1 1/2 inch maximum thickness.
- B. Dampen and roller compact sand to level surface.
- C. Screed and scarify top 1/2 inch of sand.
- D. Place paver units in the pattern shown on the Drawings.
- E. Place half units or special shaped units at edges and interruptions. Maintain evenly spaced joints. Machine saw partial units.
  - 1. Joint Width: 1/16 to 3/16 inches.
- F. Spread sand over surface and sweep into joints. Moisten joints and recover with additional sand until firm joints are achieved. Remove excess sand.
- G. Tamp and level paver units with mechanical plate vibrator until units are firmly bedded, level, and to correct elevation and slope gradient.
- H. Spread sand over surface and sweep into joints.

### 3.3 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.
- B. Do not clean pavers until pavers and mortar are dry for minimum of three days.
- C. Clean soiled surfaces using cleaning solution. Do not harm pavers, joint materials, or adjacent surfaces.
- D. Use non-metallic tools in cleaning operations.
- E. Rinse surfaces thoroughly with clean water.
- F. Broom clean paving surfaces. Dispose of excess sand.

3.4 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.
- B. Protect paver surface with sheets of plywood.

END OF SECTION

## SECTION 32 16 23

### SIDEWALKS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Concrete paving for standard and decorative sidewalks.
- B. Related Requirements:
  - 1. Section 31 23 23 - Fill.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M182 - Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.
- B. American Concrete Institute:
  - 1. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- C. ASTM International:
  - 1. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
  - 2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
  - 3. ASTM A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
  - 4. ASTM A767 - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
  - 5. ASTM A775 - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
  - 6. ASTM A884 - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
  - 7. ASTM A934 - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
  - 8. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
  - 9. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
  - 10. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 11. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
  - 12. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
  - 13. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.

14. ASTM C150 - Standard Specification for Portland Cement.
15. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
16. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
17. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
18. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
19. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
20. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
21. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
22. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
23. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
24. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
25. ASTM C979 - Standard Specification for Pigments for Integrally Colored Concrete.
26. ASTM C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
27. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
28. ASTM C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
29. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.
30. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
31. ASTM C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
32. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
33. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
34. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
35. ASTM D5893 - Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.
36. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
37. ASTM E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
38. ASTM E903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.



- 39. ASTM E1918 - Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
- 40. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

### 1.3 PREINSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.
- B. Convene minimum one week prior to commencing Work of this Section.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
  - 1. Submit required information regarding concrete materials, joint filler, admixtures, and curing compounds.
  - 2. Mix Design:
    - a. Submit concrete mix design for each concrete strength prior to commencement of Work.
    - b. Submit separate mix designs if admixtures are required for hot- and cold-weather concrete Work.
    - c. Identify mix ingredients and proportions, including admixtures.
  - 3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Source Quality-Control Submittals: Indicate results of shop tests and inspections.
- E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- F. Qualifications Statement:
  - 1. Submit qualifications for manufacturer and installer.

### 1.5 QUALITY ASSURANCE

- A. Obtain cementitious materials from same source throughout. If material shortage occurs alternate materials may be used in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- A.
- B. Perform Work according to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).

## 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

## 1.8 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Minimum Conditions: Do not place concrete if ambient temperature is less than 40 deg. F, or if surface is wet or frozen.
- C. Subsequent Conditions: Maintain minimum 50 deg. F, for not less than 72 hours after placing, and at a temperature above freezing for remainder of curing period.

## 1.9 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
  - 2. Indicate field measurements on Shop Drawings.

# PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Concrete:

1. All concrete shall be non-structural as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), Section 347, "Portland Cement Concrete - Class NS".
- B. Forms:
1. Description: Forms shall be either wood or metal.
  2. Forms shall be straight, free from warps or bends, and of sufficient strength and rigidity to resist the pressure of the concrete without distortion.
  3. Height: Equal to full depth of finished sidewalk.
  4. Flexible forms shall be used for all headers constructed on a radius.
- C. Joints:
1. Joint Filler:
    - a. Material: Asphalt-impregnated fiberboard or felt.
    - b. Comply with ASTM D1751.
    - c. Thickness: 1/4 inch unless otherwise shown.
- D. Steel Reinforcement:
1. Deformed Reinforcing:
    - a. Steel: Comply with ASTM A615/A615M.
    - b. Yield Grade: 60 ksi.
    - c. Billet Bars: Deformed.
    - d. Finish: Uncoated.
  2. Deformed Bar Mats:
    - a. Description: Steel bars.
    - b. Comply with ASTM A184/A184M.
    - c. Fabrication: Comply with ASTM A615 or ASTM A706.
    - d. Yield Strength: 60 ksi.
    - e. Finish: Uncoated.
  3. Welded Plain-Wire Fabric:
    - a. Comply with ASTM A1064/A1064M.
    - b. Finish: Uncoated.
  4. Dowels:
    - a. Description: Plain steel bars.
    - b. Comply with ASTM A615.
    - c. Yield Strength: 60 ksi.
    - d. Length: As indicated on Drawings.
    - e. Ends: Square, with burrs removed.
    - f. Finish: Uncoated.
  5. Tie Wire:
    - a. Type: Annealed.
    - b. Minimum Size: 16 gauge.
    - c. Finish: Uncoated.

- E. Glass-Fiber Reinforcement:
  - 1. Description: Alkali-resistant, glass-fiber rovings specifically formulated for use in concrete.
  - 2. Length: Varying from 1-1/2 to 2 inches.
- F. Decorative Sidewalk:
  - 1. Description: Rock salt and leaf stamped decorative sidewalks shall comply with the requirements in the City Standard Detail T-14.
  - 2. Description: Brick ribbon decorative sidewalks shall comply with the requirements in the City Standard Detail T-15.

## 2.2 FABRICATION

- A. Reinforcing:
  - 1. Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).

## 2.3 MIXES

- A. Concrete:
  - 1. Mix concrete according to ACI 304, and deliver concrete according to ASTM C94.
  - 2. Mix Design:
    - a. Compressive Strength: 2,200 psi at seven days.
    - b. Compressive Strength: 3,000 psi at 28 days.
    - c. Slump: 3 to 5 inches.
    - d. Air Entrainment:
      - 1) Comply with ASTM C94.
      - 2) Exposure Condition: Mild.
      - 3) Maximum Variation from Required Air Content: 1.5 percent.
  - 3. Admixtures:
    - a. Use accelerating admixtures in cold weather only if approved by Engineer in writing.
    - b. Use of admixtures will not relax cold-weather placement requirements.
    - c. Use calcium chloride only if approved by Engineer in writing.
    - d. Use set-retarding admixtures during hot weather only if approved by Engineer in writing.

## 2.4 ACCESSORIES

- A. Curing compound, liquid surface sealer, surface retarder, joint sealers, and cover sheets shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).

## 2.5 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Testing: Comply with ASTM C94.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- C. Verify that gradients and elevations of subgrade are as indicated on Drawings.
- D. Verify reinforcing placement for proper size, spacing, location, and support.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Moisten substrate to minimize absorption of water from fresh concrete.
- C. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

### 3.3 INSTALLATION

- A. Subgrade:
  - 1. Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Forms:
  - 1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
  - 2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
  - 3. Clean forms and coat with form oil each time before concrete is placed.
  - 4. Wood Forms: Thoroughly wet with water before concrete is placed.
- C. Reinforcement:
  - 1. Place reinforcing as indicated on Drawings.
  - 2. Interrupt reinforcing at expansion joints.

3. Place dowels to achieve indicated paving alignment.
  4. Provide doweled joints at locations and spacing shown on the Drawings.
- D. Placing Concrete:
1. Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), and City Standard Detail T-16.
- E. Joints:
1. Saw-cut contraction joints 3/16 inch wide at optimum time (as soon as the concrete has hardened to the degree that excessive raveling will not occur and before uncontrolled shrinkage cracking begins) after finishing, cutting one-third into depth of slab.
  2. Transverse expansion joints shall be in the locations shown on the drawings, but shall not exceed intervals of one hundred twenty feet.
  3. Seal joints as indicated on Drawings.
- F. Exposed Aggregate:
1. Apply surface retarder where exposed aggregate finish is required.
  2. Wash exposed aggregate surface with clean water and scrub with stiff bristle brush, exposing aggregate.
- G. Finishing:
1. Light broom finish and trowel edges of joints.
  2. Texture Direction: Transverse to paving direction.
  3. Ramps: Broom perpendicular to slope.
  4. Place clear curing compound on exposed concrete surfaces immediately after finishing.
  5. Edges and Joints:
    - a. Edger Radius: 1/8 inch.
    - b. Spalled Corners and Edges: Clean and fill with mortar mixture and finish.
- H. Curing:
1. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
  2. Impervious Sheeting:
    - a. Wet exposed surface and cover with impervious sheeting material, overlapped minimum 12 inches.
    - b. Maintain sheet in contact with concrete for minimum seven days.
- I. Backfilling: After curing, backfill, grade, and compact adjacent disturbed area as indicated.

### 3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.
- C. Maximum Variation from True Position: 1/4 inch.

- D. Line and Grade for Forms: 1/8 inch in any 10-foot-long section.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Inspection and Testing:
  - 1. Comply with Florida Department of Transportation standards.
  - 2. Cylinder Compressive Strength:
    - a. Comply with ASTM C39/C39M.
    - b. Acceptance: According to Florida Department of Transportation standards.
    - c. Dispose of remaining cylinders if testing is not required.
  - 3. Slump, Temperature, and Air Content:
    - a. Measure for each compressive-strength concrete sample.
    - b. Slump: Comply with ASTM C143.
    - c. Air Content: Comply with ASTM C173.
    - d. Temperature: Comply with ASTM C1064.
  - 4. Records:
    - a. Maintain records of placed concrete items.
    - b. Record date, location of pour, quantity, air temperature, and number of test samples taken.

### 3.6 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, rain and flowing water, and mechanical injury.
- C. Do not permit traffic over paving until 75 percent design strength of concrete has been achieved.
- D. Damaged Concrete:
  - 1. Remove and reconstruct concrete that has been damaged for entire length between scheduled joints.
  - 2. Refinishing damaged portion is not acceptable.
  - 3. Dispose of damaged portions.

END OF SECTION

## SECTION 32 17 13

### PARKING BUMPERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Precast concrete parking bumpers.
  - 2. Timber parking bumpers.
  - 3. Plastic parking bumpers.
  - 4. Parking bumper anchors.
- B. Related Requirements:
  - 1. Section 32 12 16 - Asphalt Paving.
  - 2. Section 32 13 13 - Concrete Paving.

##### 1.2 REFERENCE STANDARDS

- A. ASTM International:
  - 1. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 2. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 3. ASTM C150 - Standard Specification for Portland Cement.
  - 4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
  - 5. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.

##### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate the Work with pavement placement and parking striping.

##### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit unit configuration, dimensions.

##### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)



## PART 2 - PRODUCTS

### 2.1 CONCRETE BUMPERS

- A. Concrete Bumpers: Precast, steel-reinforced, air-entrained concrete, 3,000-psi minimum compressive strength,

### 2.2 CONFIGURATION

- A. Nominal Size: six (6) inches high, nine (9) inches wide, four (4) feet long.
- B. Profile: Rectangular cross section with sloped vertical faces, square ends.

### 2.3 ACCESSORIES

- A. Dowels: Steel, galvanized finish; 1/2 inch diameter, 18-inch long, pointed tip.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install units without damage to shape or finish. Replace or repair damaged units.
- B. Install units in alignment with adjacent work.
- C. Fasten units in place with two (2) dowels for each bumper.

END OF SECTION

## SECTION 32 17 23

### PAVEMENT MARKINGS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Traffic lines and markings.
  - 2. Legends.
  - 3. Paint.
  - 4. Glass beads.
- B. Related Requirements:
  - 1. Section 32 12 16 - Asphalt Paving.
  - 2. Section 32 13 13 - Concrete Paving.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M247 - Standard Specification for Glass Beads Used in Pavement Markings.
- B. ASTM International:
  - 1. ASTM D34 - Standard Guide for Chemical Analysis of White Pigments.
  - 2. ASTM D126 - Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
  - 3. ASTM D562 - Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
  - 4. ASTM D711 - Standard Test Method for No-Pick-Up Time of Traffic Paint.
  - 5. ASTM D713 - Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
  - 6. ASTM D1301 - Standard Test Methods for Chemical Analysis of White Lead Pigments.
  - 7. ASTM D1394 - Standard Test Methods for Chemical Analysis of White Titanium Pigments.
  - 8. ASTM D1475 - Standard Test Method for Density of Liquid Coatings, Inks, and Related Products.
  - 9. ASTM D1640 - Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings.
  - 10. ASTM D2202 - Standard Test Method for Slump of Sealants.
  - 11. ASTM D2371 - Standard Test Method for Pigment Content of Solvent-Reducible Paints.

12. ASTM D2621 - Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.
13. ASTM D2743 - Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.
14. ASTM D4280 - Standard Specification for Extended Life Type, Non-plowable, Raised Retroreflective Pavement Markers.
15. ASTM D4505 - Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life.

### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit paint formulation for each type of paint.
- C. Samples:
  1. Plates:
    - a. Submit four samples of each color of material.
    - b. Prepare two without glass beads and two with glass beads for each different batch of material.
    - c. After approval, Owner will retain these plates for field comparisons of applied paint.
  2. Paint:
    - a. Submit two one-gallon and four one-quart paint samples accompanied by properly executed test reports.
  3. Glass Beads: Submit samples according to AASHTO M247.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Test and Evaluation Reports: Indicate source and acceptance test results according to AASHTO M247.
- F. Manufacturer Instructions:
  1. Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, and bead embedment and application rate.
  2. Submit detailed instructions on installation requirements, including storage and handling procedures.
- G. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- H. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

- I. Qualifications Statements:
  - 1. Submit qualifications for manufacturer and applicator.
  - 2. Submit manufacturer's approval of applicator.

#### 1.4 QUALITY ASSURANCE

- A. Perform Work according to the following:
  - 1. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition)
  - 2. Manual on Uniform Traffic Control Devices (MUTCD).
  - 3. Florida Building Code, "Chapter 11 – Florida Accessibility Code for Building Construction."
  - 4. City of Ocala, "Standard Details for Traffic Pavement Markings."

#### 1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
- B. Applicator: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
  - 1. According to manufacturer instructions.
  - 2. Paint:
    - a. Invert containers several days prior to use if paint has been stored more than two months.
    - b. Minimize exposure to air when transferring paint.
    - c. Seal drums and tanks when not in use.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

## 1.7 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Do not apply materials if surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- C. Do not apply exterior coatings during rain or snow if relative humidity is outside range required by paint manufacturer, or if moisture content of surfaces exceeds that required by paint manufacturer.
- D. Minimum Conditions: Do not apply paint if temperatures are expected to fall below 60 deg. F within 24 hours after application.
- E. Thermoplastic Compound: Do not apply unless pavement surface temperature is minimum 40 deg. F and rising.
- F. Maximum VOCs: Do not exceed limit required by State or Environmental Protection Agency.

## 1.8 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish three-year manufacturer's warranty for pavement markings.

## PART 2 - PRODUCTS

### 2.1 SPEED CUSHIONS

- A. Installation of speed cushions shall be approved by the City Traffic Engineer in accordance with the City Traffic Hump Guidelines. Approved speed cushions shall be RubberForm's C-1010-1-K 78" x 80" with one arrow speed in accordance with the manufacturer specifications. Refer to City Standard Detail T-8. All speed cushions installation shall have signs and pavement markings in accordance with the MUTCD.

### 2.2 PAINTED PAVEMENT MARKINGS

- A. Furnish materials according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- B. Performance and Design Criteria:
  - 1. Paint Adhesion: Adhere to road surface, forming smooth continuous film one minute after application.

2. Paint Drying: Tack free by touch as not to transfer by vehicle tires within two minutes after application.

C. Paint:

1. Traffic Paint shall be fast-dry water based in accordance with Section 971 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
2. Description: Ready mixed, conventional, fast-dry, waterborne traffic paints.
3. Lead-free and nontoxic.
4. Minimum Retroreflectance: 300 mcd/lx-m<sup>2</sup>.
5. Durability Rating: 6 or more, after in place for nine months.
6. Properties:
  - a. Pigment Percent by Weight: Minimum 57%.
  - b. Vehicle Percent by Weight: Minimum 40%.
  - c. Volatile Organic Content: Maximum 150 g/L.
  - d. Minimum Density: 13.5 lb./gal.
  - e. Viscosity: 80 to 100 Kreb Units at 77 deg. F.
7. Grind:
  - a. Fineness of Grind: 3 HS.
8. Wet Film Thickness: Minimum 25 mils at 90 percent relative humidity and 72 deg. F or in accordance with the manufacturer's recommendation.
  - a. Comply with ASTM D1640/D1640M.

D. Glass Spheres:

1. Glass spheres shall be a single drop of Type 1 glass spheres in accordance with Section 971 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
2. Coating: Enhance embedment and adherence with paint.

E. Thermoplastic Compound:

1. Thermoplastic Compounds shall comply with Section 711 and Section 971 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

F. Raised Pavement Markers (RPM):

1. Raised Pavement Markers shall be installed with lane lines, centerlines, and transitions on all public streets and roads.
2. All RPMs shall be Class B in accordance with Section 706 and Section 970 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
3. Blue RPMs shall be used for marking fire hydrant locations.
4. RPMs shall be installed with the use of bituminous hot melt adhesive.

## 2.3 APPLICATION EQUIPMENT

- A. Application equipment for all pavement markings shall be of the type and quality specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.4 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Test and analyze traffic paints according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- C. Certificate of Compliance:
  - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application preparation.
- B. Do not apply paint to concrete surfaces until concrete has cured for 28 days.
- C. Agitate paint for 1 to 15 minutes prior to application to ensure even distribution of pigment.
- D. Maintenance and Protection of Traffic:
  - 1. Provide short-term traffic control as specified in Section 01 50 00 - Temporary Facilities and Controls.
  - 2. Prevent interference with marking operations and prevent traffic on newly applied markings before dry.
  - 3. Maintain travel lanes between as directed by the Engineer.
  - 4. Maintain access to existing businesses, residences, and other properties requiring access.
- E. Surface Preparation.
  - 1. Prepare surfaces according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

### 3.2 DEMOLITION

- A. Existing thermoplastic or water base paint pavement markings shall be removed only by water blasting, grinding, or blacking-out the pavement marking with driveway sealant.
  - 1. Existing markings removed by grinding shall utilize the 'block or circle' method to avoid the shape of the old markings.
  - 2. The driveway sealant shall be provided with a three-year warranty.

- B. Repair pavement or surface damage caused by removal methods.
- C. Clean and repair existing, remaining, or reinstalled lines and legends.

### 3.3 APPLICATION

- A. Pavement Markings shall be applied as follows:
  - 1. All pavement markings shall be a minimum of 6-inch wide.
    - a. All pavement markings within City Rights-of-Way shall be Thermoplastic.
    - b. Pavement markings on private property may be either paint or Thermoplastic.
  - 2. Intersection Pavement Markings:
    - a. For typical pavement marking at intersections, refer to City Standard Detail T-9 & T-10.
    - b. All crosswalks shall be of the STANDARD OR SPECIAL EMPHASIS type, in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Index No. 711-001.
  - 3. School Pavement Markings:
    - a. All school pavement markings shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Index No. 711-001.
  - 4. ADA Pavement Markings:
    - a. All ADA pavement markings shall conform to the applicable provisions of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and Florida State Building Code 'Chapter 11 – Florida Accessibility Code for Building Construction'.
  - 5. Off-Street Parking Stall Pavement Markings:
    - a. Passenger car parking stalls shall comply with the following:
      - 1) ADA compliant parking stalls shall comply with the requirements of City Standard Detail T-11.
  - 6. On-Street Parking Pavement Markings:
    - a. All on-street parking pavement markings shall conform to the following:
      - 1) No parking is permitted within 15 feet of a fire hydrant. Refer to City Standard Details T-12 & T-13.
      - 2) No parking is permitted within 20 feet of a crosswalk.
      - 3) No parking is permitted within 30 feet of a traffic signal or traffic control sign (stop, yield, etc.).
      - 4) No parking is permitted within 50 feet of any railroad crossing.
      - 5) No parking is permitted in any alley, lane or other roadway that does not provide a minimum of 10 feet clearance.
- B. Application Rate:
  - 1. Application rates shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) for each material being applied.
- C. Painting:
  - 1. Apply paint pneumatically, using guidelines and templates as necessary to control application.



2. Manually paint numbers, letters, and symbols.
3. Prevent splattering and overspray when applying markings.
4. Paint Guns: Simultaneously apply paint binder at uniform specified rates.
5. Dispense at ambient temperature.

D. Reflective Media:

1. Immediately follow paint application.
2. Bead Guns:
  - a. Dispense glass beads simultaneously at specified rate.
  - b. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time.
  - c. Verify weight of glass beads.

E. Thermoplastic Compound:

1. Place on dry pavement.
2. Apply centerline, skip line, edge line, and other longitudinal type markings with mobile applicator.
3. Place special markings, crosswalks, stop bars, legends, arrows, and similar patterns with portable applicator.

F. Raised Pavement Markers:

1. Align prefabricated markers and permanently fix in place by means of epoxy adhesives.
2. Prior to applying adhesive, thoroughly clean area by water blasting and by compressed air.

G. Dimensions and Locations: As indicated on Drawings.

H. Installation Standards: Install Work according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

### 3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Tolerances shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.
- B. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

- C. Acceptance:
  - 1. Repair lines and markings which after application and curing do not meet following criteria:
    - a. Incorrect location.
    - b. Insufficient thickness, width, coverage, or retention.
    - c. Uncured or discolored material.
    - d. Insufficient bonding.

### 3.6 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Collect and legally dispose of residues from painting operations.

### 3.7 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free.
- C. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free.
- D. If vehicle crosses a marking and tracks it, or if splattering or overspray occurs, eradicate affected marking and resultant tracking and apply new markings.
- E. Follow manufacturer instructions or use minimum of 30 minutes of dry time.
- F. Barrier cones are satisfactory protection for materials being dried.

### 3.8 MAINTENANCE

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance service.
- B. Provide service and maintenance of traffic paints for three years from date of Substantial Completion.

END OF SECTION

## SECTION 32 31 13

### CHAIN LINK FENCES AND GATES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Fence framework, fabric, and accessories.
  - 2. Excavation for post bases.
  - 3. Concrete foundation for posts.
  - 4. Manual gates and related hardware.
  - 5. Privacy slats.

##### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM A121 - Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
  - 2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 4. ASTM A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
  - 5. ASTM A491 - Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
  - 6. ASTM A817 - Standard Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcellled Tension Wire.
  - 7. A1011/ Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
  - 8. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
  - 9. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
  - 10. ASTM F552 - Standard Terminology relating to Chain Link Fencing.
  - 11. ASTM F567 - Standard Practice for Installation of Chain-Link Fence.
  - 12. ASTM F626 - Standard Specification for Fence Fittings.
  - 13. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
  - 14. ASTM F900 - Standard Specification for Industrial and Commercial Swing Gates.
  - 15. ASTM F934 - Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.

16. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
17. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
18. ASTM F1183 - Standard Specification for Aluminum Alloy Chain Link Fence Fabric.
19. ASTM F1184 - Standard Specification for Industrial and Commercial Horizontal Slide Gates.
20. ASTM F1345 - Standard Specification for Zinc - 5% Aluminum -Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric.

B. Chain Link Fence Manufacturers Institute:

1. CLFMI - Product Manual.

### 1.3 SYSTEM DESCRIPTION

- A. Fence Height: as indicated on Drawings.
- B. Line Post Spacing: At intervals not exceeding 10 feet.
- C. Fence Post and Rail Strength: Conform to ASTM F1043 Light Industrial Fence quality.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.
- D. Samples: Submit two 12x12 inch samples of fence fabric.
- E. Manufacturer's Installation Instructions: Submit installation requirements.

### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.
- C. Operation and Maintenance Data: Procedures for submittals.

## 1.6 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five (5) years of documented experience.

## 1.8 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.
- C. Identify each package with manufacturer's name.
- D. Store fence fabric and accessories in secure and dry place.

# PART 2 - PRODUCTS

## 2.1 MATERIALS AND COMPONENTS

- A. Materials and Components: Conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.2 COMPONENTS

- A. Line posts, corner and terminal posts, gate posts, top and brace rails, gate frames, fabric, tension wires, tension bands, tension straps and tire wire shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.3 ACCESSORIES

- A. Caps, fittings, extension arms, and gate hardware shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.4 GATES

### A. General:

1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
2. Factory assemble gates.
3. Gates shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.5 FINISHES

- ### A.
- Chain link fencing finishes shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- ### A.
- Install framework, fabric, accessories and gates according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- ### B.
- Set intermediate, terminal, and gate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
- ### C.
- Line Post Footing Depth Below Finish Grade: As shown on the Drawings.
- ### D.
- Corner, Gate and Terminal Post Footing Depth Below Finish Grade: As shown on the Drawings.
- ### E.
- Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
- ### F.
- Install top rail through line post tops and splice with 6-inch long rail sleeves.
- ### G.
- Install center and bottom brace rail on corner gate leaves.
- ### H.
- Place fabric on outside of posts and rails.
- ### I.
- Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
- ### J.
- Position bottom of fabric 2 inches above finished grade.

- K. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- L. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- M. Install bottom tension wire stretched taut between terminal posts.
- N. Install support arms sloped outward and attach barbed wire; tension and secure.
- O. Support gates from gate posts. Do not attach hinged side of gate from building wall.
- P. Install gate with fabric and barbed wire overhang to match fence. Install three hinges on each gate leaf.
- Q. Connect to existing fence as shown on the Drawings.
- R. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.
- S. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.
- T. Center and align posts. Place concrete around posts, and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.
- U. Extend concrete footings 2 inches above grade, and trowel, forming crown to shed water.
- V. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.

### 3.2 ERECTION TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Plumb: 1/4 inch.
- C. Maximum Offset From Indicated Position: 1 inch.
- D. Minimum distance from property line: 6 inches.

END OF SECTION

SECTION 32 92 19  
SODDING & SEEDING

PART 1 – GENERAL

1.1 SUMMARY

- A. The requirements for seeding and sodding shall conform and be governed by the latest Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) section 570 for Performance Turf with the following exceptions and clarifications for specific portions of that specification. Unless otherwise specified in the project bid documents, seeding and sodding is considered incidental to the project and is to be included in the pay item for pipe or roadway measurement and payment item.

1.2 Replace Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-1 Description with the following:

- A. Establish a growing, healthy turf over all areas designated in the Plans within 90 days of finished construction. Use sod in areas designated in the Plans to be sodded. Use seed, hydroseed, bonded fiber matrix, or sod in all other areas. Maintain performance turf areas until final acceptance of all Contract work.

1.3 Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-3 Construction Methods – Modified as follows.

- A. Replace 570-3.1 General with the following: Remove all construction debris in performance turf areas. Install performance turf at the earliest practical time for erosion control and establishment. Shape the areas to be planted to the plan typical sections and lines and grade shown in the Plans. All of the permanent performance turf material shall be in place prior to final acceptance. The City will only pay for replanting as necessary due to factors determined by the Engineer to be beyond control of the Contractor. Install all performance turf on shoulder areas prior to the placement of the friction course on adjacent pavement.
- B. Replace 570-3.2 Seeding with the following: Seed must produce visible seedlings within 45 days of planting. Use of compost meeting the requirements of Section 987 as mulch is acceptable unless otherwise specified.
- C. Replace 570-3.3 Sod with the following: Place the sod on the prepared surface, with edges in close contact. Do not use sod which has been cut for more than 48 hours. Place the sod to the edge of all landscape areas as shown in the Plans and the Standard Plans. Place rolled sod parallel with the roadway and cut any exposed netting even with the sod edge. Monitor placed sod for growth of exotic or invasive pest plants and noxious weeds. If exotic or invasive pest plants and/or noxious weeds manifest themselves within 30 days of placement of the sod during the months April through October, within 60 days of placement of the sod during the months of November through March treat affected areas by means acceptable to the City at no expense to the City. If pest plants and/or noxious weeds manifest themselves after the time frames described above from date of placement of sod, the Engineer, at his sole option, will determine if treatment is required and whether the Contractor will be compensated (through change orders) for such treatment.



- D. Replace 570-3.4 Hydroseeding with the following: Use equipment specifically designed for mixing the mulch, seed, fertilizer, tackifier and dye, and applying the slurry uniformly over the areas to be hydroseeded. Use mulch that does not contain reprocessed wood or paper fibers. Mix fertilizer as required into the hydroseeding slurry. Ensure that the dye does not contain growth or germination inhibiting chemicals. When polyacrylamide is used as part of hydroseeding mix, only anionic polymer formulation with free acrylamide monomer residual content of less than 0.05% is allowed. Cationic polyacrylamide shall not be used in any concentration. Do not spray polyacrylamide containing mixtures onto pavement. These may include tackifiers, flocculants or moisture-holding compounds.

1.4 Replace Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-4 Turf Establishment with the following:

- A. Perform all work necessary, including watering and fertilizing, to sustain an established turf, free of noxious weeds, at no additional expense to the City. Provide the filling, leveling, and repairing of any washed or eroded areas, as necessary. Established turf is defined as follows:
1. An established root system (leaf blades break before seedlings or sod can be pulled from the soil by hand).
  2. No bare spots larger than one square foot.
  3. No continuous sod seams running perpendicular to the face of the slope.
  4. No deformation of the performance turf areas caused by mowing or other Contractor equipment.
  5. No exposed sod netting.
  6. No competing vegetation, exotic or invasive pest plants or noxious weeds.

Monitor turf areas and remove all competing vegetation, exotic or invasive pest plants, and noxious weeds (as listed by the Florida Exotic Pest Plant Council, Category I “List of Invasive Species”, Current Edition, <https://www.fleppc.org>). Remove such vegetation regularly by manual, mechanical, or chemical control means, as necessary. When selecting herbicides, pay particular attention to ensure use of chemicals that will not harm desired turf or wildflower species. Use herbicides in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 7-1.7.

If at the time that all other work on the project is completed, but all turf areas have not met the requirements for established turf set forth in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-4, continuously maintain all turf areas until the requirements for established turf set forth in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-4 have been met.

During establishment and until the performance turf is established in accordance with this Section, continue the inspection, maintenance, and documentation of erosion and

sedimentation control items in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification Section 104. Remove and dispose of all erosion and sedimentation control items after the performance turf has been established.

Notify the Engineer, with a minimum of seven calendar days advance notice, to conduct inspections of the performance turf at approximate 90-day intervals during the establishment period to determine establishment. Results of such inspections will be made available to the Contractor within seven calendar days of the date of inspection. Determination of an established turf will be based on the entire project and not in sections.

Upon the determination by the Engineer that the requirements of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-4 have been met and an established turf has been achieved and all erosion and sedimentation control items have been removed, the Engineer will release the Contractor from any further responsibility provided for in this Specification.

The Contractor's establishment obligations of this specification will not apply to deficiencies due to the following factors, if found by the Engineer to be beyond the control of the Contractor, his subcontractors, vendors or suppliers:

1. Determination that the deficiency was due to the failure of other features of the Contract.
2. Determination that the deficiency was the responsibility of a third-party performing work not included in the Contract or its actions.

The City will only pay for replanting as necessary due to factors determined by the City to be beyond the control of the Contractor.

1.5 Replace Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-9 Basis of Payment with the following:

- A. Payment for this item shall be per specification 01 22 00 for Measurement and Payment which states that unless provided by specific bid items in the Schedule of Prices Bid, the work covered in this section shall be considered incidental or appurtenant and no measurement or payment will be made.
- B. If the project specific schedule of prices bid specify a separate item for work covered under this section, then payment will be made under that pay item on a per square yard basis.

END OF SECTION

## SECTION 33 01 10.58

### DISINFECTION OF WATER UTILITY PIPING SYSTEMS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. The Contractor shall disinfect all parts of the Work, including but not being limited to: pipe, fittings, joints, valves, hydrants, service lines and any other incidentals and appurtenances.
- B. Section Includes:
  - 1. Disinfection of potable water distribution system.
  - 2. Testing and reporting of results.
- C. Related Requirements:
  - 1. Section 33 14 13 – Public Water Utility Distribution Piping.

##### 1.2 REFERENCE STANDARDS

- A. American Water Works Association:
  - 1. AWWA B300 - Hypochlorites.
  - 2. AWWA C651 - Disinfecting Water Mains.

##### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Disinfection Procedure:
  - 1. Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.
- C. Product Data: Submit manufacturer information for proposed chemicals and treatment doses.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Certify that final water complies with disinfectant quality standards of Florida Department of Environmental Protection.
- F. Test and Evaluation Reports: Indicate testing results comparative to specified requirements.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:

1. Submit qualifications for manufacturer and applicator.

#### 1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

B. Disinfection Report:

1. Type and form of disinfectant used.
2. Date and time of disinfectant injection start and completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing for each outlet tested.

#### 1.5 QUALITY ASSURANCE

A. Perform Work according to AWWA C651 and Florida Department of Environmental Protection standards.

#### 1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.

B. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

### PART 2 - PRODUCTS

#### 2.1 DISINFECTION CHEMICALS

A. Chemicals:

1. Hypochlorite: Comply with AWWA B300.
2. The use of chlorine tablets shall not be allowed.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

- B. Verify that piping system has been cleaned, inspected, and pressure tested.
- C. Verify that access fittings have been installed under Section 33 14 13 – Public Water Utility Distribution Piping.
- D. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.

### 3.2 DISINFECTION

- A. Provide required equipment to perform Work of this Section.
- B. Disinfect pipeline installation according to AWWA C651.
  - 1. Maintain minimum 10 ppm residual after a contact period of not less than 24 hours.
- C. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline does not exceed 0.2 ppm.
- D. Replace permanent system devices that were removed for disinfection.
- E. Legally dispose of chlorinated water.

### 3.3 SAMPLING AND TESTING

- A. Bacteriological Testing:
  - 1. After disinfection, samples of water for bacteriological analysis shall be collected and tested by an independent testing laboratory approved by the State of Florida and the Engineer.
  - 2. The Contractor shall employ an independent company, specializing in water sampling to collect the sample(s).
  - 3. Water being collected for testing shall not have chlorine residual higher than is normally maintained in other parts of the distribution system.
  - 4. Sworn certificates, in triplicate, of the tests shall be submitted to the Engineer.
  - 5. Samples shall be taken on two (2) consecutive days and in the presence of and as directed by the Engineer or as required by the Florida Department of Environmental Protection.
  - 6. All test results shall be submitted to the Florida Department of Environmental Protection for approval.
  - 7. Should these samples or subsequent samples prove to be unsatisfactory, the piping shall be disinfected until satisfactory samples are obtained.

END OF SECTION

## SECTION 33 01 30.11

### TELEVISION INSPECTION OF SEWERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Pipeline flushing and cleaning.
  - 2. Television inspection of sewer pipelines.
  - 3. Audio-video recording of pipeline interior.
- B. Related Requirements:
  - 1. Section 01 50 00 - Temporary Facilities and Controls.
  - 2. Section 33 01 30.72 - Cured-in-Place Pipe Lining.
  - 3. Section 33 01 30.79 - Fold-and-Form Pipe Lining.
  - 4. Section 33 31 11 - Public Sanitary Sewerage Gravity Piping.

##### 1.2 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with Owner and Engineer.

##### 1.3 SCHEDULING

- A. Section 01 30 00 - Administrative Requirements: Requirements for scheduling.
- B. Furnish Work schedule for periods of time when sewer piping section is out of service.

##### 1.4 SEQUENCING

- A. Section 01 10 00 - Summary: Requirements for sequencing.

##### 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Portable Hard Drive:
  - 1. Submit portable hard drive with color video files and pipe inspection reports.
  - 2. Portable hard drive shall become property of Owner.

- C. Inspection Logs:
  - 1. Submit cleaning and television inspection logs for each section of sewer line to be rehabilitated.
  - 2. Inspection Logs shall be coded per PACP standards and shall include, but may not be limited to the following information:
    - a. Stationing and location of lateral services, wyes, or tees.
    - b. Date and clock time references.
    - c. Pipe joints.
    - d. Infiltration/inflow defects.
    - e. Cracks.
    - f. Leaks.
    - g. Offset joints.
    - h. Obstructions.
- D. Submit specific detailed description of proposed bypass pumping system, including written description of plan addressing schedule, quantity, capacity, and location of pumping equipment.
- E. Submit spill plan to address any spills that might occur.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- G. Qualifications Statement:
  - 1. Submit qualifications for pipeline inspector.

#### 1.6 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Environmental Protection standards.

#### 1.7 QUALIFICATIONS

- A. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.
- B. The Contractor shall always employ a Pipeline Assessment and Certification Program (PACP) certified inspector during the Work.
  - 1. Submit evidence of current PACP certification.
- C. The Contractor's field technicians shall be certified for Confined Space Entry as defined in OSHA regulations, 29CFR1910 and all amendments.
  - 1. The Contractor shall provide evidence of OSHA 10- or 30-hour Confined Space Entry certification for all field technicians.

## PART 2 - PRODUCTS

### 2.1 CCTV EQUIPMENT

#### A. CCTV System:

1. The Contractor shall utilize CCTV system that is complete with closed circuit television camera, monitor, and computer system with video capture card or specialized video recording equipment capable of pausing and resuming live recordings, capable of entering a manhole cover with a minimum 18-inch diameter clearance, and all necessary equipment for successful completion of television inspection.
2. The camera, monitor, and other components of the CCTV system shall be capable of producing a minimum 460-line resolution video.
3. The Contractor shall have capabilities to perform inspections as specified in areas where vehicle access to manholes is limited.

#### B. Pipe Inspection Camera:

1. Pipe Inspection Camera shall be designed for inspection of sanitary sewer pipes.
2. Camera shall have pan and tilt capabilities:
  - a. Pan: 275 degrees.
  - b. Tilt: 360 degrees.
3. The camera shall be solid-state color with remote control of pan and tilt functions.
4. Cameras incorporating mirrors for viewing sides or using exposed rotating heads are not acceptable.
5. The camera shall be capable of displaying on the video the City name, project name, Contractor name, date, pipe size and material, and line identification number. Information shall be shown at the beginning of the recording but shall not proceed throughout the recording.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application examination.
- B. Verify location of sewer pipelines to be inspected.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for application preparation.
- B. Flush and clean pipeline to remove sludge, dirt, sand, stone, grease, and other materials to ensure clear view of interior conditions.



- C. Debris:
  - 1. Intercept flushed debris at next downstream manhole using weir or screening device.
  - 2. Remove and dispose of debris off Site and in accordance with all applicable regulations.
- D. Bypassing:
  - 1. Furnish temporary bypass pumping system, as required, around Work area for time required to complete television inspection.
  - 2. Provide standby pump of equal or greater capacity at bypass location.
  - 3. Provide safety precautions, including barricades, lights, and flaggers as specified in Section 01 50 00 - Temporary Facilities and Controls.

### 3.3 APPLICATION

- A. Closed-Circuit Television (CCTV) Camera System:
  - 1. Use cameras specifically designed and constructed for closed-circuit sewer line inspection.
  - 2. Use camera capable of moving both upstream and downstream with minimum 1,000 feet horizontal distance within one setup and using direct-reading cable position meter.
- B. Pipeline Inspection:
  - 1. Video record sections of sewer pipeline between designated manholes.
  - 2. Identify and record locations of flat grades, dips, deflected joints, open joints, broken pipe, protrusions into pipeline, and points of infiltration.
  - 3. Locate and record service connections.
  - 4. Record locations of pipeline defects, connection horizontal distance in feet, and direction from manholes.
  - 5. Video-record with pipe section plugged to view 100 percent of pipe ID.
  - 6. Use flow-control methods as required for bypass pumping system to eliminate surcharging and to reduce flow.
- C. The Contractor shall utilize PACP coding methods for assessment of the pipe(s) and preparation of the inspection report(s).

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

END OF SECTION

## SECTION 33 01 30.72

### CURED-IN-PLACE PIPE LINING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. General:

1. Cured-in-Place Pipe Lining shall provide for the reconstruction of clay sewer mains by the installation of a resin-impregnated flexible tube, which is formed to the original pipe by use of a hydrostatic head. The resin is cured using hot water under hydrostatic pressure within the tube. The Cured-In-Place Pipe (CIPP) will be continuous and tight fitting.
2. This specification references ASTM F1216 (Rehabilitation of pipelines by the inversion and curing of a resin-impregnated tube), ASTM F1743 (Rehabilitation of pipelines by pulled-in- place installation of a cured-in-place thermosetting resin pipe), and ASTM D790 (Test methods for flexural properties of un-reinforced plastics) which are made a part hereof by such reference.

###### B. Section Includes:

1. Cleaning and flushing of existing sanitary sewers.
2. Television inspection and assessment of sewer pipelines.
3. Installing an inverted, resin-impregnated tube pipe liner.
4. Reestablishing service connections.

###### C. Related Requirements:

1. Section 33 01 30.11 - Television Inspection of Sewers.
2. Section 33 05 05.33 - Infiltration and Exfiltration Testing.
3. Section 33 05 05.41 - Air Testing.
4. Section 33 05 05.43 - Mandrel Testing.

##### 1.2 REFERENCE STANDARDS

###### A. ASTM International:

1. ASTM D5260 - Standard Classification for Chemical Resistance of Poly (Vinyl Chloride) (PVC) Homopolymer and Copolymer Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
2. ASTM D5813 - Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems.
3. ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.

4. ASTM F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).
5. ASTM F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP).

### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with users connected to system.
- C. Notify customers at least 48 hours in advance of expected disruption of sanitary service.
- D. Limit disruption of service to individual properties to one-time occurrence for maximum of eight (8) hours.
- E. Do not disrupt residential customer service between hours of 5:00 PM and 8:00 AM.
- F. Provide and maintain temporary facilities, including piping and pumps, to meet requirements.

### 1.4 PREINSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.
- B. Convene minimum one week prior to commencing Work of this Section.

### 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
  1. Submit manufacturer information regarding liner material, curing chemicals, and lubricants.
  2. Submit complete description of proposed wet-out procedures.
- C. Shop Drawings: Indicate liner dimensions for each pipe size to be relined.
- D. Samples: Submit two samples of liner material in both uncured and cured state.
- E. Portable External Hard Drive:
  1. Submit video recordings of piping sections as follows:
    - a. Show condition of existing pipe and pipe joints and location of existing service connections after cleaning and prior to relining.

- b. Show cured liner and reestablished service connections after relining Work has been completed.
  - F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
  - G. Delegated Design Submittals:
    - 1. Submit signed and sealed Shop Drawings with design calculations and assumptions for liner thickness.
    - 2. Liner thickness shall be no less than the minimum specified herein.
  - H. Test and Evaluation Reports: Submit reports certifying that liner material meets ASTM testing standards as specified in this Section.
  - I. Manufacturer Instructions:
    - 1. Submit detailed description of liner placement and curing procedures for piping.
    - 2. Include description of procedures for sealing liner material at manholes and reestablishing service connections.
    - 3. Submit manufacturer's requirements for receiving, handling, and storage of materials.
  - J. Source Quality-Control Submittals: Indicate results of shop tests and inspections.
  - K. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
  - L. Qualifications Statements:
    - 1. Submit qualifications for manufacturer, installer, licensed professional, pipeline assessor, and inspector.
    - 2. Submit manufacturer's approval of installer.
- 1.6 CLOSEOUT SUBMITTALS
- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
  - B. Project Record Documents: Record actual locations of each service connection.
- 1.7 QUALITY ASSURANCE
- A. Perform Work according to ASTM F1216, ASTM F1743, and ASTM D790 standards.
- 1.8 QUALIFICATIONS
- A. Only Commercially Proven products with substantial successful long-term track records will be approved. All trenchless rehabilitation products and installers shall meet the requirements in the General Conditions and all criteria listed below.
    - 1. Manufacturer: For a Product to be considered Commercially Proven, a minimum of 400,000 linear feet or 1,000 manhole-to-manhole line sections of successful

wastewater collection system installations in the U.S. shall be documented to the satisfaction of the Engineer to assure commercial viability.

2. Installer: For an Installer to be considered as Commercially Proven, the Installer must satisfy all insurance, financial, and bonding requirements of the Owner, and must have had at least 5 (five) years active experience in the commercial installation of the product. In addition, the Installer shall have successfully installed at least 400,000 feet of the product bid in wastewater collection systems. Acceptable documentation of these minimum installations is required.
3. The Contractor shall provide Third Party Test Results supporting the long-term performance and structural strength of the submitted product and such data shall be satisfactory to the Engineer. Test samples shall be prepared to simulate installation methods and trauma of the product. No product will be approved without independent third-party testing verification.
4. Both the rehabilitation manufacturing and installation processes shall operate under a quality management system, which is third party certified to ISO 9000 or other internationally recognized organization standards. Proof of certification shall be required for approval.

B. Inspector:

1. Person specializing in inspection of sewer pipeline rehabilitation.
2. Currently certified in Inspector Training and Certification Program (ITCP) of NASSCO.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
  1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  2. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

- A. Field Measurements:
  1. Verify field measurements prior to fabrication.
  2. Indicate field measurements on Shop Drawings.

## 1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish two-year manufacturer's warranty for liner.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE AND DESIGN CRITERIA

- A. Design lining material to have sufficient structural strength to support dead loads, live loads, and groundwater load imposed, assuming existing pipe cannot share loading or contribute to structural integrity of liner.
- B. Design liner to least-possible thickness to minimize decreasing interior pipe diameter.
- C. Design liner material to provide jointless, continuous, and structurally sound construction able to withstand imposed static, dynamic, and hydrostatic loads on a long-term basis.
- D. Identify design provisions for shrinkage control to prevent future misalignment of service reconnections.

### 2.2 INVERTED, RESIN-IMPREGNATED TUBE PIPE LINER

- A. Tube: The sewn Tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F1216 or ASTM F1743, Section 5. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.
  - 1. The wet-out tube shall have a uniform thickness that when compressed at installation pressures will meet or exceed the design thickness.
  - 2. The tube shall be sewn to a size that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during inversion. Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be utilized.
  - 3. The outside layer of the tube, before wet-out, shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate monitoring of resin saturation during the resin impregnation (wet-out) procedure.
  - 4. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the Tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.
  - 5. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
  - 6. Seams in the tube shall be stronger than the un-seamed felt.

7. The outside of the tube shall be marked for distance at regular intervals along its entire length, not to exceed five (5) feet. Such markings shall include the Manufacturers name or identifying symbol.
  8. The tubes must be manufactured in the USA.
- B. Resin: The resin system shall be a corrosion resistant polyester, vinyl ester, or epoxy and catalyst system that when properly cured within the tube composite meets the requirements of ASTM F1216 and ASTM F1743, the physical properties herein, and those which are to be utilized in the design of the CIPP for this project. The resin shall produce CIPP that will comply with the specified structural and chemical resistance requirements.
1. The CIPP shall be designed as per ASTM F1216, Appendix X1. The CIPP design shall assume no bonding to the original pipe wall.
  2. Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (Tube and Resin) and general workmanship of the installation and curing. A percentage of the instantaneous flexural modulus value, as measured by ASTM D-790 testing, will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Values in excess of 50% will not be applied unless substantiated by qualified third party test data. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in design.
  3. The Enhancement Factor (K) to be used in 'Partially Deteriorated' design conditions shall be assigned a value of seven (7). Application of Enhancement Factors in excess of seven (7) shall be substantiated through independent test data.
  4. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occurs during testing of field samples, new samples will be cut from the work. Any reoccurrence may cause rejection of the work.
  5. The cured pipe material (CIPP) shall conform to the structural properties, as listed below.

Property	Test Method	Cured Composite Per ASTM F1216	Cured Composite (400 k Resin)
Modulus of Elasticity	ASTM D-790 (Short term)	250,000 psi	400,000 psi
Flexural Stress	ASTM D-790	4,500 psi	4,500 psi

6. The required structural CIPP wall thickness shall be as based as a minimum, on the physical properties specified and in accordance with the design equations in the appendix of ASTM F1216, and the following design parameters:

Design Safety Factor	=	2.0
Retention Factor for Long-Term Flexural Modulus to be used in design (as determined by Long-Term tests described in paragraph 491.12.6.2)	=	1% to 60%
Ovality*	=	2%
Soil Depth (above crown)*	=	3 FT to 20 FT
Soil Density**	=	120 PCF
Design Condition (partially or fully deteriorated)***	=	FD
* Denotes information which can be provided here or in inspection video tapes or project construction plans.		
** Denotes information required only for fully deteriorated design conditions.		
*** Based on review of video logs, conditions of pipeline can be fully or partially deteriorated. (See ASTM F1216 Appendix) The Engineer will be sole judge as to pipe conditions and parameters utilized in design.		

7. Regardless of calculated thickness, CIPP wall thickness shall be no less than the following:

Pipe Diameter	Minimum CIPPL Design Thickness (Felt / Fiberglass)
8-inch	6.0 mm / 3.0 mm
10-inch	6.0 mm / 3.0 mm
12-inch	7.5 mm / 5.0 mm
15-inch	7.5 mm / 5.0 mm
18-inch	9.0 mm / 7.0 mm
21-inch	10.5 mm / 7.0 mm
24-inch	12.0 mm / 7.0 mm
30-inch	15.0 mm / 9.0 mm
36-inch	16.5 mm / 11.0 mm
42-inch	19.5 mm / 11.0 mm
48-inch	22.5 mm / 13.0 mm

8. Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.

C. Hydrophilic Seals:

1. Hydrophilic water-stop end seals shall be bands, 20 mm wide and 5 mm thick, installed at all manhole entrances.



2. Manufacturers:
  - a. Hydrotite, RS-0520-3.51,
  - b. MC-2005T
  - c. or approved equal.

## 2.3 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Inspection and Testing:
  1. Chemical Resistance: The CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical testing requirements.
  2. Hydraulic Capacity: Overall, the hydraulic profile shall be maintained as large as possible. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.
  3. CIPP Field Samples: When requested by the Engineer, the Contractor shall submit test results from field installations in the USA of the same resin system and tube materials as proposed for the actual installation. These test results must verify that the CIPP physical properties specified have been achieved in previous field applications.
  4. Provide shop inspection and testing of completed assembly.
  5. Chemical and Physical Testing: Test cured samples according to ASTM D5260.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify location of piping to be relined.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. It shall be the responsibility of the Owner to locate and designate all manhole access points open and accessible for the work and provide rights of access to these points. If a street must be closed to traffic because of the orientation of the sewer, the Contractor shall institute the action necessary to do this for the mutually agreed time period.

- C. The Owner shall provide access to water hydrants for cleaning, inversion, and other activities requiring water. The Contractor shall use a meter and backflow preventer provided by the City of Ocala after application is made at the City Building Department.
- D. Cleaning: The Contractor, when required, shall remove all internal debris out of the sewer line that will interfere with the installation of CIPP. The Owner shall provide a dump site for all debris removed from the sewers during the cleaning operation. Unless stated otherwise, it is assumed this site will be at or near the sewage treatment facility to which the debris would have arrived in absence of the cleaning operation. Any hazardous waste material encountered during this project will be considered a changed condition.
- E. Bypassing Sewage:
  - 1. The Contractor, when required, shall provide for the flow of sewage around the section or sections of pipe designated for repair.
  - 2. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow.
  - 3. Submit detailed bypass plan to the Engineer prior to beginning the Work.
- F. Inspection of Pipelines: Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by close circuit television. The interior of the pipeline shall be carefully inspected to determine the location of any conditions which may prevent proper installation of CIPP into the pipelines, and it shall be noted so that these conditions can be corrected. A DVD of the video and suitable log shall be kept for later reference by the Owner.
- G. Line Obstructions: It shall be the responsibility of the Contractor to clear the line of obstructions such as solids and roots that will prevent the insertion of CIPP. If pre-installation inspection reveals an obstruction such as a protruding service connection, dropped joint, or a collapse that will prevent the inversion process, that was not evident on the pre-bid video and cannot be removed by conventional sewer cleaning equipment, then the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Engineer prior to the commencement of the Work and shall be considered as a separate pay item.
- H. Public Notification: The Contractor shall make every effort to maintain service usage throughout the duration of the project. In the event that a service will be out of service, the maximum amount of time of no service shall be eight (8) hours for any property served by the sewer.
- I. A public notification program shall be implemented, and shall as a minimum, require the Contractor to contact each home or business connected to the sanitary sewer and informing them of the work to be conducted, and when the sewer will be off-line. The Contractor shall also provide the following:
  - 1. Written notice to be delivered to each home or business the day prior to the beginning of work being conducted on the pipe section, and a local telephone

number of the Contractor they can call to discuss the project or any problems which could arise.

2. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.

- J. The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing and curing the CIPP.

### 3.3 INSTALLATION

- A. Perform lining and reestablish service connections without need for excavation while minimizing disruptions to customers, adjacent occupied buildings, and traffic.
- B. CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6, with the following modifications:
  1. Resin Impregnation: The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used. To ensure thorough resin saturation throughout the length of the felt tube, the point of vacuum shall be no further than 25 feet from the point of initial resin introduction. After vacuum in the tube is established, a vacuum point shall be no further than 75 feet from the leading edge of the resin. The leading edge of the resin slug shall be as near to perpendicular as possible. A roller system shall be used to uniformly distribute the resin throughout the tube. If the Installer uses an alternate method of resin impregnation, the method must produce the same results. Any alternate resin impregnation method must be proven.
  2. Tube Insertion: The wet-out tube shall be positioned in the pipeline using either inversion or a pull-in method. If pulled into place, a power winch should be utilized, and care should be exercised not to damage the tube as a result of pull-in friction. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
  3. Temperature gauges shall be placed inside the tube at the invert level of each end to monitor the temperatures during the cure cycle.
  4. Curing shall be accomplished by utilizing hot water under hydrostatic pressure in accordance with the manufacturer's recommended cure schedule.
- C. Branch connections to buildings shall be reopened without excavation, utilizing a remote-controlled cutting device, monitored by a CCTV camera. The Contractor shall certify he has a minimum of two complete working cutters plus spare key components on the site before each inversion. Unless otherwise directed by the Engineer or his authorized representative, all laterals will be reinstated. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor shall be responsible for all costs and liability associated with such excavation and restoration.

D. Service Connections:

1. Reestablish existing sewer service connections through use of closed-circuit television camera and remote-controlled cutting device.
2. Match invert of reestablished service with previously existing invert.
3. Maintain minimum of 95 percent to maximum of 100 percent of original service connection opening.
4. Reestablish sewer service connection with uniform cuts free of burrs and sharp edges.
5. After reestablishing service connection, flush piping clean.

3.4 FIELD QUALITY CONTROL

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Testing of Completed Pipe Liner:

1. CIPP Samples shall be prepared and physical properties tested in accordance with ASTM F1216 or ASTM F1743, Section 8, using either method proposed. The flexural properties shall meet or exceed the values listed in Table 1 of the applicable ASTM.
2. Wall thickness of samples shall be determined as described in paragraph 8.1.6 of ASTM F1743. The minimum wall thickness at any point shall not be less than 87 1/2% of the design thickness as specified herein.
3. Visual inspection of the CIPP shall be in accordance with ASTM F1743, Section 8.6.

C. Liner Acceptance:

1. Adjust, repair, modify, or replace components failing to perform as specified and rerun tests.
2. If liner fails to form, remove failed liner and install new liner.
3. Conduct closed-circuit video inspection of completed relining Work, indicating no visual defects, including foreign inclusions, dry spots, pinholes, cracks, or delamination.
4. Confirm that service connections are complete and unobstructed.
5. No infiltration of groundwater is permitted.
6. Make final adjustments to liner under direction of manufacturer's representative.

D. Furnish installation certificate from manufacturer's representative attesting that liner has been properly installed and is ready for startup and testing.

E. Upon acceptance of the installation work and testing, the Contractor shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

END OF SECTION

## SECTION 33 01 30.79

### FOLD-AND-FORM PIPE LINING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. General:

1. It is the intent to provide for the reconstruction of existing pipelines by the installation of a high strength PVC expanded in place new pipe. Expansion shall be accomplished by circulating steam, or other approved method and providing pressure to properly expand the PVC pipe tight against the host pipe. After expansion the PVC pipe shall extend over the length of the host pipe from manhole to manhole in a continuous, jointless, tight fitting, watertight pipe-within-a-pipe.

###### B. Section Includes:

1. Cleaning and flushing of existing sanitary sewers.
2. Television inspection and assessment of sewer pipelines.
3. Installing fold-and-form pipe liner.
4. Installing deformed polyethylene pipe liner.
5. Reestablishing service connections.

###### C. Related Requirements:

1. Section 33 01 30.11 - Television Inspection of Sewers.
2. Section 33 05 05.33 - Infiltration and Exfiltration Testing.
3. Section 33 05 05.41 - Air Testing.
4. Section 33 05 05.43 - Mandrel Testing.

##### 1.2 REFERENCE STANDARDS

###### A. ASTM International:

1. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
2. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
3. ASTM D696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics.
4. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
5. ASTM D1784 - Specifications for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
6. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

7. ASTM D5260 - Standard Classification for Chemical Resistance of Poly (Vinyl Chloride) (PVC) Homopolymer and Copolymer Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
8. ASTM F1504 – Standard Specification for Folded Poly (Vinyl Chloride) (PVC) Pipe for Existing Sewer and Conduit Rehabilitation.
9. ASTM F1867 - Standard Practice for Installation of Folded/Formed Poly (Vinyl Chloride) (PVC) Pipe Type A for Existing Sewer and Conduit Rehabilitation.
10. ASTM F1871 - Standard Specification for Folded/Formed Poly (Vinyl Chloride) Pipe Type A for Existing Sewer and Conduit Rehabilitation.

### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with users connected to system.
- C. Notify customers at least 48 hours in advance of expected disruption of sanitary service.
- D. Limit disruption of service to individual properties to one-time occurrence for maximum of eight hours.
- E. Do not disrupt customer service between hours of 5:00 PM and 8:00 AM.
- F. Provide and maintain temporary facilities, including piping and pumps, to meet requirements.

### 1.4 PREINSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.
- B. Convene minimum one week prior to commencing Work of this Section.

### 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information regarding liner material.
  1. Furnish complete catalog cuts.
  2. Technical data.
  3. Furnish the manufacturer's recommended installation method.
- C. Shop Drawings: Indicate liner dimensions for each pipe size to be relined.
- D. Samples: Submit two samples of liner material.

- E. Digital Video Discs (DVDs):
    - 1. Submit video recordings of piping sections as follows:
      - a. Show condition of existing pipe and pipe joints and location of existing service connections after cleaning and prior to relining.
      - b. Show liner and reestablished service connections after relining Work has been completed.
  - F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
  - G. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions for liner thickness.
  - H. Test and Evaluation Reports: Submit reports certifying that liner material meets ASTM testing standards as specified in this Section.
  - I. Manufacturer Instructions:
    - 1. Submit detailed description of liner placement and installation procedures.
    - 2. Include description of procedures for sealing liner material at manholes and reestablishing service connections.
    - 3. Submit manufacturer's requirements for receiving, handling, and storage of materials.
  - J. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
  - K. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
  - L. Qualifications Statements:
    - 1. Submit qualifications for manufacturer, licensed professional, pipeline assessor, and inspector.
    - 2. Submit manufacturer's approval of installer.
    - 3. Submit detailed resume of the field superintendent who will direct the Work.
      - a. The field superintendent shall have at least two (2) years field supervisory experience in trenchless pipeline reconstruction. The field superintendent shall be on the job full time during any and all steps of the pipe installation.
- 1.6 CLOSEOUT SUBMITTALS
- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
  - B. Project Record Documents: Record actual locations of each service connection.
- 1.7 QUALITY ASSURANCE
- A. Perform Work according to applicable ASTM standards.

## 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum five (5) years of documented experience in installation of liner materials.
- C. Pipeline Assessor:
  - 1. Person specializing in assessing condition of sewer pipelines prior to and following relining.
  - 2. Currently certified in Pipeline Assessment and Certification Program (PACP) of the National Association of Sewer Service Companies (NASSCO).
- D. Inspector:
  - 1. Person specializing in inspection of sewer pipeline rehabilitation.
  - 2. Currently certified in Inspector Training and Certification Program (ITCP) of NASSCO.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

## 1.10 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
  - 2. Indicate field measurements on Shop Drawings.
- B. The Contractor shall carry out all operations in strict accordance with OSHA and manufacturer's safety requirements. Particular attention is drawn to those safety requirements involving working with hazardous/combustible material (if needed), scaffolding (if required) and entering confined spaces.



## 1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish two-year manufacturer's warranty for liner.

## PART 2 - PRODUCTS

### 2.1 FOLD-AND-FORM PVC PIPE LINER

- A. The PVC pipe shall be fabricated to a size that, when installed, will neatly and tightly fit the internal circumference of the existing pipe. Allowance for longitudinal stretching during insertion shall be made.
- B. The minimum length shall span the distance from inlet to outlet of the respective pipe to be reconstructed. The CONTRACTOR shall verify the lengths in the field before starting work.
- C. Identify design provisions for shrinkage control to prevent future misalignment of service reconnections.
- D. Design lining material to have sufficient structural strength to support dead loads, live loads, and groundwater load imposed, assuming existing pipe cannot share loading or contribute to structural integrity of liner.
- E. Design liner material to provide jointless, continuous, and structurally sound construction able to withstand imposed static, dynamic, and hydrostatic loads on a long-term basis.
- F. The minimum thickness for PVC pipe shall conform to ASTM 3034-SDR26.
- G. The PVC compound shall be chemically resistant to withstand exposure to domestic sewage.
- H. The Contractor shall furnish, prior to use of the materials, satisfactory written certification of compliance with the manufacturer's standards and specifications for all materials.

### 2.2 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Inspection and Testing:
  - 1. Inspect extruded material for defects and physical properties according to ASTM D1785.
  - 2. Verify that liner material is homogeneous and free of defects, cracks, holes, blisters, protrusions, foreign materials, or other deleterious faults.

3. Marking:
    - a. For testing purposes, mark each production lot with identical marking number.
    - b. Mark each reel of folded PVC pipe at intervals not to exceed 5 feet with coded number identifying manufacturer, size, cell class, machine, shift, and date when liner was extruded.
  4. Chemical and Physical Testing: Test cured samples according to ASTM D5260.
- C. Owner Inspection:
1. Make liner products available for inspection at manufacturer's factory prior to packaging for shipment.
  2. Notify Owner at least seven days before inspection is allowed.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify location of piping to be relined.
- C. Prior to all Work, the Contractor shall carefully inspect the area for existing conditions.
- D. The Contractor shall field verify all existing pipe diameters prior to ordering pipe materials. In the event of a discrepancy, the Contractor shall immediately notify the Engineer. No Work shall be performed in an area of discrepancy until it has been fully resolved by the Engineer.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Cleaning: Clean existing sewer pipes of debris, sedimentation, and mineral deposits with high-velocity cleaner, bucket and scraper, root saws, or rolling or balling units.
- C. Initial Video Inspection and Repair:
  1. Conduct closed-circuit video inspection as specified in Section 33 01 30.11 - Television Inspection of Sewers.
  2. Determine condition of existing piping, degree of offset of joints, and locations of crushed walls and obstructions.
  3. Determine sizes and locations of service entrances and connections.
  4. Evaluation of pipe conditions performed by pipeline assessor.
  5. Inspection of Work performed by an ITCP-certified inspector.

- D. Line Obstructions: It shall be the responsibility of the Contractor to clear the line of obstructions or collapsed pipe that will prevent reconstruction. If inspection reveals an obstruction that cannot be removed by conventional pipe cleaning equipment, then the Contractor shall hydraulically re-round the pipe or make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Engineer prior to commencement of the Work and shall be considered as a separate pay item.
- E. Bypassing Flow:
  - 1. The Contractor, when required, shall provide for the flow around the section of pipe designated for reconstruction.
  - 2. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow.
  - 3. Once the PVC pipe has been pulled into the host pipe, no flow shall be allowed to pass through that section of pipe until the PVC pipe is fully expanded.
  - 4. Submit detailed bypass plan to the Engineer prior to beginning the Work.

### 3.3 INSTALLATION

- A. Installation: The method of installation shall be compatible with the manufacturer's recommended practices. The new pipe shall be inserted into the existing pipe through existing manholes, without modification of manholes, other than minor chipping of manhole channels or removing processing equipment.
- B. If liner fails to re-form, remove failed liner and install new liner.
- C. Finish:
  - 1. The finished liner pipe shall be continuous over the entire length of run between two (2) manholes.
  - 2. Any defects affecting the integrity or strength of the new PVC pipe shall be repaired at the Contractor's expense.
  - 3. Any ribs resulting in the cross-sectional area of the pipe shall be removed or the pipe replaced in its entirety at the Contractor's expense unless approved otherwise by the Engineer.
- D. Sealing at Manhole: If the pipe fails to make a tight seal at the manhole, the Contractor shall apply a seal at that point. The seal shall be of a resin mixture compatible with the pipe material.
- E. Service Connections:
  - 1. After the pipe has been expanded in place, the Contractor shall reconnect the existing active service connections.
  - 2. The Contractor shall be responsible to confirm the active laterals prior to reconnection.

3. Lateral reconnection shall be performed without excavation from the interior of the pipeline by means of a television camera and a cutting device that re- establishes the service connections to not less than 90% capacity.
- F. The Contractor shall furnish all labor, materials, and incidentals required to restore or replace all removed or damaged paving, curbing, sidewalks, gutters, shrubbery, fences, sod, or other disturbed surfaces or structures to a condition equal to that before the Work began to the satisfaction of the Engineer.
- G. Surplus pipe, tools, and temporary structures shall be removed by the Contractor. All dirt, rubbish, and pipe material from the operation shall be legally disposed of by the Contractor.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. The Contractor shall provide a pipe “coupon” specimen from each run of pipe for testing, after installation, by an approved laboratory. All expenses for the testing of these specimens will be paid for by the Owner. The cost of re-tests made necessary by the failure of the samples of specimens to meet the specified requirements shall be paid for by the Contractor.
- C. Each pipe shall be subject to inspection by the Engineer immediately before it is installed, and defective pipe may be rejected.
- D. Upon completion of the installation, a visual inspection shall be performed of the pipe expanded in place via a closed-circuit television camera. A DVD or Flash Drive disc of the inspection shall be provided to the Owner.
  1. Visual inspection shall verify that no visual defects, including foreign inclusions, dry spots, pinholes, cracks, or delamination exist within the pipe.
  2. No infiltration of groundwater is permitted.
- E. The manufacturer’s recommendations shall be the basis for acceptance or rejection of actual methods of installation used in the Work.
- F. Corrections to defective installation shall be according to the manufacturer’s recommendations.
- G. No pipe shall be reconstructed without prior notification of the Engineer.
- H. Furnish installation certificate from equipment manufacturer's representative attesting that liner has been properly installed and is ready for startup and testing.

END OF SECTION

SECTION 33 05 05.31  
HYDROSTATIC TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Hydrostatic testing of pressure piping.
- B. Related Requirements:
  - 1. Section 33 31 23 - Sanitary Sewerage Force Main Piping.
  - 2. Section 33 14 13 - Public Water Utility Distribution Piping.

1.2 REFERENCE STANDARDS

- A. American Water Works Association:
  - 1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
  - 2. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit following items prior to start of testing:
  - 1. Testing procedures.
  - 2. List of test equipment.
  - 3. Testing sequence schedule.
  - 4. Provisions for disposal of flushing and test water.
  - 5. Certification of test gage calibration.
- C. Test and Evaluation Reports: Indicate results of piping tests.
- D. Qualifications Statement:
  - 1. Submit qualifications field personnel responsible for supervising hydrostatic testing.

1.4 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Environmental Protection (FDEP) standards.

## 1.5 QUALIFICATIONS

- A. Applicator: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

## PART 2 - PRODUCTS

### 2.1 HYDROSTATIC TESTING

- A. Equipment:
  - 1. Pressure pump.
  - 2. Pressure hose.
  - 3. Water meter.
  - 4. Test connections.
  - 5. Pressure relief valve.
  - 6. Pressure Gage: Calibrated to 0.1 psi.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that piping is ready for testing.
- C. Verify that trenches are backfilled.
- D. Verify that pressure piping thrust restraints have been installed.

### 3.2 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Testing of Pressure Piping:
  - 1. Test system according to AWWA C600 and following:
    - a. Test Pressure: Not less than 150 psig or 50 psi in excess of maximum static pressure, whichever is greater.
    - b. Conduct hydrostatic test for a minimum of two (2) hours.
    - c. Slowly fill section to be tested with water of approved quality; expel air from piping at high points. If hydrants, blow-offs, or other outlets are not available at high points for releasing air, the Contractor shall make the necessary taps at such points and shall plug said holes after completion of the test.

- d. Install corporation cocks at high points.
  - e. Close air vents and corporation cocks after air is expelled.
  - f. Raise pressure to specified test pressure.
  - g. Observe joints, fittings, and valves under test.
  - h. Remove and renew cracked pipes, joints, fittings, and valves showing visible leakage, and retest.
  - i. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
  - j. Maintain pressure within plus or minus 5 psi of test pressure.
  - k. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
  - l. Compute maximum allowable leakage using following formula:
    - 1)  $L = SD \times \sqrt{P}/C$ .
    - 2) L = testing allowance, gph.
    - 3) S = length of pipe tested, feet.
    - 4) D = nominal diameter of pipe, inches.
    - 5) P = average test pressure during hydrostatic test, psig.
    - 6) C = 133,200.
  - m. If pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.
  - n. Leakage:
    - 1) If test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.
    - 2) Correct visible leaks regardless of quantity of leakage.
2. HDPE Pipe Testing:
- a. In addition to the leakage requirements above, HDPE pipe shall not exceed the following allowable expansion rates:

HDPE Pipe Diameter	Allowable Expansion
2"	0.10 gallons/100 feet of pipe
3"	0.15 gallons/100 feet of pipe
4"	0.25 gallons/100 feet of pipe
6"	0.55 gallons/100 feet of pipe
8"	0.95 gallons/100 feet of pipe
10"	1.25 gallons/100 feet of pipe
12"	2.25 gallons/100 feet of pipe
14"	2.75 gallons/100 feet of pipe
16"	3.25 gallons/100 feet of pipe
18"	4.25 gallons/100 feet of pipe
20"	5.45 gallons/100 feet of pipe
24"	8.75 gallons/100 feet of pipe

3. If testing of piping indicates leakage greater than that allowed, locate source of leakage, make corrections, and retest until leakage is within acceptable limits.
4. Correct visible leaks regardless of quantity of leakage.
5. If, in the judgement of the Engineer, it is impractical to follow the foregoing procedures exactly for any reason, modifications to the procedure shall be made as required and approved by the Engineer. This shall not relieve the Contractor of the responsibility to meet the leakage and expansion requirements specified herein.

END OF SECTION



## SECTION 33 05 05.33

### INFILTRATION AND EXFILTRATION TESTING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Testing of Manholes: Exfiltration testing.
- B. Related Requirements:
  - 1. Section 33 05 61 - Concrete Manholes.
  - 2. Section 33 31 11 - Public Sanitary Sewerage Gravity Piping.

##### 1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit following items prior to start of testing:
  - 1. Testing procedures.
  - 2. List of test equipment.
  - 3. Testing sequence schedule.
  - 4. Provisions for disposal of flushing and test water.
  - 5. Certification of test gage calibration.
- C. Test and Evaluation Reports: Indicate results of manhole and piping tests.
- D. Qualifications Statement:
  - 1. Submit qualifications for applicator.

##### 1.3 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Environmental Protection standards.

##### 1.4 QUALIFICATIONS

- A. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

## PART 2 - PRODUCTS

### 2.1 EXFILTRATION TESTING

- A. Equipment:
  - 1. Plugs.
  - 2. Pump.
  - 3. Measuring device.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that manholes and piping are ready for testing.
- C. Verify that trenches are backfilled.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for preparation.
- B. Plugs:
  - 1. Plug outlets, wye branches, and laterals.
  - 2. Brace plugs to resist test pressures.

### 3.3 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Manhole Testing:
  - 1. Repair both outside and inside of joint to ensure permanent seal.
  - 2. Test manholes with manhole frame set in place.
  - 3. Plug pipes in manhole.
  - 4. Remove water from manhole.
  - 5. Observe plugs over period of not less than two hours to ensure that there is no leakage into manhole.
  - 6. Determine ground water level outside manhole.
  - 7. Fill manhole with water within 4 inches of top of cover frame.
  - 8. Prior to testing, allow manhole to soak from minimum of four hours to maximum of 72 hours.

9. After soak period, adjust water level inside manhole to within 4 inches of top of cover frame.
10. Measure water level from top of manhole frame.
11. At end of four-hour testing period, again measure water level from top of manhole frame; compute drop in water level during testing period.
12. Manhole exfiltration test is considered satisfactory when drop in water level is less than 0.1 percent (0.1%) of the water surface elevation within the manhole.
13. If unsatisfactory testing results are achieved, repair manhole and retest until result meets criteria.
14. Repair visible leaks regardless of quantity of leakage.

END OF SECTION

## SECTION 33 05 05.36

### VACUUM TESTING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Vacuum testing of manholes.
- B. Related Requirements:
  - 1. Section 33 05 61 - Concrete Manholes.
  - 2. Section 33 05 76 - Fiberglass Manholes.
  - 3. Section 33 31 11 - Public Sanitary Sewerage Gravity Piping.

##### 1.2 REFERENCE STANDARDS

- A. ASTM International:
  - 1. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

##### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit following items prior to start of testing:
  - 1. Testing procedures.
  - 2. List of test equipment.
  - 3. Testing sequence schedule.
  - 4. Provisions for disposal of flushing and test water.
  - 5. Certification of test gage calibration.
- C. Test and Evaluation Reports: Indicate results of manhole tests.
- D. Qualifications Statement:
  - 1. Submit qualifications for applicator.

##### 1.4 QUALIFICATIONS

- A. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

## PART 2 - PRODUCTS

### 2.1 VACUUM TESTING

- A. Equipment:
  - 1. Vacuum pump.
  - 2. Vacuum line.
  - 3. Vacuum Tester Base:
    - a. Compression band seal.
    - b. Outlet port.
  - 4. Shutoff valve.
  - 5. Stopwatch.
  - 6. Plugs.
  - 7. Vacuum Gage: Calibrated to 0.1 in. Hg.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that manholes are ready for testing.
- C. Verify that manholes are backfilled.

### 3.2 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Manhole Testing:
  - 1. Repair both outside and inside of joint to ensure permanent seal.
  - 2. Test manholes with manhole frame set in place.
  - 3. Vacuum Testing:
    - a. Comply with ASTM C1244.
    - b. Plug pipe openings; securely brace plugs and pipe.
    - c. Inflate compression band to create seal between vacuum base and structure.
    - d. Connect vacuum pump to outlet port with valve open, then draw vacuum to 10 in. Hg.
    - e. Close valve.
    - f. Manhole Test Duration in Seconds:
      - 1) Manhole Diameter of 4 Feet: 60.
      - 2) Manhole Diameter of 5 Feet: 75.
      - 3) Manhole Diameter of 6 Feet: 90.

- g. Record vacuum drop during test period.
  - h. If vacuum drop is greater than 1 in. Hg during testing period, repair and retest manhole.
  - i. If vacuum drop of 1 in. Hg does not occur during test period, manhole is acceptable; discontinue testing.
  - j. If vacuum test fails to meet 1-in. Hg drop in specified time after repair, repair and retest manhole.
- 4. If unsatisfactory testing results are achieved, repair manhole and retest until result meets criteria.
  - 5. Repair visible leaks regardless of quantity of leakage.

END OF SECTION

## SECTION 33 05 05.41

### AIR TESTING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Low-pressure air testing of gravity sewer piping.
- B. Related Requirements:
  - 1. Section 33 31 11 - Public Sanitary Sewerage Gravity Piping.

##### 1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Submit following items prior to start of testing:
  - 1. Testing procedures.
  - 2. List of test equipment.
  - 3. Testing sequence schedule.
  - 4. Provisions for disposal of flushing and test water.
  - 5. Certification of test gage calibration.
- C. Test and Evaluation Reports: Indicate results of piping tests.
- D. Qualifications Statement:
  - 1. Submit qualifications for applicator.

##### 1.3 QUALITY ASSURANCE

- A. Perform Work according to ASTM F1417-11a - Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air.

##### 1.4 QUALIFICATIONS

- A. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

## PART 2 - PRODUCTS

### 2.1 AIR TESTING

- A. Equipment:
  - 1. Air compressor.
  - 2. Air supply line.
  - 3. Shutoff valves.
  - 4. Pressure regulator.
  - 5. Pressure relief valve.
  - 6. Stopwatch.
  - 7. Plugs.
  - 8. Pressure Gage: Calibrated to 0.1 psi.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that piping is ready for testing.
- C. Verify that trenches are backfilled.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for preparation.
- B. Lamping:
  - 1. Lamp gravity piping after flushing and cleaning.
  - 2. Perform lamping operation by shining light at one end of each pipe section between manholes.
  - 3. Observe light at the other end.
  - 4. Pipe not installed with uniform line and grade will be rejected.
  - 5. Remove and reinstall rejected pipe sections.
  - 6. Clean and lamp until pipe section is installed to uniform line and grade.
- C. Plugs:
  - 1. Plug outlets, wye branches, and laterals.
  - 2. Brace plugs to resist test pressures.



### 3.3 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Low-Pressure Air Testing:
  - 1. Test each reach of gravity sewer piping between manholes.
  - 2. Introduce air pressure slowly to approximately 4 psig.
  - 3. Determine ground water elevation above spring line of piping.
  - 4. For every foot of ground water above spring line of piping, increase starting air test pressure by 0.43 psi.
  - 5. Do not increase pressure above 10 psig.
  - 6. Allow pressure to stabilize for at least five minutes.
  - 7. Adjust pressure to 3.5 psig or to increased test pressure as determined above when ground water is present.
  - 8. Do not make allowance for laterals.
  - 9. Minimum Testing Duration in Minutes Per 100 Feet:
    - a. Pipe Size 3 Inches: 0.2.
    - b. Pipe Size 4 Inches: 0.3.
    - c. Pipe Size 6 Inches: 0.7.
    - d. Pipe Size 8 Inches: 1.2.
    - e. Pipe Size 10 Inches: 1.5.
    - f. Pipe Size 12 Inches: 1.8.
    - g. Pipe Size 15 Inches: 2.1.
    - h. Pipe Size 18 Inches: 2.4.
    - i. Pipe Size 21 Inches: 3.0.
    - j. Pipe Size 24 Inches: 3.6.
    - k. Pipe Size 27 Inches: 4.2.
    - l. Pipe Size 30 Inches: 4.8.
    - m. Pipe Size 33 Inches: 5.4.
    - n. Pipe Size 36 Inches: 6.0.
  - 10. Record drop in pressure during testing period.
  - 11. If air pressure drops more than 1.0 psi during testing period, piping has failed.
  - 12. If 1.0-psi air pressure drop has not occurred during testing period, piping is acceptable; discontinue testing.
  - 13. If piping fails, test reach of piping in incremental stages until leaks are isolated, repair leaks, and retest entire reach between manholes.
  - 14. If unsatisfactory testing results are achieved, make necessary repairs and retest until result meets criteria.
  - 15. Repair visible leaks regardless of quantity of leakage.

END OF SECTION

## SECTION 33 05 05.43

### MANDREL TESTING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes: Deflection testing of plastic sewer piping.
- B. Related Requirements:
  - 1. Section 33 31 11 - Public Sanitary Sewerage Gravity Piping.

##### 1.2 REFERENCE STANDARDS

- A. ASTM International:
  - 1. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

##### 1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit following items prior to start of testing:
  - 1. Testing procedures.
  - 2. List of test equipment.
  - 3. Testing sequence schedule.
  - 4. Provisions for disposal of flushing and test water.
  - 5. Certification of test gage calibration.
  - 6. Deflection mandrel drawings and calculations.
- C. Test and Evaluation Reports: Indicate results of piping tests.

#### PART 2 - PRODUCTS

##### 2.1 DEFLECTION TESTING

- A. Equipment:
  - 1. Go-No-Go mandrel.
  - 2. Pull/retrieval ropes.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that piping is ready for testing.
- C. Verify that trenches are backfilled.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for preparation.
- B. Lamping:
  - 1. Lamp gravity piping after flushing and cleaning.
  - 2. Perform lamping operation by shining light at one end of each pipe section between manholes.
  - 3. Observe light at the other end.
  - 4. Pipe not installed with uniform line and grade will be rejected.
  - 5. Remove and reinstall rejected pipe sections.
  - 6. Clean and lamp until pipe section is installed to uniform line and grade.
- C. Plugs:
  - 1. Plug outlets, wye branches, and laterals.
  - 2. Brace plugs to resist test pressures.

### 3.3 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Deflection Testing of Plastic Sewer Piping:
  - 1. Perform vertical ring deflection testing on PVC and ABS sewer piping after backfilling has been in place for at least 30 days, but not longer than 12 months.
  - 2. Allowable maximum deflection for installed plastic sewer pipe is no greater than five percent of original vertical internal diameter.
  - 3. Perform deflection testing using Go-No-Go mandrel.
  - 4. Mandrel Diameter:
    - a. Not less than 95 percent of base or average ID of pipe.
    - b. Pipe Diameter: Comply with ASTM D2122.
  - 5. Perform testing without mechanical pulling devices.
  - 6. Locate, excavate, replace, and retest piping that exceeds allowable deflection.

END OF SECTION

SECTION 33 05 07.00  
BORING AND JACKING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Casing and jacking pipe.
  - 2. Carrier pipe.
  - 3. Excavation for approach trenches and pits.
- B. Related Requirements:
  - 1. Section 33 14 13 – Public Water Utility Distribution Piping.
  - 2. Section 33 15 00 – Public Reclaimed Water Distribution Piping.
  - 3. Section 33 31 11 – Public Sanitary Sewerage Gravity Piping.
  - 4. Section 33 31 23 – Sanitary Sewerage Force Main Piping.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO HB-17 - Standard Specifications for Highway Bridges.
  - 2. AASHTO M133 - Standard Specification for Preservatives and Pressure Treatment Processes for Timber.
  - 3. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Railway Engineering and Maintenance-of-Way Association:
  - 1. AREMA - Manual for Railway Engineering.
- C. American Welding Society:
  - 1. AWS D1.1/.
- D. ASTM International:
  - 1. ASTM A36/A.
  - 2. ASTM A53/.
  - 3. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
  - 4. ASTM A449 - Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use.
  - 5. ASTM A1011/.
  - 6. ASTM C33/.
  - 7. ASTM C150/.
  - 8. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.

9. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
10. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>).
11. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>).
12. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

E. National Utility Contractors Association:

1. NUCA - Guide to Pipe Jacking and Micro-tunneling Design.

### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with authorities having jurisdiction and utilities within construction area.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information regarding casing pipe or tunnel liner plate, showing sizes, shapes, methods of attachment, connection details, and details of grout holes.
- C. Shop Drawings:
  1. Indicate details of casing, jacking head, sheeting, and other falsework for trenches and pits, and associated support, field sketches, and other details to complete Work.
  2. Indicate relationship of proposed installation to natural features over installation, angle of installation, right-of-way lines, and general layout of built facilities.
  3. Indicate cross-section(s) from field survey, showing installation in relation to actual profile of ground.
  4. Submit description of proposed construction plan, dewatering plan, and plan to establish and maintain vertical and horizontal alignments.
  5. If requested by the Engineer for reasons of casing misalignment, the Contractor shall resubmit to the Engineer for approval, shop drawings of the installation, showing measures that will be taken to maintain the carrier pipe on line and grade. Carrier pipe shall not be installed until this submittal is approved.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Welder Certificates: Certify welders and welding procedures employed on Work, verifying AWS qualification within previous 12 months.

- F. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions for tunnel liner.
- G. Submit occupancy permit for agency having jurisdiction for installations along and under public thoroughways and lands.
- H. Submit emergency response procedures to handle situations when conduit is compromised and jeopardizes safety or integrity of installation.
- I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- J. Qualifications Statements:
  - 1. Submit qualifications for installer and licensed professional.
  - 2. Welders: Qualify procedures and personnel according to AWS D1.1/D1.1M.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of casing or tunnel liner, carrier pipe, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

#### 1.6 QUALITY ASSURANCE

- A. Obtain occupancy permit when boring, jacking, or tunneling under or within rights-of-way of highways and railroads.
- B. Perform Work according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition), City of Ocala, and Marion County standards, as applicable.

#### 1.7 QUALIFICATIONS

- A. Installer: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.
- B. Welders: American Welding Society certified within previous twelve (12) months for employed weld types.
- C. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of Florida.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Handling: Support casing and carrier pipes with nylon slings during handling.
- D. Storage:
  - 1. Store products according to manufacturer instructions.
  - 2. Use wooden shipping braces between layers of stacked pipe.
  - 3. Stack piping lengths no more than three layers high.
  - 4. Store field joint materials in original shipping containers.
- E. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide temporary end caps and closures on piping and fittings and maintain in place until installation.
  - 3. Protect piping from entry of foreign materials and water by installing temporary covers, completing sections of Work, and isolating parts of completed system.
  - 4. Provide additional protection according to manufacturer instructions.

## 1.9 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Storage Temperature: Maintain 60 to 85 degrees F.

## 1.10 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
  - 2. Indicate field measurements on Shop Drawings.

## PART 2 - PRODUCTS

### 2.1 CASING AND JACKING PIPE

- A. Steel Casing Pipe:
  - 1. Comply with ASTM A53/A53M or AWWA C202 for mill pipe and ASTM A139 or AWWA C201 for fabricated pipe.
  - 2. Minimum Yield Strength: 35,000 psi.

3. Diameter and thickness: As shown on the Drawings.
  4. Welded Joints:
    - a. Comply with AWS D1.1/D1.1M.
    - b. Full circumference.
  5. Where required, casing vent pipe shall be 2-inch Schedule 80 galvanized steel pipe conforming to ASTM Specification A120-73, with galvanized malleable iron screwed fittings conforming to ANSI B16.3.
- B. Performance and Design Criteria:
1. Casing Pipe: Leakproof.
  2. Loading:
    - a. Highways:
      - 1) Earth cover.
      - 2) H-20 live loading, according to AASHTO HB-17.
      - 3) Impact loading according to AASHTO HB-17 plus 50 percent.
    - b. Railways:
      - 1) Earth cover.
      - 2) Comply with AREMA - Manual for Railway Engineering.
      - 3) Impact loading according to AREMA guidelines plus 50 percent.
  3. Bracing, Backstops, and Jacks: Of sufficient rating for continuous jacking without stopping except to add pipe sections, and to minimize tendency of ground material to freeze around casing pipe.

## 2.2 CARRIER PIPE

- A. Water System Piping: As specified in Section 33 14 13 – Public Water Utility Distribution Piping.
- B. Reclaimed System Piping: As specified in Section 33 15 00 – Public Reclaimed Water Distribution Piping.
- C. Sanitary Sewage System Gravity Piping: As specified in Section 33 31 11 – Public Sanitary Sewerage Gravity Piping.
- D. Sanitary Sewage System Force Main Piping: As specified in Section 33 31 23 – Sanitary Sewerage Force Main Piping.

## 2.3 MATERIALS

- A. Soil Backfill for trench approaches and pits to finish grade shall be in accordance with Section 125 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. After installation of the carrier pipe, the ends of the casing pipe shall be sealed up with a minimum of six inches (6") thickness of concrete and concrete pre- cast bricks. Concrete can be mixed on site using Portland cement and sand mixture or grout mixture.



- C. Pressure-Grout Mix: One-part Portland cement and six parts mortar sand, mixed with water to consistency applicable for pressure grouting.
  - 1. Mortar Sand: Comply with ASTM C33.
  - 2. Portland Cement:
    - a. Comply with ASTM C150.
    - b. Type: I.

## 2.4 ACCESSORIES

- A. Casing Spacers:
  - 1. Casing spacers shall be bolt on style with a two (2) piece shell made of polymer or glass reinforced plastic or Type 304 stainless steel of a minimum 14-gauge thickness.
  - 2. Each shell section shall have bolt flanges and/or a hinged side, bolt flange shall be formed with ribs for added strength. Connecting side shall have a minimum of three (3) 5/16" 304 stainless steel bolts.
  - 3. The shell shall be lined with ribbed PVC with a retaining section that overlaps the edge of the shell and prevents slippage. Bearing surfaces (runners) shall be made from UHMW Polymer or glass reinforced plastic and attached to support structures (risers) at appropriate position to properly support the carrier within the casing and to ease installation.
  - 4. Runners shall be attached mechanically by 304 stainless steel threaded fasteners that are inserted through the riser section and TIG welded for strength.
  - 5. Risers shall be made of 304 stainless steel of a minimum 10-gauge. Risers shall be TIG welded to the shell.
  - 6. All metal surfaces shall be fully chemically passivated.
  - 7. Manufacturers:
    - a. Cascade Waterworks Manufacturing, CCS,
    - b. Pipeline Seal & Insulator, CC8G-2,
    - c. Raci Casing Spacers,
    - d. The BWM Company, SS-8,
    - e. CCI Pipeline Systems, CSS-8, CSS-12,
    - f. or approved equal.
- B. Where carrier pipe other than ductile iron is to be connected to the installation, proper adaptors shall be installed as shown and specified.
- C. Where required, casings for crossing shall be provided with a 2-inch diameter vent pipe at one end extending not less than four feet above ground surface and above maximum elevation of high water. Place vent pipe in valve box when feasible, in lieu of aboveground. Top of vent pipe shall be turned down 180° with elbow fittings and properly screened.
- D. Steel Strapping: Comply with ASTM A36/A36M.
- E. Casing Pipe Coating: Bituminous.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that connection sizes, locations, and invert elevations are as indicated on Drawings.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Identify required lines, levels, contours, and datum locations.
- C. Existing Utilities:
  - 1. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.
  - 2. Coordinate with utility companies to support or relocate existing utilities in conflict with the Work.
- D. Establish elevations of casing as shown on the Drawings.
- E. Maintain access to existing facilities and other active installations requiring access.

### 3.3 INSTALLATION

- A. Dewatering:
  - 1. As specified in Section 125 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 2. Intercept and divert surface drainage precipitation and ground water away from excavation through use of dikes, curb walls, ditches, pipes, sumps, or other methods.
  - 3. Develop substantially dry subgrade for subsequent operations.
  - 4. Comply with requirements of local and state authorities for dewatering to any watercourse, prevention of stream degradation, and erosion and sediment control.
- B. Pits or Approach Trenches:
  - 1. Excavate approach trenches or pits as Site conditions require.
  - 2. Ensure that casing entrance faces as near perpendicular in alignment as conditions permit.
  - 3. Establish vertical entrance face at least 1 foot above top of casing.

C. Casing Pipe:

1. Boring:

- a. Push pipe into ground with boring auger rotating within pipe to remove soil.
- b. Do not advance cutting head ahead of casing pipe, except for distance necessary to permit cutting teeth to maintain clearance for pipe.
- c. Arrange machine bore and cutting head to be removable from within pipe.
- d. Arrange face of cutting head to provide barrier to free flow of soft material.
- e. If unstable soil is encountered during boring, retract cutting head into casing to permit balance between pushing pressure and ratio of pipe advancement to quantity of soil.
- f. Grout to fill voids if voids develop greater than OD of pipe by approximately 1 inch.
- g. If boring is obstructed, relocate jack or tunnel as directed by Engineer.

2. Jacking:

- a. Construct adequate thrust wall normal to proposed line of thrust.
- b. Impart thrust load to pipe through suitable thrust ring sufficiently rigid to ensure uniform distribution of thrust load on full pipe circumference.

3. Drilling and Jacking:

- a. Use oil-field-type rock roller bit or plate bit made up of individual roller cutter units solidly welded to pipe.
- b. Turned and push pipe for its entire length by drilling machine to give bit necessary cutting action.
- c. Inject high-density slurry (oil field drilling mud) to head as cutter lubricant.
- d. Inject slurry at rear of cutter units to prevent jetting action ahead of pipe.

4. Mining and Jacking: Use manual hand-mining excavation from within casing pipe as casing is advanced with jacks, allowing minimum ground standup time ahead of casing pipe.

D. Pressure Grouting: Pressure-grout annular space between casing pipe and surrounding earth.

E. Carrier Pipe:

1. Clean, inspect, and handle pipe as specified.
2. Placement:
  - a. Place carrier pipe as specified.
  - b. Prevent damage to pipe joints as carrier pipe is placed in casing.
3. Supports:
  - a. Support pipeline within casing such that no external loads are transmitted to carrier pipe.
  - b. Attach supports to barrel of carrier pipe; do not rest carrier pipe on bells.
4. Grout ends of casing to seal.

3.4 TOLERANCES

- A. If casing is not bored within 5% of the elevation or grade shown, the casing shall be abandoned by filling with concrete. The bore and jack shall then be relocated and re-

bored at a new location determined by the Engineer, whose decision shall be final. All abandonment of failed bores and re-bores shall be performed at the expense of the Contractor.

- B. Excavation: Do not overcut excavation by more than 1 inch greater than OD of casing pipe.
- C. Pipe Bells: Minimum 1/2-inch clearance to casing.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Compaction Testing:
  - 1. Shall be in accordance with Section 31 23 23.00 - Fill.
  - 2. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

### 3.6 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove temporary facilities for casing installation and jacking operations as specified in Section 01 50 00 - Temporary Facilities and Controls.

### 3.7 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect plant life, lawns, and other features of final landscaping.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

END OF SECTION

## SECTION 33 05 07.13

### UTILITY DIRECTIONAL DRILLING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Excavation for approach trenches and pits.
  - 2. Horizontal directional drilling.
  - 3. Pipe.
  - 4. Drilling fluid system.
- B. Related Requirements:
  - 1. Section 33 05 05.31 - Hydrostatic Testing.
  - 2. Section 33 05 05.33 - Infiltration and Exfiltration Testing.
  - 3. Section 33 05 05.43 - Mandrel Testing.
  - 4. Section 33 05 97 - Identification and Signage for Utilities.
  - 5. Section 33 14 13 - Public Water Utility Distribution Piping.
  - 6. Section 33 15 00 – Public Reclaimed Water Distribution Piping.
  - 7. Section 33 31 23 – Sanitary Sewerage Force Main Piping.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Water Works Association:
  - 1. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - 2. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.
  - 3. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
  - 4. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission.
- C. ASTM International:
  - 1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 12 400 ft-lbf/ft<sup>3</sup>.
  - 2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort 56,000 ft-lbf/ft<sup>3</sup>.

3. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
4. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
5. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Inside Diameter.
6. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
7. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
8. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
9. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
10. ASTM D2683 - Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
11. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
12. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.
13. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
14. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
15. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
16. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
17. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
18. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.
19. ASTM F1056 - Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings.
20. ASTM F1962 - Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings.

D. North American Society for Trenchless Technology:

1. NASTT - Horizontal Directional Drilling Good Practices Guidelines.

- E. Plastics Pipe Institute:
  - 1. PPI TR-46 - Guidelines for Use of Mini-Horizontal Directional Drilling for Placement of High-Density Polyethylene Pipe.

### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with authorities having jurisdiction and all utilities within construction area.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
  - 1. Identify source of water used for drilling.
  - 2. Submit copy of approvals and permits for use of water source.
- C. Shop Drawings:
  - 1. Submit technical data for equipment, method of installation, and proposed sequence of construction.
  - 2. Include information pertaining to pits, dewatering, method of spoils removal, and equipment size, capacity, and capabilities, including installing pipe on radius, type of drill bit, drilling fluid, method of monitoring line and grade, detection of surface movement, name plate data for drilling equipment, and mobile spoils removal unit.
- D. If the Contractor proposes any changes to the pull-back distance or profile shown on the drawings, Contractor shall be required to submit a complete design for the proposed pipe including an analysis for pull-back forces, external loads including full hydrostatic pressure if empty, external forces due to borehole collapse, ovalization during pull-back, thermal stress while exposed to Sun-light, shortening after release of pull-back force, and tensile stress during pull-back.
- E. The Contractor shall submit a Bore Plan that includes the following:
  - 1. Contact information and experience for the drilling fluid specialist.
  - 2. Complete drill equipment specifications.
  - 3. The number of passes the bore will include to get the product pipe installed.
  - 4. The pilot bore, and all reaming bore sizes, including the final pullback with the product pipe.
  - 5. Drilling rod length in feet.
  - 6. The pilot bore, pre-ream bores, if any, and pullback production rate in minutes per drilling rod to maintain adequate mud flow.
  - 7. Details of the entry and exit pit locations along with entry and exit angles for the bore, drawn to scale, depicting the position of all required equipment, access points,

existing facilities to remain in place, existing traffic lanes to be maintained in operation, office trailers, and storage sites.

- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- H. Qualifications Statement:
  - 1. Submit qualifications for driller.
- I. Submit City, County, and/or State occupancy permit for installations along or under public thoroughways and lands.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of pipe and invert elevations.
- C. Bore Path Report: Furnish a Bore Path Report to the Engineer within seven (7) days of the completion of each bore path. Data collected by the Owner or Engineer does not relieve the Contractor from the responsibility of recording his own data. Bore Path Report shall include the following:
  - 1. Location of project, project name and number.
  - 2. Name of person collecting data, including title, position, and company name.
  - 3. Site location: Contract Drawing station number or reference to a permanent structure within the project right-of-way.
  - 4. Driller's Log and identification of the detection method used.
  - 5. Elevations and offset dimensions of installed pipe as referenced to the drawings.
    - a. Record actual depth of pipe at 10-foot intervals.
  - 6. Data log of pullback force during product pipe installation.
  - 7. For all failed bores, include location, depth, and length of pipe left in place and explanation for failure.
  - 8. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
  - 9. Depth and location of drill bits and drill stems not removed from bore.

#### 1.6 QUALITY ASSURANCE

- A. Perform Work according to following:
  - 1. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Section 555.
  - 2. NASST - Horizontal Directional Drilling Good Practices Guidelines.
  - 3. ASTM F1962.



4. PPI TR-46.

B. QUALIFICATIONS

C. Driller: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Handling:

1. Use shipping braces between layers of stacked pipe.
2. Support pipes with nylon slings during handling.

D. Storage:

1. According to manufacturer instructions.
2. Stack piping lengths no more than three layers high.
3. Store field joint materials in original shipping containers in dry area indoors.

E. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Protect pipe from entry of foreign materials and water by installing temporary covers, completing sections of Work, and isolating parts of completed system.
3. Provide additional protection according to manufacturer instructions.

1.8 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Maintain storage temperature of 60 to 85 degrees F.

1.9 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

## PART 2 - PRODUCTS

### 2.1 HORIZONTAL DIRECTIONAL DRILLING

- A. Pipe used for horizontal directional drills shall be provided in accordance with Sections 33 14 13 - Public Water Utility Distribution Piping and 33 31 23 - Sanitary Pressure Sewer Piping.
  - 1. Pipe for Directional Bores in FDOT Rights-of-Way shall be HDPE fusion pipe or PVC fusion pipe unless otherwise shown or specified.
  - 2. Pipe for Directional Bores in City Rights-of-Way shall be HDPE fusion pipe, PVC fusion pipe, restrained joint ductile iron pipe, or restrained joint PVC pipe unless otherwise shown or specified.
  - 3. HDPE pipe for Directional Bores shall include fused mechanical joint fittings at each end for piping connections.
- B. Performance and Design Criteria:
  - 1. Drilling Steering System: Remote with continuous electronic monitoring of boring depth and location.
  - 2. Ratio of Reaming Diameter to Pipe OD:
    - a. Nominal Pipe Diameter of 6 Inches and Smaller: Maximum of 1.5.
    - b. Nominal Pipe Diameter Larger Than 6 Inches: Submit recommended ratio and reaming procedures for review by Engineer.
- C. Water Source:
  - 1. Potable.
  - 2. Obtained from the Owner or other source approved by the Engineer.
- D. Underground Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
- E. Materials:
  - 1. Drilling Fluid: Select or design drilling fluids for the site-specific soil conditions.
    - a. For drilling operations that will be below waters of the State of Florida, only bentonite free drilling fluids shall be used.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that connection sizes, locations, and invert elevations are according to Drawings.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning work.
- C. Maintain access to existing facilities indicated to remain during execution of the Work.
- D. Locate and identify utilities indicated to remain and protect from damage.
- E. Identify required lines, levels, contours, and data locations.
- F. Protect plant life, lawns, and other features remaining as portion of final landscaping.
- G. Protect benchmarks and survey control points from excavating equipment and vehicular traffic.
- H. Establish pipe elevations with not less than three (3) feet of cover unless otherwise required by the agency having jurisdiction.
- I. Establish minimum separation between potable water piping and sanitary sewer piping, according to FDEP code.

### 3.3 INSTALLATION

- A. Dewatering:
  - 1. Intercept and divert surface drainage, precipitation, and ground water away from excavation using dikes, curb walls, ditches, pipes, sumps, or other approved means.
  - 2. Develop and maintain substantially dry subgrade during drilling and pipe installation.
  - 3. Comply with State of Florida requirements for discharging water to watercourse, preventing stream degradation, and controlling erosion and sediment.
- B. Excavation:
  - 1. Excavation and backfill shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 2. Excavate approach trenches and pits as Site conditions require; minimize number of access pits.
  - 3. Provide sump areas to contain drilling fluids.
  - 4. Restore areas after completion of drilling and carrier pipe installation.
- C. Drilling:
  - 1. Drill pilot bore with vertical and horizontal alignment as indicated on Drawings.

2. Surveying:
    - a. Utilize locating and tracking system for boring to track installation.
    - b. Survey entire drill path and mark entry and exit locations with stakes.
    - c. If a magnetic guidance system is used, survey drill path for surface geomagnetic variations or anomalies.
  3. Guiding:
    - a. Guide drill remotely from ground surface to maintain alignment by monitoring signals transmitted from drill bit.
    - b. Monitor depth, pitch, and position.
    - c. Adjust drill head orientation to maintain correct alignment.
  4. Drilling Fluid:
    - a. Inject drilling fluid into bore to stabilize hole, remove cuttings, and lubricate drill bit and pipe.
    - b. Continuously monitor drilling fluid pumping rate, pressure, viscosity, and density while drilling pilot bore, back reaming, and installing pipe to ensure adequate removal of soil cuttings and stabilization of bore.
    - c. Provide relief holes when required to relieve excess pressure.
    - d. Minimize heaving during pullback.
  5. Verification of Accuracy:
    - a. Calibrate and verify electronic monitor accuracy during first 50 feet of bore in presence of Engineer before proceeding with other drilling.
    - b. If required accuracy is not met, adjust equipment or provide new equipment capable of meeting required accuracy.
  6. After completing pilot bore, remove drill bit.
- D. Drilling Obstructions:
1. If obstructions are encountered during drilling, notify Engineer immediately.
  2. Do not proceed around obstruction without approval of Engineer.
  3. For conditions requiring more than 3 feet of deviation in horizontal alignment, submit revised Shop Drawings to Engineer for approval before resuming Work.
  4. Maintain adjusted bore alignment within easement or right-of-way.
- E. Piping:
1. Install reamer and pipe pulling head; select reamer with minimum bore diameter required for pipe installation.
  2. Attach pipe to pipe pulling head and pull reamer and pipe to entry pit along pilot bore.
  3. Inject drilling fluid through reamer to stabilize bore and lubricate pipe.
  4. Install piping with horizontal and vertical alignment as shown on the Drawings.
  5. Protect and support pipe being pulled into bore such that pipe moves freely and is not damaged during installation.
  6. The Contractor shall stop all work and notify the Engineer if there is any indication that the installed pipe has sustained damage. The Engineer will determine if the installation is in compliance with the Contract Documents. The Engineer may

require non-compliant installations to be abandoned and capped on both ends or filled with flowable fill. All abandonment of failed bores and re-bores shall be performed at the expense of the Contractor.

7. Do not exceed pipe manufacturer's recommended pullback forces.
8. Trace Wire:
  - a. Install two (2) 12-gauge insulated trace wires continuous with each bore of non-metallic pipe.
  - b. Splice trace wires only at intermediate bore pits.
  - c. Tape or insulate trace wire at splices to prevent corrosion and maintain integrity of pipe detection.
  - d. Terminate trace wire for each pipe run at structures along pipe system.
  - e. Provide extra length of trace wire at each structure such that trace wire can be pulled 3 feet out top of structure for connection to detection equipment.
  - f. Test trace wire for continuity for each bore before acceptance.
9. Provide sufficient length of pipe to extend past termination point to allow pipe connection.
10. Allow minimum of 24 hours for stabilization after installing pipe before making connections to pipe.
11. Mark location and depth of bore with spray paint on paved surfaces and on wooden stakes on non-paved surfaces at 25-foot intervals and record locations for As-Built Drawings.

F. Slurry Removal and Disposal:

1. Contain excess drilling fluids at entry and exit points until recycled or removed from Site; provide recovery system to remove drilling spoils from access pits.
2. Drilling Spoils:
  - a. Remove, transport, and legally dispose of drilling spoils.
  - b. Do not discharge drilling spoils in sanitary sewers, storm sewers, or other drainage systems.
  - c. When drilling in suspected contaminated soil, test drilling fluid for contamination before disposal.
3. If drilling fluid leaks to surface, immediately contain leak and barricade area from vehicular and pedestrian travel before resuming drilling operations.
4. Complete cleanup of drilling fluid at end of each working day.

G. Backfilling:

1. Install backfill as specified in Section 125 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
2. Backfill approach trenches and pits with subsoil fill to contours and elevations as indicated on Drawings.

### 3.4 TOLERANCES

- A. Maximum Variation from Horizontal Position: 12 inches.

- B. Maximum Variation from Vertical Elevation: 2 inches.
- C. Minimum Horizontal and Vertical Clearance from Other Utilities: 12 inches.
- D. Deviation:
  - 1. If pipe installation deviates beyond specified tolerances, abandon bore, remove installed pipe, re-bore, and reinstall pipe in correct alignment.
  - 2. Fill abandoned bores with grout or flowable fill material and cap both ends.
  - 3. All abandonment of failed bores and re-bores shall be performed at the expense of the Contractor.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Upon completion of pipe installation, test pipe according to following:
  - 1. Sanitary Sewer Pipe Testing: As specified in Section 33 05 05.31 - Hydrostatic Testing.
  - 2. Water Distribution Pipe Testing: As specified in Section 33 14 13 - Public Water Utility Distribution Piping and Section 33 05 05.31 – Hydrostatic Testing.
  - 3. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
- C. Certify that equipment for drilling has been properly set up and is ready for drilling.

### 3.6 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. Upon completion of drilling and pipe installation, remove drilling spoils, debris, and unacceptable material from approach trenches and pits.
- C. Clean up excess slurry from ground.

### 3.7 RESTORATION

- A. Restore approach trenches and pits to original condition.
- B. Remove temporary facilities for drilling operations.
- C. Restore any damage resulting from heaving, settlement, separation of pavement, and escaped drilling fluid from the boring operations at no additional cost to the Owner.

END OF SECTION

SECTION 33 05 61  
CONCRETE MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Modular precast concrete manholes, polymer concrete manholes, and structures with tongue-and-groove joints and transition to cover frame, covers, anchorage, and accessories.
  - 2. Doghouse manhole connections to existing sanitary sewer lines.
  - 3. Bedding and cover materials.
  - 4. Vertical adjustment of existing manholes and structures.
- B. Related Requirements:
  - 1. Section 33 05 05.33 - Infiltration and Exfiltration Testing.
  - 2. Section 33 05 05.36 – Vacuum Testing.
  - 3. Section 33 31 11 - Public Sanitary Sewerage Gravity Piping.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway Transportation Officials:
  - 1. AASHTO M91 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
  - 2. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
  - 3. AASHTO M306 - Standard Specification for Drainage, Sewer, Utility, and Related Castings.
- B. American Concrete Institute:
  - 1. ACI 350/350-06 – Code Requirements for Environmental Engineering Concrete Structures & Commentary.
  - 2. ACI 440/440.1R-15 – Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer (FRP) Bars.
  - 3. ACI 530/530.1 - Building Code Requirements and Specification for Masonry Structures.
  - 4. ACI 548/548.6R-96 – Polymer Concrete-Structural Applications State-of-the-Art Report.
- C. ASTM International:
  - 1. ASTM A48/A48M – Standard Specification for Gray Iron Castings.
  - 2. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets.

3. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
4. ASTM C497 – Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
5. ASTM C579 – Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic, Surfacing, and Polymer Concretes.
6. ASTM C580 – Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
7. ASTM C857 – Standard Practice for Minimum Structural Design Loading for Underground Utility Structures.
8. ASTM C877 – Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.
9. ASTM C913 – Standard Specification for Precast Concrete Water and Wastewater Structures.
10. ASTM C923 – Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
11. ASTM C990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
12. ASTM D648 – Test Method for Deflection Temperature of Plastics Under Flexural Load in Edgewise Position.
13. ASTM D2584 – Test Method for Ignition Loss of Cured Reinforced Resins.
14. ASTM D6783 – Standard Specification for Polymer Concrete Pipe.
15. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
16. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with connection to existing sewer facilities.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information for manhole covers, component construction, features, configuration, materials, jointing methods, and dimensions.
- C. Shop Drawings:
  1. Indicate structure locations and elevations.
  2. Indicate sizes and elevations of piping, penetrations, and manhole inverts.



- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- H. Qualifications Statement:
  - 1. Submit qualifications for manufacturer.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of manholes and connections, and record invert elevations.

#### 1.6 QUALITY ASSURANCE

- A. Perform Work as shown and specified and according to applicable FDEP and Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

#### 1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Handling: Comply with precast concrete manufacturer instructions and ASTM C913 for unloading and moving precast manholes and drainage structures.
- D. Storage:
  - 1. Store materials according to manufacturer instructions.
  - 2. Store precast concrete manholes and drainage structures to prevent damage to Owner's property or other public or private property.

3. Repair property damaged from materials storage.

E. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.9 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry Work.

1.10 EXISTING CONDITIONS

- A. Field Measurements:
  1. Verify field measurements prior to fabrication.
  2. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five (5) year manufacturer's warranty for concrete manholes.

PART 2 - PRODUCTS

2.1 CONCRETE MANHOLES

- A. Manhole Sections:
  1. General: Manholes shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter. Concrete manholes shall not be used for new construction within 400 linear feet of a wet well or the manhole into which a force main dumps.
  2. Materials:
    - a. Reinforced Precast Concrete: Comply with ASTM C478, with the exclusion of Section 10 (a) and as modified herein.
    - b. Cement shall meet the requirements of ASTM C150 for Portland Cement Type II.
    - c. Concrete shall meet the minimum requirements for Class III.
    - d. Minimum wall thickness shall be as shown on the Drawings.

- e. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14. Contractor shall be responsible for all testing.
    - f. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.
  - 3. Gaskets: Comply with ASTM C923.
  - 4. Joints:
    - a. Joint contact surfaces shall be formed exactly parallel with a 2-degree slope and nominal 1/16-inch clearance with the tongue equipped with a proper recess for the installation of an O-ring rubber gasket or pre-molded plastic joint sealer.
    - b. Pre-molded plastic joint sealer, if used, shall be Ramnek or approved equal and joints shall be pre-primed and wrapped on the exterior to provide a sealed manhole.
    - c. Comply with ASTM C913.
    - d. Maximum Leakage: 0.025 gal. per hour per foot of joint at 3 feet of head.
  - 5. Manufacturers:
    - a. Del Zotto,
    - b. Taylor Precast,
    - c. or approved equal.
- B. Coatings and Liners:
- 1. Coatings shall cover the interior and exterior surfaces of the manhole except the joint contact surfaces and the annular openings for pipe connections.
    - a. Exterior coating shall be bituminous coating as specified in Section 09 90 00 – Painting and Coating.
  - 2. For mildly corrosive environments, interior coating shall be coal tar epoxy as specified in Section 09 90 00 – Painting and Coating.
  - 3. For highly corrosive environments, manholes shall include a polyurea or high-density polyethylene liner as shown on the Drawings or specified.
    - a. HDPE Liner:
      - HDPE liner shall be embedded into pre-cast concrete with anchoring ribs during manufacturing process. Anchoring ribs shall be placed a minimum of 30 per square foot of liner in one piece with the HDPE sheet, and shall be of the same material.
      - Liner shall be 80 mils. thick minimum, with a minimum resistance to pull out of 125 pounds per square foot and withstand a back pressure of 30 psi.
      - The HDPE material shall have a maximum working temperature of 140° F, fire classification of V2 as defined by UL-94, density of 0.945 g/cc as defined in ASTM D792-86, and puncture resistance of 170 lbs. as defined by ASTM D4833.
      - The liner shall be flexible to elongate to bridge up to a 1/4-inch setting or expansion.

- b. Polyurea Liner:
  - Liner shall be a two component, 100% solids, zero (0) volatile organic compound, pure polyurea.
  - Liner system shall be designed for highly corrosive wastewater environments.
  - Liner system shall consist of the following:
    - a) Primer/Moisture Barrier: Minimum 30 to 100 mils dry film thickness (DFT)
    - b) Top Coat: Minimum 125 mils DFT.
  - Primer/Moisture Barrier shall be designed specifically for the lining system.
  - Surfaces shall be prepared in accordance with the manufacturer's requirements.
  - Lining shall be applied in accordance with the manufacturer's requirements.
  - Manufacturers:
    - a) GML Coatings, Inc. - Green Monster Liner,
    - b) or approved equal.
- C. Mortar and Grout shall be Embeco 167 and 381 or approved equal.
  - 1. The Contractor shall apply Master Builders' Master Seal or approved equal membrane curing compound, conforming to ASTM C309, Type I, Class B, to interior and exterior finished grout.
- D. Clear Inside Dimensions shall be as indicated on Drawings.
  - 1. In no case shall the inside diameter be less than 48-inches.
- E. Design Depth shall be as indicated on Drawings.
- F. Clear Cover Opening:
  - 1. As indicated on Drawings.
- G. Pipe Entry:
  - 1. Furnish openings as indicated on Drawings.
  - 2. Pipes shall be connected to manholes with heavy duty flexible rubber connector boots conforming to ASTM C923 with stainless steel bands and hardware.

## 2.2 POLYMER CONCRETE MANHOLES

- A. Manhole Sections:
  - 1. General: Manholes shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter. Polymer concrete manholes shall only be used for new construction within 400 linear feet of a wet well and/or the manhole into which a force main dump.

2. Materials:
  - a. Polymer Concrete: Comply with ASTM C478 with allowable compositional and sizing difference as designed by the polymer concrete manufacturer.
  - b. Polymer Concrete Mix Design shall consist of thermosetting resin, sand, and aggregate. No Portland cement shall be allowed as part of the mix design matrix. All sand and aggregate shall be inert in an acidic environment.
  - c. Reinforcement – Shall use acid resistant reinforcement (FRP Bar) in accordance with ACI 440.1R-06 as applicable for polymer concrete design.
  - d. The wall thickness of polymer concrete structures shall not be less than that prescribed by the manufacturer's design by less than 95% of stated design thickness.
  - e. Thermosetting Resin – The resin shall have a minimum deflection temperature of 158° F when tested at 264 psi (1.820 mPa) following Test Method D 648. The resin content shall not be less than 7% of the weight of the sample as determined by test method D 2584. Resin selection shall be suitable for applications in the corrosive conditions to which the polymer concrete manhole structures will be exposed.
  - f. Each polymer concrete manhole component shall be free of all defects, including indentations, cracks, foreign inclusions and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. Cosmetic defect shall not be cause for rejection. The nominal internal diameter of manhole components shall not vary more than 2%. Variations in height of two opposite sides of risers and cones shall not be more the 5/8 inch. The under run in height of a riser or cone shall not be more than ¼ in/ft of height with a maximum of ½ inch in any one section.
  - g. Marking and Identification – Each manhole shall be marked with the following information - Manufacturer's name or trademark, Manufacturer's location and Production Date.
  - h. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14. Contractor shall be responsible for all testing.
  - i. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.
3. Gaskets: Comply with ASTM C923.
4. Joints:
  - a. Manhole joints shall be assembled with a bell/spigot or shiplap butyl mastic and/or gasketed joint so that on assembly, manhole base, riser, and top section make a continuous and uniform manhole. Joint sealing surfaces shall be free of dents, gouges, and other surface irregularities that would affect joint integrity.
  - b. Minimum clearance between wall penetrations and joints shall be per manufacturer's design.
  - c. Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe-manhole connections. Invert slope through

manhole is as indicated on drawings. All precast base sections to be cast monolithically. Polymer bench and channel are to be constructed with all polymer concrete material. Extended ballast slab requirements for buoyancy concerns can be addressed with cementitious concrete material.

- d. Provide resilient connectors conforming to requirements of ASTM C 923 or other options as available. All connectors are to be water tight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.
  - e. Joint contact surfaces shall be formed exactly parallel with a 2-degree slope and nominal 1/16-inch clearance with the tongue equipped with a proper recess for the installation of an O-ring rubber gasket or pre-molded plastic joint sealer.
  - f. Pre-molded plastic joint sealer, if used, shall be Ramnek or approved equal and joints shall be pre-primed and wrapped on the exterior to provide a sealed manhole.
  - g. Comply with ASTM C913.
  - h. Maximum Leakage: 0.025 gal. per hour per foot of joint at 3 feet of head.
5. Manufacturers:
- a. Armorock LLC

B. Coatings and Liners:

- 1. Coatings shall cover the interior and exterior surfaces of the manhole except the joint contact surfaces and the annular openings for pipe connections.
  - a. Exterior coating shall be bituminous coating as specified in Section 09 90 00 – Painting and Coating.
- 2. For mildly corrosive environments, interior coating shall be coal tar epoxy as specified in Section 09 90 00 – Painting and Coating.
- 3. For highly corrosive environments, manholes shall include a polyurea or high density polyethylene liner as shown on the Drawings or specified.
  - a. HDPE Liner:
    - 1) HDPE liner shall be embedded into polymer concrete with anchoring ribs during manufacturing process. Anchoring ribs shall be placed a minimum of 30 per square foot of liner in one piece with the HDPE sheet, and shall be of the same material.
    - 2) Liner shall be 80 mils. thick minimum, with a minimum resistance to pull out of 125 pounds per square foot, and withstand a back pressure of 30 psi.
    - 3) The HDPE material shall have a maximum working temperature of 140° F, fire classification of V2 as defined by UL-94, density of 0.945 g/cc as defined in ASTM D792-86, and puncture resistance of 170 lbs. as defined by ASTM D4833.
    - 4) The liner shall be flexible to elongate to bridge up to a 1/4-inch setting or expansion.

- b. Polyurea Liner:
  - 1) Liner shall be a two component, 100% solids, zero (0) volatile organic compound, pure polyurea.
  - 2) Liner system shall be designed for highly corrosive wastewater environments.
  - 3) Liner system shall consist of the following:
    - a) Primer/Moisture Barrier: Minimum 30 to 100 mils dry film thickness (DFT).
    - b) Top Coat: Minimum 125 mils DFT.
  - 4) Primer/Moisture Barrier shall be designed specifically for the lining system.
  - 5) Surfaces shall be prepared in accordance with the manufacturer's requirements.
  - 6) Lining shall be applied in accordance with the manufacturer's requirements.
  - 7) Manufacturers:
    - a) GML Coatings, Inc. – Green Monster Liner,
    - b) or approved equal.

C. Grouting:

- 1. All materials needed for grouting and patching will be a polyester mortar compound provided by the manufacturer or an approved equal by the manufacturer.
- 2. The Contractor shall apply Master Builders' Master Seal or approved equal membrane curing compound, conforming to ASTM C309, Type I, Class B, to interior and exterior finished grout.

D. Clear Inside Dimensions shall be as indicated on Drawings.

- 1. In no case shall the inside diameter be less than 48-inches.

E. Design Depth shall be as indicated on Drawings.

F. Clear Cover Opening:

- 1. As indicated on Drawings.

G. Pipe Entry:

- 1. Furnish openings as indicated on Drawings.
- 2. Pipes shall be connected to manholes with heavy duty flexible rubber connector boots conforming to ASTM C923 with stainless steel bands and hardware.

## 2.3 FRAMES AND COVERS

A. Standard Manhole Ring and Cover:

- 1. Manhole frames and covers shall be constructed of close-grained gray iron, smooth, clean, free from blisters and defects.
- 2. Material: Cast iron.

3. Comply with the following:
  - a. ASTM A48/A48M, Class 30B.
  - b. Federal Specification RR-F-621-C.
4. Manhole frames and covers shall meet or exceed requirements for AASHTO H-20 load rating and AASHTO M306.
5. Surface: Machined flat bearing.
6. Cover Design: Closed.
7. All components shall be black epoxy coated.
8. Cover shall be molded and marked as shown on the Drawings.
9. Manufacturers:
  - a. U.S. foundry, USF 170CE (22-inch), USF 655CW-M (32-inch)
  - b. Vulcan Foundry V-1337-2 (22-inch),
  - c. or approved equal.

B. Hinged Manhole Ring and Cover:

1. Hinged manhole ring and cover shall be constructed of sound ductile iron, smooth, clean, free from blisters and defects.
2. Frames shall be circular and incorporate a seating gasket.
3. Cover hinge system shall include a 90-degree blocking system.
4. Hinge box shall be self-cleaning with dual wiper infiltration plug.
5. Covers shall include locks.
6. Comply with the following:
  - a. ASTM A48/A48M, Class 30B.
  - b. Federal Specification RR-F-621-C.
  - c. ISO 1083.
7. Manhole frames and covers shall meet or exceed requirements for AASHTO H-20 load rating and AASHTO M306.
8. Cover Design: Closed.
9. All components shall be black epoxy coated.
10. Cover shall be molded and marked as shown on the Drawings.
11. Manufacturers:
  - a. U.S. foundry, USF 750 (24-inch), USF 751 (32-inch)
  - b. East Jordan Iron Works, ERGO,
  - c. Pamrex,
  - d. or approved equal.

## 2.4 RISER RINGS

A. Riser Rings:

1. Precast adjusting rings shall have 22-inch or 32-inch access entrance diameter.
2. Ring shall be constructed of 4,000 psi concrete, using 1/4-inch round steel ring, 1/4-inch diameter for reinforcing.
3. Thickness of 2 Inches, 4-inches, or 6 Inches
4. Comply with ASTM C478.



- 5. Manufacturers:
  - a. Del Zotto,
  - b. Taylor Precast,
  - c. or approved equal.

- B. Accessories:
  - 1. Joint Sealant: Comply with ASTM C990.
  - 2. Bolts: Stainless steel; ASTM F593.

## 2.5 MATERIALS

- A. Cover, Bedding, and Backfill:
  - 1. Bedding, cover, and soil backfill materials shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.6 ACCESSORIES

- A. Foundation Slab:
  - 1. Cast-in-place concrete as specified in Section 03 30 00 - Cast-in-Place Concrete.
  - 2. Top Surface: Level.
- B. Joint Sealant: Comply with ASTM C990.
- C. Fasteners: Stainless steel; ASTM F593.
- D. Concrete: As specified in Section 03 30 00 - Cast-in-Place Concrete.

## 2.7 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Provide shop inspection and testing of completed assembly.
- C. Owner Inspection:
  - 1. Make completed manholes available for inspection at manufacturer's factory prior to packaging for shipment.
  - 2. Notify Owner at least seven days before inspection is allowed.
- D. Owner Witnessing:
  - 1. Allow witnessing of factory inspections and tests at manufacturer's test facility.
  - 2. Notify Owner at least seven days before inspections and tests are scheduled.

- E. Certificate of Compliance:
  - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
  - 2. Specified shop tests are not required for Work performed by approved manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that items provided by other Sections of Work are properly sized and located.
- C. Verify that built-in items are in proper location and are ready for roughing into Work.
- D. Verify that excavation base is ready to receive Work and excavations and that dimensions and elevations are as indicated on Drawings.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.
- C. Coordinate placement of inlet and outlet pipe or duct sleeves as required by other Sections.
- D. Do not install manholes and structures where Site conditions induce loads exceeding structural capacity of manholes or structures.
- E. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

### 3.3 INSTALLATION

- A. Manholes are considered confined spaces and the Contractor shall follow the requirements of the owner and all associated regulations for confined space entry.
  - 1. Confined space is defined as large enough for a person to work with restricted means of entry and exit.

2. The Contractor is responsible for the safety of his/her personnel. The Contractor shall use a gas detector to measure the gases present. If no gases are present the structure may be entered. When gases are detected, fresh air shall be forced into the area until acceptable levels of air quality are obtained.
  3. A tripod/hoist unit shall be set up and manned.
- B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface structures or utilities in immediate or adjacent areas.
- C. Correct over-excavation in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- D. Remove large stones or other hard matter impeding consistent backfilling or compaction.
- E. Protect manhole from damage or displacement while backfilling operation is in progress.
- F. Excavating:
1. Excavation and backfill shall be performed in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) to the locations and depths shown.
  2. Excavate undesirable material to a minimum depth of 12-inches below the proposed grade and backfill as specified.
  3. Place gravel under manholes located in wet soil conditions.
  4. Provide clearance around sidewalls of manhole or structure for construction operations.
  5. If ground water is encountered, prevent accumulation of water in excavations; place manhole or structure in dry trench.
  6. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Engineer.
- G. Base and Alignment:
1. Place foundation slab and trowel top surface level.
  2. Grout base of shaft sections to achieve slope to exit piping, trowel smooth, and contour as indicated on Drawings.
  3. Place manhole sections plumb and level, trim to correct elevations, and anchor to foundation slab.
- H. Attachments:
1. Set cover frames and covers level to correct elevations without tipping.
- I. Backfilling:
1. As specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compacted to the requirements specified in Section 31 23 23.00 – Fill.

- J. Coating: All coating shall be factory applied.
- K. Precast Concrete Manholes:
1. Precast manholes shall be installed in accordance with the manufacturer's recommendations.
  2. Lift precast components at lifting points designated by manufacturer.
  3. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.
  4. Assembly:
    - a. Assemble multi-section manholes and structures by lowering each section into excavation.
    - b. Install gasket joints between precast sections according to manufacturer recommendations.
    - c. Lower, set level, and firmly position base section before placing additional sections.
  5. Remove foreign materials from joint surfaces and verify that sealing materials are placed properly.
  6. Maintain alignment between sections by using guide devices affixed to lower section.
  7. Joint sealing materials may be installed on Site or at manufacturer's plant.
  8. Verify that installed manholes meet required alignment and grade.
  9. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe; fill annular spaces with mortar.
  10. Cut pipe flush with interior of structure.
- L. Doghouse Manholes and Structures:
1. Stake out location and burial depth of existing sewer line in area of proposed manhole or structure.
  2. Carefully excavate around existing sewer line to adequate depth for foundation slab installation.
  3. Protect existing pipe from damage.
  4. Cut out soft spots and replace with granular fill compacted as specified in Section 31 23 23.00 - Fill.
  5. Bear firmly and fully on compacted crushed stone bedding.
  6. Precast slabs must have keyways to connect walls to slab.
  7. Formed-in-place slabs shall be a minimum of 12-inches thick.
    - a. Concrete reinforcement shall be sized by the manufacturer.
  8. Grout pipe entrances per grout manufacturer's installation procedures.
  9. Coordinate with the Engineer to determine time of day for connections to existing facilities.
  10. Block upstream flow at existing manhole or structure with expandable plug.
  11. Use hydraulic saw to cut existing pipe at manhole or structure entrance and exit and along pipe length at a point halfway up OD on each side of pipe.
  12. Bottom half of pipe is to remain as manhole flow channel.

13. Saw cut to smooth finish with top half of pipe flush with interior of manhole or structure.
  14. Grout base of manhole or structure to achieve slope to manhole or structure channel and trowel smooth.
- M. All grouting shall be performed in accordance with the grout manufacturer's recommended procedures so that there is zero leakage through openings or around pipes.
1. The grout and/or mortar shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces.
  2. Grout mixed on-site shall be used with potable water and masonry sand from concrete supplier. Dirty pond water and existing excavated sand shall not be used.
- N. Manhole Inverts:
1. Manhole bases shall be formed of Class I concrete while the manholes are under construction.
    - a. The Contractor shall not use fill, stone, brick, or other materials below concrete invert. The entire invert shall be constructed of concrete.
  2. Cut off pipes at inside face of the manhole and construct the invert to the shape and size of the pipe indicated.
  3. All inverts shall follow the grades of the pipe entering the manholes.
  4. Changes in direction of the sewer and entering branch or branches shall be laid out in smooth curves of the longest possible radius which is targeted to the centerlines of adjoining pipelines.
  5. Regardless of differences in entrance and exit elevations, flow channels for all pipes are to be formed to present a smooth transition of flow and shall be subject to the approval of the Engineer.
  6. Flow channels shall be constructed in accordance with the Drawings.
- O. Entire interior of manhole shall be coated with coal tar epoxy or liner as specified, including adjustment rings.
- P. Connect pipes to new manholes using pipe boots and clamps.
- Q. Connect pipes to lined manholes after liners have been completed and sealed.
- R. Sanitary Manhole Drop Connections:
1. Bottom 90-degree bend shall be cast in place using concrete.
  2. Pipes shall be held firmly in place while concrete is being formed.
  3. Drop connections shall be constructed in accordance with the Drawings.
- S. Castings:
1. Set frames using mortar and masonry to the elevations indicated on Drawings. If specified tolerances cannot be met, manhole shall be modified.
  2. Install radially laid concrete brick with 1/4-inch-thick, vertical joints at inside perimeter.
  3. If more than one course of concrete brick is required, stagger vertical joints.

4. The Contractor shall prepare the base for the manhole frame to a condition satisfactory to the Engineer. All loose, broken or cracked brick shall be removed along with excess grout to provide a smooth, solid, level surface to receive the new buildup of the manhole top.
  5. Frame shall be set concentric with the masonry and in a full bed of grout or mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight.
    - a. The frame shall be completely embedded and sealed to the manhole with grout or mortar.
    - b. Grout or mortar shall be applied so as to leave no air pockets or voids and shall cover the area from the top of the frame to the outside edge of the manhole.
  6. Manhole frames and covers shall be set to conform accurately to the finished ground or pavement surface as established by the Contract Drawings, unless otherwise directed by the Engineer.
  7. Only clean brick shall be used in brick adjustment. If required, the bricks shall be moistened prior to application of the grout or mortar.
    - a. Each brick shall be laid in a full bed and joint of grout or mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed.
    - b. Grout shall be one-part cement and two parts sand. Lime shall not be used.
    - c. Grout shall be coated with epoxy.
  8. Outside faces of brick masonry or concrete adjusting rings shall be covered with grout or mortar from 3/8-inch to 1/2-inch thick. If required, brick concrete shall be properly moistened prior to application of the grout or mortar. The mortar or grout shall be carefully spread and troweled so that all cracks are thoroughly worked out. After hardening, the grout or mortar shall be thoroughly checked for bond and soundness by being tapped. Unbonded or unsound grout or mortar shall be removed and replaced.
- T. Unless otherwise directed by the Engineer, the Contractor may elect to remove the manhole top completely to facilitate construction or leave in place until the base course is constructed.
1. The manhole shall be protected from damage if it is to be left in place until final adjustment.
  2. If the Contractor elects to remove the manhole top, he shall place sufficient covering over the manhole, to the satisfaction of the Engineer, to eliminate infiltration of dirt, Limerock, stone, brick, debris, etc., until the top is adjusted to grade.
  3. In either of the cases above, the Contractor will be responsible for any undesirable material entering the manhole or sewer system as a result of the Work.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

- B. Testing:
  - 1. Cast-in-Place Concrete: As specified in Section 03 30 00 - Cast-in-Place Concrete.
  - 2. Concrete Manhole Sections: As specified in Section 33 05 05.33 - Infiltration or Exfiltration Testing and Section 33 05 05.41 – Air Testing.
- C. At least one compaction density test shall be made on the prepared base for each manhole. It is expressly agreed and understood that the Owner reserves the right to perform additional compaction tests on its own or to increase or decrease the frequency of compaction testing.
  - 1. Compaction tests shall be in accordance with the specifications. Should the test fail, the Contractor shall be required to take the appropriate action to satisfy the compaction requirement and at no time shall the manhole base be set in place without an approved compaction test or until satisfactory test is acquired.
- D. Equipment Acceptance: Adjust, repair, modify, or replace components failing to perform as specified and retest.

### 3.5 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Vertical Adjustment of Existing Manholes and Structures:
  - 1. Manhole frame and covers shall be adjusted with brick masonry or precast concrete adjusting rings.
  - 2. Frames shall be adjusted to conform accurately to the grades shown on the Drawings and specified herein.
  - 3. The manhole shall be modified if tolerances cannot be met.
  - 4. Frames, Grates, and Covers:
    - a. Remove frames, grates, and covers and clean of mortar fragments.
    - b. Reset to required elevation according to requirements specified for installation of castings.
  - 5. Reinforcing Bars:
    - a. Remove concrete without damaging existing vertical reinforcing bars if removal of existing concrete wall is required.
    - b. Clean vertical bars of concrete and bend into new concrete top slab or splice to required vertical reinforcement as indicated on Drawings.
  - 6. Clean and apply sand-cement bonding compound on existing concrete surfaces to receive cast-in-place concrete as specified in Section 033000 - Cast-in-Place Concrete.

END OF SECTION

## SECTION 33 05 97

### IDENTIFICATION AND SIGNAGE FOR UTILITIES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Plastic ribbon tape for placement above direct-buried utility.
  - 2. Trace wire for placement above direct-buried utility.
- B. Related Requirements:
  - 1. Section 33 14 13 - Public Water Utility Distribution Piping.
  - 2. Section 33 15 00 – Public Reclaimed Water Distribution System Piping.
  - 3. Section 33 31 11 - Public Sanitary Sewerage Gravity Piping.
  - 4. Section 33 31 23 - Sanitary Sewerage Force Main Piping.

##### 1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer catalog information for each specified product.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Qualifications Statement:
  - 1. Submit qualifications for manufacturer.

##### 1.3 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

##### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance materials.

##### 1.5 QUALITY ASSURANCE

- A. Perform Work according to AWWA standards.



## 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of experience.

## PART 2 - PRODUCTS

### 2.1 MARKING TAPE, DETECTABLE UNDERGROUND SYSTEM

- A. Description:
  - 1. All underground pipe shall have electronically detectable warning/path marking tape.
  - 2. The marking tape shall be made of polyethylene (or approved equivalent) material, 6 inches wide and a minimum of 6 millimetres thick.
  - 3. The marking tape shall have detectable markers embedded in the tape and spaced adequately to provide a near continuous path to allow for easy detection at any point along the pipe. The signal should be such that it will provide guidance on the direction of the signal
  - 4. The marking tape shall be able to function and be detected without the need for a direct connection to an external power source (e.g. no access points needed).
  - 5. Each detectable marker embedded in the path marking system shall function independently, so that even if a section of pipe is removed, the remaining marked sections will continue to function.
  - 6. System must be able to provide a depth measurement using a underground cable/pipe locator
  - 7. The path marking system should not require grounding
  - 8. The tape shall be blue, green or purple in color and shall be marked with words "CAUTION (WATER, SEWER or RECLAIM) LINE BURIED BELOW" (or an approved equivalent wording). The wording shall be repetitive along the full length of the tape.
  - 9. Path marking tape shall be detectable at a minimum of 48" below grade regardless of soil composition
  - 10. Manufacturers:
    - a. 3M Electronic Marking System (EMS) Path Marking Tape
    - b. or approved equal.

### 2.2 TRACE WIRE

- A. Locating Wire for Bored Mains:
  - 1. Conductor: Magnetically detectable tracer wire shall be a #12 AWG (0.0808" diameter) fully annealed, high carbon 1055 grade steel, high strength solid copper clad steel conductor (HS-CCS).
  - 2. Covering: Tracer wire shall be insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, and rated for direct burial use at 30 volts.
  - 3. Color:
    - a. Color shall be blue for water, green for sewage force mains, and purple for reuse mains.
  - 4. Manufacturers:

- a. Copperhead Industries, SoloShot, Pro Trace HF-CCS PE45,
- b. or approved equal.

B. Locating Wire for Open Cut Mains:

1. Conductor: Magnetically detectable tracer wire shall be a #14 AWG (0.0641" diameter) fully annealed, low carbon 1010 grade steel, solid copper-clad steel (CCS) conductor.
2. Covering: Tracer wire shall be insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, and rated for direct burial use at 30 volts.
3. Color:
  - a. Color shall be blue for water, green for sewage force mains and gravity sewer, and purple for reuse mains.
4. Manufacturers:
  - a. Copperhead Industries, SoloShot, Pro Trace HF-CCS 30,
  - b. or approved equal.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. The Contractor shall install Marking Tape 12 inches to 18 inches above the top of the pipe.
- B. Trace Wire shall be installed on the top and bottom of all nonmetallic pipe.

END OF SECTION

## SECTION 33 14 13

### PUBLIC WATER UTILITY DISTRIBUTION PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. General: This section includes the minimum requirements for installing water systems, which includes the furnishing, installing, laying, jointing, and testing of all water lines, hydrants, fittings, valves and appurtenances, including necessary service connections required for a complete system as shown on the Drawings and specified herein. The Work shall also include such connections, reconnections, relocations, temporary services, abandonments, and all other provisions in regard to existing water service operations and modifications required to perform the Work.
- B. Section Includes:
  - 1. Pipe and fittings for public potable water lines.
  - 2. Tapping sleeves and valves.
  - 3. Positive-displacement meters.
  - 4. Pipe support systems.
  - 5. Bedding and cover materials.
- C. Related Requirements:
  - 1. Section 33 01 10 - Disinfection of Water Utility Piping Systems
  - 2. Section 33 05 97 - Identification and Signage for Utilities.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Society of Mechanical Engineers:
  - 1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- C. ASTM International:
  - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A123.
  - 3. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
  - 4. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>).

5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>).
6. ASTM D1785 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
7. ASTM D2241 - Standard Specification for Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series).
8. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
9. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
10. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
11. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
12. ASTM F 714-05 Standard Specification for Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter.

D. American Water Works Association:

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
7. AWWA C153 - Ductile-Iron Compact Fittings.
8. AWWA C200 - Steel Water Pipe, 6 In. (150 mm) and Larger.
9. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe.
10. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. (100 mm) and Larger - Shop Applied.
11. AWWA C206 - Field Welding of Steel Water Pipe.
12. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
13. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings.
14. AWWA C213 - Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
15. AWWA C300 - Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.
16. AWWA C301 - Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.
17. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
18. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
19. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
20. AWWA C606 - Grooved and Shouldered Joints.
21. AWWA C700 - Cold-Water Meters - Displacement Type, Metal Alloy Main Case.

22. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
23. AWWA C702 - Cold-Water Meters - Compound Type.
24. AWWA C707 - Encoder-Type Remote-Registration Systems for Cold-Water Meters.
25. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.
26. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
27. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.
28. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

E. National Fire Protection Association:

1. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

F. NSF International:

1. NSF 61 - Drinking Water System Components - Health Effects.
2. NSF 372 - Drinking Water System Components - Lead Content.

### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with termination of water main connection at Site boundary, connection to municipal water utility service, and trenching.

### 1.4 PREINSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.
- B. Convene minimum one (1) week prior to commencing Work of this Section.

### 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information regarding pipe materials, pipe fittings, valves, hydrants, hangers, and supports as required for completion of the Work.
- C. The Contractor shall submit certificates of inspection from the manufacturer that the pipe, valves, and fittings to be supplied have been inspected at the plant and meet the

requirements of the Contract Documents. These certificates shall be submitted prior to beginning Work.

- D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- E. Preconstruction Photographs: Submit digital files of color photographs of Work areas and material storage areas, as specified in Section 01 70 00 - Execution and Closeout Requirements.
- F. Qualifications Statements:
  - 1. Submit qualifications for manufacturer and installer.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. All installed infrastructure shall be referenced to state plane coordinates.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

#### 1.7 QUALITY ASSURANCE

- A. All pipe, valves, fire hydrants, and fittings shall be clearly marked with the name or trademark of the manufacturer, the batch number, the location of the plant, date of manufacture, strength designation and pressure rating.
- B. Materials in Contact with Potable Water:
  - 1. Certified according to NSF 61 and NSF 372.
  - 2. Certified lead free in accordance with the Safe Drinking Water Act.
- C. All materials shall be free from defects, impairing strength, and durability, and be of the best commercial quality for the purpose specified. Materials shall be new, less than one year old from manufacture date. It shall have structural properties sufficient to safely sustain or withstand strains and stress to which it is normally subjected and be true to detail.
- D. Manufacturer shall supply a certificate of application that PVC pressure pipe meets all requirements of AWWA C-900/C-905.

- E. Flow Meters:
  - 1. A copy of the affidavit of compliance from the manufacturer shall be submitted and shall certify that flow meters will be furnished in full compliance with the requirements of this specification and those of applicable AWWA standards.
  - 2. Contractor shall submit actual test results for each water meter by serial number and certify the accuracy of the meter.

#### 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with a minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing Work of this Section with a minimum five (5) years of documented experience in installation of liner materials.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. The date stamped on any pipe shall be within one (1) year of delivery to the Site.
- C. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- D. Storage:
  - 1. Store materials according to manufacturer instructions.
  - 2. Block individual and stockpiled pipe lengths to prevent moving.
  - 3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
  - 4. Store PE and PVC materials out of sunlight.
- E. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

#### 1.10 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
  - 2. Indicate field measurements on Shop Drawings.

#### 1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.



## PART 2 - PRODUCTS

### 2.1 WATER PIPING

#### A. Ductile Iron Pipe:

1. Flanged ductile iron pipe shall comply with AWWA C115.
2. Bell and spigot ductile iron pipe shall comply with ANSI/AWWA C150/A21.50 AND ANSI/AWWA C151/A21.51,
3. Pipe shall be rated for a minimum working pressure of 200 psi working pressure or project requirements, whichever is greater plus a 100 psi minimum surge allowance and 2 to 1 factor of safety, using a Type II laying condition and a minimum depth of cover of four (4) feet.
4. The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe.
5. Manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe.
6. Pipe and fittings shall be NSF approved for potable water use and bear the NSF logo.
7. Ductile iron pipe shall be manufactured in the United States of America.
8. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.
9. Pipes with cracked or chipped linings or defective pipes will be rejected.
10. Bituminous Outside Coating:
  - a. Comply with AWWA C151
  - b. Apply by airless spray method
11. Pipe Cement Mortar Lining:
  - a. Comply with ANSI/AWWA C104/A21.4.
12. PE Encasement: Comply with AWWA C105.
13. Pipe Class:
  - a. Comply with AWWA C151.
  - b. Pipe Diameters 4-inch through 12-inch: Class 350 (minimum).
  - c. Pipe Diameters 14-inch through 20-inch: Class 250 (minimum).
  - d. Pipe Diameters 24-inch and larger: Class 200 (minimum).
14. Fittings:
  - a. Material: Ductile iron; comply with AWWA C110.
  - b. Compact Fittings: Comply with AWWA C153.
  - c. Coating and Lining:
    - 1) Bituminous Coating: Comply with AWWA C110.
    - 2) Cement-Mortar Lining: Comply with AWWA C104; double thickness.
15. Joints:
  - a. Joints shall be in accordance with ANSI/AWWA C111/A21.11, of latest revision, and be furnished complete with all necessary accessories.
  - b. Flanged Joints: Comply with AWWA C115.

- c. Push-On Restrained Joints: Shall be restrained using grip gaskets or lock-rings.
  - 1) Manufacturers:
    - a) American: Fast-Grip Gaskets,
    - b) McWane: Sure Stop Restrained Gaskets,
    - c) Griffin: Talon Restrained Gaskets,
    - d) U.S. Pipe: Field Lok Restrained Gaskets.
- d. Locking Ring Restrained Joints:
  - 1) Manufacturers:
    - a) American: Lok-Ring,
    - b) McWane: Super-Lock,
    - c) Griffin: Snap-Lok
    - d) U.S. Pipe: TR Flex Gripper
    - e) EBAA Iron Works: Mega-Lug Restraint Harness – Series 1700,
    - f) Sigma: PVP-Lok Restraint
    - g) Tyler Union: Tuff Grip MJ Fitting Restraint
- e. Restrained Fitting, Mega-Lug, DIP:
  - 1) Restrained Fittings shall be ductile iron conforming to ANSI/AWWA C151/A21.51 specifications.
  - 2) All restrained mega-lugs shall be furnished with accessories and have a minimum pressure resistance of 200 psi.
  - 3) Manufacturers:
    - a) EBAA Iron Works, Series 1100,
    - b) Sigma, One Lok Series SLD,
    - c) Tyler Union Tuflock,
    - d) or approved equal.
- f. Flanged Joints:
  - 1) Comply with AWWA/ANSI 115/A21.51.
  - 2) Pipe shall be furnished complete with all accessories.
  - 3) Gaskets: Unless otherwise shown or specified, gaskets shall be minimum 1/8-inch thick, full-face type. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.

B. Polyethylene Pipe:

- 1. Pipe shall conform to AWWA C901 and ASTM D-2737, PE 3408, copper tube outside diameter.
- 2. Pipe shall have a pressure rating of not less than 200 psi.
- 3. Pipe shall be NSF approved for potable water use.
- 4. Pipe Color: Blue.
- 5. Pipe Diameters: 3/4" to 2".

- C. Copper Pipe:
1. Pipe shall be seamless and comply with ASTM B88, hard temper and applicable AWWA specifications.
  2. Pipe shall have a pressure rating of not less than 200 psi.
  3. Pipe shall be NSF approved for potable water use.
- D. High Density Polyethylene Pipe (HDPE):
1. Comply with AWWA C901 and C906, PE 3408.
  2. HDPE pipe shall DR-9 or DR-11.
  3. HDPE pipe shall have a pressure rating of not less than 160 psi.
  4. Pipe Outside Diameter: Iron Pipe Sizes (IPS).
  5. Fittings:
    - a. Comply with AWWA C901 and C906.
    - b. Type: Molded or fabricated.
  6. Joints: Butt fusion.
  7. HDPE pipe shall be NSF approved for potable water use and bear the NSF logo.
- E. PVC Pipe (Push on Joint, 4" and Larger):
1. Comply with AWWA C900 and C905.
  2. PVC pipe shall be DR-14 or DR-18 and have a pressure rating of no less than 200 psi.
  3. PVC shall be NSF 61 approved and bear the NSF logo.
  4. Fittings: Mechanical joint ductile iron, complying with AWWA C111.
    - a. Restraint system shall be non-penetrating type specifically designed for PVC pipe.
  5. Push-On Joints:
    - a. Comply with ASTM D3139 and ASTM F477.
    - b. Seals: PVC flexible elastomeric.
    - c. Solvent-cement couplings are not permitted.
  6. Restrained Joints:
    - a. Where required, joints shall be restrained using restrained joint PVC piping system or bell restraint harnesses complying with all applicable AWWA specifications.
    - b. Manufacturers:
      - 1) Certain Teed: Certa-Lok C900/RJ Restrained Joint, Mechanical Gland Adapters for DR 14 and DR 18 pipe;
      - 2) EBAA Iron Works: Bell Restraint Harness for C900 PVC Pipe, Series 1600 for DR 14 and DR 18 pipe;
      - 3) Sigma: PVP-LOK Restraint;
      - 4) S&B Technical Products: Bull Dog Joint Restraints;
      - 5) Tyler Union: Tuff Grip MJ Fitting Restraint.
  7. Restrained Fitting, Mega-Lug, PVC:
    - a. Restraint Fittings shall be ductile iron conforming to ANSI/AWWA C111/A21.11 specifications.

- b. All restrained mega-lugs shall be furnished with accessories and have a minimum pressure resistance of 200 psi.
  - c. Manufacturers:
    - 1) EBAA Iron Works, Series 2000,
    - 2) Tyler Union, Tuflock,
    - 3) Sigma One-Lok, Series SLG,
    - 4) or approved equal.
- F. PVC Pipe (Solvent Weld):
  - 1. Solvent Weld PVC Pipe shall conform to ASTM D1785, Schedule 80.
  - 2. Pipe shall be grey in color and marked for use.
  - 3. Pipe shall have a pressure rating of no less than 200 psi.
  - 4. PVC shall be NSF 61 approved and bear the NSF logo.
  - 5. Solvent Weld PVC Fittings shall conform to ASTM D2467.
  - 6. Pipe Diameters: 3/4" to 2".
  - 7. Fittings:
    - a. Solvent Weld PVC Fittings shall conform to ASTM D2466, ASTM D2467, and applicable AWWA standards.
    - b. Fittings shall have a pressure rating of no less than 200 psi.
    - c. All fittings shall be NSF approved for potable water use.
- G. PVC Pipe (Push on Joint, 2" Water Main):
  - 1. Push on joint PVC pipe for 2" diameter water mains shall conform to ASTM D2672, SDR 21 and applicable AWWA standards.
  - 2. Pipe shall have a pressure rating of no less than 200 psi.
  - 3. Pipe shall be blue in color.
  - 4. PVC shall be NSF 61 approved and bear the NSF logo.
  - 5. Joints: Gasketed Bell Joint.
  - 6. Fittings: Schedule 80 PVC conforming to ASTM D2467.
- H. PVC Pipe (Thermal Butt-Fusion Joint):
  - 1. Thermal Butt-Fusion Joint PVC Pipe shall be utilized for horizontal directional drills 4" diameter or larger and shall conform to AWWA C900 and C905 standards.
  - 2. PVC pipe shall be DR-18 and have a pressure rating of no less than 200 psi.
  - 3. PVC pipe shall be blue in color.
  - 4. PVC shall be NSF 61 approved and bear the NSF logo.
- I. Brass Fittings:
  - 1. Brass Bushing:
    - a. Brass bushings shall have hex head and shall be threaded.
    - b. Bushings shall conform to applicable AWWA standards.
    - c. Bushings shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.

2. Coupling, Brass:
  - a. Brass couplings shall be a compression connection for copper tube size polyethylene tubing to male iron pipe threads.
  - b. Couplings shall conform to applicable AWWA standards.
  - c. Couplings shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
  - d. Manufacturers:
    - 1) Mueller, H-15428,
    - 2) Ford, C84-33 (3/4"), C84-44 (1"), C84-77 (2"),
    - 3) A. Y. McDonald, 4578-22,
    - 4) or approved equal.
3. Elbow, Regular 90-degree, Brass:
  - a. Brass elbow shall be NPT threaded.
  - b. Brass elbows shall conform to applicable AWWA standards.
  - c. Brass elbows to be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
4. Plug, Brass:
  - a. Brass plug shall be threaded.
  - b. Plugs shall conform to applicable AWWA standards.
  - c. Plugs shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
5. Nipple, Brass:
  - a. Brass nipple shall have threaded ends.
  - b. All brass nipples shall conform to applicable AWWA standards.
  - c. Nipples shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
6. Tee, Brass Compression Packjoint:
  - a. Brass Compression Tee shall for connecting polyethylene pipes shall conform to AWWA C800 and ASTM B-62.
  - b. Packjoint nut shall have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
  - c. Tee shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
  - d. Manufacturers:
    - 1) Ford, T444,
    - 2) Mueller, H15381,
    - 3) A.Y. McDonald, 4760-22,
    - 4) or approved equal.
7. Fire Department Connection, Brass:
  - a. Brass Fire Department Connection shall be used for auxiliary connection by a fire department to boost water system pressure in sprinkler system mains.
  - b. This connection shall be UL listed and FM approved in accordance with NFPA and consist of a brass straight or 90° Angular body, have two (2) 2-

- 1/2" female NST inlets with clapper and pin lug swivels, and (1) female NPT outlet.
- c. Furnish with standard NST plugs and chains.
- d. Fitting shall be stamped with wording indicating "Auto Sprinkler".
- e. Brass Fire Department Connection shall conform to applicable AWWA standards.
- 8. Coupling, Pack Joint:
  - a. Pack Joint Couplings shall be for connection of copper tube size polyethylene tubing to male iron pipe threads.
  - b. Coupling shall conform to applicable AWWA standards.
  - c. Pack Joint Couplings shall be NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.
  - d. Manufacturers:
    - 1) Mueller, H15428,
    - 2) Ford, C84,
    - 3) or approved equal.

## 2.2 ADAPTOR COUPLINGS

- A. Coupling, Brass Adaptor Elbow:
  - 1. Brass Adaptor Elbow Coupling for connecting polyethylene pipe shall conform to AWWA C800 and ASTM B-62.
  - 2. Pack joint nut shall have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
  - 3. All couplings shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
  - 4. Manufacturers:
    - a. Ford, L44-33, L-44-44, L-44-77,
    - b. Mueller, H-15526N,
    - c. A. Y. McDonald, 4761-22,
    - d. or approved equal.
- B. Coupling, Brass Adaptor Reducing:
  - 1. Reducing Brass Coupling Adaptor shall be for connection of 1" polyethylene pipe to 3/4" polyethylene pipe and shall conform to AWWA C800 and ASTM B-62.
  - 2. All couplings shall be brass, NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.
  - 3. Manufacturers:
    - a. Ford, L-44-34,
    - b. A.Y. McDonald, 4761-22,
    - c. Mueller, H15526N,
    - d. or approved equal.
- C. Coupling, Ductile Iron Pipe:
  - 1. Ductile Iron Pipe Couplings shall conform to applicable AWWA standards.

2. Ductile Iron Pipe Couplings shall be ductile iron, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
- D. Coupling, Ductile Iron Pipe, Restrained
1. Restrained Ductile Iron Pipe Couplings shall conform to applicable AWWA standards.
  2. Restrained Ductile Iron Pipe Couplings shall be ductile iron, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
  3. Manufacturers:
    - a. EBAA Iron Works, Mega Coupling Series 3800 Restrained Coupling,
    - b. or approved equal.
- E. Coupling, Brass Adaptor Corporation Elbow:
1. Brass Adaptor Corporation Elbows shall conform to AWWA C800 and ASTM B-62.
  2. Brass Adaptor Corporation Elbows shall be brass, NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.
  3. Inlet: Mueller thread (swivel nut).
  4. Outlet: CTS packjoint.
- F. Repair Coupling, Stainless Steel
1. Stainless Steel Repair Couplings for pipe repair shall conform to applicable AWWA standards.
  2. Repair couplings shall be stainless steel, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.

## 2.3 VALVES

- A. Resilient Seat Gate Valves:
1. Resilient Seat Gate Valves shall conform to AWWA C509 or C515 and shall be provided for 2-inch diameter through 10-inch diameter water mains.
  2. Valve shall be pressure rated for 175 psi.
  3. Valve Body: Cast Iron or Ductile Iron.
  4. Valve Wedge: Cast Iron or Ductile Iron and completely encapsulated in EPDM.
  5. Valve stems shall be O-ring sealed and non-rising stem design.
  6. Valve Stems shall be Type 304 or 431 stainless steel.
  7. Gate valves shall be NSF 61 approved and bear the NSF logo.
  8. Operating nut shall be 2" square and turn counter clockwise to open the valve.
  9. Joints:
    - a. Mechanical Joint end connections shall fully conform with ANSI/AWWA C111/A21.11 for 4" diameter and larger.
    - b. Flanged end connections shall fully conform with ANSI B16.1 for 4" diameter and larger.
    - c. Threaded Joint: 2" diameter only.

10. Manufacturers:
  - a. American Flow Control, Series 2500 (2" diameter and larger),
  - b. Mueller, A2360-20-F (4" diameter and larger), A2360-8-F (2" diameter),
  - c. Clow, F6100 (4" diameter and larger), F6103 (2" diameter),
  - d. or approved equal.
  
- B. Butterfly Valves:
  1. Butterfly Valves shall conform to AWWA C504 and shall be provided for water mains 12-inch diameter and larger.
  2. Working Pressure: 175 psi.
  3. Valve Body: Cast Iron
  4. Valve Seat: Neoprene.
  5. Disc: Ductile Iron, ASTM A-536.
  6. Valve Stem: Type 304 or 431 Stainless Steel.
  7. Butterfly valves shall be NSF 61 approved and bear the NSF logo.
  8. Operating nut shall be 2" square and shall turn counter clockwise to open.
  9. Valve interior and exterior shall be epoxy coated in accordance with AWWA C550.
  10. Joints:
    - a. Flanged end connections shall fully conform with ANSI B16.1.
    - b. Mechanical Joint end connections shall fully conform with ANSI/AWWA C111/A21.11.
  11. Manufacturers:
    - a. Mueller, B3211-20,
    - b. DeZurik, Class 200 MJ,
    - c. Pratt, Ground Hog,
    - d. M&H / Clow, Style 4500,
    - e. GA Industries, Series 800,
    - f. Valmatic, VM-2104,
    - g. or approved equal.
  
- C. Insertion Valves:
  1. Insertion valves shall meet or exceed the testing requirements of AWWA C509 or C515.
  2. Valve body may be cast iron, ductile iron, or Type 304 stainless steel.
  3. Valve shall be pressure rated for 175 psi.
  4. Valve Stem: Type 304 or 431 Stainless Steel.
  5. Insertion valves shall be NSF 61 approved and bear the NSF logo.
  6. Operating nut shall be 2" square and turn counter clockwise to open the valve with an operating rate of three (3) turns per inch of nominal pipe size.
  7. Interior Lining: Epoxy.
  8. Exterior Coating: Tar.
  9. Manufacturers:
    - a. Advanced Valve Technologies, EZ Valve,
    - b. Hydra-Stop, Insta-Valve Plus,



- c. Team Industrial Services, Insert Valve,
  - d. or approved equal.
- D. Check Valves (Threaded Swing-Flex Type):
  - 1. Threaded swing-flex type check valves shall be used in conjunction with fire department connections and shall be suitable for vertical or horizontal installation.
  - 2. The valve shall be UL listed and certified by FM Approval in accordance with the NFPA.
  - 3. Valve shall be pressure rated for 175 psi and shall conform to all applicable AWWA standards.
  - 4. Threaded swing-flex type check valves shall be NSF 61 approved and bear the NSF logo.
  - 5. Materials:
    - a. Valve Body: Cast Brass.
    - b. Clapper: Bronze.
    - c. Seat Ring: Bronze.
    - d. Stainless steel spring and hinge pin.
  - 6. Joints: NPT inlet and outlet.
- E. Check Valves (Flanged Swing-Flex Type)
  - 1. Flanged swing-flex type check valves shall conform to AWWA C508.
  - 2. Flanges shall conform to ANSI B16.1.
  - 3. Materials:
    - a. The flexible disc shall be one piece and precision molded with alloy steel and Nylon reinforcement and an integral O-ring style seat for drop tight seating at low pressure.
    - b. Valve Body: Ductile Iron.
  - 4. Valve shall be pressure rated for 175 psi.
  - 5. Check valves shall be NSF 61 approved and bear the NSF logo.
  - 6. Manufacturers:
    - a. Val-Matic, 500A Swing-Flex,
    - b. Clow, Ken-Flex,
    - c. Pratt, Flex Check,
    - d. Mueller, Flex Check,
    - e. GA Industries, Ludlow Check,
    - f. or approved equal.
- F. Air Release Valves (Stainless Steel):
  - 1. Stainless Steel Air Release Valves shall be of the type designed for use in water distribution systems to exhaust entrapped air from water mains and shall conform to all applicable AWWA standards.

2. Valve shall be simple lever type and be constructed and tested to 175 psi working pressure.
3. Air release valves shall be NSF 61 approved and bear the NSF logo.
4. Materials:
  - a. Body and Cover: Stainless Steel
  - b. Interior Working Parts: Stainless Steel
5. Air release valve inlets and outlets shall be threaded to NPT standards.
6. Manufacturers:
  - a. Empire, Figure 910,
  - b. Val-Matic, Model 15, 22, and 25,
  - c. GA Industries, Figure 910,
  - d. or approved equal.

G. Air Release Valves (Plastic Body):

1. Plastic Body Air Release Valves shall be of the type designed for use in water distribution systems to exhaust entrapped air from water mains and shall conform to all applicable AWWA standards.
2. Valve shall be simple lever type and be constructed and tested to 175 psi working pressure.
3. Air release valves shall be NSF 61 approved and bear the NSF logo.
4. Materials:
  - a. Body and Cover: PVC
  - b. Interior Working Parts: PVC
5. Air release valve inlets and outlets shall be threaded to NPT standards.
6. Manufacturers:
  - a. A.R.I. Flow Control Accessories, Ltd., D-040,
  - b. or approved equal.

H. Corporation Stops:

1. Corporation stop shall meet AWWA C800 and ASTM B62.
2. Inlet shall be threaded per AWWA IP standard with outlet copper tube size pack joint.
3. Pack joint nut to have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
4. Corporation stop shall be NSF approved for potable water use and shall have a pressure rating of 200 psi.
5. Manufacturers:
  - a. Ford, F-1100,
  - b. Hays, 5204CJ,
  - c. Mueller, H15028,
  - d. A. Y. McDonald, 4704-22,
  - e. or approved equal.

I. Corporation Stops (Polyethylene):

1. Corporation stop shall meet AWWA C800 and ASTM B62.
2. Inlet shall be threaded per AWWA IP standard with outlet copper tube size pack joint for polyethylene.
3. Pack joint nut to have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
4. Corporation stop shall be NSF approved for potable water use and shall have a pressure rating of 200 psi.
5. Manufacturers:
  - a. Ford, F-1000,
  - b. Hays, 5200CJ,
  - c. Mueller, H15008,
  - d. A. Y. McDonald, 4701-22,
  - e. or approved equal.

J. Curb Ball Valves:

1. Curb Ball Valve shall conform to AWWA C800 and ASTM B62.
2. Inlet and outlet shall be female iron pipe thread with tee head lock wing.
3. Valve shall be NSF approved for potable water use and be pressure rated for 175 psi.
4. Manufacturers:
  - a. Ford, B 41,
  - b. A. Y. McDonald, 6101W,
  - c. Mueller, B20200,
  - d. or approved equal.

K. Hose Bibbs:

1. Hose Bibbs shall be brass with iron pipe thread up stream and hose thread downstream.
2. Valve operator shall turn counter-clockwise to open.
3. Hose bibb shall be NSF approved for potable water use and conform to all applicable AWWA standards.
4. Hose bibb shall have a pressure rating of 200 psi.
5. Manufacturers:
  - a. Conbraco, No. 35-202-10,
  - b. Red-White Valve Co., RW 5313,
  - c. or approved equal.

## 2.4 TAPPING SLEEVES AND VALVES

A. Tapping Saddles:

1. Tapping Saddles for water main tapping shall be suitable for tapping cast iron, ductile iron, and PVC pipe.
2. Saddles shall be approved for potable water use, shall have a pressure rating of 200 psi, and shall be certified to ANSI/NSF61 specifications.

3. Tapping Saddles shall have Stainless Steel Stems.
  4. Description:
    - a. Material:
      - 1) Body: Ductile Iron.
      - 2) Bolts: Hot Dip Galvanized.
    - b. Type: Dual compression.
    - c. Outlet Flange Dimensions and Drilling: Comply with ASME B16.1, Class 125, and MSS SP-60.
  5. Manufacturers:
    - a. Mueller, H-615,
    - b. or approved equal.
- B. Sleeve, Tapping, Steel:
1. Body: Carbon Steel
  2. Flanges: AWWA C207 Class D, ANSI 150 lb. drilling.
  3. Steel Tapping Sleeve shall have test plug with ¾" NPT and recessed cavity for mating tapping valves.
  4. Gasket: Grade 60 gasket compounded for use with water, oil, salt solutions, mild acids, bases, and natural gas.
  5. Bolts, washers, and nuts: 18-8 stainless steel type 304.
  6. Finish: Fusion bonded epoxy coated to an average of 12 mil thickness inside and out, per AWWA C213.
  7. Sleeves shall be NSF approved for potable water and shall have a minimum pressure rating of 200 psi.
  8. Manufacturers:
    - a. Smith-Blair, 622,
    - b. Dresser, 610,
    - c. JCM, 412,
    - d. Romac, FTS420SSFE,
    - e. or approved equal.
- C. Sleeve, Tapping, Stainless Steel:
1. Body: 18-8 stainless steel
  2. Lugs: 18-8 stainless steel
  3. Bolts, washers, and nuts: NC rolled thread, 18-8 stainless steel
  4. Gasket: Virgin SBR compounded for water service, full wrap around design.
  5. Flange: 18-8 stainless steel with ¾" NPT test plug.
  6. All sleeves shall conform to applicable AWWA standards.
  7. All sleeves to be NSF approved for potable water and shall have a minimum pressure rating of 200 psi.
  8. Manufacturers:
    - a. Romac, Style SST,
    - b. Ford, Fast,
    - c. JCM, 432,

- d. Dresser, 630,
- e. Mueller, H304SS,
- f. or approved equal.

D. Tapping Valves:

1. Tapping Valves shall be resilient seat gate valves that conform to AWWA C509 or C515.
2. Valve shall be pressure rated for 175 psi.
3. Valve Body: Cast Iron or Ductile Iron.
4. Valve Wedge: Cast Iron or Ductile Iron and completely encapsulated in EPDM.
5. Valve Stems shall be O-ring sealed and non-rising stem design.
6. Valve Stems shall be Type 304 or 431 stainless steel.
7. Gate valves shall be NSF 61 approved and bear the NSF logo.
8. Operating nut shall be 2" square and turn counter clockwise to open the valve.
9. Joints:
  - a. Tapping Valves shall be flanged joint by mechanical joint.
  - b. Mechanical Joint end connections shall fully conform with ANSI/AWWA C111/A21.11 for 4" diameter and larger.
  - c. Flanged end connections shall fully conform with ANSI B16.1 for 4" diameter and larger.
  - d. Threaded Joint: 2" diameter only.
10. Manufacturers:
  - a. American Flow Control, Series 2500,
  - b. Mueller, T2360-16-F,
  - c. Clow, F6114,
  - d. or approved equal.

## 2.5 FLOW METERS

A. Electromagnetic Meters:

1. Electromagnetic Meters shall have a Stainless Steel or Brass body containing not less than 75% copper.
2. Positive Displacement Flow Meters shall be rated for 200 psi working pressure.
3. Size, model, and direction of flow shall be marked permanently on outer case of all meters. The name of the manufacturer shall be marked permanently on the lid of the register box. The serial number of the meter shall be imprinted on the lid and on meter main case.
4. Register:
  - a. The register shall be permanently hermetically sealed.
  - b. No fogging, large numerals, tempered glass or plastic lens.
  - c. Unit of Measure: Cubic foot.
  - d. Straight and AMI reading, and low flow indicator.

- e. The register shall connect to a Cellular Endpoint. AMI transmitter via factory potted NICOR Connector as part of the register. The AMI transmitter shall be capable of communicating to Badger's Beacon AMA Cellular Metering System.
  - 5. Connection: Flanged and/or screwed ends as designated
    - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
  - 6. Manufacturers:
    - a. Badger,
    - b. or approved equal.
- B. Electromagnetic Flow Meter for Fire Service:
- 1. Electromagnetic Flow Meters for Fire Service shall meet or exceed requirements of AWWA C703 standards and shall be NSF approved for potable water use.
  - 2. Materials:
    - a. Body: Stainless Steel.
    - b. Electrodes: Type 316 Stainless Steel.
    - c. Display Housing: Aluminum Alloy with glass display window.
  - 3. Electromagnetic Flow Meters shall be rated for 200 psi working pressure.
  - 4. Connection: Flanged.
    - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
  - 5. Electronic Display:
    - a. Electronic display shall be included with Electromagnetic Flow Meter.
    - b. Display shall include three (3) outputs for pulses and alarm and shall display usage and total.
    - c. Electronic display shall be mounted in a secure location.
  - 6. Manufacturers:
    - a. Badger,
    - b. or approved equal.
- C. Electromagnetic Flow Meters:
- 1. Electromagnetic Flow Meters shall meet or exceed requirements of AWWA C751 standards and shall be NSF approved for potable water use.
  - 2. Materials:
    - a. Body: Bronze, Cast Iron, or Stainless Steel.
    - b. Liner: Fusion-bonded epoxy coated.
    - c. Electrodes: Type 316 Stainless Steel.
    - d. Display Housing: Aluminum Alloy with glass display window.
  - 3. Electromagnetic Flow Meters shall be rated for 200 psi working pressure.
  - 4. Connection: Flanged.
    - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.

5. Register:
  - a. The register shall be permanently hermetically sealed.
  - b. No fogging, large numerals, tempered glass lens.
  - c. Unit of Measure: Cubic foot.
  - d. Magnetic drive, low torque registration.
  - e. Straight and AMI reading, and low flow indicator.
  - f. The register shall connect to a Cellular Endpoint. AMI transmitter via factory potted NICOR Connector as part of the register. The AMI transmitter shall be capable of communicating to Badger's Beacon AMA Cellular Metering System.
6. Manufacturers:
  - a. ABB, Aquamaster,
  - b. AMCO, Q4000 Mag Meter,
  - c. McCrometer, Ultra Mag,
  - d. Badger,
  - e. or approved equal.

D. Remote Readers:

1. Remote Readers shall conform to all applicable AWWA specifications.
2. Electronic LCD time counter, battery operated, to be mounted in a NEMA four(4) fiberglass enclosure.
3. Manufacturers:
  - a. Hersey, Model REC-1,
  - b. or approved equal.

## 2.6 FIRE ASSEMBLIES

A. Fire Hydrants:

1. Fire hydrant assemblies shall conform to AWWA C-502.
2. Fire hydrant shall contain two (2) 2 ½" hoses and one (1) 4 ½" steamer connection with National standard fire hose coupling screw threads, 5 ¼" valve opening, and 6" diameter mechanical joint inlet.
3. Operating nut shall be 1 ½" pentagon and open counter clockwise.
4. Stem shall be stainless steel.
5. Fire hydrants shall be factory painted Red (Epoxy Primer, Polyurethane Finish Coat, Safety Red, CC13, ANSI Z53.1-1971).
6. Inside of hydrant shoe shall be epoxy coated.
7. Bonnet shall be bolted to upper barrel with bonnet bolt and nut.
8. Hydrants shall have drain holes and be complete with all accessories.
9. Fire hydrant assemblies shall be NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.
10. Manufacturers:
  - a. Mueller, Centurion 250,
  - b. American Flow Control, B-84-B

- c. M & H, Style 129,
- d. Clow, Medallion F2545,
- e. or approved equal.

B. Detector Check Assemblies, Single:

- 1. Single Detector Check Assemblies shall conform to applicable AWWA standards and consist of one (1) internally spring loaded “Y” figure check valve with cast iron body, bronze replaceable seat ring with stainless steel stem and spring.
- 2. All internal cast iron parts shall be epoxy coated.
- 3. The bypass assembly shall consist of an internally spring-loaded double check valve in series with a water meter which shall read in cubic feet and a shutoff gate valve.
- 4. Single detector check assemblies shall have a minimum pressure rating of 200 psi, meet USC approval, and NSF approval for potable water.
- 5. Manufacturers:
  - a. Hersey, EDC II,
  - b. Ames, 1000 DCV,
  - c. or approved equal.

C. Detector Check Assemblies, Double:

- 1. Double Detector Check Assemblies shall conform to applicable AWWA standards and consist of two (2) internally spring loaded “Y” figure check valves having cast iron bodies, bronze replaceable seat rings and stainless steel stems and springs.
- 2. All internal cast iron parts shall be epoxy coated.
- 3. The bypass assembly shall consist of a bronze body internally spring-loaded double check valve in series with a bronze water meter which shall read in cubic feet and two (2) gate valves.
- 4. Double detector check assemblies shall have a minimum pressure rating of 200 psi, meet USC approval, and NSF approval for potable water.
- 5. Manufacturers:
  - a. Febco, 806YD,
  - b. Hersey, DDC II,
  - c. Ames, 3000-DCDA,
  - d. Wilkins, 350-DA,
  - e. or approved equal.

D. Check Assemblies, Double:

- 1. Double check valve assemblies shall conform to applicable AWWA standards and consist of two (2) internally spring loaded “Y” figure check valves having cast iron bodies, bronze replaceable seat rings and stainless steel stems and springs.
- 2. All internal cast iron parts shall be epoxy coated.
- 3. Double check valve assemblies shall have a minimum pressure rating of 200 psi and meet USC approval and NSF approval for potable water.



4. Manufacturers:
  - a. Febco, 805YD,
  - b. Hersey, No. 2,
  - c. Watts, 709RW,
  - d. Ames, 2000-SS,
  - e. or approved equal.

E. Fire Flow Assembly:

1. Fire flow assembly shall consist of an internal spring loaded “Lever” check valve, magnetic drive, mainline proportional meter, bypass turbine meter, bypass check valve and shutoff valve.
2. Valve shall meet UL and FM approvals.
3. Meters shall read in cubic feet.
4. Assembly shall be cast iron and conform to all applicable AWWA standards.
5. Fire flow assemblies shall meet NSF approval for potable water use and shall have a minimum pressure rating of 200 psi.
6. Manufacturers:
  - a. Hersey, MFM-MHR
  - b. Neptune, Protectus III,
  - c. Sensus, Fireline,
  - d. or approved equal.

F. Hydrant Out of Service Markers:

1. Fire Hydrant Out of Service Markers shall be heavy duty plastic markers installed on the steamer nozzle and stenciled with “OUT OF SERVICE” on one side in bold black paint.
2. Markers shall fit 4” and 4 ½” steamer nozzle.
3. Color to be high visibility orange.
4. Out of Service Markers shall be installed on all new hydrants until flow tested and placed into service.

## 2.7 REPAIR SLEEVES

- A. General: Couplings shall be furnished with the pipe stop removed. Couplings shall be provided with plain, Grade 27, rubber gaskets and with black, steel, track-head bolts with nuts.
- B. Sleeve, Compression, Galvanized Steel:
  1. Galvanized Steel Compression Sleeve shall be hot dip galvanized and shall have a protected gasket.
  2. Sleeves shall conform to applicable AWWA standards.
  3. Sleeves shall be NSF approved for potable water and shall have a minimum pressure rating of 200 psi.
  4. Manufacturers:
    - a. Smith-Blair, 522,

- b. Telsco Industries, 700 Series,
  - c. or approved equal.
- C. Sleeve, Compression, Brass:
  - 1. Brass Compression Sleeves for joining 2" HDPE to 2" PVC Piping shall be brass and shall have a protected gasket.
  - 2. Sleeves shall conform to applicable AWWA standards.
  - 3. Sleeves shall be NSF approved for potable water and shall have a minimum pressure rating of 200 psi.
- D. Sleeve, Ductile Iron, Mechanical Joint:
  - 1. Ductile Iron Mechanical Joint Sleeves shall conform to ANSI/AWWA C153 for compact fittings, three (3") inch through 36" diameter.
  - 2. Sleeves shall be ductile iron long pattern with mechanical joint ends and shall be cement mortar lined and bituminous sealed.
  - 3. Sleeves shall be furnished with accessories.
  - 4. Ductile Iron Mechanical Joint Sleeves shall be NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.

## 2.8 SERVICE TAPPING SADDLES

- A. Service Tapping Saddle for Cast Iron, Ductile Iron, and PVC Water Mains:
  - 1. Tapping saddles for cast iron, ductile iron, and PVC water mains shall conform to applicable AWWA standards.
  - 2. Outlet shall be for connection to PVC or polyethylene pipe.
  - 3. Tapping saddles shall be nylon coated or painted ductile iron with double stainless steel strap and neoprene gasket.
  - 4. Tapping saddles shall have a pressure rating of 200 psi and shall be NSF approved for potable water use.
  - 5. Manufacturers:
    - a. Ford, F202,
    - b. Baker, 181,
    - c. Mueller, DR-25 Series,
    - d. Romac Industries, 202-N or S Series,
    - e. Smith-Blair, 313 Series,
    - f. or approved equal.
- B. Service Tapping Saddle for HDPE Water Mains:
  - 1. Tapping saddles for HDPE water mains shall conform to applicable AWWA standards.
  - 2. Outlet shall be for connection to PVC or polyethylene pipe.
  - 3. Tapping saddles shall be nylon coated or painted ductile iron with double stainless steel strap and neoprene gasket.
  - 4. Tapping saddles shall have a pressure rating of 200 psi and shall be NSF approved for potable water use.

5. Manufacturers:
  - a. Mueller, DR-2S Series,
  - b. Romac Industries, 202-N or S Series,
  - c. Smith-Blair, 313 Series,
  - d. or approved equal.

## 2.9 VALVE BOXES AND LIDS

### A. Valve Box:

1. Valve boxes shall not be deeper than five (5) feet without Owner approval.
2. Bottom Section:
  - a. Cast iron, ASTM A48, heavy duty screw type.
  - b. Cast iron screw valve box will be only type allowed in asphalt pavement.
  - c. Cast iron screw or sliding type valve box may be used in right of way as specified per project.
3. Valve Box Extension:
  - a. Cast iron, ASTM A48, heavy duty screw type extension.
  - b. For deep valves use six (6) inch ductile or cast iron pipe cut to proper length so only one valve box extension is used.
4. Valve Box Tops shall be cast iron, screw type and conform to ASTM A48.
5. Valve Box Tops shall be rated for H-20 traffic in conformance with AASHTO M-306.
6. Manufacturers:
  - a. Tyler, #6850-5625-24B (Bottom), #6050-5625-585C (Extension), #6850-5625-16T (Top),
  - b. Opelika Foundry, #4908-5562-S-625 (Bottom), #4906X-64E (Extension), #4905-5562-S-55S (Top),
  - c. Sigma, VB 2622 (Bottom), VB302-18 (Extension), VB2621X (Top),
  - d. Star Pipe Products, VBB24SHD (Bottom), VBEX14S (Extension), VBT16SHD (Top),
  - e. or approved equal.

### B. Valve Box Lid:

1. Provide cast iron, ASTM A48, heavy duty, screw type, valve box, 5 1/4" shaft for non-pavement installations.
2. Valve Box Lid shall be rated for H-20 traffic in conformance with AASHTO M-306.
3. Cover shall be marked "WATER".
4. Manufacturers:
  - a. Sigma, VB2600X,
  - b. Tyler, 5 1/4" Drop Lid,
  - c. Opelika Foundry, #4908-562 Lid,
  - d. Star Pipe Products, VBLIOHD,

e. or approved equal.

C. Non-Pop Valve Box Lid:

1. Provide high tech molded polymer lid, ASTM A48, heavy duty, screw type, valve box, 5 1/4" shaft cast iron valve box top.
2. Non-Pop Valve Box Lids shall be installed in heavy traffic pavement areas.
3. Valve Box Lids shall be rated for H-20 traffic in conformance with AASHTO M-306.
4. All boxes shall conform to applicable AWWA standards.
5. Cover shall be marked "WATER".
6. Manufacturers:
  - a. SW Services, 5 1/4" Non-Pop Lid,
  - b. or approved equal.

2.10 METER BOXES AND LIDS

A. Lid, Gulf Meter Box:

1. Gulf Meter Box Lids shall be locking type, plastic material, heavy duty, and with legend "WATER METER" on lid.
2. Meter Box Lids shall conform to applicable AWWA standards.

B. Box, Gulf Meter:

1. Meter box shall be furnished with locking lid.
2. Lid shall be plastic material, heavy duty, and with the legend "WATER METER".
3. Box shall conform to applicable AWWA standards.
4. Manufacturer:
  - a. Ford, G148-233,
  - b. Mueller, H-1453-3
  - c. or approved equal.

C. Box, Polymer Meter:

1. Meter box shall be constructed of polymer concrete and reinforced by a heavy weave fiberglass type service box.
2. Logo on cover shall read "WATER METER".
3. Covers shall be non-locking and have hinged reader lid.
4. Color shall be blue.
5. Box and cover shall have H-10 load rating unless specified otherwise
6. Box shall include mouse holes on both ends and have stacking capability.
7. Polymer Meter Boxes shall conform to applicable AWWA standards.
8. Manufacturers:
  - a. DFW Plastics, DFWB40WBC-14-1T 63D (24" x 36"),
  - b. or approved equal.

D. Box, Utility, Precast Concrete Vault:

1. Precast Concrete Utility Box shall meet the requirements of ASTM C478, with the exclusion of Section 10 (a), except as modified herein.
2. Cement shall meet the requirements of ASTM C150, Specification for Portland Cement, Type I/II.
3. Concrete for utility boxes shall be 4,000 PSI and meet the minimum requirements for Class III.
4. Minimum wall thickness shall be six inches.
5. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with Section 345 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) except that the CONTRACTOR shall be responsible for all testing.
6. Reinforcing steel shall be #4 GR60 rebar 12" O.C. both ways.
7. Utility box shall be constructed with open bottom.
8. Where a top slab is required, it shall be six inches (6") thick, 4,000 PSI concrete with #4 GR60 rebar 12" O.C. both ways.
9. Where details call for aluminum hatch to be cast with the utility box, the hatch shall be as specified in Section 33 32 1 – Field-Erected Wastewater Pumping Stations.

## 2.11 PIPE SUPPORTS AND ANCHORING

- A. Metal for Pipe Support Brackets:
  1. Material: Structural steel.
  2. Finish: Galvanized.
  3. Coating: Bituminous paint.
- B. Metal Tie Rods and Clamps or Lugs:
  1. Material: Galvanized steel.
  2. Size: Comply with NFPA 24.
  3. Coating: Bituminous paint.

## 2.12 CONCRETE ENCASEMENT AND CRADLES

- A. Concrete:
  1. As specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  2. Type: Reinforced, air entrained.
  3. Compressive Strength: 4,000 psi at 28 days.
  4. Finish: Rough troweled.

## 2.13 MATERIALS

- A. Backfill:
  1. Bedding, cover, and soil backfill materials shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.14 FINISHES

- A. Steel: Hot-dip galvanized after fabrication, according to ASTM A123/A123M.
- B. Protective Coating: Coal-tar epoxy for below grade piping and epoxy paint for exposed piping.

## 2.15 ACCESSORIES

- A. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
- B. Vaults: As specified in Section 33 05 63 - Concrete Vaults and Chambers.
- C. Steel Rods, Bolt, Lugs, and Brackets:
  - 1. Comply with ASTM A36/A36M or A307, Grade A carbon steel unless otherwise shown or specified.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.
- C. The Contractor shall field verify vertical and horizontal locations of all underground facilities in advance of construction to verify that no conflicts exist with the proposed pipe alignment and depth.
  - 1. Should a conflict be discovered, the Contractor shall contact the Engineer immediately and provide all pertinent information for preparation of a remedial design.
- D. Verify that existing utility water main size, location, and invert are as indicated on Drawings.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Preconstruction Site Photos:
  - 1. As specified in Section 01 70 00 - Execution and Closeout Requirements.

2. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
3. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
4. Include Project description, date taken, and sequential number on back of each photograph.

C. Pipe Cutting and Lining Repair:

1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
3. Grind edges smooth with beveled end for push-on connections.
4. Remove all traces of oil, grease, asphalt, dust, dirt, etc.
5. Remove damaged lining and clean any exposed metal by sanding or scraping. Sandblasting and power tool cleaning is also acceptable.
  - a. Remove any loose lining by chiseling, cutting, or scraping to well adhered lined area before patching.
  - b. Lining patch shall overlap remaining lining at least one (1) inch.
6. With the area to be sealed or repaired absolutely cleaned and thoroughly roughened, apply a coat of repair compound specified in the applicator's "Certificate of Application" as furnished and approved with the pipe submittal. The Contractor shall apply the repair compound in strict accordance with the manufacturer's written instructions.
7. The Contractor shall repair damaged coating and lining immediately, using the repair compound recommended by the manufacturer.
8. The cost of repair to cut pipe ends or damaged linings shall be incidental to construction and the Contractor shall absorb the cost thereof in the unit price specified for related items.

D. Remove scale and dirt on inside and outside before assembly.

E. Prepare pipe connections to equipment with flanges or unions.

### 3.3 INSTALLATION

- A. Bedding and installation shall be Class B as shown on the Drawings unless otherwise specified or directed by the Engineer.
- B. Horizontal Directional Drill and Jack and Bore Installations shall be in accordance with Specification Section 33 05 07.00 – Boring and Jacking and Section 33 05 07.13 – Utility Directional Drilling.

C. Handling and Cutting Pipe:

1. The Contractor shall exercise extreme care in handling and laying pipe and fittings to avoid damaging, scratching or marring machined surfaces, and abrasion of the pipe or fitting coating.
2. Any fitting showing a crack and any fitting or pipe that has received a severe blow that may have resulted in an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and immediately removed from the Work.
3. Any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved by the Engineer, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least twelve (12) inches from the visible limits of the crack.
4. Except as otherwise approved, all cuttings shall be done with a machine having rolling wheel cutters, or pipe saw adapted for that purpose. All cut ends shall be examined for possible cracks caused by cutting.

D. Abandoning Water Mains:

1. Water Mains Abandoned in Place: The Contractor shall cut the water main as required to make connections or install plugs. That portion of the pipe to be abandoned and left in place shall be plugged at locations where the pipe was cut or punctured. Plugging shall be accomplished by grouting the end or punctured area to the satisfaction of the Engineer.
2. Water Mains Abandoned in Place with Grout Fill: The Contractor shall cut the water main as required, install plugs, and fill the pipe with grout as shown on the Drawings.
3. Water mains to be abandoned and removed shall be cut or disconnected as required.

E. Pipe Installation:

1. Comply with AWWA C600 and C605 as applicable.
2. Handle and assemble pipe according to pipe and gasket manufacturer instructions and as indicated on Drawings.
3. Steel Rods, Bolts, Lugs, and Brackets: Coat buried steel before backfilling.
4. No water main shall be installed within six (6) feet of a sanitary sewer line, unless the bottom of the water main is at least six (6) inches higher than the crown of the sanitary sewer, or unless special permission is obtained from the Engineer or FDEP. In no case shall a water main be placed in the same trench with a sanitary sewer.
5. Water Main Location:
  - a. Water mains shall be constructed eight (8) feet off the north or east right of way lines unless otherwise shown on the plans.
  - b. Water lines to be constructed in easements shall be centered within the boundaries of the easement.



- c. If trees or other structures should interfere with the alignment of the water main, the water main shall be adjusted towards the right of way line.
  - d. Minimum depth of installation shall be three (3) feet, measured from the top of the pipe to the finished grade or centerline of roadway directly above the pipe.
  - e. Minimum horizontal clearance between parallel water mains and sanitary sewer gravity mains shall be six (6) feet, ten (10) feet preferred.
  - f. Minimum horizontal clearance between parallel water mains and sanitary sewer force mains shall be six (6) feet, ten (10) feet preferred.
  - g. Minimum horizontal clearance between parallel water mains and storm sewer mains shall be three (3) feet.
  - h. Minimum horizontal clearance between parallel water mains and reuse force mains shall be three (3) feet.
  - i. Minimum vertical clearance between water mains and gravity sanitary sewer mains crossing each other shall be six (6) inches, twelve (12) feet preferred.
  - j. Minimum vertical clearance between water mains and storm sewer mains crossing each other shall be six (6) inches, twelve (12) inches preferred.
  - k. Minimum vertical clearance between water mains and sanitary sewer force mains crossing each other shall be twelve (12) inches.
  - l. Minimum vertical clearance between water mains and reuse force mains crossing each other shall be twelve (12) inches.
6. Route pipe in straight line and re-lay pipe that is out of alignment or grade.
  7. Ductile-Iron Piping and Fittings: Comply with AWWA C600.
  8. PVC Pipe Piping and Fittings: Comply with AWWA C605.
  9. Field Welding Materials: Comply with AWWA C206.
  10. Flanged Joints: Do not use in underground installations except within structures.
  11. To ensure correct fitting of pipe and couplings, all sleeve-type couplings and accessories shall be furnished by the supplier of the pipe.
  12. High Points:
    - a. Install pipe with no high points other than shown on the Drawings.
    - b. If approved by the Engineer, minor changes in alignment may be permitted to avoid underground facilities.
    - c. If unforeseen field conditions arise that necessitate high points, install air-release valves as specified or as directed by the Engineer.
  13. Bearing:
    - a. The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe .
    - b. Excavate bell holes to permit proper joint installation.
    - c. The spigot end of the pipe shall abut the base of the socket of the adjacent pipe in such a manner that there will be no gaps along the perimeter of the mating halves.
  14. Do not lay pipe in wet or frozen trench.
  15. The Contractor shall take all necessary precautions to prevent flotation of the pipe from flooding of the trench.

16. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object.
17. Immediately before jointing the pipe, the mating ends shall be thoroughly cleaned of all dirt, debris, and foreign material.
18. Prevent mud, sand, or other foreign material from entering pipe during placement.
19. At all times when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.
20. Allow for expansion and contraction without stressing pipe or joints.
21. Close pipe openings with watertight plugs during Work stoppages.
22. Install access fittings to permit disinfection of water system performed under Section 33 01 10 - Disinfection of Water Utility Piping Systems.
23. Cover:
  - a. Establish elevations of buried piping with not less than four (4) feet of cover.
  - b. Measure depth of cover from final surface grade to top of pipe barrel.
24. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
25. Any defective pipe that may have been installed shall be removed and replaced with sound pipe at no additional cost to the Owner.

F. Pipe Joint Assembly:

1. Assemble all joints in accordance with recommendations of the manufacturer.
2. If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure.
3. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench.
4. If unusual jointing resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, re-clean the joint components, and repeat the assembly steps.
5. Note that fitting bells may permit less insertion depth than pipe bells.
6. When mechanical equipment is used to assemble joints, care should be taken to prevent over-insertion.

G. Valves

1. Valves shall be installed as indicated on Drawings and according to manufacturer instructions.
2. Valves shall be set vertically so that stems form a vertical line. Care shall be taken to keep out dirt and sand, and no valve shall be operated until it has been cleaned of sand, grit, or other foreign material.
3. No valve operating nut shall be deeper than five (5) feet without Owner approval.
4. Valve Boxes:
  - a. All valves shall be fitted with heavy duty traffic rated valve box and cover as specified herein.

- b. Valve boxes shall be long enough to reach from the valve to finished ground level and shall be installed as recommended by the manufacturer.
- c. Valve boxes shall have suitable barrel and shaft extension sections to cover and protect the valve bonnet section.
- d. Extension sections fabricated by one piece of ductile iron are allowed. No more than one (1) shaft extension shall be used in any one (1) valve installation.
- e. Valve box extensions shall be by same manufacturer as valve box or ductile iron pipe.
- f. Valve boxes shall be installed in vertical alignment and positioned to facilitate the operation of the valve with a standard valve wrench. The box shall be installed as shown on the drawings and shall be set on firmly packed soil or bricks to prevent settlement and to prevent bearing on the valve or the main at any point.
- g. Adjustment of valve boxes shall be subject to the approval of the Engineer. The Contractor shall maintain vertical alignment and position to permit operation of the valve with a standard valve wrench.
- h. All valve boxes located in heavy traffic pavement areas shall include non-pop covers as specified.
- i. Terminate locating wire for all sizes of PVC and HDPE water mains in the valve boxes in accordance with the Drawings.
- j. Valve Box Adjustment:
  - 1) All valve boxes within the area of finished construction shall be adjusted to finish grade as shown and specified.
  - 2) Valve boxes damaged during construction shall be replaced by the Contractor at no additional cost to the Owner. Removal and replacement of valve boxes during construction may be authorized, provided the Contractor insures that sufficient valve ties are available and on site in order to quickly locate the valve.
  - 3) Adjustment of valve boxes shall be subject to approval of the Engineer.

H. Hydrants:

- 1. As indicated on Drawings and according to manufacturer instructions.
- 2. The Contractor shall be responsible for hydrant adjustment to grade and all extensions, fittings, pipe, or appurtenances required to achieve the required adjustments.
- 3. Hydrants shall be set so that a minimum of seven (7) feet of clearance on each side and seven (7) feet of clearance on front and back is provided between the hydrant operating nut and any obstacles that may hinder opening and closing of the hydrant.
- 4. Fire hydrants shall be blocked by concrete or mega-lug restraints on the back side of the hydrant to prevent movement due to water pressure thrust.
- 5. Only one (1) extension shall be allowed to adjust the hydrant to final grade. Hydrant extension shall be by the same manufacturer as the hydrant. Maximum length of extension is two (2) feet.

6. Gravel shall be placed around the base of the hydrant to insure complete drainage of the hydrant when closed.
  7. The Contractor shall place a hydrant status sign on the steamer connection of each fire hydrant until hydrants have been accepted by the Engineer and are ready for use.
- I. Double continuous tracing wires shall be installed on all non-metallic pipes per Specification Section 33 05 97 – Identification and Signage for Utilities.
- J. Early warning tape, as specified in Section 33 05 97 – Identification and Signage for Utilities, shall be installed 12-inches to 18-inches above all sanitary sewer forcemains.
- K. Tapping Sleeves and Valves: As indicated on Drawings and according to manufacturer instructions.
- L. Water Service Connections:
1. Water services shall be installed at property corners and may be either single or double type services.
  2. Water meters shall be located at the right-of-way line.
  3. All water services shall be installed with a locating wire in accordance with Section 33 05 97 - Identification and Signage for Utilities and the Drawings.
    - a. Locating wires shall be installed to a three o'clock, nine o'clock position, or directly under the service pipe.
    - b. Locating wire shall not be installed directly over the main. Plastic tie straps shall be used to secure the wire.
  4. Water services under roads shall be installed in a casing.
    - a. For one (1) inch diameter service piping, install in two (2) inch diameter PVC, HDPE, or steel casing.
    - b. For two (2) inch diameter service piping, install in four (4) inch PVC, HDPE, or steel casing.
  5. Existing water services that are to be relocated to new water mains shall be relocated as indicated on the plans. The Contractor shall install all new service pipe and fittings, including the back side of the meter box.
  6. Where new water services are to replace existing water services, the entire existing water service shall be removed to the main except for the valve or corporation stop controlling the service. This shall include the pipe and gooseneck assembly.
- M. PE Encasement:
1. Encase ductile iron piping in PE to prevent contact with surrounding backfill material when pipe is installed in corrosive soils as shown on the Drawings.
  2. Comply with AWWA C105.
  3. Terminate encasement 3 to 6 inches above ground where pipe is exposed.

N. Bedding and Backfilling:

1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 – Fill.
3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
4. Maintain optimum moisture content of bedding material to attain required compaction density.
5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
  - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.
  - b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
  - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.

O. Cleaning and Flushing:

1. As the Work progresses, the interior of the water piping shall be cleaned of all dirt, jointing material, and superfluous materials of every description.
2. Prior to the pressure and leakage tests, all piping shall be thoroughly cleaned of all dirt, dust, oil, grease, and other foreign matter. This work shall be done with care to avoid damage to any inside coating.
3. All lines shall be thoroughly flushed with clean water to clear the lines of all foreign matter.

P. Disinfection of Potable Water Piping Systems: As specified in Section 33 01 10 - Disinfection of Water Utility Piping Systems.

3.4 PIPE SUPPORT AND THRUST RESTRAINT

- A. The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the Drawings or specified.
- B. Where buried piping contains fittings, which raise or lower the centerline of the pipe, suitable socket clamps, tie rods, or other approved restraining devices shall be used to prevent movement of the fittings. The restraining devices shall be coated thoroughly and heavily with an approved bituminous paint.

- C. All bends, tees, and other fittings in pipelines, and sleeve-coupled pipelines buried in the ground shall be backed with Class 1 concrete placed against undisturbed earth where firm support can be obtained or by the use of restrained joints. If the soil does not provide firm support, then suitable clamps, and accessories or restrained joints shall be provided to brace the fitting properly. Such items shall be coated thoroughly and heavily with an approved bituminous paint after assembly or, if necessary, before assembly.
- D. Thrust blocks and joint restraints shall be provided as shown.

### 3.5 MAINTENANCE OF SERVICE

- A. Maintenance of service is of the utmost importance and no service shall be discontinued without the consent of the Engineer for each interruption of said service.
- B. In no case will any service be discontinued without at least 48-hour notice given to the Engineer by the Contractor.
- C. Contractor shall be responsible for 48-hour notification (residential) and 2-week notification (commercial) to those affected by the shutdown, including door hanger/notice distribution.
- D. To achieve minimum inconvenience to the public and users of the water system, portions of the Work may have to be performed outside of normal working hours at no additional cost to the Owner.

### 3.6 CONNECTION TO EXISTING WATER LINES

- A. Connections to existing water lines shall be as shown on the Drawings or as directed by the Engineer. Connection shall not occur until approval has been obtained from the Florida Department of Environmental Protection.
- B. Connection of new to existing mains shall be performed in the normal accepted method for connecting mains and shall be done without unduly disrupting service. All connections are subject to the approval of the Engineer as to method, time, and location.
- C. Construct locate wire(s) point of connection on ferrous pipe at non-ferrous pipe joints.
- D. To ensure adequate backflow prevention and accountability of water use, the Contractor shall install a temporary jumper connection as shown on the Drawings.
- E. Where new lines are connected to existing lines, the Contractor shall take appropriate action to prevent existing lines from interfering with the disinfection or pressure testing portions of the Work. Failure to do so will not relieve the Contractor of the responsibility of properly disinfecting and pressure-testing the entire system installed. The Contractor shall bear full responsibility for his action or inaction in this matter and shall not claim damages, injuries or additional compensation for his action or inaction.

- F. At least 48 hours prior to beginning the actual connection operation, the Contractor shall excavate and expose the main to be tapped at the proposed location and shall so advise the Engineer to allow for inspection of the exposed facilities.
- G. Water from existing lines cut either by accident or during connection to proposed lines shall not be disposed of in a manner that would be injurious to residents, property, or structures.
- H. Existing water mains or services reduced to 20 psi, or lower, shall be bacteriologically tested by Contractor to ensure no contamination. Boil water notices or advisories shall be issued to affected customers whether by accident or planned.

### 3.7 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Install pipe to indicated elevation within tolerance of 5/8 inch.

### 3.8 PAVEMENT CROSSINGS

- A. Bases, Sidewalk, Curb, and Driveway Repairs – The Contractor shall replace any and all bases, sidewalks, curbs and gutter, and driveways with materials and workmanship sufficient to give an equal and similar surface to the disturbed areas as existed before construction.
- B. Pavement removal and replacement shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and as shown on the Drawings.

### 3.9 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Testing:
  - 1. All parts of the Work including, but not being limited to, pipe, fittings, joints, valves, hydrants, and any other appurtenances shall be subjected to testing as described herein. To achieve this, all methods of testing shall be approved by the Engineer and FDEP
  - 2. Except as otherwise directed, all pipelines shall be tested. Pipelines installed in excavation or bedded in concrete shall be tested prior to the backfilling of the excavation or placing of the concrete and exposed piping shall be tested prior to field painting.

3. All piping to operate under liquid pressure shall be tested in sections of approved length. The section of pipe being tested shall be limited to a maximum length of 2000 feet. For these tests the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment and all labor required, without additional compensation. The Contractor shall furnish suitable pressure gauges, pumps, and measuring tank.
4. The Contractor shall be responsible for the cost of all water used for testing and flushing. The Contractor shall make suitable arrangements with the Owner for the monitoring of water consumption and locations to which water may be made available. Water charges shall be in accordance with City of Ocala Ordinance Section 70- 413.
5. Pressure test piping system as specified in Section 33 05 05.31 – Hydrostatic Testing.
6. Disinfection and bacteriological testing shall be performed as specified in Section 33 01 10 – Disinfection of Water Utility Piping Systems.
7. Compaction Testing:
  - a. See Section 31 23 23.00 – Fill for requirements for compaction testing.
  - b. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

END OF SECTION



## SECTION 33 15 00

### PUBLIC RECLAIMED WATER DISTRIBUTION PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. General: This section includes the minimum requirements for installing reclaimed water systems, which includes the furnishing, installing, laying, jointing, and testing of all reclaimed water lines, hydrants, fittings, valves and appurtenances, including necessary service connections required for a complete system as shown on the Drawings and specified herein. The Work shall also include such connections, reconnections, relocations, temporary services, abandonments, and all other provisions in regard to existing reclaimed water service operations and modifications required to perform the new work. Improvements not in accordance with these requirements must be approved by the Engineer or a representative thereof before the Work is accepted.
- B. Section Includes:
  - 1. Pipe and fittings for reclaimed water lines.
  - 2. Tapping sleeves and valves.
  - 3. Positive-displacement meters.
  - 4. Pipe support systems.
  - 5. Bedding and cover materials.
- C. Related Requirements:
  - 1. Section 33 05 97 - Identification and Signage for Utilities.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Society of Mechanical Engineers:
  - 1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- C. ASTM International:
  - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A123.
  - 3. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

4. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>).
5. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>).
6. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
7. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
8. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
9. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
10. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
11. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
12. ASTM F 714-05 Standard Specification for Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter.

D. American Water Works Association:

1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
7. AWWA C153 - Ductile-Iron Compact Fittings.
8. AWWA C200 - Steel Water Pipe, 6 In. (150 mm) and Larger.
9. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe.
10. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. (100 mm) and Larger - Shop Applied.
11. AWWA C206 - Field Welding of Steel Water Pipe.
12. AWWA C207 - Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
13. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings.
14. AWWA C213 - Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
15. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
16. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
17. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
18. AWWA C606 - Grooved and Shouldered Joints.
19. AWWA C700 - Cold-Water Meters - Displacement Type, Metal Alloy Main Case.

20. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
21. AWWA C702 - Cold-Water Meters - Compound Type.
22. AWWA C707 - Encoder-Type Remote-Registration Systems for Cold-Water Meters.
23. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.
24. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
25. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.
26. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

E. National Fire Protection Association:

1. NFPA 24 - Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with termination of reclaimed water main connection at Site boundary, connection to existing reclaimed water system, and trenching.

### 1.4 PREINSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.
- B. Convene minimum one (1) week prior to commencing Work of this Section.

### 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information regarding pipe materials, pipe fittings, valves, hydrants, hangers, and supports as required for completion of the Work.
- C. The Contractor shall submit certificates of inspection in triplicate from the manufacturer that the pipe, valves, and fittings to be supplied have been inspected at the plant and meet the requirements of the Contract Documents. These certificates shall be submitted prior to beginning Work.
- D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

- E. Preconstruction Photographs: Submit digital files of color photographs of Work areas and material storage areas, as specified in Section 01 70 00 - Execution and Closeout Requirements.
- F. Qualifications Statements:
  - 1. Submit qualifications for manufacturer and installer.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. All installed infrastructure shall be referenced to state plane coordinates.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

#### 1.7 QUALITY ASSURANCE

- A. All pipe, valves, fire hydrants, and fittings shall be clearly marked with the name or trademark of the manufacturer, the batch number, the location of the plant, date of manufacture, strength designation and pressure rating.
- B. All materials shall be free from defects impairing strength and durability, and be of the best commercial quality for the purpose specified. Materials shall be new, less than one year old from manufacture date. It shall have structural properties sufficient to safely sustain or withstand strains and stress to which it is normally subjected and be true to detail.
- C. Manufacturer shall supply a certificate of application that PVC pressure pipe meets all requirements of AWWA C900/C905.
- D. Flow Meters:
  - 1. A copy of the affidavit of compliance from the manufacturer shall be submitted and shall certify that flow meters will be furnished in full compliance with the requirements of this specification and those of applicable AWWA standards.
  - 2. Contractor shall submit actual test results for each reclaimed water meter by serial number and certify the accuracy of the meter.

#### 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with a minimum five (5) years of documented experience.

- B. Installer: Company specializing in performing Work of this Section with a minimum five (5) years of documented experience in installation of liner materials.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
  - 1. Store materials according to manufacturer instructions.
  - 2. Block individual and stockpiled pipe lengths to prevent moving.
  - 3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
  - 4. Store PE and PVC materials out of sunlight.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

#### 1.10 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
  - 2. Indicate field measurements on Shop Drawings.

#### 1.11 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

### PART 2 - PRODUCTS

#### 2.1 RECLAIMED WATER PIPING

- A. Ductile Iron Pipe:
  - 1. Flanged ductile iron pipe shall comply with AWWA C115.
  - 2. Bell and spigot ductile iron pipe shall comply with ANSI/AWWA C150/A21.50 AND ANSI/AWWA C151/A21.51,
  - 3. Pipe shall be rated for a minimum working pressure of 200 psi working pressure or project requirements, whichever is greater plus a 100 psi minimum surge allowance and 2 to 1 factor of safety, using a Type II laying condition and a minimum depth of cover of four (4) feet.

4. The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe.
5. Manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe.
6. Each pipe section shall include purple co-axial stripes on the exterior at 90-degree intervals.
7. Ductile iron pipe shall be manufactured in the United States of America.
8. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.
9. Pipes with cracked or chipped linings or defective pipes will be rejected.
10. Bituminous Outside Coating:
  - a. Comply with AWWA C151
  - b. Apply by airless spray method
11. Pipe Cement Mortar Lining:
  - a. Comply with ANSI/AWWA C104/A21.4.
12. PE Encasement: Comply with AWWA C105.
13. Pipe Class:
  - a. Comply with AWWA C151.
  - b. Pipe Diameters 4-inch through 12-inch: Class 350 (minimum).
  - c. Pipe Diameters 14-inch through 20-inch: Class 250 (minimum).
  - d. Pipe Diameters 24-inch and larger: Class 200 (minimum).
14. Fittings:
  - a. Material: Ductile iron; comply with AWWA C110.
  - b. Compact Fittings: Comply with AWWA C153.
  - c. Coating and Lining:
    - 1) Bituminous Coating: Comply with AWWA C110.
    - 2) Cement-Mortar Lining: Comply with AWWA C104.
15. Joints:
  - a. Joints shall be in accordance with ANSI/AWWA C111/A21.11 and be furnished complete with all necessary accessories.
  - b. Flanged Joints: Comply with AWWA C115.
  - c. Push-On Restrained Joints: Shall be restrained using grip gaskets or lock-rings.
    - 1) Manufacturers:
      - a) American: Fast-Grip Gaskets,
      - b) McWane: Sure Stop Restrained Gaskets,
      - c) Griffin: Talon Restrained Gaskets,
      - d) U.S. Pipe: Field Lok Restrained Gaskets.
      - e) or approved equal.
  - d. Locking Ring Restrained Joints:
    - 1) Manufacturers:
      - a) American: Lok-Ring,
      - b) McWane: Super-Lock,
      - c) Griffin: Snap-Lok

- d) U.S. Pipe: TR Flex Gripper
    - e) EBAA Iron Works: Mega-Lug Restraint Harness – Series 1700,
    - f) Sigma: PVP-Lok Restraint
    - g) Tyler Union: Tuff Grip MJ Fitting Restraint
    - h) or approved equal.
  - e. Restrained Fitting, Mega-Lug, DIP:
    - 1) Restrained Fittings shall be ductile iron conforming to ANSI/AWWA C151/A21.51 specifications.
    - 2) All restrained mega-lugs shall be furnished with accessories and have a minimum pressure resistance of 200 psi.
    - 3) Manufacturers:
      - a) EBAA Iron Works, Series 1100,
      - b) Sigma, One Lok Series SLD,
      - c) Tyler Union Tuflock,
      - d) or approved equal.
  - f. Flanged Joints:
    - 1) Comply with AWWA/ANSI 115/A21.51.
    - 2) Pipe shall be furnished complete with all accessories.
    - 3) Gaskets: Unless otherwise shown or specified, gaskets shall be minimum 1/8-inch thick, full-face type. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.
- B. Polyethylene Pipe:
- 1. Pipe shall conform to AWWA C901 and ASTM D-2737, PE 3408, copper tube outside diameter.
  - 2. Pipe shall have a pressure rating of not less than 200 psi.
  - 3. Pipe Color: Purple.
  - 4. Pipe Diameters: 3/4" to 2".
- C. High Density Polyethylene Pipe (HDPE):
- 1. Comply with AWWA C901 and C906, PE 3408.
  - 2. HDPE pipe shall DR-9 or DR-11.
  - 3. HDPE pipe shall have a pressure rating of not less than 160 psi.
  - 4. Pipe Outside Diameter: Iron Pipe Sizes (IPS).
  - 5. Fittings:
    - a. Comply with AWWA C901 and C906.
    - b. Type: Molded or fabricated.
  - 6. Joints: Butt fusion.
  - 7. Pipe shall be color coded with purple striping.
- D. PVC Pipe (Push on Joint, 4" and Larger):
- 1. Comply with AWWA C900 and C905.

2. PVC pipe shall be DR-14 or DR-18 and have a pressure rating of no less than 200 psi.
  3. Color: Purple.
  4. Fittings: Mechanical joint ductile iron, complying with AWWA C111.
    - a. Restraint system shall be non-penetrating type specifically designed for PVC pipe.
  5. Push-On Joints:
    - a. Comply with ASTM D3139 and ASTM F477.
    - b. Seals: PVC flexible elastomeric.
    - c. Solvent-cement couplings are not permitted.
  6. Restrained Joints:
    - a. Where required, joints shall be restrained using restrained joint PVC piping system or bell restraint harnesses complying with all applicable AWWA specifications.
    - b. Manufacturers:
      - 1) Certain Teed: Certa-Lok C900/RJ Restrained Joint, Mechanical Gland Adapters for DR 14 and DR 18 pipe;
      - 2) EBAA Iron Works: Bell Restraint Harness for C900 PVC Pipe, Series 1600 for DR 14 and DR 18 pipe;
      - 3) Sigma: PVP-LOK Restraint;
      - 4) S&B Technical Products: Bull Dog Joint Restraints;
      - 5) Tyler Union: Tuff Grip MJ Fitting Restraint.
  7. Restrained Fitting, Mega-Lug, PVC:
    - a. Restraint Fittings shall be ductile iron conforming to ANSI/AWWA C111/A21.11 specifications.
    - b. All restrained mega-lugs shall be furnished with accessories and have a minimum pressure resistance of 200 psi.
    - c. Manufacturers:
      - 1) EBAA Iron Works, Series 2000,
      - 2) Tyler Union, Tuflock,
      - 3) Sigma One-Lok, Series SLG,
      - 4) or approved equal.
- E. PVC Pipe (Solvent Weld):
1. Solvent Weld PVC Pipe shall conform to ASTM D1785, Schedule 80.
  2. Pipe shall be labeled in accordance with FDEP requirements.
  3. Pipe shall have a pressure rating of no less than 200 psi.
  4. Solvent Weld PVC Fittings shall conform to ASTM D2467.
  5. Pipe Diameters: 3/4" to 2".
  6. Fittings:
    - a. Solvent Weld PVC Fittings shall conform to ASTM D2466, ASTM D2467, and applicable AWWA standards.
    - b. Fittings shall have a pressure rating of no less than 200 psi.



- F. PVC Pipe (Push on Joint, 2" Reclaimed Water Main):
1. Push on joint PVC pipe for 2" diameter reclaimed water mains shall conform to ASTM D2672, SDR 21 and applicable AWWA standards.
  2. Pipe shall have a pressure rating of no less than 200 psi.
  3. Pipe shall be purple in color.
  4. Joints: Gasketed Bell Joint.
  5. Fittings: Schedule 80 PVC conforming to ASTM D2467.
- G. PVC Pipe (Thermal Butt-Fusion Joint):
1. Thermal Butt-Fusion Joint PVC Pipe shall be utilized for horizontal directional drills 4" diameter or larger and shall conform to AWWA C900 and C905 standards.
  2. PVC pipe shall be DR-18 and have a pressure rating of no less than 200 psi.
  3. PVC pipe shall be purple in color.
- H. Brass Fittings:
1. Brass Bushing:
    - a. Brass bushings shall have hex head and shall be threaded.
    - b. Bushings shall conform to applicable AWWA standards.
    - c. Bushings shall be brass and shall have a minimum pressure rating of 200 psi.
  2. Coupling, Brass:
    - a. Brass couplings shall be a compression connection for copper tube size polyethylene tubing to male iron pipe threads.
    - b. Couplings shall conform to applicable AWWA standards.
    - c. Couplings shall be brass and shall have a minimum pressure rating of 200 psi.
    - d. Manufacturers:
      - 1) Mueller, H-15428,
      - 2) Ford, C84-33 (3/4"), C84-44 (1"), C84-77 (2"),
      - 3) A. Y. McDonald, 4578-22,
      - 4) or approved equal.
  3. Elbow, Regular 90-degree, Brass:
    - a. Brass elbow shall be NPT threaded.
    - b. Brass elbows shall conform to applicable AWWA standards.
    - c. Brass elbows to be brass and shall have a minimum pressure rating of 200 psi.
  4. Plug, Brass:
    - a. Brass plug shall be threaded.
    - b. Plugs shall conform to applicable AWWA standards.
    - c. Plugs shall be brass and shall have a minimum pressure rating of 200 psi.
  5. Nipple, Brass:
    - a. Brass nipple shall have threaded ends.
    - b. All brass nipples shall conform to applicable AWWA standards.
    - c. Nipples shall be brass and shall have a minimum pressure rating of 200 psi.

6. Tee, Brass Compression Packjoint:
  - a. Brass Compression Tee shall for connecting polyethylene pipes shall conform to AWWA C800 and ASTM B-62.
  - b. Packjoint nut shall have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
  - c. Tee shall be brass and shall have a minimum pressure rating of 200 psi.
  - d. Manufacturers:
    - 1) Ford, T444,
    - 2) Mueller, H15381,
    - 3) A.Y. McDonald, 4760-22,
    - 4) or approved equal.
7. Coupling, Pack Joint:
  - a. Pack Joint Couplings shall be for connection of copper tube size polyethylene tubing to male iron pipe threads.
  - b. Coupling shall conform to applicable AWWA standards.
  - c. Pack Joint Couplings shall have a minimum pressure rating of 200 psi.
  - d. Manufacturers:
    - 1) Mueller, H15428,
    - 2) Ford, C84,
    - 3) or approved equal.

## 2.2 ADAPTOR COUPLINGS

- A. Coupling, Brass Adaptor Elbow:
  1. Brass Adaptor Elbow Coupling for connecting polyethylene pipe shall conform to AWWA C800 and ASTM B-62.
  2. Pack joint nut shall have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
  3. All couplings shall be brass and shall have a minimum pressure rating of 200 psi.
  4. Manufacturers:
    - a. Ford, L44-33, L-44-44, L-44-77,
    - b. Mueller, H-15526N,
    - c. A. Y. McDonald, 4761-22,
    - d. or approved equal.
- B. Coupling, Brass Adaptor Reducing:
  1. Reducing Brass Coupling Adaptor shall be for connection of 1" polyethylene pipe to 3/4" polyethylene pipe and shall conform to AWWA C800 and ASTM B-62.
  2. All couplings shall be brass and shall have a minimum pressure rating of 200 psi.
  3. Manufacturers:
    - a. Ford, L-44-34,
    - b. A.Y. McDonald, 4761-22,
    - c. Mueller, H15526N,
    - d. or approved equal.

- C. Coupling, Ductile Iron Pipe:
  - 1. Ductile Iron Pipe Couplings shall conform to applicable AWWA standards.
  - 2. Ductile Iron Pipe Couplings shall be ductile iron and shall have a minimum pressure rating of 200 psi.
- D. Coupling, Ductile Iron Pipe, Restrained
  - 1. Restrained Ductile Iron Pipe Couplings shall conform to applicable AWWA standards.
  - 2. Restrained Ductile Iron Pipe Couplings shall be ductile iron and shall have a minimum pressure rating of 200 psi.
  - 3. Manufacturers:
    - a. EBAA Iron Works, Mega Coupling Series 3800 Restrained Coupling,
    - b. or approved equal.
- E. Coupling, Brass Adaptor Corporation Elbow:
  - 1. Brass Adaptor Corporation Elbows shall conform to AWWA C800 and ASTM B-62.
  - 2. Brass Adaptor Corporation Elbows shall be brass and shall have a minimum pressure rating of 200 psi.
  - 3. Inlet: Mueller thread (swivel nut).
  - 4. Outlet: CTS packjoint.
- F. Repair Coupling, Stainless Steel
  - 1. Stainless Steel Repair Couplings for pipe repair shall conform to applicable AWWA standards.
  - 2. Repair couplings shall be stainless steel and shall have a minimum pressure rating of 200 psi.

## 2.3 VALVES

- A. Resilient Seat Gate Valves:
  - 1. Resilient Seat Gate Valves shall conform to AWWA C509 or C515 and shall be provided for 2-inch diameter through 10-inch diameter reclaimed water mains.
  - 2. Valve shall be pressure rated for 175 psi.
  - 3. Valve Body: Cast Iron or Ductile Iron.
  - 4. Valve Wedge: Cast Iron or Ductile Iron and completely encapsulated in EPDM.
  - 5. Valve stems shall be O-ring sealed and non-rising stem design.
  - 6. Valve Stems shall be Type 304 or 431 stainless steel.
  - 7. Operating nut shall be 2" square and turn counter clockwise to open the valve.
  - 8. Joints:
    - a. Mechanical Joint end connections shall fully conform with ANSI/AWWA C111/A21.11 for 4" diameter and larger.
    - b. Flanged end connections shall fully conform with ANSI B16.1 for 4" diameter and larger.
    - c. Threaded Joint: 2" diameter only.

9. Manufacturers:
  - a. American Flow Control, Series 2500 (2" diameter and larger),
  - b. Mueller, A2360-20-F (4" diameter and larger), A2360-8-F (2" diameter),
  - c. Clow, F6100 (4" diameter and larger), F6103 (2" diameter),
  - d. or approved equal.
- B. Butterfly Valves:
  1. Butterfly Valves shall conform to AWWA C504 and shall be provided for reclaimed water mains 12-inch diameter and larger.
  2. Working Pressure: 175 psi.
  3. Valve Body: Cast Iron
  4. Valve Seat: Neoprene.
  5. Disc: Ductile Iron, ASTM A-536.
  6. Valve Stem: Type 304 or 431 Stainless Steel.
  7. Operating nut shall be 2" square and shall turn counter clockwise to open.
  8. Valve interior and exterior shall be epoxy coated in accordance with AWWA C550.
  9. Joints:
    - a. Flanged end connections shall fully conform with ANSI B16.1.
    - b. Mechanical Joint end connections shall fully conform with ANSI/AWWA C111/A21.11.
  10. Manufacturers:
    - a. Mueller, B3211-20,
    - b. DeZurik, Class 200 MJ,
    - c. Pratt, Ground Hog,
    - d. M&H / Clow, Style 4500,
    - e. GA Industries, Series 800,
    - f. Valmatic, BFV 150,
    - g. or approved equal.
- C. Insertion Valves:
  1. Insertion valves shall meet or exceed the testing requirements of AWWA C509 or C515.
  2. Valve body may be cast iron, ductile iron, or Type 304 stainless steel.
  3. Valve shall be pressure rated for 175 psi.
  4. Valve Stem: Type 304 or 431 Stainless Steel.
  5. Operating nut shall be 2" square and turn counter clockwise to open the valve with an operating rate of three (3) turns per inch of nominal pipe size.
  6. Interior Lining: Epoxy.
  7. Exterior Coating: Tar.
  8. Manufacturers:
    - a. Advanced Valve Technologies, EZ Valve,
    - b. Rangeline, Hydro Stop Valve,
    - c. Team Industrial Services, Insert Valve,
    - d. or approved equal.

- D. Check Valves (Threaded Swing-Flex Type):
1. Threaded swing-flex type check valves shall be used in conjunction with fire department connections and shall be suitable for vertical or horizontal installation.
  2. The valve shall be UL listed and certified by FM Approval in accordance with the NFPA.
  3. Valve shall be pressure rated for 175 psi and shall conform to all applicable AWWA standards.
  4. Materials:
    - a. Valve Body: Cast Brass.
    - b. Clapper: Bronze.
    - c. Seat Ring: Bronze.
    - d. Stainless steel spring and hinge pin.
  5. Joints: NPT inlet and outlet.
- E. Check Valves (Flanged Swing-Flex Type)
1. Flanged swing-flex type check valves shall conform to AWWA C508.
  2. Flanges shall conform to ANSI B16.1.
  3. Materials:
    - a. The flexible disc shall be one piece and precision molded with alloy steel and Nylon reinforcement and an integral O-ring style seat for drop tight seating at low pressure.
    - b. Valve Body: Ductile Iron.
  4. Valve shall be pressure rated for 175 psi.
  5. Manufacturers:
    - a. Val-Matic, 500A Swing-Flex,
    - b. Clow, Ken-Flex,
    - c. Pratt, Flex Check,
    - d. Mueller, Flex Check,
    - e. or approved equal.
- F. Air Release Valves (Stainless Steel):
1. Stainless Steel Body Air Release Valves shall be of the type designed for use in reclaimed water distribution systems to exhaust entrapped air from reclaimed water mains and shall conform to all applicable AWWA standards.
  2. Valve shall be simple lever type and be constructed and tested to 175 psi working pressure.
  3. Materials:
    - a. Body and Cover: Stainless Steel
    - b. Interior Working Parts: Stainless Steel
  4. Air release valve inlets and outlets shall be threaded to NPT standards.
  5. Manufacturers:
    - a. Empire, Figure 910,
    - b. Val-Matic, Model 15, 22, and 25,
    - c. or approved equal.

G. Air Release Valves (Plastic Body):

1. Plastic Body Air Release Valves shall be of the type designed for use in reclaimed water distribution systems to exhaust entrapped air from reclaimed water mains and shall conform to all applicable AWWA standards.
2. Valve shall be simple lever type and be constructed and tested to 175 psi working pressure.
3. Materials:
  - a. Body and Cover: PVC
  - b. Interior Working Parts: PVC
4. Air release valve inlets and outlets shall be threaded to NPT standards.
5. Manufacturers:
  - a. A.R.I. Flow Control Accessories, Ltd., S-021,
  - b. or approved equal.

H. Corporation Stops:

1. Corporation stop shall meet AWWA C800 and ASTM B62.
2. Inlet shall be threaded per AWWA IP standard with outlet copper tube size pack joint.
3. Pack joint nut to have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
4. Corporation stop shall have a pressure rating of 200 psi.
5. Manufacturers:
  - a. Ford, F-1100,
  - b. Hays, 5204CJ,
  - c. Mueller, H15028,
  - d. A. Y. McDonald, 4704-22,
  - e. or approved equal.

I. Corporation Stops (Polyethylene):

1. Corporation stop shall meet AWWA C800 and ASTM B62.
2. Inlet shall be threaded per AWWA IP standard with outlet copper tube size pack joint for polyethylene.
3. Pack joint nut to have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
4. Corporation stop for polyethylene pipe shall have a pressure rating of 200 psi.
5. Manufacturers:
  - a. Ford, F-1000,
  - b. Hays, 5200CJ,
  - c. Mueller, H15008,
  - d. A. Y. McDonald, 4701-22,
  - e. or approved equal.

J. Curb Ball Valves:

1. Curb Ball Valve shall conform to AWWA C800 and ASTM B62.

2. Inlet and outlet shall be female iron pipe thread with tee head lock wing.
3. Valve shall be pressure rated for 175 psi.
4. Manufacturers:
  - a. Ford, B 11,
  - b. A. Y. McDonald, 6101W,
  - c. Mueller, B20200,
  - d. or approved equal.

## 2.4 ELECTRIC ACTUATORS

- A. Provide automatic electric actuators to be controlled by PLC or SCADA.
- B. Each electric actuator shall be furnished complete with a motor, gearing, handwheel, limit and torque switches, lubricants, heating elements, wiring and terminals.
- C. Each actuator shall be constructed as a self-contained unit with a weatherproof housing and shall be integrally assembled on the applicable valve by the valvemanufacturer.
- D. Motors shall be totally enclosed, high torque design made expressly for valve actuator service, capable of operating the valve under full differential pressure for a complete open-close and reverse cycle of travel at least twice in immediate succession without overheating.
- E. Motors shall be designed in accordance with NEMA standards and shall operate successfully at any voltage within 10 percent above or below rated voltage. Motor bearing shall be permanently lubricated.
- F. Manufacturers:
  1. Auma,
  2. Pratt,
  3. or approved equal.

## 2.5 TAPPING SLEEVES AND VALVES

- A. Sleeve, Tapping, Steel:
  1. Body: Carbon Steel
  2. Flanges: AWWA C207 Class D, ANSI 150 lb. drilling.
  3. Steel Tapping Sleeve shall have test plug with ¾" NPT and recessed cavity for mating tapping valves
  4. Gasket: Grade 60 gasket compounded for use with reclaimed water, oil, salt solutions, mild acids, bases, and natural gas.
  5. Bolts, washers, and nuts: 18-8 stainless steel type 304.
  6. Finish: Fusion bonded epoxy coated to an average of 12 mil thickness inside and out, per AWWA C213.
  7. Sleeves shall have a minimum pressure rating of 200 psi.

8. Manufacturers:
  - a. Smith-Blair, 622,
  - b. Dresser, 610,
  - c. JCM, 412,
  - d. Romac, FTS420SSFE,
  - e. or approved equal.
- B. Sleeve, Tapping, Stainless Steel:
  1. Body: 18-8 stainless steel
  2. Lugs: 18-8 stainless steel
  3. Bolts, washers, and nuts: NC rolled thread, 18-8 stainless steel
  4. Gasket: Virgin SBR compounded for reclaimed water service, full wrap around design.
  5. Flange: 18-8 stainless steel with 3/4" NPT test plug.
  6. All sleeves shall conform to applicable AWWA standards.
  7. All sleeves shall have a minimum pressure rating of 200 psi.
  8. Manufacturers:
    - a. Romac, Style SST,
    - b. Ford, Fast,
    - c. JCM, 432,
    - d. Dresser, 630,
    - e. Mueller, H304SS,
    - f. or approved equal.
- C. Tapping Valves:
  1. Tapping Valves shall be resilient seat gate valves that conform to AWWA C509 or C515.
  2. Valve shall be pressure rated for 175 psi.
  3. Valve Body: Cast Iron or Ductile Iron.
  4. Valve Wedge: Cast Iron or Ductile Iron and completely encapsulated in EPDM.
  5. Valve stems shall be O-ring sealed and non-rising stem design.
  6. Valve Stems shall be Type 304 or 431 stainless steel.
  7. Operating nut shall be 2" square and turn counter clockwise to open the valve.
  8. Joints:
    - a. Tapping Valves shall be flanged joint by mechanical joint.
    - b. Mechanical Joint end connections shall fully conform with ANSI/AWWA C111/A21.11 for 4" diameter and larger.
    - c. Flanged end connections shall fully conform with ANSI B16.1 for 4" diameter and larger.
    - d. Threaded Joint: 2" diameter only.
  9. Manufacturers:
    - a. American Flow Control, Series 2500,
    - b. Mueller, T2360-16-F,
    - c. Clow, F6114,



- d. or approved equal.

## 2.6 FLOW METERS

### A. Electromagnetic Meters:

1. Electromagnetic Meters shall have a Stainless Steel or Brass body containing not less than 75% copper.
2. Positive Displacement Flow Meters shall be rated for 200 psi working pressure.
3. Size, model, and direction of flow shall be marked permanently on outer case of all meters. The name of the manufacturer shall be marked permanently on the lid of the register box. The serial number of the meter shall be imprinted on the lid and on meter main case.
4. Register:
  - a. The register shall be permanently hermetically sealed.
  - b. No fogging, large numerals, tempered glass or plastic lens.
  - c. Unit of Measure: Cubic foot.
  - d. Straight and AMI reading, and low flow indicator.
  - e. The register shall connect to a Cellular Endpoint. AMI transmitter via factory potted NICOR Connector as part of the register. The AMI transmitter shall be capable of communicating to Badger's Beacon AMA Cellular Metering System.
5. Connection: Flanged and/or screwed ends as designated
  - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
6. Manufacturers:
  - a. Badger,
  - b. or approved equal.

### B. Propeller Flow Meter:

1. Propeller Flow Meters shall meet or exceed requirements of AWWA C704 standards.
2. Materials:
  - a. Body: Stainless Steel.
3. Propeller Flow Meters shall be rated for 200 psi working pressure.
4. Connection: Flanged.
  - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
5. Register:
  - a. The register shall be permanently hermetically sealed.
  - b. No fogging, large numerals, tempered glass lens.
  - c. Unit of Measure: Cubic foot.
  - d. Magnetic drive, low torque registration.
  - e. Straight and AMI reading, and low flow indicator.

- f. The register shall connect to a Cellular Endpoint. AMI transmitter via factory potted NICOR Connector as part of the register. The AMI transmitter shall be capable of communicating to Badger's Beacon AMA Cellular Metering System.
- C. Electromagnetic Flow Meters:
  1. Electromagnetic Flow Meters shall meet or exceed requirements of AWWA C751 standards.
  2. Materials:
    - a. Body: Stainless Steel.
    - b. Liner: Fusion-bonded epoxy coated.
    - c. Electrodes: Type 316 Stainless Steel.
    - d. Display Housing: Aluminum Alloy with glass display window.
  3. Electromagnetic Flow Meters shall be rated for 200 psi working pressure.
  4. Provide inline strainer to remove large debris from the line that may result in downstream damage to the service. Strainer shall be supplied upon request from the Owner.
  5. Connection: Flanged.
    - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
  6. Register:
    - a. The register shall be permanently hermetically sealed.
    - b. No fogging, large numerals, tempered glass lens.
    - c. Unit of Measure: Cubic foot.
    - d. Magnetic drive, low torque registration.
    - e. Straight and AMI reading, and low flow indicator.
    - f. The register shall connect to a Cellular Endpoint. AMI transmitter via factory potted NICOR Connector as part of the register. The AMI transmitter shall be capable of communicating to Badger's Beacon AMA Cellular Metering System.
  7. Manufacturers:
    - a. ABB, Aquamaster,
    - b. AMCO, Q4000 Mag Meter,
    - c. McCrometer, Ultra Mag,
    - d. Badger,
    - e. or approved equal.

## 2.7 FIRE ASSEMBLIES

- A. Fire Hydrants:
  1. Fire hydrant assemblies shall conform to AWWA C-502.
  2. Fire hydrant shall contain two (2) 2 ½" hoses and one (1) 4 ½" steamer connection with National standard fire hose coupling screw threads, 5 ¼" valve opening, and 6" diameter mechanical joint inlet.

3. Operating nut shall be 1 ½" pentagon and open counter clockwise.
4. Stem shall be stainless steel.
5. Fire hydrants shall be factory painted purple (Epoxy Primer, Polyurethane Finish Coat, CC13, ANSI Z53.1-1971).
6. Inside of hydrant shoe shall be epoxy coated.
7. Bonnet shall be bolted to upper barrel with bonnet bolt and nut.
8. Hydrants shall have drain holes and be complete with all accessories.
9. Fire hydrant assemblies shall have a minimum pressure rating of 200 psi.
10. Manufacturers:
  - a. Mueller, Centurion 250,
  - b. American Flow Control, B-84-B
  - c. M & H, Style 129,
  - d. Clow, Medallion F2545,
  - e. or approved equal.

B. Detector Check Assemblies, Single:

1. Single Detector Check Assemblies shall conform to applicable AWWA standards and consist of one (1) internally spring loaded "Y" figure check valve with cast iron body, bronze replaceable seat ring with stainless steel stem and spring.
2. All internal cast iron parts shall be epoxy coated.
3. The bypass assembly shall consist of an internally spring-loaded double check valve in series with a reclaimed water meter which shall read in cubic feet and a shutoff gate valve.
4. Single detector check assemblies shall have a minimum pressure rating of 200 psi and meet USC approval.
5. Manufacturers:
  - a. Hersey, EDC II,
  - b. Ames, 1000 DCV,
  - c. or approved equal.

C. Detector Check Assemblies, Double:

1. Double Detector Check Assemblies shall conform to applicable AWWA standards and consist of two (2) internally spring loaded "Y" figure check valves having cast iron bodies, bronze replaceable seat rings and stainless steel stems and springs.
2. All internal cast iron parts shall be epoxy coated.
3. The bypass assembly shall consist of a bronze body internally spring-loaded double check valve in series with a bronze reclaimed water meter which shall read in cubic feet and two (2) gate valves.
4. Double detector check assemblies shall have a minimum pressure rating of 200 psi and meet USC approval.
5. Manufacturers:
  - a. Febco, 806YD,
  - b. Hersey, DDC II,
  - c. Ames, 3000-DCDA,

- d. Wilkins, 350-DA,
- e. or approved equal.

D. Check Assemblies, Double:

- 1. Double check valve assemblies shall conform to applicable AWWA standards and consist of two (2) internally spring loaded “Y” figure check valves having cast iron bodies, bronze replaceable seat rings and stainless steel stems and springs.
- 2. All internal cast iron parts shall be epoxy coated.
- 3. Double check valve assemblies shall have a minimum pressure rating of 200 psi and meet USC approval.
- 4. Manufacturers:
  - a. Febco, 805YD,
  - b. Hersey, No. 2,
  - c. Watts, 709RW,
  - d. Ames, 2000-SS,
  - e. or approved equal.

E. Hydrant Out of Service Markers:

- 1. Fire Hydrant Out of Service Markers shall be heavy duty plastic markers installed on the steamer nozzle and stenciled with “OUT OF SERVICE” on one side in bold black paint.
- 2. Markers shall fit 4” and 4 ½” steamer nozzle.
- 3. Color to be high visibility orange.
- 4. Out of Service Markers shall be installed on all new hydrants until flow tested and placed into service.

## 2.8 REPAIR SLEEVES

A. General: Couplings shall be furnished with the pipe stop removed. Couplings shall be provided with plain, Grade 27, rubber gaskets and with black, steel, track-head bolts with nuts.

B. Sleeve, Compression, Galvanized Steel:

- 1. Galvanized Steel Compression Sleeve shall be hot dip galvanized and shall have a protected gasket.
- 2. Sleeves shall conform to applicable AWWA standards.
- 3. Sleeves shall have a minimum pressure rating of 200 psi.
- 4. Manufacturers:
  - a. Smith-Blair, 522,
  - b. Telsco Industries, 700 Series,
  - c. or approved equal.

C. Sleeve, Compression, Brass:

- 1. Brass Compression Sleeves for joining 2” HDPE to 2” PVC Piping shall be brass and shall have a protected gasket.

2. Sleeves shall conform to applicable AWWA standards.
3. Sleeves shall have a minimum pressure rating of 200 psi.

D. Sleeve, Ductile Iron, Mechanical Joint:

1. Ductile Iron Mechanical Joint Sleeves shall conform to ANSI/AWWA C153 for compact fittings, three (3") inch through 36" diameter.
2. Sleeves shall be ductile iron long pattern with mechanical joint ends and shall be coal tar epoxy lined and bituminous sealed.
3. Sleeves shall be furnished with accessories.
4. Ductile Iron Mechanical Joint Sleeves shall have a minimum pressure rating of 200 psi.

## 2.9 SERVICE TAPPING SADDLES

A. Service Tapping Saddle for Cast Iron, Ductile Iron, and PVC Reclaimed Water Mains:

1. Tapping saddles for cast iron, ductile iron, and PVC reclaimed water mains shall conform to applicable AWWA standards.
2. Outlet shall be for connection to PVC or polyethylene pipe.
3. Tapping saddles shall be nylon coated or painted ductile iron with double stainless steel strap and neoprene gasket.
4. Tapping saddles shall have a pressure rating of 200 psi.
5. Manufacturers:
  - a. Ford, F202,
  - b. Baker, 181,
  - c. Mueller, DR-25 Series,
  - d. Romac Industries, 202-N or S Series,
  - e. Smith-Blair, 313 Series,
  - f. or approved equal.

B. Service Tapping Saddle for HDPE Reclaimed Water Mains:

1. Tapping saddles for HDPE reclaimed water mains shall conform to applicable AWWA standards.
2. Outlet shall be for connection to PVC or polyethylene pipe.
3. Tapping saddles shall be nylon coated or painted ductile iron with double stainless steel strap and neoprene gasket.
4. Tapping saddles shall have a pressure rating of 200 psi.
5. Manufacturers:
  - a. Mueller, DR-2S Series,
  - b. Romac Industries, 202-N or S Series,
  - c. Smith-Blair, 313 Series,
  - d. or approved equal.

## 2.10 VALVE BOXES AND LIDS

### A. Valve Box:

1. Valve boxes shall not be deeper than five (5) feet without Owner approval.
2. Bottom Section:
  - a. Cast iron, ASTM A48, heavy duty screw type.
  - b. Cast iron screw valve box will be only type allowed in asphalt pavement.
  - c. Cast iron screw or sliding type valve box may be used in right of way as specified per project.
3. Valve Box Extension:
  - a. Cast iron, ASTM A48, heavy duty screw type extension.
  - b. For deep valves use six (6) inch ductile or cast iron pipe cut to proper length so only one valve box extension is used.
4. Valve Box Tops shall be cast iron, screw type and conform to ASTM A48.
5. Valve Box Tops shall be rated for H-20 traffic in conformance with AASHTO M-306.
6. Manufacturers:
  - a. Tyler, #6850-5625-24B (Bottom), #6050-5625-585C (Extension), #6850-5625-16T (Top),
  - b. Opelika Foundry, #4908-5562-S-625 (Bottom), #4906X-64E (Extension), #4905-5562-S-55S (Top),
  - c. Sigma, VB 2622 (Bottom), VB302-18 (Extension), VB2621X (Top),
  - d. Star Pipe Products, VBB24SHD (Bottom), VBEX14S (Extension), VBT16SHD (Top),
  - e. or approved equal.

### B. Valve Box Lid:

1. Provide cast iron, ASTM A48, heavy duty, screw type, valve box, 5 1/4" shaft for non-pavement installations.
2. Valve Box Lids shall be rated for H-20 traffic in conformance with AASHTO M-306.
3. Cover shall be marked "RECLAIM".
4. Manufacturers:
  - a. Sigma, VB2600X,
  - b. Tyler, 5 1/4" Drop Lid,
  - c. Opelika Foundry, #4908-562 Lid,
  - d. Star Pipe Products, VBLIOHD,
  - e. or approved equal.

### C. Non-Pop Valve Box Lid:

1. Provide high tech molded polymer lid, ASTM A48, heavy duty, screw type, valve box, 5 1/4" shaft cast iron valve box top.
2. Non-Pop Valve Box Lids shall be installed in heavy traffic pavement areas.

3. Valve Box Lids shall be rated for H-20 traffic in conformance with AASHTO M-306.
4. All boxes shall conform to applicable AWWA standards.
5. Cover shall be marked "RECLAIM".
6. Manufacturers:
  - a. SW Services, 5 1/4" Non-Pop Lid,
  - b. or approved equal.

## 2.11 METER BOXES AND LIDS

- A. Lid, Gulf Meter Box:
  1. Gulf Meter Box Lids shall be locking type, cast iron, heavy duty, with legend "RECLAIMED WATER METER" on lid.
  2. Meter Box Lids shall conform to applicable AWWA standards.
- B. Box, Gulf Meter:
  1. Meter box shall be furnished with locking lid.
  2. Lid shall be cast iron, heavy duty cast with the legend "RECLAIMED WATER METER".
  3. Box shall conform to applicable AWWA standards.
  4. Manufacturer:
    - a. Ford, G148-233,
    - b. Mueller, H-1453-3
    - c. or approved equal.
- C. Box, Polymer Meter:
  1. Meter box shall be constructed of polymer concrete and reinforced by a heavy weave fiberglass type service box.
  2. Logo on cover shall read "RECLAIMED WATER METER".
  3. Covers shall be non- locking and have hinged reader lid.
  4. Box and cover shall have H-10 load rating unless specified otherwise
  5. Box shall include mouse holes on both ends and have stacking capability.
  6. Polymer Meter Boxes shall conform to applicable AWWA standards.
  7. Manufacturers:
    - a. Oldcastle Precast Enclosure Solutions, 1730 MSBCF (17"x30"),
    - b. or approved equal.
- D. Box, Utility, Precast Concrete Vault:
  1. Precast Concrete Utility Box shall meet the requirements of ASTM C478, with the exclusion of Section 10 (a), except as modified herein.
  2. Cement shall meet the requirements of ASTM C150, Specification for Portland Cement, Type I/II.
  3. Concrete for utility boxes shall be 4,000 PSI and meet the minimum requirements for Class III.
  4. Minimum wall thickness shall be six inches.

5. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with Section 345 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) except that the CONTRACTOR shall be responsible for all testing.
6. Reinforcing steel shall be #4 GR60 rebar 12" O.C. both ways.
7. Utility box shall be constructed with open bottom.
8. Where a top slab is required, it shall be six inches (6") thick, 4,000 PSI concrete with #4 GR60 rebar 12" O.C. both ways.
9. Where details call for aluminum hatch to be cast with the utility box, the hatch shall be as specified in Section 33 32 13 – Packaged Wastewater Pumping Stations.

## 2.12 PIPE SUPPORTS AND ANCHORING

- A. Metal for Pipe Support Brackets:
  1. Material: Structural steel.
  2. Finish: Galvanized.
  3. Coating: Bituminous paint.
- B. Metal Tie Rods and Clamps or Lugs:
  1. Material: Galvanized steel.
  2. Size: Comply with NFPA 24.
  3. Coating: Bituminous paint.

## 2.13 CONCRETE ENCASEMENT AND CRADLES

- A. Concrete:
  1. As specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  2. Type: Reinforced, air entrained.
  3. Compressive Strength: 4,000 psi at 28 days.
  4. Finish: Rough troweled.

## 2.14 MATERIALS

- A. Backfill:
  1. Bedding, cover, and soil backfill materials shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.15 FINISHES

- A. Steel: Hot-dip galvanized after fabrication, according to ASTM A123/A123M.
- B. Protective Coating: Coal-tar epoxy for below grade piping and epoxy paint color Pantona Purple 5-22C for exposed piping.



## 2.16 ACCESSORIES

- A. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
- B. Steel Rods, Bolt, Lugs, and Brackets:
  - 1. Comply with ASTM A36/A36M or A307, Grade A carbon steel unless otherwise shown or specified.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.
- C. The Contractor shall field verify vertical and horizontal locations of all underground facilities in advance of construction to verify that no conflicts exist with the proposed pipe alignment and depth.
  - 1. Should a conflict be discovered, the Contractor shall contact the Engineer immediately and provide all pertinent information for preparation of a remedial design.
- D. Verify that existing reclaimed water main size, location, and invert are as indicated on Drawings.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Preconstruction Site Photos:
  - 1. As specified in Section 01 70 00 - Execution and Closeout Requirements.
  - 2. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
  - 3. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
  - 4. Include Project description, date taken, and sequential number on back of each photograph.
- C. Pipe Cutting and Lining Repair:
  - 1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
3. Grind edges smooth with beveled end for push-on connections.
4. Remove all traces of oil, grease, asphalt, dust, dirt, etc.
5. Remove damaged lining and clean any exposed metal by sanding or scraping. Sandblasting and power tool cleaning is also acceptable.
  - a. Remove any loose lining by chiseling, cutting, or scraping to well adhered lined area before patching.
  - b. Lining patch shall overlap remaining lining at least one (1) inch.
6. With the area to be sealed or repaired absolutely cleaned and thoroughly roughened, apply a coat of repair compound specified in the applicator's "Certificate of Application" as furnished and approved with the pipe submittal. The Contractor shall apply the repair compound in strict accordance with the manufacturer's written instructions.
7. The Contractor shall repair damaged coating and lining immediately, using the repair compound recommended by the manufacturer.
8. The cost of repair to cut pipe ends or damaged linings shall be incidental to construction and the Contractor shall absorb the cost thereof in the unit price specified for related items.

D. Remove scale and dirt on inside and outside before assembly.

E. Prepare pipe connections to equipment with flanges or unions.

### 3.3 INSTALLATION

A. Bedding and installation shall be Class B as shown on the Drawings unless otherwise specified or directed by the Engineer.

B. Horizontal Directional Drill and Jack and Bore Installations shall be in accordance with Specification Section 33 05 07.00 – Boring and Jacking and Section 33 05 07.13 – Utility Directional Drilling.

C. Handling and Cutting Pipe:

1. The Contractor shall exercise extreme care in handling and laying pipe and fittings to avoid damaging, scratching or marring machined surfaces, and abrasion of the pipe or fitting coating.
2. Any fitting showing a crack and any fitting or pipe that has received a severe blow that may have resulted in an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and immediately removed from the Work.
3. Any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved by the Engineer, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in

the sound barrel at a point at least twelve (12) inches from the visible limits of the crack.

4. Except as otherwise approved, all cuttings shall be done with a machine having rolling wheel cutters, or pipe saw adapted for that purpose. All cut ends shall be examined for possible cracks caused by cutting.

D. Abandoning Reclaimed Water Mains:

1. Reclaimed Water Mains Abandoned in Place: The Contractor shall cut the reclaimed water main as required to make connections or install plugs. That portion of the pipe to be abandoned and left in place shall be plugged at locations where the pipe was cut or punctured. Plugging shall be accomplished by grouting the end or punctured area to the satisfaction of the Engineer.
2. Reclaimed Water Mains Abandoned in Place with Grout Fill: The Contractor shall cut the water main as required, install plugs, and fill the pipe with grout as shown on the Drawings.
3. Reclaimed water mains to be abandoned and removed shall be cut or disconnected as required.

E. Pipe Installation:

1. Comply with AWWA C600 and C605 as applicable.
2. Handle and assemble pipe according to pipe and gasket manufacturer instructions and as indicated on Drawings.
3. Steel Rods, Bolts, Lugs, and Brackets: Coat buried steel before backfilling.
4. Reclaimed Water Main Location:
  - a. Reclaimed water mains shall be constructed two (2) feet off the north or east right of way lines unless otherwise shown on the plans.
  - b. Reclaimed water lines to be constructed in easements shall be centered within the boundaries of the easement.
  - c. If trees or other structures should interfere with the alignment of the reclaimed water main, the reclaimed water main shall be adjusted towards the right of way line.
  - d. Minimum depths shall be 48" in all road rights of way and easements.
  - e. Minimum depths for reclaimed water mains shall be 36" in residential and conflict areas. The depth of cover shall be measured from the top of the reclaimed water main to the finished grade or centerline of roadway directly above the pipe.
  - f. Minimum horizontal clearance between parallel reclaimed water mains and potable water mains shall be three (3) feet.
  - g. Minimum horizontal clearance between parallel reclaimed water mains and sanitary sewer gravity mains shall be three (3) feet.
  - h. Minimum horizontal clearance between parallel reclaimed water mains and storm sewer mains shall be three (3) feet.
  - i. Minimum horizontal clearance between parallel reclaimed water mains and sanitary sewer force mains shall be three (3) feet.

- j. Minimum vertical clearance between reclaimed water mains and gravity sanitary sewer mains crossing each other shall be six (6) inches, twelve (12) feet preferred.
  - k. Minimum vertical clearance between reclaimed water mains and storm sewer mains crossing each other shall be six (6) inches, twelve (12) inches preferred.
  - l. Minimum vertical clearance between reclaimed water mains and sanitary sewer force mains crossing each other shall be six (6) inches, twelve (12) inches.
  - m. Minimum vertical clearance between reclaimed water mains and potable water mains crossing each other shall be twelve (12) inches.
5. Route pipe in straight line and re-lay pipe that is out of alignment or grade.
  6. Ductile-Iron Piping and Fittings: Comply with AWWA C600.
  7. PVC Pipe Piping and Fittings: Comply with AWWA C605.
  8. Field Welding Materials: Comply with AWWA C206.
  9. Flanged Joints: Do not use in underground installations except within structures.
  10. To ensure correct fitting of pipe and couplings, all sleeve-type couplings and accessories shall be furnished by the supplier of the pipe.
  11. High Points:
    - a. Install pipe with no high points other than shown on the Drawings.
    - b. If approved by the Engineer, minor changes in alignment may be permitted to avoid underground facilities.
    - c. If unforeseen field conditions arise that necessitate high points, install air-release valves as specified or as directed by the Engineer.
  12. Bearing:
    - a. The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe.
    - b. Excavate bell holes to permit proper joint installation.
    - c. The spigot end of the pipe shall abut the base of the socket of the adjacent pipe in such a manner that there will be no gaps along the perimeter of the mating halves.
  13. Do not lay pipe in wet or frozen trench.
  14. The Contractor shall take all necessary precautions to prevent flotation of the pipe from flooding of the trench.
  15. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object.
  16. Immediately before jointing the pipe, the mating ends shall be thoroughly cleaned of all dirt, debris, and foreign material.
  17. Prevent mud, sand, or other foreign material from entering pipe during placement.
  18. At all times when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.
  19. Allow for expansion and contraction without stressing pipe or joints.

20. Close pipe openings with watertight plugs during Work stoppages.
21. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
22. Any defective pipe that may have been installed shall be removed and replaced with sound pipe at no additional cost to the Owner.

F. Pipe Joint Assembly:

1. Assemble all joints in accordance with recommendations of the manufacturer.
2. If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure.
3. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench.
4. If unusual jointing resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, re-clean the joint components, and repeat the assembly steps.
5. Note that fitting bells may permit less insertion depth than pipe bells.
6. When mechanical equipment is used to assemble joints, care should be taken to prevent over-insertion.

G. Valves

1. Valves shall be installed as indicated on Drawings and according to manufacturer instructions.
2. Valves shall be set vertically so that stems form a vertical line. Care shall be taken to keep out dirt and sand, and no valve shall be operated until it has been cleaned of sand, grit, or other foreign material.
3. No valve operating nut shall be deeper than five (5) feet without Owner approval.
4. Valve Boxes:
  - a. All valves shall be fitted with heavy duty traffic rated valve box and cover.
  - b. Valve boxes shall be long enough to reach from the valve to finished ground level and shall be installed as recommended by the manufacturer.
  - c. Valve boxes shall have suitable barrel and shaft extension sections to cover and protect the valve bonnet section.
  - d. Extension sections fabricated by one piece of ductile iron are allowed. No more than one (1) shaft extension shall be used in any one (1) valve installation.
  - e. Valve box extensions shall be by same manufacturer as valve box or ductile iron pipe.
  - f. Valve boxes shall be installed in vertical alignment and positioned to facilitate the operation of the valve with a standard valve wrench. The box shall be installed as shown on the drawings and shall be set on firmly packed soil or bricks to prevent settlement and to prevent bearing on the valve or the main at any point.

- g. Adjustment of valve boxes shall be subject to the approval of the Engineer. The Contractor shall maintain vertical alignment and position to permit operation of the valve with a standard valve wrench.
- h. All valve boxes located in heavy traffic pavement areas shall include non-pop covers as specified.
- i. Terminate locating wire for all sizes of PVC and HDPE reclaimed water mains in the valve boxes in accordance with the Drawings.
- j. Valve Box Adjustment:
  - 1) All valve boxes within the area of finished construction shall be adjusted to finish grade as shown and specified.
  - 2) Valve boxes damaged during construction shall be replaced by the Contractor at no additional cost to the Owner. Removal and replacement of valve boxes during construction may be authorized, provided the Contractor insures that sufficient valve ties are available and on site in order to quickly locate the valve.
  - 3) Adjustment of valve boxes shall be subject to approval of the Engineer.

H. Hydrants:

- 1. As indicated on Drawings and according to manufacturer instructions.
- 2. The Contractor shall be responsible for hydrant adjustment to grade and all extensions, fittings, pipe, or appurtenances required to achieve the required adjustments.
- 3. Hydrants shall be set so that a minimum of seven (7) feet of clearance on each side and seven (7) feet of clearance on front and back is provided between the hydrant operating nut and any obstacles that may hinder opening and closing of the hydrant.
- 4. Fire hydrants shall be blocked by concrete or mega-lug restraints on the back side of the hydrant to prevent movement due to water pressure thrust.
- 5. Only one (1) extension shall be allowed to adjust the hydrant to final grade. Hydrant extension shall be by the same manufacturer as the hydrant. Maximum length of extension is two (2) feet.
- 6. Gravel shall be placed around the base of the hydrant to insure complete drainage of the hydrant when closed.
- 7. The Contractor shall place a hydrant status sign on the steamer connection of each fire hydrant until hydrants have been accepted by the Engineer and are ready for use.

I. Double continuous tracing wires shall be installed on all non-metallic pipes per Specification Section 33 05 97 – Identification and Signage for Utilities.

J. Early warning tape, as specified in Section 33 05 97 – Identification and Signage for Utilities, shall be installed 12-inches to 18-inches above all sanitary sewer forcemains.

K. Tapping Sleeves and Valves: As indicated on Drawings and according to manufacturer instructions.

- L. Reclaimed Water Service Connections:
1. Reclaimed water services shall be installed at property corners and may be either single or double type services.
  2. Reclaimed water meters shall be located at the right-of-way line and on the property owner's side of the right of way line.
  3. All reclaimed water services shall be installed with a locating wire in accordance with Section 33 05 97 - Identification and Signage for Utilities and the Drawings.
    - a. Locating wires shall be installed to a three o'clock, nine o'clock position, or directly under the service pipe.
    - b. Locating wire shall not be installed directly over the main. Plastic tie straps shall be used to secure the wire.
  4. Reclaim water services under roads shall be installed in a casing.
    - a. For one (1) inch diameter service piping, install in two (2) inch diameter PVC, HDPE, or steel casing.
    - b. For two (2) inch diameter service piping, install in four (4) inch PVC, HDPE, or steel casing.
  5. Existing reclaimed water services that are to be relocated to new mains shall be relocated as indicated on the plans. The Contractor shall install all new service pipe and fittings, including the back side of the meter box.
  6. Where new reclaimed water services are to replace existing services, the entire existing service shall be removed to the main except for the valve or corporation stop controlling the service. This shall include the pipe and gooseneck assembly.
- M. PE Encasement:
1. Encase ductile iron piping in PE to prevent contact with surrounding backfill material when pipe is installed in corrosive soils as shown on the Drawings.
  2. Comply with AWWA C105.
  3. Terminate encasement 3 to 6 inches above ground where pipe is exposed.
- N. Bedding and Backfilling:
1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 – Fill.
  3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
  4. Maintain optimum moisture content of bedding material to attain required compaction density.
  5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
    - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.

- b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
  - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.
- O. Cleaning and Flushing:
  - 1. As the Work progresses, the interior of the reclaimed water piping shall be cleaned of all dirt, jointing material, and superfluous materials of every description.
  - 2. Prior to the pressure and leakage tests, all piping shall be thoroughly cleaned of all dirt, dust, oil, grease, and other foreign matter. This work shall be done with care to avoid damage to any inside coating.
  - 3. All lines shall be thoroughly flushed with clean water to clear the lines of all foreign matter.

### 3.4 PIPE SUPPORT AND THRUST RESTRAINT

- A. The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the Drawings or specified.
- B. Where buried piping contains fittings, which raise or lower the centerline of the pipe, suitable socket clamps, tie rods, or other approved restraining devices shall be used to prevent movement of the fittings. The restraining devices shall be coated thoroughly and heavily with an approved bituminous paint.
- C. All bends, tees, and other fittings in pipelines, and sleeve-coupled pipelines buried in the ground shall be backed with Class 1 concrete placed against undisturbed earth where firm support can be obtained or by the use of restrained joints. If the soil does not provide firm support, then suitable clamps, and accessories or restrained joints shall be provided to brace the fitting properly. Such items shall be coated thoroughly and heavily with an approved bituminous paint after assembly or, if necessary, before assembly.
- D. Thrust blocks and joint restraints shall be provided as shown.

### 3.5 MAINTENANCE OF SERVICE

- A. Maintenance of service is of the utmost importance and no service shall be discontinued without the consent of the Engineer for each interruption of said service.
- B. In no case will any service be discontinued without at least 24-hour notice given to the Engineer by the Contractor.



- C. To achieve minimum inconvenience to the public and users of the reclaimed water system, portions of the Work may have to be performed outside of normal working hours at no additional cost to the Owner.

### 3.6 CONNECTION TO EXISTING RECLAIMED WATER LINES

- A. Connections to existing reclaimed water lines shall be as shown on the Drawings or as directed by the Engineer. Connection shall not occur until approval has been obtained from the Florida Department of Environmental Protection.
- B. Connection of new to existing mains shall be performed in the normal accepted method for connecting mains and shall be done without unduly disrupting service. All connections are subject to the approval of the Engineer as to method, time, and location.
- C. Construct locate wire(s) point of connection on ferrous pipe at non-ferrous pipe joints.
- D. Where new lines are connected to existing lines, the Contractor shall take appropriate action to prevent existing lines from interfering with pressure testing of the Work. Failure to do so will not relieve the Contractor of the responsibility to properly pressure test the entire system installed. The Contractor shall bear full responsibility for his action or inaction in this matter and shall not claim damages, injuries or additional compensation for his action or inaction.
- E. At least 48 hours prior to beginning the actual connection operation, the Contractor shall excavate and expose the main to be tapped at the proposed location and shall so advise the Engineer to allow for inspection of the exposed facilities.
- F. Reclaimed water from existing lines cut either by accident or during connection to proposed lines shall not be disposed of in a manner that would be injurious to residents, property, or structures.

### 3.7 PAVEMENT CROSSINGS

- A. Bases, Sidewalk, Curb, and Driveway Repairs – The Contractor shall replace any and all bases, sidewalks, curbs and gutter, and driveways with materials and workmanship sufficient to give an equal and similar surface to the disturbed areas as existed before construction.
- B. Pavement removal and replacement shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and as shown on the Drawings.

### 3.8 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Install pipe to indicated elevation within tolerance of 5/8 inch.

### 3.9 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Testing:
  - 1. All parts of the Work including, but not being limited to, pipe, fittings, joints, valves, hydrants, and any other appurtenances shall be subjected to testing as described herein. To achieve this, all methods of testing shall be approved by the Engineer and FDEP
  - 2. Except as otherwise directed, all pipelines shall be tested. Pipelines installed in excavation or bedded in concrete shall be tested prior to the backfilling of the excavation or placing of the concrete and exposed piping shall be tested prior to field painting.
  - 3. All piping to operate under liquid pressure shall be tested in sections of approved length. The section of pipe being tested shall be limited to a maximum length of 2000 feet. For these tests the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment and all labor required, without additional compensation. The Contractor shall furnish suitable pressure gauges, pumps, and measuring tank.
  - 4. The Contractor shall be responsible for the cost of all water used for testing and flushing. The Contractor shall make suitable arrangements with the Owner for the monitoring of water consumption and locations to which water may be made available. Water charges shall be in accordance with City of Ocala Ordinance Section 70- 413.
  - 5. Pressure test piping system as specified in Section 33 05 05.31 – Hydrostatic Testing.
  - 6. Compaction Testing:
    - a. See Section 31 23 23.00 – Fill for compaction testing requirements.

END OF SECTION

## SECTION 33 31 11

### PUBLIC SANITARY SEWERAGE GRAVITY PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. General: This section includes the minimum requirements for installing sanitary sewer gravity systems, which includes the furnishing, installing, laying, jointing, and testing of all sewer lines, manholes, fittings and appurtenances, including necessary service connections required for a complete system to connect to City sewer and as shown on the Drawings and specified herein. The Work shall also include such connections, reconnections, relocations, temporary services, abandonments, and all other provisions in regard to existing sewer operations and modifications as required.
- B. Section Includes:
  - 1. Sanitary sewerage piping.
  - 2. Connection to existing manholes.
  - 3. Wye branches and tees.
  - 4. Sanitary laterals.
  - 5. Bedding and cover materials.
- C. Related Requirements:
  - 1. Section 31 05 13 - Soils for Earthwork.
  - 2. Section 31 05 16 - Aggregates for Earthwork.
  - 3. Section 31 23 16 - Excavation.
  - 4. Section 31 23 23 - Fill.
  - 5. Section 33 05 05.33 - Infiltration and Exfiltration Testing.
  - 6. Section 33 05 05.43 - Mandrel Testing.
  - 7. Section 33 05 61 - Concrete Manholes.
  - 8. Section 33 05 97 - Identification and Signage for Utilities.

##### 1.2 DEFINITIONS

- A. ABS: Acrylonitrile butadiene styrene.
- B. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.
- C. EPDM: Ethylene-propylene-diene monomer.

### 1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Water Works Association:
  - 1. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
  - 2. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
  - 3. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - 4. AWWA C150 - Thickness Design of Ductile-Iron Pipe.
  - 5. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
  - 6. AWWA C153 - Ductile-Iron Compact Fittings.
- C. ASTM International:
  - 1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
  - 2. ASTM A123/.
  - 3. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
  - 4. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric).
  - 5. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
  - 6. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
  - 7. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
  - 8. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals (Metric).
  - 9. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 10. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 11. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  - 12. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  - 13. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  - 14. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
  - 15. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

16. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
17. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

#### 1.4 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with the Owner and all authorities having jurisdiction.
- C. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning work.

#### 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer catalog cuts and other information indicating proposed materials, accessories, details, and construction information.
- C. Permits: Submit three (3) copies of all permits required for completion of the Work shown and specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Test and Evaluation Reports: Submit reports indicating field tests made and results obtained.
- F. The pipe or fitting manufacturer shall supply a "Certificate of Application" that the lining applicator has met the specified requirements.
- G. Manufacturer Instructions:
  1. Indicate special procedures required to install specified products.
  2. Submit detailed description of procedures for connecting new sewer to existing sewer line and directional drilling installation.
- H. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- J. Qualifications Statement:
  1. Submit qualifications for manufacturer(s) and installer(s).

## 1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record invert elevations and actual locations of pipe runs, connections, manholes, cleanouts, existing utilities adjacent to new utilities, and all other pertinent features associated with the Work.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

## 1.7 QUALITY ASSURANCE

- A. Perform Work according to applicable Federal, State, and Local standards.

## 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
  - 1. Pipe with cracked or chipped linings or defects in the pipe will be rejected.
- C. Storage:
  - 1. Store materials according to manufacturer instructions.
  - 2. Store valves in shipping containers with labeling in place.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Block individual and stockpiled pipe lengths to prevent moving.
  - 3. Provide additional protection according to manufacturer instructions.

## 1.10 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.

2. Indicate field measurements on Shop Drawings.

## PART 2 - PRODUCTS

### 2.1 SANITARY SEWERAGE PIPING

#### A. Polyvinyl Chloride (PVC) Pipe:

1. Gravity sewer PVC pipe shall conform to ASTM 3034, SDR-26.
2. Color: Green.
3. Pipe manufacturer shall supply a Certificate of Application that the pipe has met requirements of ASTM 3034, SDR-26.
4. PVC fittings shall conform to ASTM 1336, SDR-26.
  - a. Fittings shall be gasketed bell joint type and green in color.

#### B. Ductile Iron Pipe:

1. Comply with AWWA C150 and AWWA C151.
2. Pipe shall be rated for a minimum working pressure of 200 psi plus a 100 psi minimum surge allowance, and a two to one (2:1) factor of safety, using a Type II laying condition and a depth of cover of 4 feet.
  - a. Pipe diameters 4-inch through 12-inch shall be Class 350, minimum.
  - b. Pipe diameters 14-inch through 20-inch shall be Class 250, minimum.
  - c. Pipe diameters 24-inches and larger shall be Class 200, minimum.
3. End Connections: Bell and spigot.
4. Ductile iron pipe shall be manufactured in the U.S.A. and each piece shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.
5. The class or nominal thickness, new weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe.
6. Pipe shall have an exterior bituminous coating applied by airless spray method.
7. Pipe shall have an interior Amine Cured Epoxy Lining.
8. PE Encasement: Comply with AWWA C105 for installation of PE Encasement when pipe is installed in corrosive soils.
9. Fittings:
  - a. Material: Ductile iron with a pressure rating that meets, but does not exceed the specified pressure rating of connected pipe.
  - b. Comply with AWWA C153 or AWWA C110.
  - c. Lining: Factory applied amine cured epoxy.
  - d. Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 90 00 - Painting and Coating.
10. Joints:
  - a. Push-On Joints:
    - 1) Comply with AWWA/ANSI C111/A21.11.

- 2) Furnish complete with all accessories required.
- b. Restrained Joint:
  - 1) Restrained joints shall be restrained using grip gaskets or locking rings.
  - 2) All restraints shall comply with applicable AWWA standards.
  - 3) Manufacturers:
    - a) American, Fast-Grip Restrained Gaskets, Lok-Ring Restrained Rings,
    - b) McWane, Sure Stop Restrained Gaskets, Super Lok Restrained Rings,
    - c) Griffin, Talon Restrained Gaskets, Snap-Lok Restrained Rings,
    - d) U.S. Pipe, Field-Lok Restrained Gaskets, TR Flex Gripper Restrained Rings,
    - e) EBAA Iron, Mega-Lug Restraint Harness, Series 1700,
    - f) Sigma, Bell Joint Restraint Series PVP (16-inch and smaller), Series SLDH (18-inch and larger),
    - g) Tyler Union, Tuff Grip MJ Fitting Restraints,
    - h) or approved equal.

C. Cleanouts:

1. Cleanout assembly shall include a PVC wye, PVC threaded/slip adaptor, threaded cleanout plug, and pipe required for connection from wye to plug,
2. All cleanout materials shall conform to ASTM F1336, SDR-26.

## 2.2 MANHOLES

- A. As specified in Section 33 05 61 - Concrete Manholes.

## 2.3 FLEXIBLE COUPLINGS

A. Flexible Couplings for connection of Clay Pipe to Ductile Iron Pipe:

1. Couplings shall be constructed of heavy duty rubber and conform to applicable AWWA standards.
2. Manufacturers:
  - a. Fernco, 1003,
  - b. Indiana Seal, 103,
  - c. Dallas Specialty, DS 03,
  - d. or approved equal.

B. Flexible Couplings for connection of Clay Pipe to PVC Pipe:

1. Couplings shall be constructed of heavy duty rubber and conform to applicable AWWA standards.
2. Manufacturers:
  - a. Fernco, 1002,
  - b. Indiana Seal, 102,
  - c. Dallas Specialty, DS 02,



- d. or approved equal.

## 2.4 FLEXIBLE PIPE BOOTS FOR MANHOLE PIPE ENTRANCES

### A. Description:

1. Material: Heavy duty rubber.
2. Comply with ASTM C923.
3. Attachment: Series-300 stainless-steel clamp and hardware.

## 2.5 MATERIALS

### A. Bedding and Cover:

1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
2. Backfill shall be compacted in accordance with Section 31 23 23.00 – Fill.
3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
4. Maintain optimum moisture content of bedding material to attain required compaction density.
5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
  - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.
  - b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
  - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material

## 2.6 MIXES

- A. Grout: Grout shall be Embeco 167 or approved equal.

- B. Mortar: Mortar shall be Embeco 381 or approved equal.

## 2.7 FINISHES

### A. Galvanizing:

1. Hot-dip galvanize after fabrication.
2. Comply with ASTM A123/A123M.

## 2.8 ACCESSORIES

- A. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.

## 2.9 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.
- B. Provide shop inspection and testing of pipe.
- C. Owner Inspection:
  - 1. Make completed pipe sections available for inspection at manufacturer's factory prior to packaging for shipment.
  - 2. Notify Owner at least seven days before inspection is allowed.
- D. Owner Witnessing:
  - 1. Allow witnessing of factory inspections and tests at manufacturer's test facility.
  - 2. Notify Owner at least seven days before inspections and tests are scheduled.
- E. Certificate of Compliance:
  - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
  - 2. Specified shop tests are not required for Work performed by approved manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that trench cut or excavation base is ready to receive Work of this Section.
- C. Verify that excavations, dimensions, and elevations are as indicated on Drawings or as directed by the Engineer.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Correct over-excavation with coarse aggregate.
- C. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.

- D. Protect and support existing sewer lines, utilities, and appurtenances.
- E. Utilities:
  - 1. Maintain profiles of utilities.
  - 2. Coordinate with existing utilities to eliminate interference.
  - 3. Notify Engineer if crossing conflicts occur.

### 3.3 INSTALLATION

- A. Bedding and Backfill:
  - 1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 – Fill.
  - 3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
  - 4. Maintain optimum moisture content of bedding material to attain required compaction density.
  - 5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
    - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.
    - b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
    - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.
- B. Piping:
  - 1. Install pipe, fittings, and accessories according to ASTM D2321, and seal joints watertight.
  - 2. Lay pipe to slope gradients as indicated on Drawings.
  - 3. Begin at downstream end of system and progress upstream.
  - 4. Bedding: As indicated on Drawings.
  - 5. Lay bell-and-spigot pipe with bells upstream.
  - 6. PE Pipe Encasement: Comply with AWWA C105, Method A.
  - 7. Backfill and compact as specified in Section 31 23 23.00 – Fill.
  - 8. Do not displace or damage pipe when compacting.
  - 9. Connect pipe to existing facilities as shown on the Drawings.
  - 10. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
- C. Manholes: As specified in Section 33 05 61 - Concrete Manholes.

D. Connections to Existing Manholes:

1. Drilling:
  - a. Core drill existing manhole to clean opening.
  - b. Use of pneumatic hammers, chipping guns, and sledge hammers are not permitted.
2. Install watertight neoprene gasket and seal with non-shrink concrete grout.
3. Encasement:
  - a. Concrete encase new sewer pipe as shown on the Drawings.
  - b. Use epoxy binder between new and existing concrete.
4. Prevent construction debris from entering existing sewer line when making connection.

E. Wye Branches and Tees:

1. Concurrent with pipe-laying operations, install wye branches and pipe tees at locations indicated on Drawings.
2. Use standard fittings of same material and joint type as sewer main.
3. Maintain minimum 5-foot separation distance between wye connection and manhole.
4. Use saddle wye or tee with stainless-steel clamps for taps into existing piping.
5. Mount saddles with solvent cement or gasket and secure with metal bands.
6. Lay out holes with template, and cut holes with mechanical cutter.

F. Bypassing Sewage:

1. The Contractor, when required, shall provide for the flow of sewage around a section or sections of pipe as required to complete the Work.
2. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow.
3. The Contractor shall submit a detailed bypass plan to the Engineer prior to performing any bypassing activities.

G. Sanitary Laterals:

1. Construct laterals from wye branch to terminal point at right-of-way.
2. Where depth of main pipeline warrants, construct riser-type laterals from wye branch.
3. Minimum Depth of Cover over Piping: 4 feet.
4. Minimum Separation Distance between Laterals: 5 feet.
5. Install watertight plug, braced to withstand pipeline test pressure thrust, at termination of lateral.
6. Install temporary marker stake as shown on the Drawings.

H. Backfilling:

1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 – Fill.
3. Place and compact material immediately adjacent to pipes to avoid damage to pipe and prevent pipe misalignment.
4. Maintain optimum moisture content of bedding material as required to attain specified compaction density.

### 3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Maximum Variation from Indicated Slope: 1/8 inch in 10 feet.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Request inspection by Engineer prior to and immediately after placing bedding.
- C. Testing:
  1. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.
  2. Pipe Testing:
    - a. Pressure Testing: As specified in Section 33 05 05.41 - Air Testing.
    - b. Infiltration and Exfiltration Testing: As specified in Section 33 05 05.33 - Infiltration and Exfiltration Testing.
    - c. Deflection Testing: As specified in Section 33 05 05.43 - Mandrel Testing.
  3. Compaction testing shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

### 3.6 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
- C. Cap open ends of piping during periods of Work stoppage.

END OF SECTION

## SECTION 33 31 23

### SANITARY SEWERAGE FORCE MAIN PIPING

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. General: This section includes the minimum requirements for installing sanitary sewer force mains, which includes the furnishing, installing, laying, jointing, and testing of all force mains, fittings, air release valves, plug valves, and appurtenances required for a complete system as shown on the Drawings and specified herein. The Work shall also include such connections, reconnections, relocations, temporary force mains, temporary pumping, abandonments, and all other provisions in regard to existing force main operations and modifications required to perform the Work.
- B. Section Includes:
  - 1. Force mains.
  - 2. Valves.
  - 3. Valve Boxes and Lids.
  - 4. Couplings and Adaptors.
  - 5. Tapping Saddles.
  - 6. Bedding and cover materials.
  - 7. Accessories.
- C. Related Requirements:
  - 1. Section 33 05 05.31 - Hydrostatic Testing.
  - 2. Section 33 05 61 - Concrete Manholes
  - 3. Section 33 05 97 - Identification and Signage for Utilities.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Water Works Association:
  - 1. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
  - 2. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - 3. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
  - 4. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In., for Water Transmission and Distribution.
  - 5. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In., for Water Transmission and Distribution.

- C. ASTM International:
1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>).
  2. ASTM F 714-05 Standard Specification for Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter.
  3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>).
  4. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  5. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
  6. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
  7. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
  8. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

### 1.3 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with connection to existing sanitary sewer system.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information indicating pipe material used, pipe accessories, valves, and restrained joint details and materials.
- C. Shop Drawings:
1. Indicate piping piece numbers and locations.
  2. Indicate restrained joint locations.
- D. The Contractor shall submit certificates of inspection in triplicate from the manufacturer that the pipe, valves, and fittings to be supplied have been inspected at the plant and meet the requirements of the Contract Documents. These certificates shall be submitted prior to beginning Work.
- E. Manufacturer Instructions: Submit special procedures required to install specified products.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

G. Qualifications Statement:

1. Submit qualifications for manufacturer, installer, and licensed professional.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record invert elevations and actual locations of pipe runs and connections.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

#### 1.6 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Environmental Protection and Florida Department of Transportation standards.

#### 1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.
- C. Licensed Professional: Professional engineer, if required, experienced in design of specified Work and licensed in State of Florida.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
  1. Store materials according to manufacturer instructions.
  2. Do not place materials on private property without written permission of property owner.
  3. Do not stack pipe higher than recommended by pipe manufacturer.



D. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Store gaskets for mechanical and push-on joints in cool and dry location, out of direct sunlight, and not in contact with petroleum products.
3. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

A. Field Measurements:

1. Verify field measurements prior to fabrication.
2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 FORCE MAIN

A. Ductile Iron Pipe:

1. Flanged ductile iron pipe shall comply with AWWA C115.
2. Bell and spigot ductile iron pipe shall comply with AWWA C150 and AWWA C151.
3. Pipe shall be rated for a minimum working pressure of 200 psi or specified project requirements, whichever is greater, plus a two to one (2:1) factor of safety, using a Type II laying condition and a depth of cover of 4 feet.
  - a. Pipe diameters 4-inch through 12-inch shall be Class 350, minimum.
  - b. Pipe diameters 14-inch through 20-inch shall be Class 250, minimum.
  - c. Pipe diameters 24-inches and larger shall be Class 200, minimum.
4. End Connections: Bell and spigot.
5. Ductile iron pipe shall be manufactured in the U.S.A. and each piece shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.
6. The class or nominal thickness, new weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe.
7. Pipe shall have an exterior bituminous coating applied by airless spray method.
8. Pipe shall have an interior Amine Cured Epoxy Lining.
9. PE Encasement: Comply with AWWA C105 for installation of PE Encasement when pipe is installed in corrosive soils.
10. Fittings:
  - a. Material: Ductile iron with a pressure rating that meets, but does not exceed the specified pressure rating of connected pipe.
  - b. Comply with AWWA C153 or AWWA C110.
  - c. Lining: Factory applied amine cured epoxy.

- d. Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 90 00 - Painting and Coating.
- 11. Joints:
  - a. Push-On Joints:
    - 1) Comply with AWWA/ANSIC111/A21.11.
    - 2) Furnish complete with all accessories required.
  - b. Restrained Joint:
    - 1) Restrained joints shall be restrained using grip gaskets or locking rings.
    - 2) All restraints shall comply with applicable AWWA standards.
    - 3) Manufacturers:
      - a) American, Fast-Grip Restrained Gaskets, Lok-Ring Restrained Rings,
      - b) McWane, Sure Stop Restrained Gaskets, Super Lok Restrained Rings,
      - c) Griffin, Talon Restrained Gaskets, Snap-Lok Restrained Rings,
      - d) U.S. Pipe, Field-Lok Restrained Gaskets, TR Flex Gripper Restrained Rings,
      - e) EBAA Iron, Mega-Lug Restraint Harness, Series 1700,
      - f) Sigma, Bell Joint Restraint Series PVP (16-inch and smaller), Series SLDH (18-inch and larger),
      - g) Tyler Union, Tuff Grip MJ Fitting Restraints,
      - h) or approved equal.
  - c. Restrained Mechanical Joints:
    - 1) Restraint shall be ductile iron conforming to ANSI/AWWA C151/A21.51.
    - 2) All restrained mechanical joints shall be furnished with accessories and have a minimum pressure resistance of 200 psi.
    - 3) Manufacturers:
      - a) EBAA Iron Works, Megalug,
      - b) Tyler Union, Tuflock,
      - c) Sigma, SLD Series,
      - d) or approved equal.
  - d. Flanged Joints:
    - 1) Comply with AWWA/ANSI 115/A21.51.
    - 2) Pipe shall be furnished complete with all accessories.
    - 3) Gaskets: Unless otherwise shown or specified, gaskets shall be minimum 1/8-inch thick, full-face type. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.
- B. PVC Pipe (Push on Joint, 4" and Larger):
  - 1. Comply with AWWA C900 and C905.
  - 2. PVC pipe shall be DR-18, minimum, and have a pressure rating of no less than 200 psi.

3. PVC pipe shall be green in color.
  4. Fittings: Mechanical joint ductile iron, complying with AWWA C111.
    - a. Restraint system shall be non-penetrating type specifically designed for PVC pipe.
  5. Push-On Joints:
    - a. Comply with ASTM D3139 and ASTM F477.
    - b. Seals: PVC flexible elastomeric.
    - c. Solvent-cement couplings are not permitted.
  6. Restrained Joints:
    - a. Where required, joints shall be restrained using restrained joint PVC piping system or bell restraint harnesses complying with all applicable AWWA specifications.
    - b. Manufacturers:
      - 1) Certain Teed: Certa-Lok C900/RJ Restrained Joint, Mechanical Gland Adapters for DR 14 and DR 18 pipe;
      - 2) EBAA Iron Works: Bell Restraint Harness for C900 PVC Pipe, Series 1600 for DR 14 and DR 18 pipe;
      - 3) Sigma: PVP-LOK Restraint;
      - 4) S&B Technical Products: Bull Dog Joint Restraints;
      - 5) Tyler Union: Tuff Grip MJ Fitting Restraint.
- C. PVC Pipe (Thermal Butt-Fusion Joint):
1. Thermal Butt-Fusion Joint PVC Pipe shall be utilized for horizontal directional drills 4" diameter and larger, and shall conform to AWWA C900 and C905 standards.
  2. PVC pipe shall be DR-18 and have a pressure rating of no less than 200 psi.
  3. PVC pipe shall be green in color.
- D. PVC Pipe (Solvent Weld):
1. Solvent Weld PVC Pipe shall conform to ASTM D1785, Schedule 80.
  2. Pipe shall be labeled in accordance with FDEP requirements.
  3. Pipe shall have a pressure rating of no less than 200 psi.
  4. Solvent Weld PVC Fittings shall conform to ASTM D2467.
  5. Fittings:
    - a. Solvent Weld PVC Fittings shall conform to ASTM D2466, ASTM D2467, and applicable AWWA standards.
    - b. Fittings shall have a pressure rating of no less than 200 psi.
- E. High Density Polyethylene Pipe (HDPE):
1. Comply with AWWA C906, PE 3408.
  2. HDPE pipe shall DR-9 or DR-11.
  3. HDPE pipe shall have a pressure rating of not less than 160 psi.
  4. Pipe Outside Diameter: Iron Pipe Sizes (IPS).
  5. HDPE pipe shall include green striping.

6. Fittings:
  - a. Comply with AWWA C901 and C906.
  - b. Type: Molded or fabricated.
7. Joints: Butt fusion.

F. Mechanical Joint Restraints:

1. Mechanical joint restraints shall include a restraining mechanism, which when activated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases.
2. Flexibility of the joint shall be maintained after burial.
3. Glands shall be manufactured of ductile iron conforming to ASTM A 536-80.
4. Restraining devices shall be of ductile iron, heat treated to a minimum hardness of 370 BHN.
5. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-headed bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53.
6. Twist off nuts shall be used to insure proper actuating of the restraining devices.
7. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1.
8. Manufacturers:
  - a. EBAA Iron Works, Megalug,
  - b. Sigma, SLD Series,
  - c. Tyler Union, Tuflock
  - d. or approved equal.

## 2.2 VALVES

A. Eccentric Plug Valves:

1. Resilient plug valve shall be permanently lubricated eccentric type with resilient faced plugs.
2. The resilient plug shall be Buna- N or neoprene coated.
3. Plug valves up to 12-inch diameter shall have a minimum pressure rating of 175 psi and plug valves 14-inch and larger shall have a minimum pressure rating of 150 psi.
4. Plug valves shall conform to ANSI/AWWA C517 and be able to shut off flow from both directions.
5. Plug valves shall have a port opening not be less than 81% on valves up to 24-inch diameter.
6. Valve bodies shall be constructed of ASTM A-126 Class B semi-steel.
7. Valve Stem: Type 304 or 431 Stainless Steel.
8. All valves shall be equipped with two (2) inch square operating nut on all sizes through 24-inch diameter and shall be equipped with gear actuators.
9. Eccentric plug valves shall be mechanical joint or flanged joint as shown on the Drawings.

10. All bolts and nuts shall be stainless steel for non-buried service valves.
11. Shall be epoxy coated inside and out.
12. Manufacturers:
  - a. Clow, F-5413,
  - b. Val-Matic, Series 5000,
  - c. DeZurik, Series 100,
  - d. Pratt, Ballcentric,
  - e. Milliken Camcentric,
  - f. VSI Waterworks, Series PVII,
  - g. or approved equal.

B. Insertion Valves:

1. Insertion valves shall meet or exceed the testing requirements of AWWA C509 or C515.
2. Valve body may be cast iron, ductile iron, or Type 304 stainless steel.
3. Valve shall be pressure rated for 175 psi.
4. Valve Stem: Type 304 or 431 Stainless Steel.
5. Operating nut shall be 2" square and turn counter clockwise to open the valve with an operating rate of three (3) turns per inch of nominal pipe size.
6. Interior Lining: Epoxy.
7. Exterior Coating: Tar.
8. Manufacturers:
  - a. Advanced Valve Technologies, EZ Valve,
  - b. Rangeline, Hydro Stop Valve,
  - c. Team Industrial Services, Insert Valve,
  - d. or approved equal.

C. Air Release Valves (Stainless Steel Body):

1. Stainless Steel Body Air Release Valves shall be of the type designed for use in sanitary sewage force mains to exhaust entrapped air and shall conform to all applicable AWWA standards.
2. Valve shall be simple lever type and be constructed and tested to 175 psi working pressure.
3. Air release valves shall be furnished with backwash accessories.
4. Materials:
  - a. Body and Cover: Stainless Steel
  - b. Interior Working Parts: Stainless Steel
5. Air release valve inlets and outlets shall be threaded to NPT standards.
6. Manufacturers:
  - a. Val-Matic, Model 48ASV,
  - b. H-TEC, Model 986,
  - c. or approved equal.

- D. Air/Vacuum Valves (Stainless Steel Body):
1. Stainless Steel Body Air/Vacuum Valves shall be of the type designed for use in sanitary sewage force mains to exhaust entrapped air while the pipe is being filled and allow air to reenter during draining to prevent vacuum conditions within the pipe.
  2. Valve shall be spherical float operated and shall close drop tight against replaceable rubber seat.
  3. Minimum working pressure: 175 psi.
  4. Air/vacuum valves shall be furnished with backwash accessories.
  5. Materials:
    - a. Body and Cover: Stainless Steel
    - b. Interior Working Parts: Stainless Steel
  6. Air/vacuum valve inlets and outlets shall be threaded to NPT standards.
  7. Manufacturers:
    - a. Empire / GA Industries, Figure 935-F (1-inch), Figure 935-A (2-inch),
    - b. H-TEC, Model 986,
    - c. or approved equal.
- E. Combination Air Valves (Plastic Body):
1. Plastic Body Combination Air Valves shall be of the type designed for use in sanitary sewage force mains to exhaust entrapped air while the pipe is being filled, allow air to reenter during draining to prevent vacuum conditions within the pipe, and release air from the system while operating under pressure.
  2. Valve shall be tested to 175 psi working pressure.
  3. Air release valves shall be furnished with required backwash accessories.
  4. Materials:
    - a. Body and Cover: PVC
    - b. Interior Working Parts: PVC and stainless steel.
  5. Air release valve inlets and outlets shall be threaded to NPT standards.
  6. Manufacturers:
    - a. A.R.I. Flow Control Accessories, Ltd., D-025-PN10,
    - b. or approved equal.
- F. Check Valves (Lever and Spring Type)
1. Lever and spring type check valves shall conform to AWWA C508.
  2. Flanges shall conform to ANSI B16.1, Class 125.
  3. Materials:
    - a. Disc: Bronze.
    - b. Valve Body: Ductile iron, bronze mounted.
  4. Valve shall be pressure rated for 175 psi.
  5. Stuffing box shall be O-ring sealed.
  6. Lever and spring with adjustable tension shall be included to control opening and closing of the clapper.
    - a. Lever and spring shall be capable of being installed on either side of valve.

7. Interior Lining: Factory applied amine cured epoxy.
8. Exterior Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 90 00 - Painting and Coating.
9. Manufacturers:
  - a. Clow, F-5382,
  - b. Mueller, A-2600-6-02,
  - c. M & H, Style 259-02,
  - d. AMI, Series 504,
  - e. or approved equal.

G. Check Valves (Flanged Swing-Flex Type)

1. Flanged swing-flex type check valves shall conform to AWWA C508.
2. Flanges shall conform to ANSI B16.1, Class 125.
3. Materials:
  - a. The flexible disc shall be one piece and precision molded with alloy steel and Nylon reinforcement and an integral O-ring style seat for drop tight seating at low pressure.
  - b. Valve Body: Ductile iron, bronze mounted.
4. Valve shall be pressure rated for 175 psi and include a mechanical position indicator.
5. Interior Lining: Factory applied amine cured epoxy.
6. Exterior Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 90 00 - Painting and Coating.
7. Manufacturers:
  - a. Val-Matic, 500A Swing-Flex,
  - b. Clow, Ken-Flex,
  - c. Pratt, Flex Check,
  - d. Mueller, Flex Check,
  - e. VSI Waterworks, Series CVII,
  - f. or approved equal.

## 2.3 VALVE BOXES AND LIDS

A. Valve Box:

1. Valve boxes shall not deeper than five (5) feet without Owner approval.
2. Bottom Section:
  - a. Cast iron, ASTM A48, heavy duty screw type.
  - b. Cast iron screw valve box will be only type allowed in asphalt pavement.
  - c. Cast iron screw or sliding type valve box may be used in right of way as specified per project.
3. Valve Box Extension:
  - a. Cast iron, ASTM A48, heavy duty screw type extension.
  - b. For deep valves use six (6) inch ductile or cast iron pipe cut to proper length so only one valve box extension is used.

4. Valve Box Tops shall be cast iron, screw type and conform to ASTM A48.
5. Valve Box Tops shall be rated for H-20 traffic in conformance with AASHTO M-306.
6. Manufacturers:
  - a. Tyler, #6850-5625-24B (Bottom), #6050-5625-585C (Extension), #6850-5625-16T (Top),
  - b. Opelika Foundry, #4908-5562-S-625 (Bottom), #4906X-64E (Extension), #4905-5562-S-55S (Top),
  - c. Sigma, VB 2622 (Bottom), VB302-18 (Extension), VB2621X (Top),
  - d. Star Pipe Products, VBB24SHD (Bottom), VBEX14S (Extension), VBT16SHD (Top),
  - e. or approved equal.

B. Valve Box Lid:

1. Provide cast iron, ASTM A48, heavy duty, screw type, valve box, 5 1/4" shaft for non-pavement installations.
2. Valve Box Lids shall be rated for H-20 traffic in conformance with AASHTO M-306.
3. Cover shall be marked "SEWER".
4. Manufacturers:
  - a. Sigma, VB2600X,
  - b. Tyler, 5 1/4" Drop Lid,
  - c. Opelika Foundry, #4908-562 Lid,
  - d. Star Pipe Products, VBLIOHD,
  - e. or approved equal.

C. Non-Pop Valve Box Lid:

1. Provide high tech molded polymer lid, ASTM A48, heavy duty, screw type, valve box, 5 1/4" shaft cast iron valve box top.
2. Non-Pop Valve Box Lids shall be installed in heavy traffic pavement areas.
3. Valve Box Lids shall be rated for H-20 traffic in conformance with AASHTO M-306.
4. All boxes shall conform to applicable AWWA standards.
5. Cover shall be marked "SEWER".
6. Manufacturers:
  - a. SW Services, 5 1/4" Non-Pop Lid,
  - b. or approved equal.

## 2.4 COUPLINGS AND ADAPTORS

A. Flange Adaptors:

1. Flange adaptors shall be cast iron with iron pipe threads.
2. Flange adaptors shall conform to applicable AWWA standards and shall receive the same interior and exterior coating as the pipe receiving the flange.
3. Lining: Factory applied amine cured epoxy.



4. Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 9000 - Painting and Coating.

B. Sleeve-Type Couplings:

1. Sleeve-type couplings shall be stainless steel couplings for plain-end cast iron and ductile iron pipe.
2. The couplings shall be furnished with the pipe stop removed.
3. Couplings shall be provided with plain, Grade 27, rubber gaskets and with stainless steel, track-head bolts with nuts.
4. To ensure correct fitting of pipe and couplings, all sleeve-type couplings, and accessories shall be furnished by the supplier of the pipe.

## 2.5 TAPPING SADDLES

A. Stainless Steel Tapping Saddles:

1. Tapping saddle shall be all Type 304 stainless steel, per ASTM A-240.
2. All welds and metal surfaces shall be chemically passivated to meet ASTM A-380.
3. Saddles to be two-piece construction with two (2) inch outlet with IPS thread.
4. Saddles to have double bolt and received bars. Bolts and nuts shall be 18-8 stainless steel.
5. Saddle shall be rated for 150 psi.
6. Manufacturers:
  - a. Ford, FRS202,
  - b. Cascade, CS22,
  - c. or approved equal.

## 2.6 MATERIALS

A. Bedding and Cover:

1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 – Fill.
3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
4. Maintain optimum moisture content of bedding material to attain required compaction density.
5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
  - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.

- b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
- c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.

## 2.7 MIXES

- A. Concrete: As specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.8 ACCESSORIES

- A. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.
- C. The Contractor shall field verify vertical and horizontal locations of all underground facilities in advance of construction to verify that no conflicts exist with the proposed pipe alignment and depth.
  - 1. Should a conflict be discovered, the Contractor shall contact the Engineer immediately and provide all pertinent information for preparation of a remedial design.
- D. Verify that excavation base is ready to receive Work.
- E. Verify that excavations, dimensions, and elevations are as indicated on the Drawings.

## 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Preconstruction Site Photos:
  - 1. As specified in Section 01 70 00 - Execution and Closeout Requirements.
  - 2. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.

3. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
4. Include Project description, date taken, and sequential number on back of each photograph.

C. Pipe Cutting and Lining Repair:

1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
3. Grind edges smooth with beveled end for push-on connections.
4. Remove all traces of oil, grease, asphalt, dust, dirt, etc.
5. Remove damaged lining and clean any exposed metal by sanding or scraping. Sandblasting and power tool cleaning is also acceptable.
  - a. Remove any loose lining by chiseling, cutting, or scraping to well adhered lined area before patching.
  - b. Lining patch shall overlap remaining lining at least one (1) inch.
6. With the area to be sealed or repaired absolutely cleaned and thoroughly roughened, apply a coat of repair compound specified in the applicator's "Certificate of Application" as furnished and approved with the pipe submittal. The Contractor shall apply the repair compound in strict accordance with the manufacturer's written instructions.
7. The Contractor shall repair damaged coating and lining immediately, using the repair compound recommended by the manufacturer.
8. The cost of repair to cut pipe ends or damaged linings shall be incidental to construction and the Contractor shall absorb the cost thereof in the unit price specified for related items.

D. Remove scale and dirt on inside and outside before assembly.

E. Prepare pipe connections to equipment with flanges or unions.

### 3.3 INSTALLATION

A. Bedding and installation shall be Class B as shown on the Drawings unless otherwise specified or directed by the Engineer.

B. Horizontal Directional Drill and Jack and Bore Installations shall be in accordance with Specification Section 33 05 07.00 – Boring and Jacking and Section 33 05 07.13 – Utility Directional Drilling.

C. Handling and Cutting Pipe:

1. The Contractor shall exercise extreme care in handling and laying pipe and fittings to avoid damaging, scratching or marring machined surfaces, and abrasion of the pipe or fitting coating.

2. Any fitting showing a crack and any fitting or pipe that has received a severe blow that may have resulted in an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and immediately removed from the Work.
3. Any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved by the Engineer, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least twelve (12) inches from the visible limits of the crack.
4. Except as otherwise approved, all cuttings shall be done with a machine having rolling wheel cutters, or pipe saw adapted for that purpose. All cut ends shall be examined for possible cracks caused by cutting.

D. Abandoning Sewer Force Mains:

1. Sewer Force Mains Abandoned in Place: The Contractor shall cut the sewer force main as required to make connections or install plugs. That portion of the pipe to be abandoned and left in place shall be plugged at locations where the pipe was cut or punctured. Plugging shall be accomplished by grouting the end or punctured area to the satisfaction of the Engineer.
2. Sewer Force Mains Abandoned in Place with Grout Fill: The Contractor shall cut the sewer force main as required, install plugs, and fill the pipe with grout as shown on the Drawings.
3. Sewer force mains to be abandoned and removed shall be cut or disconnected as required.

E. Pipe Installation:

1. Comply with AWWA C600 and C605 as applicable.
2. Handle and assemble pipe according to pipe and gasket manufacturer instructions and as indicated on Drawings.
3. Steel Rods, Bolts, Lugs, and Brackets: Coat buried steel before backfilling.
4. No sanitary sewer force main shall be installed within six (6) feet of a potable water line, unless the crown of the sewer main is at least six (6) inches lower than the bottom of the water line, or unless special permission is obtained from the Engineer and FDEP. In no case shall a sanitary sewer main be placed in the same trench with a water main.
5. Sanitary Sewer Force Main Location:
  - a. Sanitary sewer force mains shall be installed as shown on the Drawings.
  - b. Every effort shall be made to avoid creation of low or high points in the force main other than those shown on the Drawings.
  - c. Minimum depth of installation shall be three (3) feet, measured from the top of the pipe to the finished grade or centerline of roadway directly above the pipe.
  - d. Minimum depth of installation at air release valve locations shall be four (4) feet.

6. Route pipe in straight line, and re-lay pipe that is out of alignment or grade.
7. Ductile-Iron Piping and Fittings: Comply with AWWA C600.
8. PVC Pipe Piping and Fittings: Comply with AWWA C605.
9. Field Welding Materials: Comply with AWWA C206.
10. Flanged Joints: Do not use in underground installations except within structures.
11. To ensure correct fitting of pipe and couplings, all sleeve-type couplings and accessories shall be furnished by the supplier of the pipe.
12. High Points:
  - a. Install pipe with no high points other than shown on the Drawings.
  - b. If approved by the Engineer, minor changes in alignment may be permitted to avoid underground facilities.
  - c. If unforeseen field conditions arise that necessitate high points, install air-release valves as specified or as directed by the Engineer.
13. Bearing:
  - a. The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe.
  - b. Excavate bell holes to permit proper joint installation.
  - c. The spigot end of the pipe shall abut the base of the socket of the adjacent pipe in such a manner that there will be no gaps along the perimeter of the mating halves.
14. Do not lay pipe in wet or frozen trench.
15. The Contractor shall take all necessary precautions to prevent flotation of the pipe from flooding of the trench.
16. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object.
17. Immediately before jointing the pipe, the mating ends shall be thoroughly cleaned of all dirt, debris, and foreign material.
18. Prevent mud, sand, or other foreign material from entering pipe during placement.
19. At all times when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.
20. Allow for expansion and contraction without stressing pipe or joints.
21. Close pipe openings with watertight plugs during Work stoppages.
22. Cover:
  - a. Establish elevations of buried piping with not less than four (4) feet of cover.
  - b. Measure depth of cover from final surface grade to top of pipe barrel.
23. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
24. Any defective pipe that may have been installed shall be removed and replaced with sound pipe at no additional cost to the Owner.

F. Pipe Joint Assembly:

1. Assemble all joints in accordance with recommendations of the manufacturer.

2. If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure.
3. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench.
4. If unusual jointing resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, re-clean the joint components, and repeat the assembly steps.
5. Note that fitting bells may permit less insertion depth than pipe bells.
6. When mechanical equipment is used to assemble joints, care should be taken to prevent over-insertion.

G. Valves

1. Valves shall be installed as indicated on Drawings and according to manufacturer instructions.
2. Valves shall be set vertically so that stems form a vertical line. Care shall be taken to keep out dirt and sand, and no valve shall be operated until it has been cleaned of sand, grit, or other foreign material.
3. No valve operating nut shall be deeper than five (5) feet without Owner approval.
4. Valve Boxes:
  - a. All valves shall be fitted with heavy duty traffic rated valve box and cover as specified herein.
  - b. Valve boxes shall be long enough to reach from the valve to finished ground level and shall be installed as recommended by the manufacturer.
  - c. Valve boxes shall have suitable barrel and shaft extension sections to cover and protect the valve bonnet section.
  - d. Extension sections fabricated by one piece of ductile iron are allowed. No more than one (1) shaft extension shall be used in any one (1) valve installation.
  - e. Valve box extensions shall be by same manufacturer as valve box or ductile iron pipe.
  - f. Valve boxes shall be installed in vertical alignment and positioned to facilitate the operation of the valve with a standard valve wrench. The box shall be installed as shown on the drawings and shall be set on firmly packed soil or bricks to prevent settlement and to prevent bearing on the valve or the main at any point.
  - g. Adjustment of valve boxes shall be subject to the approval of the Engineer. The Contractor shall maintain vertical alignment and position to permit operation of the valve with a standard valve wrench.
  - h. All valve boxes located in heavy traffic pavement areas shall include non-pop covers as specified.
  - i. Terminate locating wire for all sizes of PVC and HDPE water mains in the valve boxes in accordance with the Drawings.

- j. Valve Box Adjustment:
  - 1) All valve boxes within the area of finished construction shall be adjusted to finish grade as shown and specified.
  - 2) Valve boxes damaged during construction shall be replaced by the Contractor at no additional cost to the Owner. Removal and replacement of valve boxes during construction may be authorized, provided the Contractor insures that sufficient valve ties are available and on site in order to quickly locate the valve.
  - 3) Adjustment of valve boxes shall be subject to approval of the Engineer.
- H. Tapping Sleeves and Valves: As indicated on Drawings and according to manufacturer instructions.
- I. Double continuous tracing wires shall be installed on all non-metallic pipes per Specification Section 33 05 97 – Identification and Signage for Utilities.
- J. Early warning tape, as specified in Section 33 05 97 – Identification and Signage for Utilities, shall be installed 12-inches to 18-inches above all sanitary sewer forcemains.
- K. PE Encasement:
  - 1. Encase ductile iron piping in PE to prevent contact with surrounding backfill material when pipe is installed in corrosive soils as shown on the Drawings.
  - 2. Comply with AWWA C105.
  - 3. Terminate encasement 3 to 6 inches above ground where pipe is exposed.
- L. Bedding and Backfilling:
  - 1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 – Fill.
  - 3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
  - 4. Maintain optimum moisture content of bedding material to attain required compaction density.
  - 5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
    - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.
    - b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
    - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.

- M. Cleaning and Flushing:
1. As the Work progresses, the interior of the piping shall be cleaned of all dirt, jointing material, and superfluous materials of every description.
  2. Prior to the pressure and leakage tests, all piping shall be thoroughly cleaned of all dirt, dust, oil, grease, and other foreign matter. This work shall be done with care to avoid damage to any inside coating.
  3. All lines shall be thoroughly flushed with clean water to clear the lines of all foreign matter.

### 3.4 PIPE SUPPORT AND THRUST RESTRAINT

- A. The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the Drawings or specified.
- B. Where buried piping contains fittings, which raise or lower the centerline of the pipe, suitable socket clamps, tie rods, or other approved restraining devices shall be used to prevent movement of the fittings. The restraining devices shall be coated thoroughly and heavily with an approved bituminous paint.
- C. All bends, tees, and other fittings in pipelines, and sleeve-coupled pipelines buried in the ground shall be backed with Class 1 concrete placed against undisturbed earth where firm support can be obtained or by the use of restrained joints. If the soil does not provide firm support, then suitable clamps, and accessories or restrained joints shall be provided to brace the fitting properly. Such items shall be coated thoroughly and heavily with an approved bituminous paint after assembly or, if necessary, before assembly.
- D. Thrust blocks and joint restraints shall be provided as shown on the Drawings.

### 3.5 CONNECTION TO EXISTING SANITARY SEWER FORCE MAINS

- A. Connections to existing force mains shall be performed as shown on the Drawings or as directed by the Engineer.
- B. Connection of new force mains to existing shall be performed in the normal accepted method for connecting mains and shall be done without unduly disrupting service. All connections are subject to the approval of the Engineer as to method, time, and location.
- C. Where existing lines are connected to proposed lines, the Contractor shall take appropriate action to ensure that the existing lines do not interfere with the pressure testing portions of the work. Failure to do so will not relieve the Contractor of the responsibility of properly pressure testing the entire system installed. The Contractor shall bear full responsibility for the action or inaction on this matter and shall not claim damages, injuries, or additional compensation for said action or inaction.



- D. At least 48 hours prior to excavating for the actual connection operation, the Contractor shall excavate and expose the main to be cut at the proposed location and shall advise the Engineer, so that the exposed area may be inspected by the Engineer to verify that no conditions are present that would hamper the connection operation.
- E. Damage caused by sewage from an accidentally cut force main or gravity sewer shall be mitigated by either pumping the sewage back into the gravity sewer system or cleaned by flushing with either fire hoses or tank trucks. Where practical, the affected area shall be treated with a disinfectant, such as Calcium Hypochlorite (HTH). Disinfectant shall be approved by the Engineer.
- F. The Contractor shall notify the City of Ocala Water Resources Department, Lift Station Division at least 48 hours prior to making connections to existing force mains.

### 3.6 CONNECTION TO SANITARY SEWER MANHOLES

- A. Where force mains are to be connected to manholes, the complete interior of the manhole shall be protected.
- B. The Contractor shall take upstream measurements necessary to properly install boots, grout pipe openings, and thoroughly clean the walls.
- C. Apply lining as shown and specified in accordance with Section 33 05 61 - Concrete Manholes. The application shall be installed in strict accordance with the manufacturer's written instructions.

### 3.7 PAVEMENT CROSSINGS

- A. Bases, Sidewalk, Curb, and Driveway Repairs – The Contractor shall replace any and all bases, sidewalks, curbs and gutter, and driveways with materials and workmanship sufficient to give an equal and similar surface to the disturbed areas as existed before construction.
- B. Pavement removal and replacement shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and as shown on the Drawings.

### 3.8 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Install pipe to indicated elevation within tolerance of 5/8 inch.

### 3.9 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Testing:

1. All testing shall be performed in the presence of the Engineer or a designated representative thereof.
2. All parts of the Work including, but not being limited to, pipe, fittings, joints, valves, and any other appurtenances shall be subjected to testing as described herein. To achieve this, all methods of testing shall be approved by the Engineer and FDEP.
3. Except as otherwise directed, all pipelines shall be tested. Pipelines installed in excavation or bedded in concrete shall be tested prior to the backfilling of the excavation or placing of the concrete and exposed piping shall be tested prior to field painting.
4. All piping to operate under liquid pressure shall be tested in sections of approved length. The section of pipe being tested shall be limited to a maximum length of 2000 feet. For these tests the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment and all labor required, without additional compensation. The Contractor shall furnish suitable pressure gauges, pumps, and measuring tank.
5. The Contractor shall be responsible for the cost of all water used for testing and flushing. The Contractor shall make suitable arrangements with the Owner for the monitoring of water consumption and locations to which water may be made available. Water charges shall be in accordance with City of Ocala Ordinance Section 70- 413.
6. Pressure test piping system as specified in Section 33 05 05.31 – Hydrostatic Testing.

C. Compaction Testing:

1. See Section 31 23 23.00 – Fill for compaction testing requirements.
2. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.10 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

## SECTION 33 32 11

### FIELD-ERECTED WASTEWATER PUMPING STATIONS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. General:

1. This Section covers the minimum requirements for installing sanitary sewer lift stations, which includes the furnishing of all labor, materials, and equipment necessary for the construction of new lift stations and wet wells. Work shall include construction of new wet wells together with all work involved in the installation of new factory built lift stations complete with concrete slab, service panels, electric service, electrical wiring, hose bibs, water services, pump tests, pipe connections, temporary pumping facilities, and other equipment, materials, incidentals and appurtenances necessary to provide a complete functional lift station.
2. Where lift stations exist, and are being replaced or modified as specified herein and, on the drawings, the Contractor shall take all measures required, including plugging, temporary pumping, installing temporary screens or basket strainers, or any other work necessary in order to maintain continuous service of the lift station until the modifications or replacement has been completed. The Contractor shall be responsible for any damage to the Owner, customers, or to the existing equipment resulting from the temporary measures specified above.

###### B. Section Includes:

1. Packaged public wastewater pumping station.
2. Initial operation of packaged public wastewater pumping station.

###### C. Related Requirements:

1. Section 33 31 23 - Sanitary Sewerage Force Main Piping

##### 1.2 REFERENCE STANDARDS

###### A. American Association of State Highway and Transportation Officials:

1. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

###### B. American Bearing Manufacturers Association:

1. ABMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

###### C. ASTM International:

1. ASTM A36/.
2. ASTM A48/.

3. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
4. ASTM A153/.
5. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
6. ASTM A709/.
7. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
8. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
9. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
10. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
11. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>).
12. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>).
13. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
14. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
15. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
16. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
17. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

D. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

E. National Fire Protection Association:

1. NFPA 70 - National Electrical Code (NEC).

F. UL, Inc.

1. UL 83 - Thermoplastic-Insulated Wires and Cables.

### 1.3 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with connection to existing facilities.

#### 1.4 PREINSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.
- B. Convene minimum one week prior to commencing Work of this Section.

#### 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data:
  - 1. Manufacturer catalog data for wet well, cover, hinged door, slide rail assembly, discharge piping, valves, junction box, level controls, and control panel.
  - 2. Manufacturer pump information, performance curve, breakaway fittings data, and access frame data.
  - 3. Control panel data and panel wiring schematic.
- C. Shop Drawings:
  - 1. Show size, materials, and components of system.
  - 2. Indicate wet well size, inlet and discharge location, cover dimensions, vent location, lifting cable location, valve locations, pump locations, discharge piping location, junction box locations, guide rail assembly location, level control locations, and ballast support flange dimensions.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions.
- F. Test and Evaluation Reports: Submit written report showing that factory pump inspections and that tests have been successfully performed.
- G. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- H. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- J. Manufacturer Reports:
  - 1. Submit report of each visit of manufacturer's representative to provide technical assistance during installation.

- 2 The manufacturer shall provide a written report, through the Contractor, and endorsed in writing by the Contractor, certifying that the equipment has been properly installed, checked and is ready for placement into routine permanent service.

K. Qualifications Statements:

1. Submit qualifications for manufacturer, installer, and licensed professional.
2. Submit manufacturer's approval of installer.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of packaged pumping stations, including wet wells and control panel.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for maintenance materials.
- B. Provide the following spare parts for each pump:
  1. One (1) set of seals.
  2. One (1) set of gaskets and O-rings.
  3. One (1) impeller.
  4. One (1) set of wear rings.
- C. The Contractor shall provide one (1) set of any special tools required for maintenance of equipment specified herein.

1.8 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Environmental Protection and Florida Department of Transportation standards.
- B. In order to unify responsibility for proper operation and service of the pumping station, it is the intent of these Specifications that all system components shall be furnished by a single manufacturer for the pump station and for the control panel, or the same (unitary source) for both.
- C. Nothing in the Contract Documents shall be interpreted as permission or direction to violate any governing code or ordinance. Electrical equipment, materials, and workmanship shall comply with the latest revisions of the following codes and standards:
  1. State and local codes and ordinances and inspecting authorities.
  2. The National Board of Fire Underwriters.
  3. National Fire Protection Associate (NFPA)

4. Underwriters Laboratories, Inc. (UL)
5. National Electrical Manufacturers Association (NEMA)
6. American National Standards Institute, Inc. (ANSI)
7. Insulated Power Cable Engineers Association (IPCEA)
8. State of Florida Department of Industrial Safety (OSHA)

#### 1.9 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum five (5) years of documented experience and shall be approved by manufacturer.
- C. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of Florida.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Handling: Support wet well with nylon slings to structural lift points.
- D. Store materials according to manufacturer instructions.
- E. Protection:
  1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  2. Provide temporary end caps and closures on piping and fittings, and maintain in place until installation.
  3. Provide additional protection according to manufacturer instructions.

#### 1.11 AMBIENT CONDITIONS

- A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Do not install wet well base or piping if bedding is wet or frozen.

## 1.12 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
  - 2. Indicate field measurements on Shop Drawings.

## 1.13 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.
- B. The manufacturer of the pump station equipment and components shall warrant it to be of quality construction, free from defects in material and workmanship. This warranty shall include specific details described below.
  - 1. The structure, equipment, apparatus, and parts furnished shall be warranted for a period of one (1) year, excepting only those items that are normally consumed in service such as light bulbs, oil, grease, etc.
  - 2. The Contractor shall be solely responsible for the warranty and all required corrective actions. The Owner may consider extending the warranty period, if possible.
- C. Components failing to perform as specified or as represented by the manufacturer or proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the Contractor at no cost to the Owner.
- D. The warranty shall become effective at the time of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Pumping Station:
  - 1. Configuration: As shown on the Drawings.
  - 2. Wet Well: Precast concrete or fiberglass as shown on the Drawings.
  - 3. Pump Type: Submersible, nonclog.
- B. System Power Characteristics:
  - 1. Electrical power to be furnished to the site will be 3-phase, 60Hz, 4-wire, 208/120, 240/120 volts, or 480/277 volts, determined by the power company, maintained within plus or minus ten percent (+ 10%).
  - 2. Control voltage shall not exceed 120 volts. If only single-phase power is available, provide variable frequency drives to convert to three-phase. Sized as required for this application.



## 2.2 PUMP PERFORMANCE AND DESIGN CRITERIA

- A. Pump Performance Requirements: The pumps furnished shall meet the "Initial Performance Requirements" set forth on the Drawings. The pump discharge bases and rail systems furnished shall be capable of supporting future pumps which will meet the "Future Performance Requirements" set forth on the Drawings.
- B. Submersible Pumps:
  - 1. Pumps shall be submersible sewage pumps, specifically designed for pumping raw, unscreened domestic sanitary sewage.
  - 2. Pump performance and design criteria shall be as shown on the Drawings.
  - 3. Materials:
    - a. All parts of the pump casing and volute which are exposed to sewage shall be constructed of gray cast iron, ASTM A-48, Class 30, 35, or 40 with smooth surfaces devoid of blow holes or other irregularities.
  - 4. All openings and internal passages shall be large enough to permit the passage of a sphere three (3) inches in diameter and any trash or stringy material which may pass through the average domestic wastewater collection system without clogging.
  - 5. Pump impellers shall have a minimum throughlet size of three (3) inches. Data to show compliance with this requirement shall be included in the required submittals.
  - 6. Discharge Connection Elbow: Permanently installed in chamber with discharge piping.
  - 7. Connection: Automatic to discharge connection elbows when lowered into place, and easily removed for inspection or service.
  - 8. All metal surfaces contacting the pumped liquid, other than stainless steel, shall be protected by a factory applied coating on the exterior of the pump which is suitable for the intended service.
  - 9. Critical mating surfaces, where watertight sealing is required, shall be machined and fitted with Nitrile or Viton rubber O-rings.
  - 10. Motor Cable Entry:
    - a. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal.
    - b. The cable entry shall consist of a single cylindrical elastomer grommet or quick connect cable connectors, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable.
    - c. The assembly shall provide ease of changing the cable when necessary using the same entry seal.
  - 11. Motor Cooling System:
    - a. Pump motors shall have cooling characteristics suitable to permit intermittent operation in a partially submerged condition, or continuous operation in a fully submerged condition.

- b. For dry pit or variable speed applications, motors shall be capable of intermittent or continuous operation while unsubmerged.
  - c. The cooling system shall provide for continuous pump operation in liquid temperature of up to 104° F. Restrictions below this temperature are not acceptable.
12. Pump Mechanical Seals:
- a. Each pump shall be provided with a tandem mechanical shaft seal system.
  - b. Seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate.
  - c. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating silicon-carbide ring.
  - d. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall be silicon-carbide/carbon, carbon/ceramic, or tungsten/tungsten construction.
  - e. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing.
  - f. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable.
  - g. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity.
  - h. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside.
  - i. The seal system shall not rely upon the pumped media for lubrication. Seal lubricant shall be FDA approved, non-toxic.
13. Pump Bearings:
- a. The pump shaft shall rotate on two (2) bearings. Motor bearings shall be permanently grease lubricated.
  - b. Upper bearing shall be a single roller bearing.
  - c. Lower bearing shall be a two-row angular contact bearing to compensate for axial thrust and radial forces.
  - d. Minimum L10 bearing life shall be 50,000 hours at any point along the useable portion of the pump curve at maximum product speed.
14. Pump Shaft:
- a. Pump and motor shaft shall be the same unit.
  - b. The pump shaft shall be an extension of the motor shaft. Couplings shall not be acceptable.
  - c. The pump shaft shall be manufactured from 300 series stainless steel.
15. Pump Impeller:
- a. The impeller shall be capable of handling solids, fibrous materials, heavy sludge, and other matter typically found in wastewater.

- b. The impeller shall be of gray cast iron, Class 35 or 40, dynamically balanced, vortex design or double shrouded non-clogging design, having a minimum throughlet size of 3 inches. Manufacturer's data to show compliance with this requirement shall be included in the required submittals.
  - 16. Pump Wear Rings:
    - a. The pump shall be provided with a means to maintain a tight clearance between the impeller and the volute in order to maintain pump efficiency. A replaceable wear ring system or an adjustable wear plate are acceptable.
  - 17. Manufacturers:
    - a. Grundfos,
    - b. Flygt,
    - c. or approved equal.
- C. Operation Sequences: Pump operational control sequences shall be as shown on the Drawings.
  - 1. Duplex Control Sequence:
    - a. When wet well liquid level increases to LEAD PUMP START setting, LEAD PUMP START switch energizes lead pump.
    - b. When wet well liquid level decreases to PUMP STOP setting, PUMP STOP switch de-energizes lead pump.
    - c. When lead pump is de-energized, alternating relay indexes such that lag pump starts on next rise in wet well liquid level.
    - d. If wet well liquid level continues to rise to LAG PUMP START setting, LAG PUMP START switch energizes lag pump.
    - e. When wet well liquid level decreases to PUMP STOP setting, PUMP STOP switch de-energizes both pumps.
    - f. If wet well liquid level continues to rise, HIGH LEVEL alarm switch energizes alarm signal when liquid level reaches HIGH-LEVEL setting.
- D. Sound, Vibration, and Thermal Control:
  - 1. Dampen or suppress noise.
  - 2. Absorb vibration.
  - 3. Accommodate thermal expansion and stresses.
  - 4. Adjust or correct for misalignment in piping systems.

## 2.3 WET WELL

### A. Description:

- 1. Submersible pump wet well system, including cover with vent and access hatch, rail assemblies, discharge pipe and fittings, plug valves, junction box, and level controls.
- 2. Wet well shall meet the requirements of ASTM C478, with the exclusion of Section 10(a), except as modified herein.
- 3. Inlet Size: As shown on the Drawings.
- 4. Discharge Size: As shown on the Drawings.

B. Precast Concrete Wet Wells:

1. Cement shall meet the requirements of ASTM C150, Specification for Portland Cement, Type II.
2. Concrete for wet well shall meet the minimum requirements for Class III.
3. Minimum wall thickness shall be eight inches or 1/12 the inside diameter, whichever is greater.
4. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14, Contractor shall be responsible for all testing.
5. Wet well shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter.
6. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.
7. Joints:
  - a. Joint contact surfaces shall be formed exactly parallel with a two-degree (2°) slope and nominal 1/16" clearance with the tongue equipped with a proper recess for the installation of an O-ring rubber gasket.
8. Joint surfaces and holes provided for handling capabilities shall be sealed after installation by the Contractor.
9. Coatings:
  - a. Interior Lining: HDPE or polyurea as shown on the Drawings and specified in Section 33 05 61 – Concrete Manholes.
  - b. Exterior Coating: Bituminous coating as specified in Section 09 90 00 – Painting and Coating.
  - c. Coatings shall be applied at point of fabrication.
10. Manufacturers:
  - a. Del Zotto,
  - b. Taylor Precast,
  - c. or approved equal.

C. Precast Polymer Concrete Wet Wells:

1. Precast polymer concrete wet wells may be used for highly corrosive environments as shown on the Drawings.
2. Precast polymer concrete wet wells shall be placed with a concrete slab for structural reinforcement and support.
3. Precast polymer concrete wet wells shall come with polymer concrete lift station sections, monolithic base sections, and all related components.
4. Provide riser sections joined with bell and spigot/ship-lap design seamed with butyl mastic and or rubber gaskets (ASTM C 990) so that on assembly, manhole base, riser, and top section make a continuous and uniform manhole structure. Joint sealing surfaces shall be free of dents, gouges and other surface irregularities that would affect joint integrity.

5. Construct riser sections for polymer concrete lift stations from standard polymer concrete cylinder sections of the diameter indicated on drawings. Use various lengths of polymer concrete sections in combination to provide correct height with the fewest joints.
6. All precast base sections to be cast monolithically. Polymer bench and channel are to be constructed with all polymer concrete material.
7. The polymer concrete lift stations shall be installed via tremie method. Extended ballast slab requirements for buoyancy concerns can be addressed with cementitious concrete material.
8. Design wall sections for depth and loading conditions with wall thickness as designed by polymer concrete manufacturer.
9. Provide tops to support AASHTO HS-20 loading or loads as required and receiving non-vented, solid cast iron frame covers or hatches, as indicated on drawings.
10. Provide resilient connectors conforming to requirements of ASTM C923. All connectors are to be water tight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.
11. Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings.
12. Polymer Concrete Mix Design shall consist of thermosetting resin, sand, and aggregate. No Portland cement shall be allowed as part of the mix design matrix. All sand and aggregate shall be inert in an acidic environment.
13. Reinforcements:
  - a. Shall use acid resistant reinforcement (FRP Bar) in accordance with ACI 440.1R-06 as applicable for polymer concrete design.
14. Each polymer concrete component shall be free of all defects, including indentations, cracks, foreign inclusions and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. Cosmetic defect shall not be cause for rejection. The nominal internal diameter of manhole components shall not vary more than 2%. Variations in height of two opposite sides of risers and cones shall not be more than 5/8 inch. The under run in height of a riser or cone shall not be more than 1/4 in/ft of height with a maximum of 1/2 inch in any one section.
15. The pipe material shall be resistant to corrosion resulting from the presence of Hydrogen Sulfide and pH values between 2 and 13.
16. Wet well top shall be precast polymer concrete reinforced with a rectangular cutout to accommodate the hatch cover assembly. The top shall also include openings for pipe penetrations as shown on the Drawings. A neck shall be extended above the top to accommodate concrete slab installation.
17. Manufacturer shall certify that wet well has been properly installed to manufacturer's requirements.
18. Manufacturers:
  - a. Armorock,
  - b. or approved equal.

D. HDPE Wet Wells:

1. HDPE wet wells may be used for highly corrosive environments as shown on the Drawings.
2. HDPE wet wells shall be placed with a concrete slab for structural reinforcement and support.
3. HDPE wet well shall be manufactured from a high density polyethylene material which meets or exceeds to minimum cell classification requirements for base materials as specified on ASTM F894 when classified in accordance with ASTM D3350.
4. Polyethylene raw material shall contain a minimum of 2%, well dispersed finely divided carbon black for UV stabilization. Additives which can be conclusively proven not to be detrimental to the pipe may also be used provided the pipe produced meets or exceeds all of the requirements of this specification.
5. The pipe shall contain no recycled compound except that generated on the manufacturers' own plant.
6. The pipe manufacturers Quality System shall be certified as meeting the requirements of an ISO 9000:2008 (or later) Quality Management System, by a qualified independent body.
7. The pipe material shall be resistant to corrosion resulting from the presence of Hydrogen Sulfide and pH values between 2 and 13.
8. Pipe shall be extrusion welded to polyethylene wet well by manual extrusion welding techniques on both the interior and exterior of the wet well.
9. The complete wet well shall have a minimum dynamic-load rating of 16,000 ft/lbs. when tested in accordance with ASTM D-3753-latest edition, section 8.
  - a. To establish this rating, the complete wet well shall not leak, crack, or suffer other damage load tested to 40,000 ft/lbs. and shall not deflect vertically downward more than 1/4" at the point of load application when loaded to 24,000 pounds.
10. Wet well top shall be HDPE reinforced with a rectangular cutout to accommodate the hatch cover assembly. The top shall also include openings for pipe penetrations as shown on the Drawings. A neck shall be extended above the top to accommodate concrete slab installation.
11. Bottom shall have a 1" thick polyethylene round plate bottom anchored to an HDPE encapsulated rebar reinforced concrete base with sufficient stiffening ribs.
  - a. The bottom shall have a minimum three inch (3") anti-floatation ring or collar.
  - b. Wet well bottom (hopper) shall be minimum 1" thickness.
12. All incoming and outgoing pipe connections shall be factory installed or installed per factory recommendations.
  - a. Installation of HDPE pipe must be performed by sanding, priming, and using reinforced band lay-up.
  - b. The HDPE shall be the same type and grade as used in the fabrication of the wet well. Boots shall be installed by the wet well manufacturer using FRP pipe stub-out for the boot sealing surface.

13. Manufacturer shall certify that wet well has been properly installed to manufacturer's requirements.
  14. Manufacturers:
    - a. Uponor Infra LTD,
    - b. or approved equal.
- E. Access Hatches – Non-Traffic Rated:
1. Provide access hatches as shown on the Drawings.
  2. Access hatches shall be constructed of one-quarter inch (1/4"), minimum, Floor Diamond Plate Aluminum with one-quarter inch (1/4"), minimum, extruded aluminum angle frame with concrete anchors and integral neoprene gasket strip.
  3. Aluminum shall be mill finished with coal tar epoxy applied to surfaces to be in contact with concrete.
  4. Hinges, bolts, and fasteners shall be stainless steel.
  5. All stainless steel is to be 316 grade stainless steel.
  6. Minimum design loading: 300 lb/ft<sup>2</sup>.
  7. Hatch shall include hold-open arm mechanism and cast aluminum drop handle and safety hasp.
  8. Fall Protection System:
    - a. Hatches shall include the manufacturer's standard safety grating.
    - b. Minimum safety grating load rating: 300 lb/ft<sup>2</sup>.
    - c. Safety grating material: FRP or aluminum.
    - d. Provide hinges and lift-assist to allow grating sections to automatically lock in place in full-open 90-degree position.
    - e. Provide hold-open arm and release assembly of aluminum or Type 316 stainless steel. Safety grating shall be colored OSHA "Safety Yellow" or "Safety Orange".
  9. Single Door Access Hatch:
    - a. Manufacturers:
      - 1) U.S. Foundry, APS,
      - 2) Halliday, S1R,
      - 3) or approved equal.
  10. Double Door Access Hatch:
    - a. Manufacturers:
      - 1) U.S. Foundry, APD,
      - 2) Halliday, S2R,
      - 3) or approved equal.
- F. Access Hatches – Traffic Rated:
1. Provide access hatches as shown on the Drawings.
  2. Access hatches shall be constructed of one-quarter inch (1/4"), minimum, Floor Diamond Plate Aluminum with one-quarter inch (1/4"), minimum, extruded aluminum angle frame with concrete anchors and integral neoprene gasket strip.

3. Aluminum shall be mill finished with coal tar epoxy applied to surfaces to be in contact with concrete.
  4. Hinges, bolts, and fasteners shall be stainless steel.
  5. All stainless steel is to be 316 grade stainless steel.
  6. Minimum design loading: H-20 Load Rating.
  7. Hatch shall include hold-open arm mechanism and cast aluminum drop handle and safety hasp.
  8. Fall Protection System:
    - a. Hatches shall include the manufacturer's standard safety grating.
    - b. Minimum safety grating load rating: 300 lb/ft<sup>2</sup>.
    - c. Safety grating material: FRP or aluminum.
    - d. Provide hinges and lift-assist to allow grating sections to automatically lock in place in full-open 90-degree position.
    - e. Provide hold-open arm and release assembly of aluminum or Type 316 stainless steel. Safety grating shall be colored OSHA "Safety Yellow" or "Safety Orange".
  9. Single Door Access Hatch:
    - a. Manufacturers:
      - 1) U.S. Foundry, AHS,
      - 2) Halliday, H1R,
      - 3) or approved equal.
  10. Double Door Access Hatch:
    - a. Manufacturers:
      - 1) U.S. Foundry, AHD,
      - 2) Halliday, H2R,
      - 3) or approved equal.
- G. Wet Well Connectors:
1. Furnish openings as indicated on Drawings.
  2. Pipes shall be connected to wet wells with heavy duty flexible rubber connector boots conforming to ASTM C923 with stainless steel bands and hardware.
  3. No adhesives or lubricants shall be employed in the installation of the connector into the wet well.
  4. The connector shall be installed in the wet well wall by use of an expanding mechanism in strict accordance with the manufacturer's recommendations.
- H. Rail System: Slide rail assembly consisting of Type 316 stainless-steel, upper and lower rail brackets and pump guide brackets.
- I. Junction Box:
1. NEMA 250 Type 4X.
  2. Furnish cable grips for incoming direct-burial cable.
- J. Level Controls: As indicated on Drawings.



## 2.4 PIPING

### A. General:

1. All suction and discharge piping including valves shall be capable of passing three inch (3") spherical solids. Flanged pipe shall be centrifugally cast ductile iron, complying with ANSI/AWWA A21.51/C 115 and Class 53 thickness. Flanges shall be cast iron Class 125 rated and complying with ANSI B16.1.

### B. Pump Suction Spool: Each pump shall be equipped with a one-piece, cast iron suction spool, flanged on each end. Each spool shall have one (1) 1 1/4" NPT and 1/4" NPT tapped hole with pipe plugs for mounting of gauges or other instrumentation.

### C. Check valves shall be full flow swing check valves as specified in Section 33 31 23 – Sanitary Sewerage Force Main Piping.

### D. Plug valves shall be as specified in Section 33 31 23 – Sanitary Sewerage Force Main Piping.

### E. Air release valves shall be as specified in Section 31 31 23 – Sanitary Sewerage Force Main Piping and as shown on the Drawings.

### F. Electromagnetic Flow Meters:

1. Electromagnetic Flow Meters shall meet or exceed requirements of AWWA C751 standards and shall be NSF approved for potable water use.
2. Materials:
  - a. Body: Bronze, Cast Iron, or Stainless Steel.
  - b. Liner: Fusion-bonded epoxy coated.
  - c. Electrodes: Type 316 Stainless Steel.
  - d. Display Housing: Aluminum Alloy with glass display window.
3. Electromagnetic Flow Meters shall be rated for 200 psi working pressure.
4. Connection: Flanged.
  - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
5. Register:
  - a. The register shall be permanently hermetically sealed.
  - b. No fogging, large numerals, tempered glass lens.
  - c. Unit of Measure: Cubic foot.
  - d. Magnetic drive, low torque registration.
  - e. Straight and AMI reading, and low flow indicator.
  - f. The register shall connect to a Cellular Endpoint. AMI transmitter via factory potted NICOR Connector as part of the register. The AMI transmitter shall be capable of communicating to Badger's Beacon AMA Cellular Metering System.
6. Manufacturers:
  - a. ABB, Aquamaster,

- b. AMCO, Q4000 Mag Meter,
- c. McCrometer, Ultra Mag,
- d. Badger,
- e. or approved equal.

G. Discharge Piping:

- 1. Discharge piping shall be as shown on the Drawings and specified in 31 31 23 – Sanitary Sewerage Force Main Piping.
- 2. Discharge piping shall include a pressure gauge assembly as follows:
  - a. Connection to force main: 1 ¼” NPT.
  - b. Valve: Ball Valve.
  - c. Pressure Gauge.

H. The piping and exposed steel framework shall be cleaned with industrial grade chemical cleaner. The prime coat shall be a zinc base synthetic primer. The finish coat shall be an epoxy grade as specified in Section 09 90 00 – Painting and Coating.

## 2.5 MAIN DISCONNECT SWITCH PANEL

A. A separate 316 Stainless Steel NEMA 4X panel shall be provided with main disconnect switch and lightning arrestors.

- 1. Manufacturers:
  - a. Square D,
  - b. Siemens,
  - c. or approved equal.

B. Main Disconnect Switch:

- 1. A NEMA 12/3R 316 Stainless Steel main disconnect switch, breaker type, shall be provided, non-fused.
- 2. Size: Sized to handle full service load, 100 amps minimum.

C. Surge Protector:

- 1. A surge protector shall be provided to protect the secondary line voltage circuitry in the main panel.
- 2. The protector shall be 3 phases, 4 wire installed on the outside of the main disconnect switch and connected to the load side terminals of the disconnect switch.
- 3. Manufacturers:
  - a. Square D, Model SDSA3650,
  - b. or approved equal.

## 2.6 CONTROL PANEL

A. Description:

- 1. Factory fabricated, self-contained.

2. Motor Control Panel: At remote location with short circuit and overload protection for pumps and alternator to alternate pump duty between pumps on successive cycles or switch operation of pumps on pump failure.
3. Furnish HIGH-LEVEL ALARM light and RUN light to warn of high-level condition or failure of pump.

B. Enclosure:

1. Panel Enclosure:
  - a. The electrical components and control equipment shall be mounted within NEMA 12/3R, dead front type control enclosures fabricated of 316 stainless steel.
  - b. Enclosure doors shall be gasketed with neoprene, hinged, and equipped with 3-point pad-lockable handle.
  - c. Control compartments shall incorporate removable back panels on which control components shall be mounted.
  - d. Back panel shall be secured to enclosures with collar studs.
  - e. Single door panels shall be mounted on aluminum posts, double door panels shall be free standing on concrete slab.

C. Components:

1. Motor Branch Components:
  - a. All motor branch components shall be of the highest industrial quality, securely fastened to removable sub-plate with stainless steel screws and lockwashers.
  - b. Sub-plate shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any components.
2. Circuit breaker and Operating Mechanism:
  - a. A properly sized heavy-duty air circuit breaker shall be furnished for each pump motor.
  - b. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.
  - c. Each breaker shall have auxiliary contacts that open when breaker is off or tripped.
3. Motor Starters/Contactors:
  - a. An open frame, across the line, NEMA rated magnetic motor starter shall be furnished for each pump motor.
  - b. Starters shall be used on applications less than 5 hp @ 240 volts or less than 10 hp @ 480 volts, and shall be designed for addition of at least two auxiliary contacts.
  - c. Soft Starters:
    - 1) Solid state soft start starters shall be installed on motors 5 hp or greater @ 240 volts, and 10 hp or greater @ 480 volts.

- 2) Manufacturers:
    - a) Stellar, SR series,
    - b) or approved equal.
- d. Variable Frequency Drives:
  - 1) Variable Frequency Drives shall be installed on motors 5 hp or greater @ 240 volts, and 10 hp or greater @ 480 volts that have excessive starts or are designed to pump 1000 GPM or more.
  - 2) Manufacturers:
    - a) Yaskawa,
    - b) or approved equal.
- e. Overload Relays:
  - 1) All motor starters shall be equipped with overload protection on all three-phases and adjustable electronic overload relays sized accordingly.
  - 2) An overload reset push-button shall be mounted through the door of the control panel in such a manner as to permit resetting the overload relays without opening the control panel door.
- f. Motor starter contacts shall be easily replaceable without removing the motor starter from its mounted position.
- 4. Manual Transfer Switch:
  - a. Provide manual transfer switch breaker to switch to generator power.
  - b. Provide Russell-Stol generator receptacle sized to main breaker so lift station can be operated by generator.
  - c. Provisions shall be made to prevent main and emergency breakers from being on at the same time.
- 5. Circuit Breakers:
  - a. Circuit breakers shall be properly sized breakers for outlets, lighting, control system, and other uses.
  - b. Breakers shall be mounted with cutouts through the dead front panel so that breaker faces will be flush with the dead front.
- 6. Phase Monitor:
  - a. A line voltage rate phase sequence and loss monitor shall be provided as shown on the Drawings.
  - b. The monitor will be pre-wired into the control circuitry to take the station out of service if a phase is reversed, lost, or drops below 83% of normal voltage.
  - c. The unit shall automatically restore the station to normal conditions when normal power is restored.
- 7. Warning Light and Horn:
  - a. The main panel shall be provided with a lexon shielded LED warning light that is red in color LED and weatherproof horn.
  - b. A silence switch shall be mounted on the dead front and below the horn.
- 8. Surge Protector:
  - a. Provide a surge protector as shown on the Drawings to prevent transient voltages from damaging control circuits and equipment.

9. GFI Receptacle:
  - a. A weatherproof duplex ground fault indicating utility receptacle providing 115 volts, 60Hz, single-phase current, shall be mounted on the front of the main panel.
  - b. Receptacle circuit shall be protected by a 20-ampere thermal-magnetic circuit breaker.
10. Control Circuitry: The control circuit shall be protected by a thermal-magnetic air circuit breaker, which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.
11. Pump Run Indicators:
  - a. Control panel shall be provided with one (1) pilot light for each pump motor for run, stop, and fault.
  - b. Light shall be wired in parallel with the related pump motor starter to indicate that the motor is or should be running, stopped, or in fault.
  - c. All indicators shall be of the LED type and have push to test function.
12. Pump Mode Selection:
  - a. Pump mode selector switches shall be connected to permit manual start and stop of each pump individually, and to select automatic operation of each pump under control of the level control system.
  - b. Manual operation shall override all shutdown systems, but not the motor overload relays.
  - c. Selector switches shall be 3-position, rotary maintained type.
  - d. Switch contacts shall be rated 15 amperes minimum at 120 volts non-inductive.
13. High Pump Temperature and Moisture Protection:
  - a. The control panel shall be equipped with circuitry to override the level control system and shut down the pump motor(s) when required to protect the pump from damage caused by excessive temperature or moisture.
  - b. A thermostat and moisture sensor shall be mounted on each pump to detect its temperature or moisture, and a signal relay shall be supplied.
  - c. If the pump temperature should rise to a level which could cause pump damage or moisture is detected, the signal relay shall drop out the motor starter. An indicator, visible on the front of the control panel, shall indicate that the pump motor has been stopped because of a high temperature or moisture condition.
  - d. The pump shall remain locked out until the pump has cooled or moisture removed and the circuit has been manually reset. Automatic reset of such a circuit shall not be acceptable.
14. Wiring:
  - a. The pump station as furnished by the manufacturer shall be completely wired except for the power feeder lines to the branch circuit breakers and final connections to remote alarm devices.

- b. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by the National Electric Code (NEC) and UL 5083 listed.
  - c. A laminated AS BUILT schematic shall be permanently attached to the inner side of the enclosure door.
- 15. Wire Identification and Sizing: Control circuit wiring inside the panel, except for the internal wiring of individual components, shall be as per UL 508c listing.
- 16. Pump Motor Connection Box:
  - a. A NEMA 12/3R Type 316 stainless steel enclosure with a hinged, bolt on cover capable of being padlocked, shall be provided and mounted on the electrical equipment rack.
  - b. An aluminum backplane shall also be provided as part of the enclosure, with suitable power and control distribution blocks and terminals mounted within to connect the pump motor to the control panel and controls.

## 2.7 LEVEL CONTROL SYSTEM

- A. General: The level control system shall start and stop the pump motors in response to change in wet well level, as set forth herein.
- B. Level Control System:
  - 1. Pressure Transmitter: 0 - 10 PSI manufactured by Wika or approved equal.
  - 2. Air Driven Bubbler System: Ingraham HR10WB3 or approved equal.
  - 3. Level control system will provide 4-20mA signal.
  - 4. Pump Level Controller: MPE SC2000-02 or approved equal.
- C. Sequence of Operation:
  - 1. The electronic controller shall continuously monitor the wet well level, permitting the operator to read wet well level at any time.
  - 2. Upon operator selection of automatic operation, the controller shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level".
  - 3. When the liquid is lowered to the "lead pump stop level", the electronic controller shall stop this pump. These actions shall constitute one pumping cycle.
  - 4. Should the wet level continue to rise, the electronic controller shall start the second pump when the liquid level reaches the "lag pump start level" so that both pumps are operating. These levels shall be adjustable as described below.
- D. Independent Lag Pump: Circuit design in which application of power to the lag pump motor starter is contingent upon completion of the lead pump circuit shall not be acceptable.

- E. High Water Alarm with Alarm Silencer:
1. The electronic pressure switch shall be equipped with an additional electronic comparator and solid-state output relay to alert maintenance personnel to a high liquid level in the wet well. In the event that the wet well liquid reaches a preset high-water alarm level, the high water output relay shall energize a signal relay. The signal relay shall complete a 115- volt circuit for an external alarm device. A red LED indicator, visible from outside the control panel, and an audible signal, shall indicate that a high wet well level exists.
  2. The signal relay shall maintain the alarm signal until the wet level has been lowered and the circuit has been manually reset.
  3. An alarm silence switch and relay shall be provided to permit maintenance personnel to de-energize the external audible device while corrective actions are underway. After silencing the alarm device, manual reset of the signal relay shall provide automatic reset of the alarm silence relay. Located outside of panel on left side as well as on dead front.
- F. Automatic Pump Alternation:
1. The level control system shall utilize the alternator relay to select first one pump, then the second pump, to run as lead pump for a pumping cycle.
  2. Alternation shall occur at the end of a pumping cycle.
- G. Electronic Controller:
1. The electronic controller shall include integral components to perform all pressure sensing signal conditioning, EMI and RFI suppression, DC power supply and 120V outputs.
  2. Comparators shall be solid state, and shall be integrated with other components to perform as described below.
    - a. Control range shall be 01 to 12.01 of water with an overall repeat accuracy of +/- 0.1 feet of water.
  3. The electronic controller shall consist of the following integral components:
    - a. Pressure Sensor.
    - b. Display.
    - c. Electronic Comparators.
    - d. Output Relays.
- H. Pressure Sensor:
1. The pressure sensor shall be a strain gauge transducer and shall receive and input pressure from the air bubbler system, mounted in the control panel.
  2. The transducer shall convert the input to a proportional electrical signal for distribution to the display and electronic comparators.
  3. The transducer output shall be filtered to prevent control response to level pulsations or surges.
  4. Transducer over-pressure rating shall be three times full scale.

I. Electronic Comparators:

1. Level adjustments shall be electronic comparator setpoints to control the levels at which the lead and lag pumps start and stop. Each of the level settings shall be adjustable, and accessible to the operator without opening the control panel or any cover panel on the electronic pressure switch.
2. Controls shall be provided to permit the operator to read the selected levels on the display. Such adjustments shall not require hard wiring, the use of electronic test equipment, artificial level simulation, or introduction of pressure to the electronic pressure switch.
3. It shall be possible to change setpoints while the unit is in operation without affecting other setpoints or operation.

J. Output Relays:

1. Each output relay in the electronic pressure switch shall be solid state.
2. Each relay input shall be optically isolated from its output and shall incorporate zero crossover switching to provide high immunity to electrical noise.
3. The ON state of each relay shall be indicated by illumination of a light emitting diode.
4. The output relay shall be individually fused providing fused overload and short circuit protection. Each output relay shall have an inductive load rating equivalent to one NEMA Size 4 contactor.
5. A pilot relay shall be incorporated for loads greater than a Size 4 contactor.

K. Serviceability:

1. The electronic pressure switch shall be equipped with replaceable plug-in integrated circuits and output fuses.
2. The main circuit board assembly shall be provided with keyed plug-in connections to "off board" components permitting main board removal without de-soldering.
3. All printed circuits shall have a conformal coating applied to both sides to protect against moisture or fungus.

## 2.8 SUPERVISORY CONTROL AND DATA ACQUISITION(SCADA)

- A. Remote Terminal Unit (RTU) shall be a microcomputer-based data collection and dissemination subsystem.
- B. The remote terminal unit shall communicate with the central site via a two-way radio link. The remote terminal unit shall be designed to accommodate plug-in function modules.
- C. The system shall be capable of being outfitted, at any time, with RTU's capable of being configured with up to fifteen (15) function modules per RTU, with no software or firmware changes to the system.
- D. All sheet metal utilized inside the enclosure must be anodized.



- E. RTU Assembly:
  - 1. Control Box with Modules.
  - 2. Connecting Antenna Cable
  - 3. Antenna Tower
  - 4. Antenna Mast
  - 5. Antenna
  - 6. All hardware necessary for a complete and operational RTU.
- F. Bring all I/O from controller to terminal strip for future use.
- G. RTU/Controller shall be MPE 2000 combination only.

## 2.9 MATERIALS

- A. Bedding and Backfill.
  - 1. Bedding, cover, and soil backfill materials shall be in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Odor Control Systems.
  - 1. Odor control systems shall be in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.10 ACCESSORIES

- A. Pipe Penetration Sealant in Concrete Structures: Non-Shrink Grout.
- B. All pipe supports, anchors, fasteners and accessories shall be Type 316 Stainless Steel.
- C. Exterior Lighting: As indicated on Drawings.
- D. Fencing and Security Gate: As indicated on Drawings.
- E. Fresh Water Supply: As indicated on Drawings.

## 2.11 SOURCE QUALITY CONTROL

- A. Provide shop inspection and testing of completed assembly.
- B. Inspection:
  - 1. Verify that motor voltage and frequency are as shown on nameplate.
  - 2. Verify that motor and cable insulation test for moisture content or insulation defects comply with UL 83.

- C. Testing:
  - 1. Submerged Pump Run: Test to determine that pump meets hydraulic performance requirements.
  - 2. Document and certify testing results in written report.
- D. Owner Inspection:
  - 1. Make completed pump assembly available for inspection at manufacturer's factory prior to packaging for shipment.
  - 2. Notify Owner at least seven days before inspection is allowed.
- E. Certificate of Compliance:
  - 1. Submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that inlet and discharge piping connections are size, location, and elevation as indicated on Drawings.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Buried piping shall be installed in accordance with Section 33 31 23 – Sanitary Sewerage Force Main Piping.
- C. Protect piping from entry of foreign materials and water by using temporary covers, completing sections of Work, and isolating parts of completed system.

### 3.3 WET WELL AND MANHOLE ABANDONMENT

- A. Existing wet wells and manholes that are no longer to be used in the sanitary sewer system shall be abandoned.
- B. The Contractor shall divert existing sewage flows as called for on the plans and as specified herein. Pipe openings shall be plugged in a manner satisfactory to the Engineer. Where manholes are to be abandoned, the rim and cover shall be removed, salvaged, and made available to Owner.

- C. Manhole and wet well tops shall be removed and disposed of by the Contractor as specified elsewhere in the specifications.
  - 1. Remove top sections to the elevations shown on the plans.
  - 2. Where no elevation is shown, the manhole or wet well top section shall be removed to the first joint or 24 inches below grade, whichever is greater.
  - 3. Wet well and manhole foundations to remain in place shall be punctured with minimum 2-inch diameter holes at maximum 6-feet spacing on center to prevent hydraulic uplift.
  - 4. The Contractor shall fill and compact the remaining bottom section with select backfill.

### 3.4 INSTALLATION

- A. Excavation:
  - 1. Excavation and backfill shall be performed as specified in Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and in indicated locations and depths.
  - 2. Keep excavation free of water during the construction process.
  - 3. Build structures to the line and grade shown on the plans.
  - 4. For the wet well, the Contractor shall excavate one (1) foot deeper than the elevation of the bottom of the wet well base and replace the material with suitable bearing rocks or gravel approved by the Engineer.
  - 5. The bottom shall provide a smooth, firm and stable foundation for the structure.
  - 6. At least one (1) compaction density test shall be made on the prepared base for each manhole. It is expressly agreed and understood that the Owner reserves the right to perform additional compaction tests or to increase or decrease the frequency of compaction test.
  - 7. Compaction testing shall be in accordance with Section 31 23 23.00 - Fill.
- B. Wet Well:
  - 1. Installation of wet wells shall comply with the manufacturer's recommendations.
  - 2. Install wet well at proper grade and to indicated alignment on Drawings.
  - 3. Wet well sections shall be set so the wet well will be vertical and with sections in true alignment.
  - 4. Joints between sections of precast concrete wet wells shall be jointed using Ram-Nek joint sealant or approved equal.
  - 5. Wet wells are considered confined spaces and the Contractor must follow the Owner requirements for confined space entry.
  - 6. All holes in sections used for handling and the annular space between the wall and entering pipe shall be thoroughly plugged and sealed in strict conformance with the manufacturer's recommendations so that there will be zero leakage through openings and around pipes.

7. After all holes, joints, annular spaces or other exposed areas have been jointed as specified above, the areas shall be sealed in accordance with its manufacturers written instructions with liner material.
8. Ballast wet well with aggregate, over ballast support flange and around entire wet well perimeter, to specific weight of not less than 63 lb. per cubic foot of wet well volume.

C. Pumps:

1. Install pumps, including fittings, brackets, and discharge piping to wet well rail assembly, lifting device, and discharge.
2. Wire pump to junction box.

D. Electrical:

1. Furnish all equipment, transportation, tools and labor, unless otherwise specified, to install a complete electrical system with wire, conduit, service panel, emergency hookup, control panel, emergency horn and light, and all other items shown, specified, or that can be reasonably inferred from the drawings, including excavation, backfill, placing of conduit, pulling wires, and testing for a complete job ready to operate. If any items for a complete job are omitted or not shown, the Contractor shall furnish and install the same without cost to the Owner.
2. Permits and Inspection - The Contractor shall make application for electrical service in the name of the Owner with voltages as indicated on the drawings.
3. Make equipment of the same type of catalogued product of the same manufacturer. Use weatherproof switches and receptacles with weatherproof covers for outdoor locations or locations subject to moisture intrusion.
4. Install all equipment in accordance with approved applicable codes, shop drawings, manufacturer's instructions, and to operate as specified.
5. Identification - Engrave nameplates, white-on-black laminated plastic, and attach with mounting frames or drive screws. Provide nameplates for all lighting and power panel boards, distribution circuit breakers, receptacles (other than standard convenience), motor control centers, switchboards, disconnect switches, selector switches, push buttons, and other major pieces of electrical equipment.
  - a. Provide typewritten circuit directories for each panel board.
  - b. Identify conductor as to load served:
    - 1) Leave all branch circuits tagged in the panel boards, in all gutters, and in all junction boxes where unused circuits terminate for the purpose of identifying the various circuits.
    - 2) Tag feeders and mains in the switchboards.
    - 3) Place identification tags within three inches (3") of the terminal connections at each feeder circuit breaker. Tag with adhesive-type marker.

6. Service Entrance – All services shall be 208/120, 240/120 or 480/277 volt, three (3) phase services. Provide a meter base, stainless steel disconnect, lightning arrestor, concrete pad for transformer and other materials required by the City of Ocala Electric Utility which will provide service to the lift station. If a step up transformer is needed, provide stainless steel housing.
7. Junction and Pull Boxes – Provide NEMA 4X watertight stainless steel enclosures for junction and pull boxes.
8. Raceway:
  - a. Rigid Aluminum Conduit: Provide rigid aluminum conduit, including bushings, couplings, elbows, and nipples meeting requirements of ANSI C 80.1 and NEC.
  - b. PVC Schedule 40 Conduit: Provide rigid Schedule 40 PVC conduit for underground burial.
  - c. Warning Tape: Provide heavy-gauge, yellow plastic tape for use in trenches containing buried conduit. Warning tape shall state “Warning, Buried Electrical.”
  - d. Raceway Schedule:
    - 1) Minimum Size: 3/4”.
    - 2) Exterior Installation: Aluminum.
    - 3) Underground Installation: Schedule 40 PVC.
9. Conductors:
  - a. Identify power and control conductors at each termination and in all accessible locations such as handholes, panels, pull boxes, and terminal boxes.
  - b. For power conductors, provide all single conductors and individual conductors of multi- conductor power cables with integral insulation pigmentation of the designated colors, except conductors larger than No. 6 AWG may be provided with color coding by wrapping the conductor at each end with vinyl tape.

- c. Conductors shall be color coded according to the following:

System	Conductor	Color
All	Equipment Grounding	Green
120/240 volts, 1-phase, 3-wire	Grounded Neutral	White
	One Hot Leg	Black
	Other Hot Leg	Red
208/120 volts, 3-phase, 4-wire	Grounded Neutral	White
	Phase A	Black
	Phase B	Red
	Phase C	Blue
240/120 volts, 3-phase, 4-wire	Grounded Neutral	White
	Phase A	Black
	Phase B	Orange
	Phase C	Blue
480/277 volts, 3-phase, 4-wire	Grounded Neutral	White/Black Tracer
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow
<p><u>Note:</u> Phase A, B, C, implies the direction of positive phase rotation. Phase rotation shall be counter clockwise beyond first point of entry.</p>		

10. Utilize only conductors meeting applicable requirements of NEMA WC3, WC5, WC7, and ICEA S-19-81, S-61-402, and S-66-524.
11. Provide stranded copper conductors type THHN/THWN.
12. Grounding:
  - a. Ground all exposed metallic parts of electrical equipment, raceway systems, and the neutral of all wiring systems in accordance with the NEC, state, local, and other applicable laws and regulations.
  - b. Provide copper-clad steel ground rods not less than 5/8" in diameter, tenfeet (10') long, driven full length into earth, spaced at six feet (6') apart.
  - c. Ground rod to ground shall be cad welded.
  - d. Ground rod connections shall be accessible for inspection in an approved underground round box enclosure flush with finish grade.

E. Supervisory Control and Data Acquisition (SCADA):

1. All lift stations shall be installed with a SCADA system. System shall be installed by the Contractor with the lift station. Installation of the SCADA system shall be required for final acceptance of the lift station.
2. SCADA systems shall be installed and operational before the lift station is on-line and functional. The Contractor shall perform a radio survey to determine height of the antenna required. Typical height will be a minimum of 20' with a 1-1/2" x 48" adjustable aluminum mast, which will be adjusted after survey is completed.

3. Coordinate with the Engineer for the radio survey and the installation of the SCADA system.

F. Backfilling:

1. Excavation and backfill shall be performed in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) to the locations and depths shown.
2. Excavate undesirable material to a minimum depth of 12-inches below the proposed grade and backfill as specified.
3. Place gravel under manholes located in wet soil conditions.
4. Provide clearance around sidewalls of manhole or structure for construction operations.
5. If ground water is encountered, prevent accumulation of water in excavations; place manhole or structure in dry trench.
6. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Engineer.
7. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 – Fill.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Preoperational Inspection:

1. Check pump and motor alignment.
2. Check for proper motor rotation.
3. Check pump and drive units for proper lubrication.

C. Wet Well Testing:

1. The wet well shall be watertight and free from infiltration.
2. Wet wells shall be free of seepage and surface moisture.
3. The Contractor shall perform the following leakage testing to demonstrate compliance with the Contract Documents:
  - a. Plug all wet well inlets and outlets with approved stoppers or plugs.
  - b. Fill the structure with water to an elevation one (1) foot below the top slab.
  - c. The water shall stand for thirty (30) minutes before the test measurements begin or until the water level stabilizes. If the water level does not stabilize within thirty (30) minutes, the structure shall be considered to have failed the test.
  - d. The maximum allowable drop in the water surface is 1/10 of one percent (1%) in 24 hours of testing.
  - e. The Contractor shall repair any leaks that may be observed, regardless of whether the leakage tests pass or fail.

D. Electrical Testing:

1. Test all wiring and connections as required by the City of Ocala representative and other authorities having jurisdiction. Correct all failures in a manner satisfactory to the City and Engineer representative.
2. The Contractor shall pay all costs of testing, including costs of correcting failures, furnishing all necessary testing equipment and of replacing or repairing any damage to associated work or surrounding area resulting therefrom and correcting faulty installations.
3. Test resistance to ground by use of a megaohm instrument with a maximum resistance to ground of five (5) ohms, and provide additional grounding as required.
4. Accomplish the following tests for all wire and connections:
  - a. Continuity.
  - b. Proper grounding.
  - c. Short circuits in system.
  - d. Electrical motor controls.
  - e. Panels with main disconnected from the feeder.
  - f. Sub and branch feeder connections.
  - g. Proper rotation of all motors.
5. Subject all electrical systems to complete operational tests in accordance with placing the station in operation.

E. Startup and Performance Testing:

1. Notify Engineer, seven (7) days prior to flow rate testing.
2. Startup and Initial Testing: Coordinate and operate pumps in conjunction with other construction activities.
3. Hydraulically test station to performance requirements by receiving, pumping, and discharging water to and from wet well.
  - a. Flow Rate and Total Dynamic Head at three (3) points on pump curve, including the specified design point.
  - b. Rate of flow and head must be within ten percent (10%) and five percent (5%) above design curve, respectively, for acceptance.
4. Test pump motor amperage draw and voltage.
  - a. Motor amp readings at or above full load amps (FLA) and Mega-Ohms reading less than 1000 mega-ohms will not be accepted.
5. Confirm general sequencing of pump and float operations at wet well and control panel are according to performance requirements.
6. Document and certify startup results in startup report.

F. Operational Testing:

1. After the system is in full operation, a full operating test shall be performed in the presence of the Engineer and a qualified manufacturer's representative.



2. The Contractor shall furnish all labor, materials, and equipment required for such test and shall correct any deficiencies noted by repairing or replacing the defective component, and re- testing as required until the equipment meets the requirements of the Contract Documents.
- G. Manufacturer Services:
1. The pump station equipment manufacturer shall furnish services of a representative approved by the Engineer to aid and be present during installation, inspect the completed installation, operate the equipment, place the equipment in operation, instruct the Owner's operations personnel in the operation and maintenance of the units.
  2. Operation and maintenance training shall include operation, service, adjustments, and routine maintenance. Recommended spare parts lists and maintenance schedules shall be provided at the time of the training.
  3. The Contractor shall furnish manufacturer representative's written report to the Engineer after the lift station has been installed and satisfactory pump tests have been run and all necessary operational features of the lift station are in accordance with the Contract Documents. The report shall certify that equipment has been satisfactorily installed, operated, and test run and that Owner personnel have been instructed by the pump manufacturer's representative.
- H. Equipment Acceptance:
1. Adjust, repair, modify, or replace system components failing to perform as specified and rerun tests.
  2. Make final adjustments to equipment under direction of manufacturer's representative.
  3. Document adjustments, repairs, and replacements in manufacturer's field services certification.
- I. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.
- J. Document and certify startup and testing results in written report.
- K. Compaction Testing:
1. See Section 31 23 23.00 – Fill for compaction testing requirements.
  2. At least one compaction density test shall be performed on the prepared base. It is expressly agreed and understood that the Owner reserves the right to perform additional compaction tests on its own or to increase or decrease the frequency of compaction testing.
  3. Compaction tests shall be in accordance with the specifications. Should the test fail, the Contractor shall be required to take the appropriate action to satisfy the compaction requirement and at no time shall the manhole base be set in place without an approved compaction test or until satisfactory test is acquired.

### 3.6 ADJUSTING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for starting and adjusting.
- B. Adjust wet well, pump, and control panel systems such that station operates to performance requirements and according to Specifications.

### 3.7 DEMONSTRATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION

## SECTION 33 42 00

### STORMWATER CONVEYANCE

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section Includes:
  - 1. Stormwater drainage piping.
  - 2. Manholes.
  - 3. Catch basins and junction boxes.
  - 4. Concrete encasement and cradles.
  - 5. Bedding and cover materials.
- B. Related Requirements:
  - 1. Section 33 01 30.11 - Television Inspection of Sewers.
  - 2. Section 33 05 05.33 - Infiltration and Exfiltration Testing.
  - 3. Section 33 05 05.43 - Mandrel Testing
  - 4. Section 33 05 61 - Concrete Manholes.

##### 1.2 DEFINITIONS

- A. ABS: Acrylonitrile butadiene styrene.

##### 1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO M036 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains.
  - 2. AASHTO M218 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized), for Corrugated Steel Pipe.
  - 3. AASHTO M245 - Standard Specification for Corrugated Steel Pipe, Polymer-Precoated, for Sewers and Drains.
  - 4. AASHTO M246 - Standard Specification for Steel Sheet, Metallic-Coated and Polymer-Precoated, for Corrugated Steel Pipe.
  - 5. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe.
  - 6. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.
  - 7. AASHTO M289 - Standard Specification for Aluminum-Zinc Alloy Coated Sheet Steel for Corrugated Steel Pipe.
  - 8. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe, 300-to 1500-mm (12- to 60-in.) Diameter.

9. AASHTO T241 - Standard Method of Test for Helical Continuously Welded Seam Corrugated Steel Pipe.
10. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg Rammer and a 457-mm Drop.

B. ASTM International:

1. ASTM A123.
2. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
4. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
5. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
6. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>).
7. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>).
8. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
9. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
10. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
11. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.
12. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
13. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
14. ASTM F405 - Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings.
15. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
16. ASTM F667/F667M - Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

#### 1.4 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with termination of storm sewer connection to existing storm sewer facilities or outfalls.

## 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information describing pipe, pipe accessories, and drainage structures.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer Instructions: Submit special procedures required to install specified products.
- E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- F. Qualifications Statement:
  - 1. Submit qualifications for manufacturer.

## 1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of pipe runs, connections, catch basins, manholes, and invert elevations.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

## 1.7 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Transportation standards.

## 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.

- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

## 1.10 EXISTING CONDITIONS

- A. Field Measurements:
  - 1. Verify field measurements prior to fabrication.
  - 2. Indicate field measurements on Shop Drawings.

## PART 2 - PRODUCTS

### 2.1 STORM DRAINAGE PIPING

- A. Ductile-Iron Piping:
  - 1. Pipe:
    - a. Comply with ASTM A746, Class 50.
    - b. Inside Nominal Diameter: As shown on the Drawings.
    - c. Ends: Bell and spigot.
  - 2. Fittings: Ductile iron.
  - 3. Joints:
    - a. Comply with ASTM A746.
    - b. Joint Devices: Rubber gasket.
- B. Reinforced Concrete Piping:
  - 1. Pipe:
    - a. Comply with ASTM C76 of the Class shown on the Drawings.
    - b. Reinforcement: Steel Wire in accordance with ANSI/ASTM A82 or ANSI/ASTM A496.
    - c. Inside Nominal Diameter: As shown on the Drawings.
    - d. End Connections: Bell and spigot.
  - 2. Joints:
    - a. Comply with ASTM C443.
    - b. Gaskets: Rubber, compression.
- C. Corrugated PE Piping:
  - 1. Pipe:
    - a. Comply with ASTM F667/F667M.
    - b. Type: Smooth interior.
    - c. Inside Nominal Diameter: As shown on the Drawings.
  - 2. Fittings: PE.
  - 3. Joints: Comply with ASTM F667/F667M.

- D. Corrugated Steel Piping:
  - 1. Pipe:
    - a. Comply with AASHTO M36.
    - b. Nominal Diameter: As shown on the Drawings.
    - c. Helical lock seam.
    - d. Coating: Inside and outside, with 0.050-inch-thick bituminous coating.
  - 2. Fittings: Corrugated steel.
  - 3. Coupling Bands:
    - a. Material: Galvanized steel.
    - b. Minimum Size: 0.052 inch thick by 10 inches wide.
    - c. Connection: Two neoprene O-ring gaskets and two galvanized-steel bolts.
- E. High Density Polyethylene Pipe (HDPE):
  - 1. Comply with AWWA C901 and C906, PE 3408.
  - 2. HDPE pipe shall DR-9 or DR-11.
  - 3. HDPE pipe shall have a pressure rating of not less than 160 psi.
  - 4. Pipe Outside Diameter: Iron Pipe Sizes (IPS).
  - 5. Fittings:
    - a. Comply with AWWA C901 and C906.
    - b. Type: Molded or fabricated.
  - 6. Joints: Butt fusion.

## 2.2 MANHOLES

- A. As specified in Section 33 05 61 – Concrete Manholes.

## 2.3 CATCH BASINS AND JUNCTION BOXES

- A. Shaft and Top Section:
  - 1. Material: Reinforced precast or cast-in-place concrete pipe sections.
  - 2. Joints: Lipped male/female.
  - 3. Nominal Shaft Diameter: As shown on the Drawings.
  - 4. Top Section: Eccentric cone or eccentric flat top as shown.
- B. Lids and Frames:
  - 1. Lids shall be as specified in Section 33 05 61 – Concrete Manholes and shown on the Drawings.
  - 2. Inlet Grates:
    - a. Inlet grates shall conform to ASTM A48, Class 30B.
    - b. Frames and grates shall meet or exceed requirements of AASHTO M306, H-20 load rating.
    - c. Frames and gratings shall be machine ground so the irregularity of contact will be minimized and the grates will be rattle-proof.
    - d. Grates shall be of the sizes and types shown on the Drawings.

- C. Base Pad:
  - 1. Material: Cast-in-place concrete, as specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 2. Compressive Strength: 4,000 psi at 28 days, reinforced concrete, air-entrained rough troweled finish.

## 2.4 CONCRETE ENCASEMENT AND CRADLES

- A. Concrete:
  - 1. Description: Reinforced concrete, as specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
  - 2. Compressive Strength: 4,000 psi at 28 days, reinforced concrete, air-entrained rough troweled finish.

## 2.5 MATERIALS

- A. Bedding, Cover, and Backfill:
  - 1. Bedding, cover, and soil backfill materials shall be in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

## 2.6 FINISHES

- A. Steel Galvanizing:
  - 1. Comply with ASTM A123/A123M.
  - 2. Hot-dip galvanized after fabrication.
- B. Galvanizing for Nuts, Bolts, and Washers: Comply with ASTM A153/A153M.
- C. Protection of Aluminum from Dissimilar Materials:
  - 1. Coat all surfaces of aluminum in contact with dissimilar materials such as concrete, masonry, and steel as specified in Section 09 90 00 – Painting and Coating.

## 2.7 ACCESSORIES

- A. Geotextile Filter Fabric:
  - 1. Comply with AASHTO M288 for subsurface drainage.
  - 2. Type:
    - a. Non-biodegradable.
    - b. Non-woven.
- B. Underground Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
- C. Pipe Support Brackets: Galvanized structural steel coated with bituminous paint.



## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that excavation base is ready to receive Work of this Section.
- C. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
- C. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.
- D. The Contractor shall field verify vertical and horizontal locations of all underground facilities in advance of construction to verify that no conflicts exist with the proposed pipe alignment and depth.
  - 1. Should a conflict be discovered, the Contractor shall contact the Engineer immediately and provide all pertinent information for preparation of a remedial design.

### 3.3 INSTALLATION

- A. Piping:
  - 1. Pipe, Fittings, and Accessories: Comply with ASTM D2321.
  - 2. Seal joints watertight.
  - 3. Place pipe on minimum bedding thickness shown.
  - 4. Install aggregate at sides.
  - 5. Manholes: As specified in Section 33 05 61 - Concrete Manholes.
  - 6. Connect to municipal storm sewer system as shown on the Drawings.
  - 7. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.
  - 8. Installation Standards: Install Work according to Florida Department of Transportation standards.
- B. Catch Basins and Junction Boxes:
  - 1. Form bottom of excavation clean and smooth, and to indicated elevation.

2. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.
3. Level top surface of base pad.
4. Sleeve concrete shaft sections to receive storm sewer pipe sections.
5. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
6. Mount lid and frame level in grout, secured to top section to indicated elevation.

C. Bedding and Backfilling:

1. Excavation, trenching, and backfilling shall be in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 – Fill.
3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
4. Maintain optimum moisture content of bedding material to attain required compaction density.
5. Where so indicated on the Drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
  - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.
  - b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
  - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.
6. Correct over-excavation with coarse aggregate or lean concrete as directed by the Engineer. No payment will be made for over-excavation or the correction thereof.

### 3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.
- B. Maximum Variation from Indicated Pipe Slope: 1/8 inch in 10 feet.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Request inspection by Engineer prior to and immediately after placing backfill cover over pipe.

- C. Inspection:
  - 1. As specified in Section 33 01 30.11 - Television Inspection of Sewers.
- D. Testing:
  - 1. Pipe Welding: Comply with AASHTO T241.
  - 2. Compaction Test:
    - a. Comply with Section 31 23 23.00 - Fill.
  - 3. Manholes: As specified in Section 33 05 61 - Concrete Manholes.
  - 4. Piping:
    - a. Infiltration and Exfiltration Testing: As specified in Section 33 05 05.33 - Infiltration and Exfiltration Testing.
    - b. Deflection Testing: As specified in Section 33 05 05.43 - Mandrel Testing.
  - 5. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.

### 3.6 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

### 3.7 ATTACHMENTS

- A. None

END OF SECTION

## SECTION 34 41 13

### TRAFFIC SIGNALS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. General: This Section includes requirements for furnishing and installing electrical traffic control signals.
- B. Section Includes:
  - 1. Traffic Signal Supports.
  - 2. Traffic Signal Controller.
  - 3. Vehicle and Pedestrian Signals.
  - 4. Miscellaneous Signal/ITS Devices.

##### 1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
  - 1. AASHTO GDHS-5 – A Policy on Geometric Design of Highways and Streets
  - 2. AASHTO LTS – Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
  - 3. AASHTO RSDG-4 – Roadside Design Guide.
- B. Institute of Electrical and Electronics Engineers (IEEE)
  - 1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
  - 2. IEEE 802.3 – Ethernet.
  - 3. IEEE C62.41.1 – Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits.
  - 4. IEEE C62.41.2 – Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.
- C. Institution of Transportation Engineers (ITE)
  - 1. ITE ATC 5201 - Advanced Transportation Controller (ATC) Standard.
- D. National Electrical Manufacturers Association (NEMA)
  - 1. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 2. NEMA ICS 1 – Standard for Industrial Control and Systems: General Requirements.
  - 3. NEMA TS-1 – Traffic Control Systems.
  - 4. NEMA TS-2 – Traffic Controller Assemblies with NTCIP Requirements.

- E. National Fire Protection Association (NFPA)
  - 1. NFPA 70 – National Electrical Code.

### 1.3 PREINSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Requirements for preinstallation meeting.
- B. Convene minimum one week prior to commencing Work of this Section.

### 1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information regarding all equipment and materials to be furnished under this Section as required for completion of the Work.
- C. The Contractor shall submit certificates of inspection from the manufacturer that the equipment and materials to be supplied have been inspected at the plant and meet the requirements of the Contract Documents. These certificates shall be submitted prior to beginning Work.
- D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- E. Qualifications Statements:
  - 1. Submit qualifications for manufacturer and installer.
- F. Shop Drawings:
  - 1. Include plans, elevations, sections, and mounting details.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Detail fabrication and assembly of equipment.
  - 4. Include diagrams for power, signal, and control wiring.
- G. Maintenance of Traffic Plan:
  - 1. The Contractor shall prepare and submit a Maintenance of Traffic Plan detailing temporary traffic control measures to be utilized if existing traffic control devices will be out of service at any time during the Work.
- H. As-built / Record Drawings:
  - 1. Prior to Final Acceptance by the City, submit to the City Traffic Engineer two (2) complete and comprehensive sets of as-built plans on twenty-four inch by thirty-six inch (24"x 36") plan sheets and one electronic file copy on readable CD. As-

built drawings shall accurately reflect the actual, as-built cabinet in the field and shall identify the following information:

- a. The location of all installed loops, the path of each loop lead-in to the splicing pull box and then the path of the homerun to the controller cabinet, including loop readings.
- b. Abandoned and unused pull boxes shall be clearly labeled. Distances from the Intersection of each installed pull box shall be measured from the perpendicular edge of curb and from the edge of the nearest curb to indicate location in relation to the roadway.
- c. The installed conduit's size and number of runs shall be clearly noted as well as the distance away from the nearest curb.
- d. If installed, the location of signal poles, controller cabinet, uninterruptible power supply and battery backup cabinet, communication cable, video detection cameras and cable, ITS cameras and cable, overhead mounted street name signs, lighted or non-lighted and cable runs, and power cable shall be shown on the plans.
- e. Two (2) sets of signal wiring color code forms shall be included with the as-built plans.
- f. Contractor shall correct any errors to the as-built plans upon review by the Engineer before Final Acceptance is complete.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of all wires and conduit and actual electrical and control wiring diagrams.
- C. Identify and describe unexpected variations to the Contract Documents.

#### 1.6 QUALITY ASSURANCE

- A. All construction of traffic signals of both public and private infrastructure improvements shall comply with the following:
  1. Manual on Uniform Traffic Control Devices (MUTCD).
  2. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition)
  3. Florida Department of Transportation Design Standards (latest edition)
  4. City-Approved Site Development Plans.
- B. All materials and equipment shall be free from defects impairing strength, durability, and operation and be of the best commercial quality for the purpose specified.
- C. Manufacturer: Company specializing in manufacturing products specified in this Section with a minimum five (5) years of documented experience.

- D. Installer: Company specializing in performing Work of this Section with a minimum five (5) years of documented experience in installation of liner materials.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
  - 1. Store materials according to manufacturer instructions.
  - 2. Do not place materials on private property or in areas obstructing pedestrian or vehicle traffic.
- D. Protection:
  - 1. Protect equipment and materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

#### 1.8 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

### PART 2 - PRODUCTS

#### 2.1 TRAFFIC SIGNAL SUPPORTS

- A. Mast Arm assemblies are preferred; if not feasible, signal supports shall be box span configuration. Mast Arm assemblies, including pedestrian signal poles, shall be painted black.

#### 2.2 MANUFACTURERS

- A. Traffic Control Cabinets shall be a Standard Trafficware Regional City of Ocala TS2-1, Type 6 Cabinet with Ethernet and able to communicate with a Windows based laptop, an Android based device, and be compatible with the City's existing advanced traffic management system software.

## 2.3 TRAFFIC CONTROLLER

- A. Standard Trafficware Regional City of Ocala TS2-1, Type 6 Cabinet shall contain, at a minimum:

Quantity	Item
1	Trafficware NEMA TS2 TYPE 1 Model ATC Controller w/Ethernet
1	Trafficware Wired Cabinet Assembly TS-2, Type 6 Model Cabinet Assembly 70006-TS2/FL
1	Trafficware Type 16 Model MMU-516L-E
4	Trafficware TS2 BIU Model 130 with RS232 Port
16	NEMA Load Switch Caltrans
16	Two-Channel LCD Detectors
1	NEMA Flasher Caltran
6	Flash Transfer Relays
1	Luminaire Interface on Power Panel
1	Trafficware TS2 Cabinet Power Supply PS2D
1	32-Channel Loop Detector Panel w/32 SRA-6LC Surge Arrestors
1	Set of FL DOT Spec Load Resistors for Back Panel
1	Ball Bearing Roller Drawer
1	Interface Panel (Fiber Interface Panel, 12-position mounted in cabinet with cables to switch)
1	Express supply ITS 8020 with fiber and ethernet connection cables panel
1	Generator Plug-in Module
4	Complete sets of the cabinet wiring diagrams shall be provided with each cabinet and reflect intersection SOP. STD 8 mode will be used unless otherwise specified on the plans, including MMU certification results.
1	6-Port Minimum Tripp-Lite Surge Protection Panel
1	Cyberlock Traffic Cabinet, Electronic Cylinder Description Part # CL-TCI
1	All other components necessary or required to fulfill the functional intent of the City of Ocala Standard Traffic Control Cabinet specified herein.

- B. An Alpha Technologies FXM 1100 Uninterrupted Power Supply (UPS) with an Alpha Technologies SE48-1616 BBS enclosure and four (4) Alpha-Cell 100 XTV 12-volt batteries compatible with the City's existing UPS/BBS software.



## 2.4 VEHICLE AND PEDESTRIAN SIGNALS

### A. Vehicle Signal Displays:

1. All Vehicle Signal Displays shall be Dialight brand XLF of XOD series with tinted lenses or later, and conform to the latest edition of the MUTCD and Section 650 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
2. Back-plates shall be installed on each vehicle signal display.
3. Vehicular signal displays shall be manufactured of light weight die-cast aluminum and flat black in color.
4. With the exception of the Downtown area of the City of Ocala, 12-inch signal lenses shall be used in all vehicle signal displays.

### B. Pedestrian Signal Assembly:

1. Pedestrian signal assembly shall be Dialight brand “walking person” and “hand” icon pedestrian signal countdown modules in accordance with the latest edition of the MUTCD, Section 653 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition,) and the Institute of Transportation Engineers (ITE) Pedestrian Traffic Control Signal Indications - Part 2: Light Emitting Diode (LED) Pedestrian Signal Modules.

### C. Vehicle and Pedestrian Signal Disconnect Wiring:

1. Vehicle and Pedestrian Signal Disconnect Wiring shall conform to the City of Ocala Standards. Contact the Public Works Traffic Division (352-351-6733) for Mast Arm terminal blocks, vehicle disconnects, pedestrian and vehicle wirings, and terminal color codes.

## 2.5 MISCELLANEOUS SIGNAL/ITS DEVICES

### A. ITS Cameras:

1. ITS Cameras shall be compatible with the City’s existing video wall display software. Contact the Public Works Traffic Division (352-351-6733) for the currently approved manufacturers.

### B. Internally Illuminated LED Street Name Signs:

1. Internally illuminated LED street name signs shall be Transportation Control Systems Britelite TCSSIGNBL series.

### C. Vehicle And Pedestrian Detection:

1. For signalized intersection concrete strain pole with overhead wiring installations, vehicle detection shall be inductive loops.
2. For signalized intersection mast arm installations, vehicle detection shall be video detection. Video detection shall be Iteris Inc. and be compatible with the City’s existing video detection software. Contact the Public Works Traffic Division (352-351-6733) for the currently approved devices.
3. Pedestrian detectors shall be Polara Engineering BDL3 series piezo pushbutton.

- D. Travel Time Readers:
  - 1. Travel time reader shall be Iteris Inc. Vantage Velocity with short antennae kit, compatible with the City's existing travel time reader software.
- E. School Zone Clocks:
  - 1. School zone clocks shall be 110VAC powered Temple model FCU 500-071 A1 time switch, compatible with the City's existing school zone clock monitoring software.
- F. Mid-Block Pedestrian Crosswalk Assemblies:
  - 1. Mid-block pedestrian crosswalk assembly shall consist of a Tapco Rectangular Rapid Flashing Beacon RRFB-XL Enhanced Crosswalk System, 110VAC, no wireless.
- G. Signal Disconnect Hangers:
  - 1. Signal disconnect hangers shall be Engineered Castings 1150-18-T disconnect hanger.

## 2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## 2.7 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Provide shop inspection and testing of completed assembly.
- C. Owner Inspection:
  - 1. Make completed equipment available for inspection at manufacturer's factory prior to packaging for shipment.
  - 2. Notify Owner at least seven days before inspection is allowed.
- D. Certificate of Compliance:
  - 1. Submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that items provided by other Sections of Work are properly sized and located.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.
- B. Coordinate installation with Owner and Engineer.
  - 1. Confirm any required temporary traffic control measures are in place prior to beginning the Work.

### 3.3 INSTALLATION

- A. General: All construction of traffic signals of both public and private infrastructure improvements (facilities) shall comply with the following:
  - 1. Manual on Uniform Traffic Control Devices (MUTCD)
  - 2. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition)
  - 3. Florida Department of Transportation Design Standards (latest edition)
  - 4. The City-Approved Site Development Plans
- B. Install traffic controller cabinet such that the cabinet door opens away from the intersection and traffic.
- C. Leave one complete loop of signal cable in bottom floor of traffic controller cabinet prior to removing cable sheathing and terminating conductors.
- D. For strain pole overhead wiring installations, signal cable shall be lashed to messenger cable utilizing spiral cable wraps.
- E. Vehicle signal heads shall be hard wired from the disconnect, no jones plugs. Terminate any unused wires feeding each signal head at the disconnect terminal strip.
- F. Vehicle signal disconnect hanger doors shall open on the backside of the traffic signal.
- G. Vehicle signal disconnect hanger doors shall be installed with adjustable hangers and extension bars.
- H. UPS/BBS cabinet shall be installed piggyback on the side of the traffic controller cabinet.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Prepare test and inspection reports.
- D. Correct any deficiencies noted.

END OF SECTION



## **APPENDIX A**

### **STANDARD DETAILS FOR CONSTRUCTION**



**STANDARD DETAILS  
FOR CONSTRUCTION**

**GENERAL DIVISION**

## A

ABD.	=	ABANDON
AC.	=	ACRES
ACT.	=	ACTUAL
ADJ.	=	ADJUST
A.T.G.	=	ADJUST TO GRADE
ARV	=	AIR RELEASE VALVE
ALT.	=	ALTERNATE
ANSI	=	AMERICAN NATIONAL STANDARDS INSTITUTE
ASTM	=	AMERICAN STANDARDS FOR TESTING & MATERIALS
AWWA	=	AMERICAN WATER WORKS ASSOCIATION
APPRH.	=	APPROACH
APPR.	=	APPROVE
APPROX.	=	APPROXIMATE
A.	=	AREA
ACP	=	ASBESTOS CEMENT PIPE
ASPH.	=	ASPHALT
ASSEM.	=	ASSEMBLY
A.C.L.	=	ATLANTIC COASTLINE RAILROAD
AVE	=	AVENUE
A.D/W	=	ASPHALT DRIVEWAY

## B

BK.	=	BACK
B. TO B.	=	BACK TO BACK
BWF	=	BARBED WIRE FENCE
B/L	=	BASELINE
BRG.	=	BEARING
BEG.	=	BEGIN
BM	=	BENCH MARK
BIT.	=	BITUMINOUS
BCP	=	BITUMINOUS COATED PIPE
BL. W.	=	BLOCK WALL
BOV	=	BLOW OFF VALVE
BOT	=	BOTTOM
B. ELEV.	=	BOTTOM ELEVATION
BLVD	=	BOULEVARD
BLDG	=	BUILDING
BLKHD.	=	BULKHEAD
BV	=	BUTTERFLY VALVE
B.C.	=	BURIED CABLE
B.O.	=	BY OTHERS
B. & J.	=	BORE & JACK

## C

CATV	=	CABLE TELEVISION	COL.	=	COLUMN	CONT.	=	CONTINUE / CONTINUOUS
C.I.	=	CAST IRON	CO.	=	COMPANY	CONTR.	=	CONTRACT / CONTRACTOR
CIP	=	CAST IRON PIPE	CONC.	=	CONCRETE	CP	=	CONTROL POINT
CB.	=	CATCH BASIN	C.B.S.	=	CONCRETE BLOCK STRUCTURE	COORD.	=	COORDINATE
CTR.	=	CENTER	C. D/W	=	CONCRETE DRIVEWAY	COR.	=	CORNER
C/L OR CL	=	CENTERLINE	C. HDW.	=	CONCRETE HEADWALL	CMP	=	CORRUGATED METAL PIPE
C. TO C.	=	CENTER TO CENTER	CMON OR CM	=	CONCRETE MONUMENT	COV. CONC.	=	COVERED CONCRETE
CH.	=	CHAIN	C. PL.	=	CONCRETE PARKING LOT	CT.	=	COURT
CLF	=	CHAIN LINK FENCE	CONC. P.	=	CONCRETE POLE	CF	=	CUBIC FEET
CHAN.	=	CHANNEL	C. S/W	=	CONCRETE SIDEWALK	CFS	=	CUBIC FEET PER SECOND
C.V.	=	CHECK VALVE	CONN.	=	CONNECTION	CY	=	CUBIC YARDS
CHD.	=	CHORD	CONST.	=	CONSTRUCT / CONSTRUCTION	CULV.	=	CULVERT
CIR.	=	CIRCLE				C & G	=	CURB & GUTTER



CITY ENGINEER'S OFFICE  
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OCALA, FLORIDA 34470

## CITY OF OCALA STANDARD DETAILS FOR CONSTRUCTION

## ABBREVIATIONS

(LETTERS A THROUGH C)

SECTION:  
GENERAL

G-1A

REVISION DATE:  
DEC 2020

## D

DLP = DECORATIVE LAMP POST	DIM. = DIMENSION	D.R.A. OR DRA = DRAINAGE RETENTION AREA
D.B. = DEED BOOK	DIR. = DIRECTION	DWG. = DRAWING
D. = DEGREE OF CURVE	D. D/W = DIRT DRIVEWAY	DR. = DRIVE
DEG. = DEGREES	D/R = DIRT ROAD	D/W = DRIVEWAY
DEPT. = DEPARTMENT	D. S/W = DIRT SIDEWALK	D/IN. = DROP INLET
DOT = DEPARTMENT OF TRANSPORTATION	DIST. = DISTANCE	DROP OR D/C = DROP CONNECTION
(D) OR DESC. = DESCRIPTION	DIT. = DITCH	D/MH = DROP MANHOLE
D.H.W. = DESIGN HIGH WATER	DBL. = DOUBLE	DIP = DUCTILE IRON PIPE
DIAG. = DIAGONAL	DRN. = DRAIN	

## E

EA. = EACH	ELLIP. = ELLIPTICAL	EST. = ESTIMATE
ESMT. = EASEMENT	EMBK. = EMBANKMENT	ETC. = ET CETERA
E/L = EASEMENT LINE	EMUL. = EMULSIFIED	EXC. = EXCAVATE
E = EAST	ENCL. = ENCLOSURE	EX. OR EXIST. = EXISTING
E.B.L. = EASTBOUND LANE	E.O.S. = END OF SURVEY	EG = EXISTING GRADE
E/P OR EOP = EDGE OF PAVEMENT	E.W. = END WALL	EXP. = EXPANSION
ELEC. = ELECTRIC	ENG. = ENGINEER	EXP. JT. = EXPANSION JOINT
EMS = ELECTRONIC MARKING SYSTEM	ENT. = ENTRANCE	EXT. = EXTENSION
EL. OR ELEV. = ELEVATION	EQ. = EQUAL	EA. W. = EACH WAY
	EQUIP. = EQUIPMENT	

## F

F. TO F. = FACE TO FACE	FB = FIELD BOOK	FM = FORCE MAIN
FED. = FEDERAL	FIN. = FINISH	FT. = FORT
F.A. = FEDERAL AID	FFE = FINISHED FLOOD ELEVATION	FCM OR F.CMON = FOUND CONCRETE MONUMENT
F.A.P. = FEDERAL AID PROJECT	FH = FIRE HYDRANT	FD.I.P. = FOUND IRON PIPE
F.H.W.A. = FEDERAL HIGHWAY ADMINISTRATION	FES = FLARED END SECTION	FD. N&D = FOUND NAIL & DISK
FT. = FEET	FLEX. = FLEXIBLE	FOUND. = FOUNDATION
FT/FT = FEET PER FOOT	FLR. = FLOOR	FR. = FRAME
FT/MIN. = FEET PER MINUTE	FDOT = FLORIDA DEPARTMENT OF TRANSPORTATION	F&G = FRAME & GATE
FT/S. = FEET PER SECOND	F.L. = FLOW LINE	FURN. = FURNISH
FNC OR FEN. = FENCE	F/H = FLUSH HEADER	F&I = FURNISH & INSTALL
FERT. = FERTILIZE	F.P. = FLUSHING POINT	FUT. = FUTURE
	FTG. = FOOTING	



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### CITY OF OCALA STANDARD DETAILS FOR CONSTRUCTION

## ABBREVIATIONS

(LETTERS D THROUGH F)

SECTION:  
GENERAL

**G-1B**

REVISION DATE:  
DEC 2020



G		H		I	
GAL.	= GALLON	HDPE	= HIGH-DENSITY POLYETHYLENE PIPE	INL	= INLET
GALV.	= GALVANIZED	HWY	= HIGHWAY	INV	= INVERT
GIP	= GALVANIZED IRON PIPE			IRR.	= IRRIGATION
GL	= GAS LINE				
GM	= GAS MAIN				
G/S	= GAS SERVICE				
GV	= GAS VALVE				
GR.	= GRADE				
GRT	= GRATE				
GRD.	= GROUND				
G.RAIL	= GUARD RAIL				
GUT.	= GUTTER				
GA.	= GUY ANCHOR				
G/W	= GUY WIRE				
G/P	= GUY POLE				
GPD	= GALLONS PER DAY				
GPH	= GALLONS PER HOUR				
GPM	= GALLONS PER MINUTE				
R		S		T	
RR	= RAILROAD	SAN. OR SS	= SANITARY SEWER	TEL	= TELEPHONE
RLS	= REGISTERED LAND SURVEYOR	SSMH	= SANITARY SEWER MANHOLE	TOS	= TOE OF SLOPE
RCP	= REINFORCED CONCRETE PIPE	SPRK	= SPRINKLER	TOB	= TOP OF BASIN
R/W OR ROW	= RIGHT-OF-WAY	SPC	= STATE PLANE COORDINATES	TRAF.	= TRAFFIC
RD	= ROAD	STM	= STORMWATER	TS	= TRAFFIC SIGN
R&C	= ROD & CAP	SMH	= STORMWATER MANHOLE	TRANS.	= TRANSFORMER
		ST	= STREET	TRANS P.	= TRANSPORTATION
		SF	= SQUARE FEET		
U		V		W	
UG	= UNDERGROUND	VCP	= VITRIFIED CLAY PIPE	WL	= WATER LINE
UGE	= UNDERGROUND ELECTRIC			WM	= WATER MAIN
UGT	= UNDERGROUND TELEPHONE			W/S	= WATER SERVICE
UGE	= UNDERGROUND ELECTRIC			WV	= WATER VALVE
U.E.	= UTILITY EASEMENT			W	= WEST



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## CITY OF OCALA STANDARD DETAILS FOR CONSTRUCTION

# ABBREVIATIONS

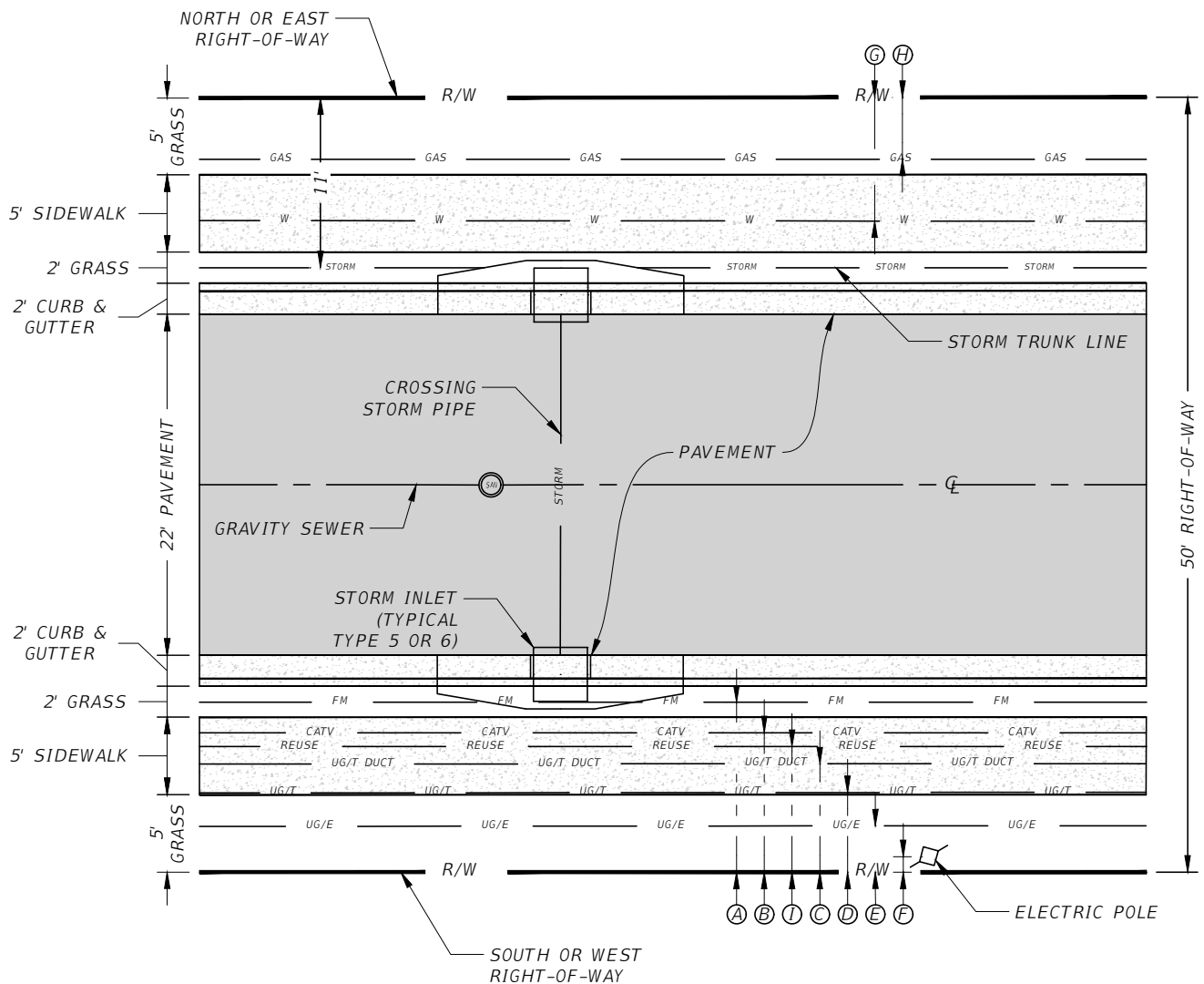
(LETTERS G THROUGH W)

SECTION:  
GENERAL

G-1C

REVISION DATE:  
DEC 2020

UTILITY	DIMENSION SYMBOL	LOCATION	UNDERGROUND DEPTH
FORCE MAIN	A	11'	48"
CABLE TV	B	9'	24"
TELEPHONE CONDUIT	C	7'	30"
TELEPHONE CABLE	D	5'	30"
ELECTRIC CONDUIT	E	3'	36"
ELECTRIC POLE	F	1'	---
SANITARY SEWER	---	CENTER	VARIES
WATER	G	8'	36"
GAS	H	4'	36"
REUSE FORCE MAIN	I	---	---



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

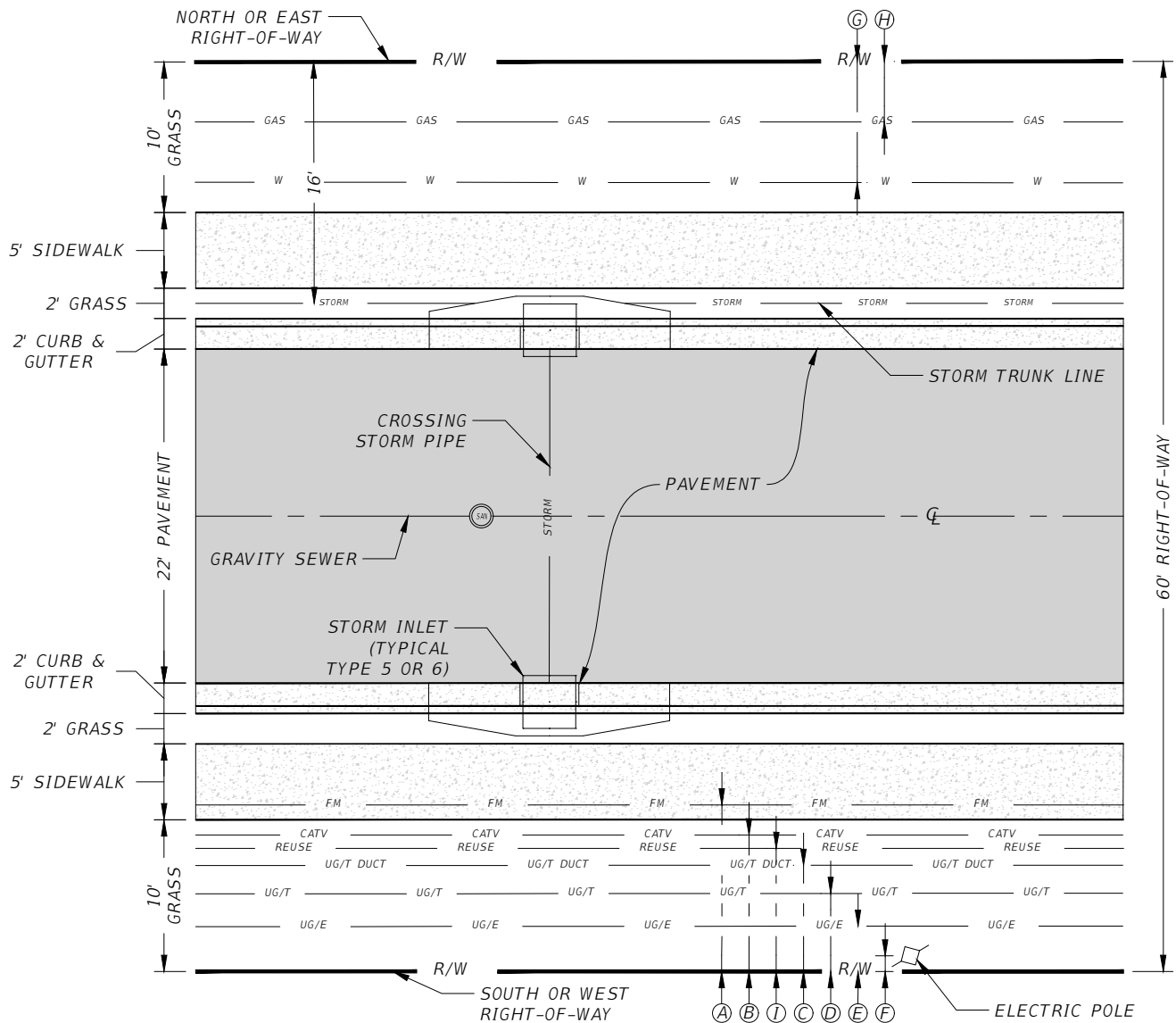
TYPICAL UTILITY  
LOCATIONS IN 50'  
RIGHT-OF-WAY WITH  
CURB & GUTTER

SECTION:  
GENERAL

G-2

REVISION DATE:  
DEC 2020

UTILITY	DIMENSION SYMBOL	LOCATION	UNDERGROUND DEPTH
FORCE MAIN	A	11'	48"
CABLE TV	B	9'	24"
TELEPHONE CONDUIT	C	7'	30"
TELEPHONE CABLE	D	5'	30"
ELECTRIC CONDUIT	E	3'	36"
ELECTRIC POLE	F	1'	---
SANITARY SEWER	---	CENTER	VARIES
WATER	G	8'	36"
GAS	H	4'	36"
REUSE FORCE MAIN	I	---	---



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

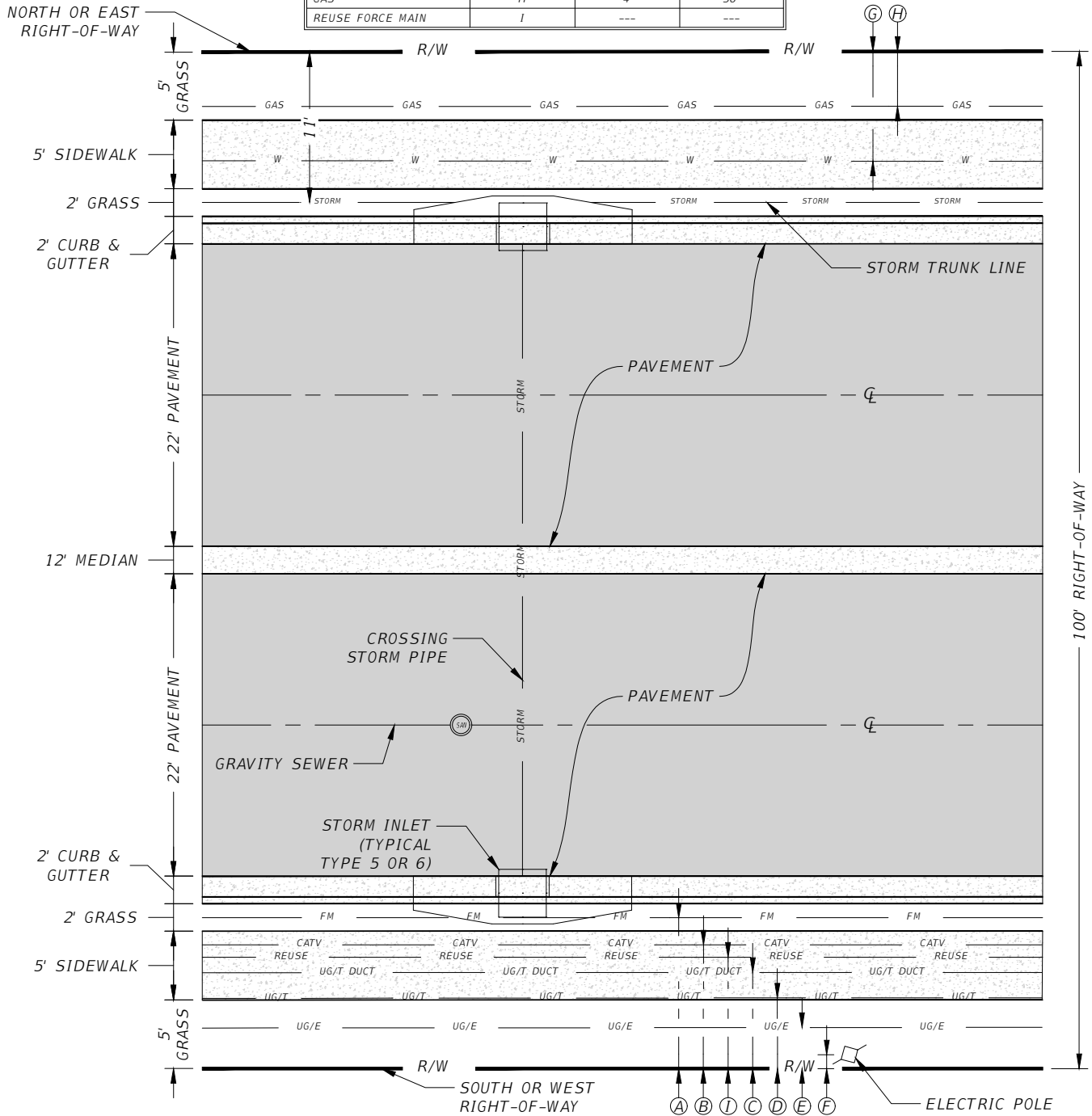
TYPICAL UTILITY  
LOCATIONS IN 60'  
RIGHT-OF-WAY WITH  
CURB & GUTTER

SECTION:  
GENERAL

G-3

REVISION DATE:  
DEC 2020

UTILITY	DIMENSION SYMBOL	LOCATION	UNDERGROUND DEPTH
FORCE MAIN	A	11'	48"
CABLE TV	B	9'	24"
TELEPHONE CONDUIT	C	7'	30"
TELEPHONE CABLE	D	5'	30"
ELECTRIC CONDUIT	E	3'	36"
ELECTRIC POLE	F	1'	---
SANITARY SEWER	---	CENTER	VARIES
WATER	G	8'	36"
GAS	H	4'	36"
REUSE FORCE MAIN	I	---	---



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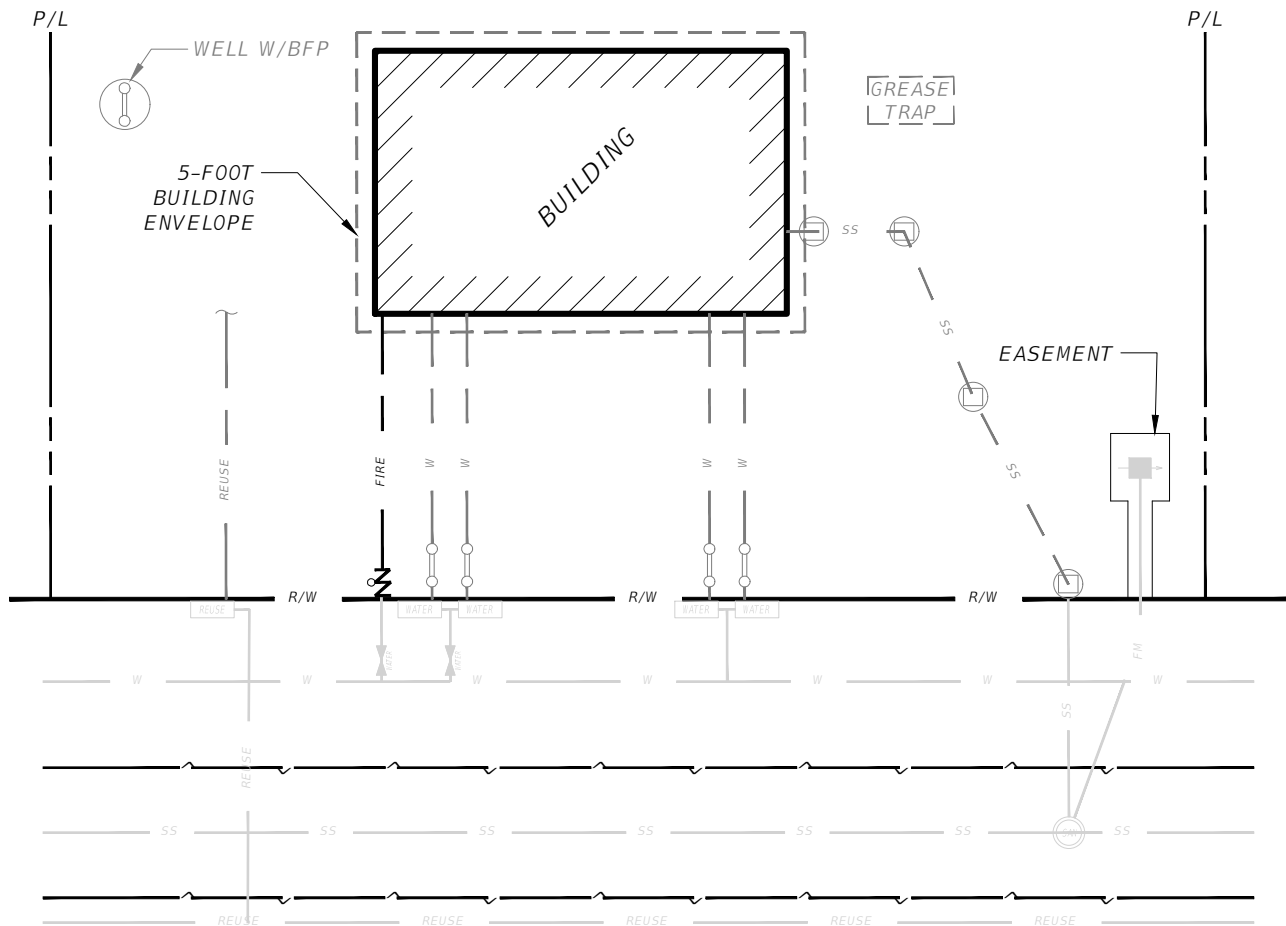
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

TYPICAL UTILITY  
LOCATIONS IN 100'  
RIGHT-OF-WAY WITH  
CURB & GUTTER

SECTION:  
GENERAL

G-4

REVISION DATE:  
DEC 2020



### NOTES:

1. ALL BACKFLOW PREVENTERS, FIRE DEPARTMENT CONNECTIONS AND DOUBLE DETECTOR CHECK ASSEMBLIES SHALL ALL BE OWNED AND MAINTAINED BY THE DEVELOPMENT.

### LEGEND

SANITARY SEWER MANHOLE	SANITARY LIFT STATION
SANITARY SEWER CLEANOUT	WATER METER
BACKFLOW PREVENTER (BFP)	DOUBLE DETECTOR CHECK

### MAINTENANCE / INSPECTION DATA

	CITY OWNS / BUILDING DEPT. INSPECTS
	CITY OWNS / WATER RESOURCES DEPT. INSPECTS
	DEVELOPMENT OWNS / BUILDING DEPT. INSPECTS
	DEVELOPMENT OWNS / WATER RESOURCES DEPT. INSPECTS
	CITY OWNS / FIRE DEPT. INSPECTS
	DEVELOPMENT OWNS / FIRE DEPT. INSPECTS



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

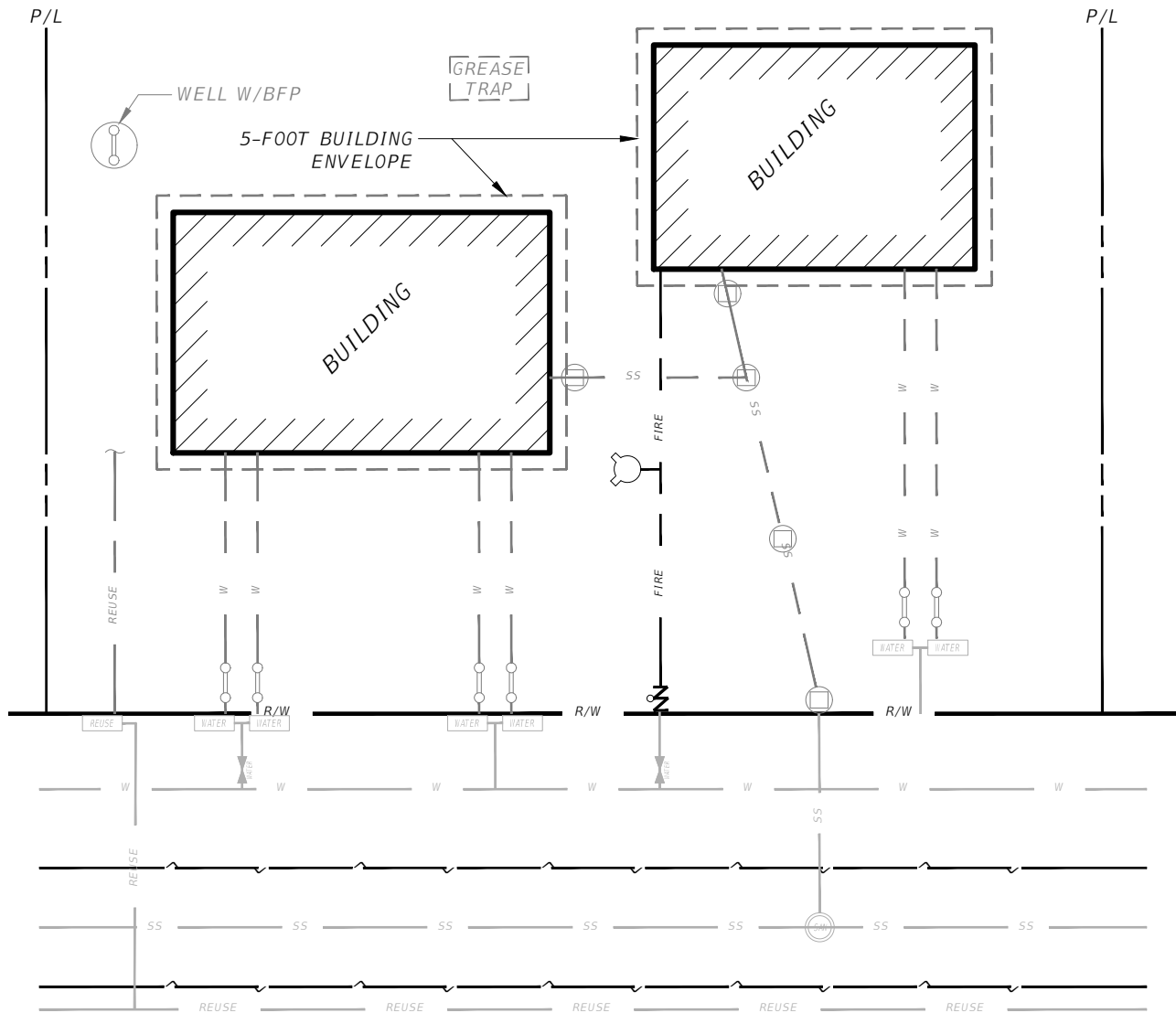
## SITE OWNERSHIP AND INSPECTION

SINGLE BUILDING SITE

SECTION:  
GENERAL

G-5

REVISION DATE:  
DEC 2020



#### NOTES:

1. ALL BACKFLOW PREVENTERS, FIRE DEPARTMENT CONNECTIONS AND DOUBLE DETECTOR CHECK ASSEMBLIES SHALL ALL BE OWNED AND MAINTAINED BY THE DEVELOPMENT.

#### LEGEND

- SANITARY SEWER MANHOLE  
 SANITARY SEWER CLEANOUT  
 BACKFLOW PREVENTER (BFP)  
 FIRE HYDRANT  
 WATER METER  
 DOUBLE DETECTOR CHECK

#### MAINTENANCE / INSPECTION DATA

- CITY OWNS / BUILDING DEPT. INSPECTS  
 CITY OWNS / WATER RESOURCES DEPT. INSPECTS  
 DEVELOPMENT OWNS / BUILDING DEPT. INSPECTS  
 DEVELOPMENT OWNS / WATER RESOURCES DEPT. INSPECTS  
 CITY OWNS / FIRE DEPT. INSPECTS  
 DEVELOPMENT OWNS / FIRE DEPT. INSPECTS



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## SITE OWNERSHIP AND INSPECTION

MULTIPLE BUILDING SITE

SECTION:  
GENERAL

G-6

REVISION DATE:  
DEC 2020

**WATER, SEWER, AND REUSE SYSTEM**  
**CONSTRUCTION, INSPECTION, AND OWNERSHIP NOTES:**

UNDERGROUND WATER, SEWER, FIRE, REUSE AND IRRIGATION SYSTEMS CONSTRUCTED ON THIS SITE SHALL BE CONSTRUCTED, TESTED, INSPECTED, OWNED, AND MAINTAINED IN ACCORDANCE WITH THE FOLLOWING:

**SEWER SYSTEM:**

CITY OF OCALA "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF STREETS, STORMWATER, TRAFFIC, WATER, AND SEWER INFRASTRUCTURE".

CONSTRUCT ALL GRAVITY SEWERS 8" AND ABOVE, INCLUDING MANHOLES AND ALL SEWER SERVICES 6" OR LESS TO THE FIRST CLEANOUT UPSTREAM FROM THE 8" OR ABOVE SEWER MAIN WITHIN THE RIGHTS-OF-WAY, TO CITY STANDARDS. THESE ELEMENTS SHALL BE OWNED, MAINTAINED, AND INSPECTED BY THE CITY OF OCALA WATER RESOURCES DEPARTMENT.

ALL GRAVITY SEWER SERVICE 8" OR MORE, INCLUDING MANHOLES, LOCATED ON PRIVATE PROPERTY SHALL BE OWNED AND MAINTAINED BY THE DEVELOPMENT AND SHALL BE BUILT IN ACCORDANCE WITH THESE STANDARD SPECIFICATIONS FOR CONSTRUCTION. THE CITY OF OCALA WATER RESOURCES DEPARTMENT WILL INSPECT ALL SUCH SERVICES TO WITHIN 5 FEET OF THE BUILDING.

STATE OF FLORIDA "STANDARD PLUMBING CODE".

ALL GRAVITY SEWER SERVICES 6" OR LESS LOCATED ON THE PROPERTY SHALL BE OWNED AND MAINTAINED BY THE DEVELOPMENT. THE CITY OF OCALA BUILDING DEPARTMENT WILL INSPECT ALL SUCH SERVICES ON PRIVATE PROPERTY.

**WATER SYSTEM:**

CITY OF OCALA "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF STREETS, STORMWATER, TRAFFIC, WATER, AND SEWER INFRASTRUCTURE".

CONSTRUCT ALL POTABLE WATER MAINS AND SERVICES IN THE RIGHT-OF-WAY, UP TO THE POINT OF METERING, TO CITY STANDARDS. INSPECTION WILL BE PERFORMED BY THE WATER RESOURCES DEPARTMENT. CITY WILL OWN AND MAINTAIN THESE FACILITIES.

ALL FIRE MAINS AND HYDRANTS, FROM THE CITY WATER MAIN TO WITHIN FIVE FEET (5') OF THE BUILDING, SHALL BE CONSTRUCTED TO CITY STANDARDS OR NFPA 24 AS REQUIRED. FIRE MAINS LOCATED WITHIN PUBLIC RIGHT-OF-WAY WILL BE OWNED AND MAINTAINED BY THE CITY, AND ALL FIRE MAINS LOCATED ON PRIVATE PROPERTY WILL BE OWNED AND MAINTAINED BY THE DEVELOPMENT. INSPECTION AND TESTING OF ALL FIRE MAINS UP TO THE DOUBLE DETECTOR CHECK (DDC) WILL BE PERFORMED BY THE CITY OF OCALA WATER RESOURCES DEPARTMENT.

STATE OF FLORIDA "STANDARD PLUMBING CODE".

ALL WATER SERVICES ON PRIVATE PROPERTY DOWNSTREAM FROM THE POINT OF METERING SHALL BE CONSTRUCTED TO THE FLORIDA STANDARD PLUMBING CODE, LATEST EDITION. INSPECTIONS AND TESTING WILL BE PERFORMED BY THE CITY OF OCALA BUILDING DEPARTMENT. THESE FACILITIES SHALL BE OWNED AND MAINTAINED BY THE DEVELOPMENT.

**REUSE SYSTEM:**

CITY OF OCALA "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF STREETS, STORMWATER, TRAFFIC, WATER, AND SEWER INFRASTRUCTURE".

CONSTRUCT ALL REUSE MAINS AND SERVICES IN THE RIGHT-OF-WAY, UP TO THE POINT OF METERING, TO CITY STANDARDS. INSPECTION WILL BE PERFORMED BY THE CITY OF OCALA WATER RESOURCES DEPARTMENT. CITY WILL OWN AND MAINTAIN THESE FACILITIES.

STATE OF FLORIDA "STANDARD PLUMBING CODE".

ALL REUSE SERVICES ON PRIVATE PROPERTY DOWNSTREAM FROM THE POINT OF METERING SHALL BE CONSTRUCTED TO THE FLORIDA STANDARD PLUMBING CODE, LATEST EDITION. INSPECTIONS AND TESTING WILL BE PERFORMED BY THE CITY OF OCALA BUILDING DEPARTMENT. THESE FACILITIES SHALL BE OWNED AND MAINTAINED BY THE DEVELOPMENT.

**IRRIGATION SYSTEM:**

CITY OF OCALA "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF STREETS, STORMWATER, TRAFFIC, WATER, AND SEWER INFRASTRUCTURE".

CONSTRUCT ALL IRRIGATION MAINS AND SERVICES IN THE RIGHT-OF-WAY, UP TO THE POINT OF METERING, TO CITY STANDARDS. INSPECTION WILL BE PERFORMED BY THE CITY OF OCALA WATER RESOURCES DEPARTMENT. CITY WILL OWN AND MAINTAIN THESE FACILITIES.

STATE OF FLORIDA "STANDARD PLUMBING CODE".

ALL IRRIGATION PIPING ON PRIVATE PROPERTY DOWNSTREAM FROM THE POINT OF METERING SHALL BE CONSTRUCTED TO THE FLORIDA STANDARD PLUMBING CODE, LATEST EDITION. INSPECTION WILL BE PERFORMED BY THE CITY OF OCALA BUILDING DEPARTMENT. THESE FACILITIES SHALL BE OWNED AND MAINTAINED BY THE DEVELOPMENT.

**PRE-CONSTRUCTION MEETING REQUIRED:**

PRIOR TO ANY UNDERGROUND WATER, SEWER, REUSE, OR IRRIGATION CONSTRUCTION ON THIS SITE THE CONTRACTOR SHALL SET UP AN ON-SITE MEETING WITH THE CITY OF OCALA PROJECT INSPECTORS (352) 401-6935 OR (352) 351-6712 TO DISCUSS SHOP DRAWINGS, INSTALLATION, INSPECTION, TESTING AND AS-BUILT REQUIREMENTS.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

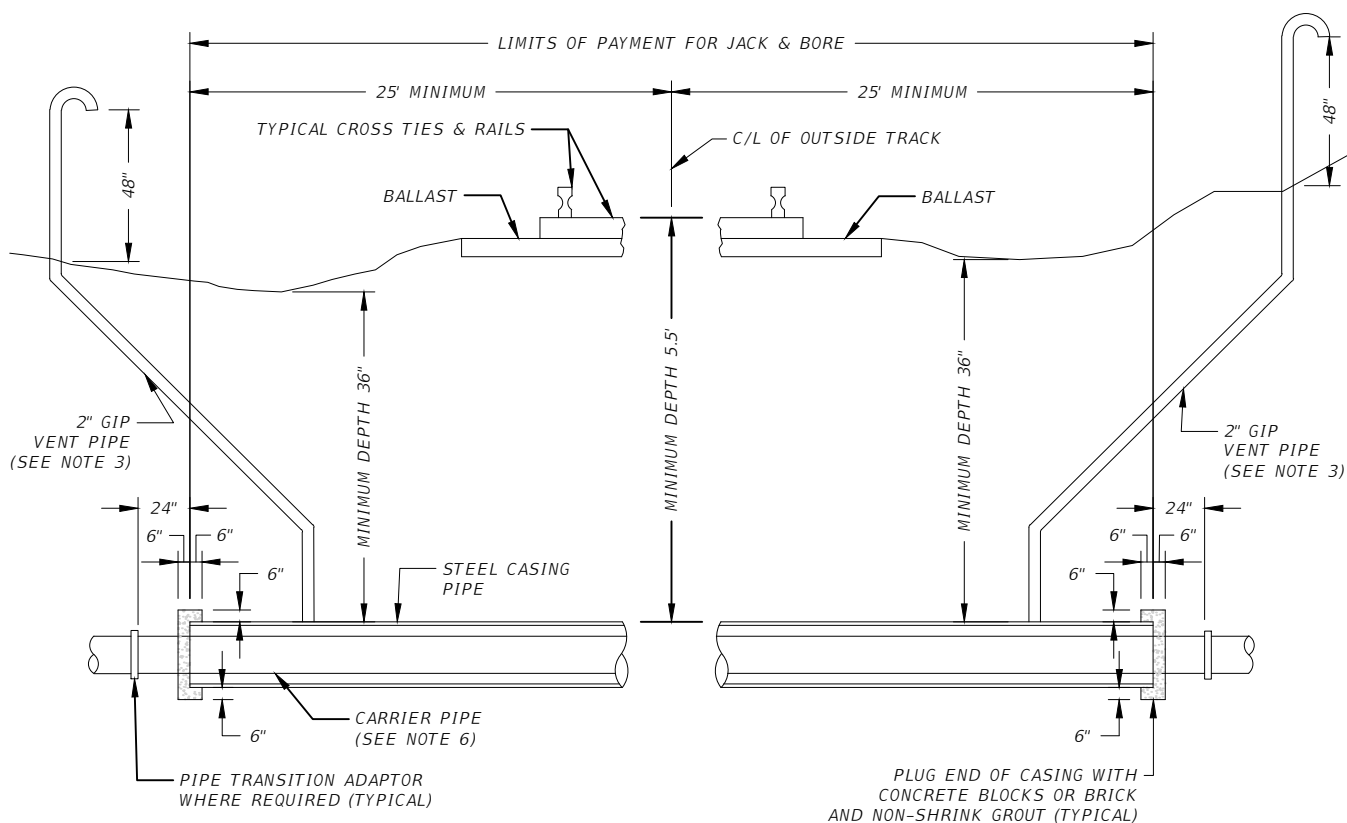
**SITE OWNERSHIP  
AND INSPECTION**

GENERAL NOTES

SECTION:  
GENERAL

**G-7**

REVISION DATE:  
DEC 2020



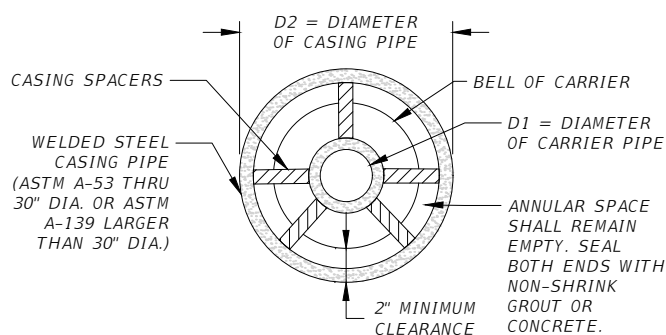
**CARRIER PIPE AND CASING PIPE SIZES (MIN)**

CARRIER PIPE NOMINAL DIAMETER (D1)	4	6	8	10	12	14	16	18	20	24	30	36	42
CASING PIPE NOMINAL DIA (D2)	18	18	18	24	24	30	30	36	36	48	48	54	60
WALL THICKNESS-INCHES	0.31	0.31	0.31	0.33	0.33	0.38	0.38	0.42	0.42	0.52	0.52	0.58	0.61

## NOTES

1. ALL REQUIREMENTS OF THE RAILROAD AS SPECIFIED BY THE AMERICAN RAILWAY ENGINEERING ASSOCIATION AND THE RAILROAD COMPANY SHALL BE ADHERED TO WHEN CROSSING RAILROADS. THE MORE STRINGENT REQUIREMENTS BETWEEN THE R/R AND THE CITY OF OCALA SHALL GOVERN IN ALL CASES.
2. THE INSIDE DIAMETER OF THE CASING SHALL BE A MINIMUM OF 6" GREATER THAN THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL OR COUPLING.
3. CASING FOR THE FORCE MAIN AND GRAVITY SEWER SHALL BE INSTALLED WITH A 2" VENT PIPE, WHERE REQUIRED, AT ONE END EXTENDING NOT LESS THAN 4' ABOVE GROUND SURFACE, AND ABOVE THE MAXIMUM ELEVATION OF HIGH WATER. THE TOP OF THE VENT PIPE SHALL BE FITTED WITH DOWN TURNED ELBOW PROPERLY SCREENED. THE VENT PIPE SHALL BE SCHEDULE NO. 40 GALVANIZED STEEL. VENT PIPE FOR WATER MAIN AND REUSE MAIN CASING IS NOT REQUIRED.
4. PAYMENT FOR BORE AND JACK SHALL INCLUDE CASING, END ENCASEMENTS, CARRIER PIPE, TRANSITION ADAPTORS, VENT PIPES AND SPACERS.
5. INSTALL CASING SPACERS TO PROVIDE A MINIMUM OF THREE PER JOINT OF PIPE. INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS.
6. WATER MAIN, FORCE MAIN, AND REUSE MAIN PIPING INSIDE CASING IS TO BE RESTRAINED JOINT PIPING.

## CROSS-SECTION



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STANDARD DETAILS  
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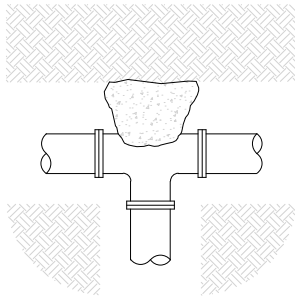
# RAILROAD JACKING & BORING

SECTION:  
GENERAL

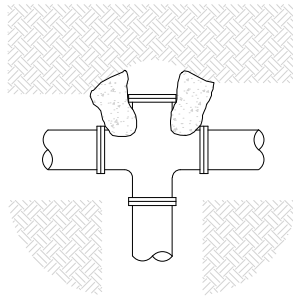
G-8

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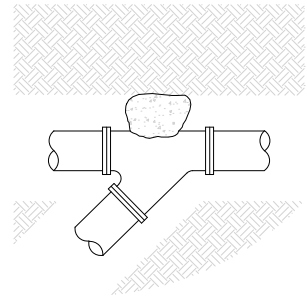




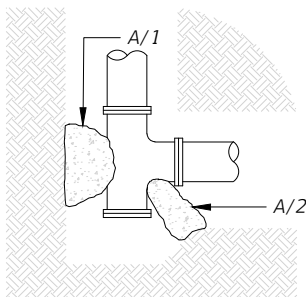
TEE



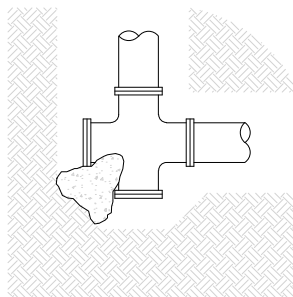
PLUGGED CROSS #1



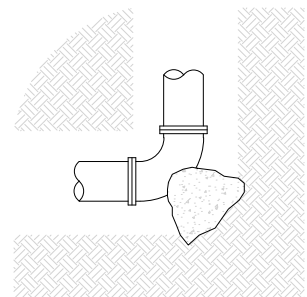
WYE



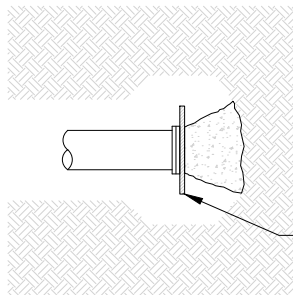
PLUGGED TEE



PLUGGED CROSS #2



BEND



$\frac{1}{4}$ " PLYWOOD OVER  
FACE OF BOLTS

PLUG

### NOTES

1. BEARING AREA OF THRUST BLOCK SHALL NOT BE LESS THAN 1.0 SQ. FT. BEARING AREA SHALL HAVE EQUAL HEIGHT AND WIDTH.
2. ALLOWABLE SOIL BEARING STRESS IS 2000 LBS. / SQ. FT.
3. BEARING AREAS, VOLUMES, AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER THIS STANDARD. THRUST BLOCKS FOR VERTICAL BENDS HAVING DOWNWARD RESULTANT THRUSTS SHALL BE THE SAME AS FOR HORIZONTAL BENDS. BEARING AREAS FOR HORIZONTAL BEND THRUST BLOCKS ARE BASED ON TEST PRESSURE OF 150 PSIG, AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 LBS. / SQ. FT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, MULTIPLY TABLE VALUES BY THE FACTOR (  $P' / S'g$ ). WHERE:  $P'$  = ACTUAL TEST PRESSURE (PSIG) AND  $S'g$  = ACTUAL OR BEARING PRESSURE (PSF).



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## THRUST BLOCKS

CAST-IN-PLACE

SECTION:  
GENERAL

G-9A

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**BEARING AREA OF THRUST BLOCKS IN  
SQUARE FEET (HORIZONTAL BENDS)**

FITTING SIZE	TEE, WYE, PLUG, OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED RUN		BEND ANGLE		
			A1	A2	45°	22½°	11¼°
4"	1.0	1.4	1.9	1.4	1.0	---	---
6"	2.1	3.0	4.3	3.0	1.6	1.0	---
8"	3.8	5.3	7.6	5.4	2.9	1.5	1.0
10"	5.9	8.4	11.8	8.4	4.6	2.4	1.2
12"	8.5	12.0	17.0	12.0	6.6	3.4	1.7
14"	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16"	15.0	21.3	30.0	21.3	11.6	6.0	3.0
18"	19.0	27.0	38.0	27.0	14.6	7.6	3.8
20"	23.5	33.3	47.0	33.3	18.1	9.4	4.7
24"	34.0	48.0	68.0	48.0	26.2	13.6	6.8

**VOLUME OF THRUST BLOCKS IN CUBIC YARDS**

FITTING SIZE	TEE, WYE, PLUG, OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED RUN		BEND ANGLE		
			A1	A2	45°	22½°	11¼°
4"	0.075	0.075	0.075	0.075	0.075	0.075	0.075
6"	0.10	0.15	0.35	0.25	0.09	0.075	0.075
8"	0.25	0.35	0.575	0.40	0.10	0.15	0.075
10"	0.45	0.60	1.00	0.60	0.35	0.20	0.10
12"	0.75	1.00	1.75	1.25	0.50	0.25	0.15
14"	1.25	1.50	2.00	1.75	0.75	0.35	0.25
16"	1.65	2.00	3.00	2.00	1.10	0.50	0.35
18"	2.25	2.75	4.00	2.75	1.75	0.80	0.45
20"	3.50	4.25	5.50	4.25	2.50	1.30	0.70
24"	5.00	6.00	7.50	6.00	4.00	2.00	1.00

**NOTES**

**(CONTINUED FROM DETAIL G-9A)**

- REQUIRED VOLUMES OR BEARING AREAS AT FITTINGS SHALL BE AS INDICATED BELOW AND ADJUSTED, IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED IN THE SPECIFICATIONS.
- KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES.
- ALL PLUGS, CAPS, TEES, AND BENDS DEFLECTING 11-DEGREES OR MORE ON MAINS 2-INCHES IN DIAMETER OR LARGER SHALL BE PROVIDED WITH SUITABLE ANCHORAGE CONSISTING OF THRUST BLOCKS OR RESTRAINED JOINTS. ALL RESTRAINED JOINT LENGTHS AS SPECIFIED IN THE TABLE ARE FOR ONE RESTRAINT DIRECTION. ALL PIPING TRANSITIONS SHALL BE RESTRAINED IN BOTH DIRECTIONS.



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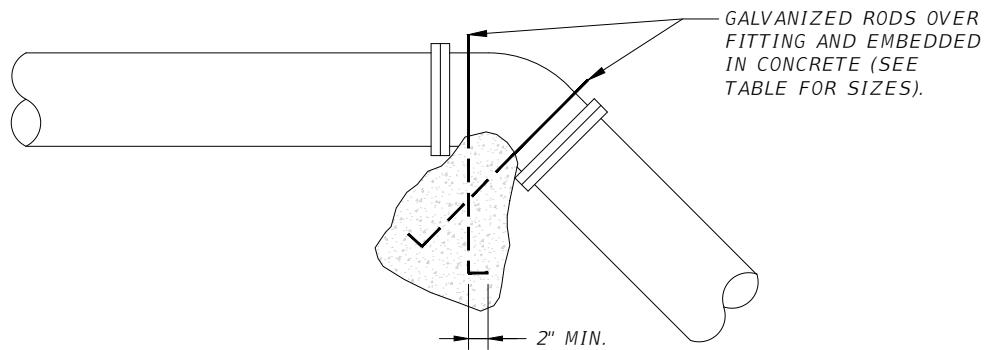
**THRUST BLOCKS**

CAST-IN-PLACE

SECTION:  
GENERAL

**G-9B**

REVISION DATE:  
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VOLUME OF THRUST BLOCK IN CUBIC FEET (VERTICAL BENDS)			
FITTING SIZE	BEND ANGLE		
	45°	22½°	11¼°
4"	1.1	0.4	0.2
6"	2.7	1.0	0.4
8"	4.0	1.5	0.6
10"	6.0	2.3	0.9
12"	8.5	3.2	1.3
14"	11.5	4.3	1.8
16"	14.8	5.6	2.3

ANCHOR ROD SIZES		
FITTING SIZE	ROD SIZE	EMBEDMENT
12" OR LESS	#6	30"
14" - 16"	#8	36"

### NOTES

- THRUST BLOCK VOLUMES FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS ARE BASED ON TEST PRESSURE OF 150 PSIG AND THE WEIGHT OF CONCRETE (4,050 LBS. / CU. YD.) TO COMPUTE VOLUMES FOR DIFFERENT TEST PRESSURES, USE THE FOLLOWING EQUATION: VOLUME = (TEST PRESSURE / 150 x TABLE VALUE).
- KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES.
- THRUST BLOCKS FOR VERTICAL BENDS HAVING DOWNWARD RESULTANT THRUSTS SHALL BE THE SAME AS FOR HORIZONTAL BENDS.
- BEARING AREA VOLUMES, AND SPECIAL BLOCKING DETAILS SHOWN ON THE PLANS TAKE PRECEDENCE OVER THE STANDARD.



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## THRUST BLOCKS

ANCHORED

SECTION:  
GENERAL

G-10

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**THRUST RESTRAINT TABLE FOR  
D.I.P. HORIZONTAL FITTINGS IN FEET**

NOMINAL PIPE DIAMETER	TEE, 90° BEND	45° BEND	22½° BEND	11¼° BEND	PLUG
4" - 6"	40	20	20	20	80
8"	60	40	20	20	100
12"	80	40	20	20	140
16"	120	60	40	20	180
18"	140	80	40	20	220
24" - 30"	160	80	40	20	300
36"	180	80	40	20	360

**NOTES**

1. MINIMUM RESTRAINED LENGTH SHALL BE ALWAYS 20 FEET.
2. IN-LINE VALVES AND THROUGH RUN OF TEES OUTSIDE LIMITS OF RESTRAINED JOINTS FROM OTHER FITTINGS NEED NOT BE RESTRAINED UNLESS OTHERWISE INDICATED ON THE DRAWINGS.



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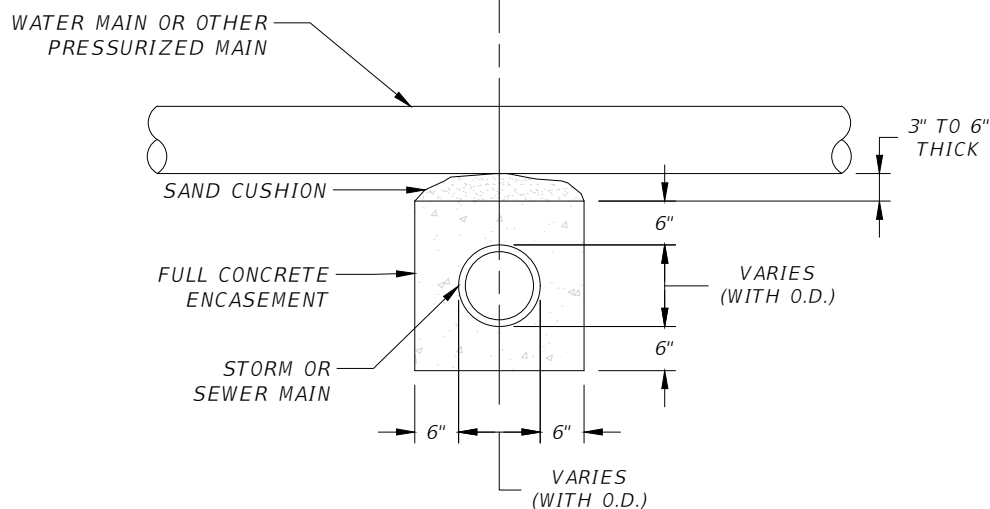
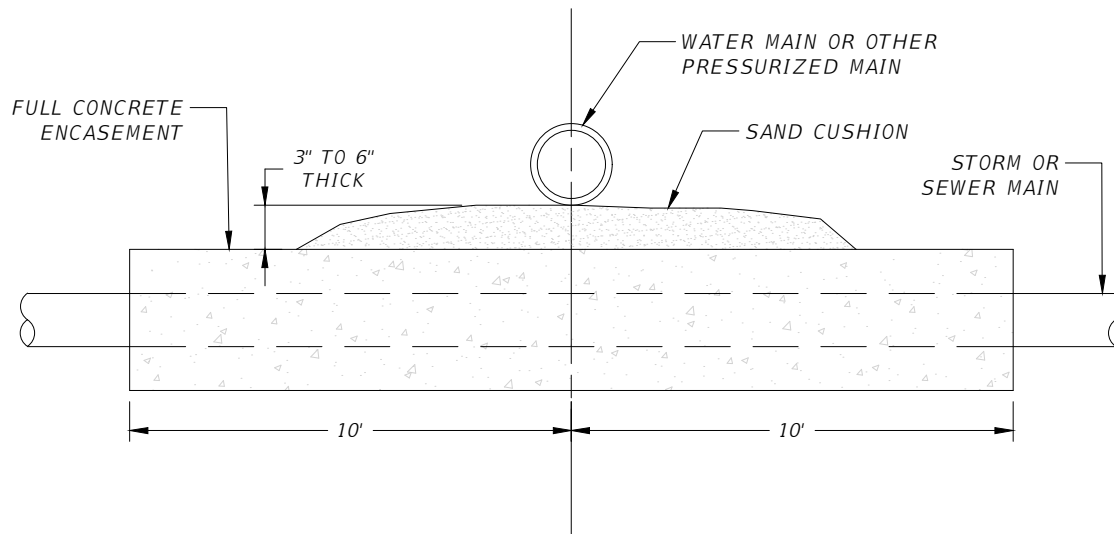
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**RESTRAINED  
JOINT SYSTEM**

SECTION:  
GENERAL

**G-11**

REVISION DATE:  
DEC 2020



### NOTES

1. USE CONCRETE ENCASEMENT WHERE VERTICAL CLEARANCE BETWEEN A WATER MAIN OR OTHER PRESSURIZED MAIN AND A STORM OR SEWER MAIN IS 12" OR LESS.
2. WHEN CROSSING STORM OR SEWER, ONE FULL JOINT OF WATER MAIN OR OTHER PRESSURIZED MAIN SHALL BE CENTERED OVER THE STORM OR SEWER MAIN.
3. CONCRETE FOR ENCASEMENT SHALL BE 3000 PSI.



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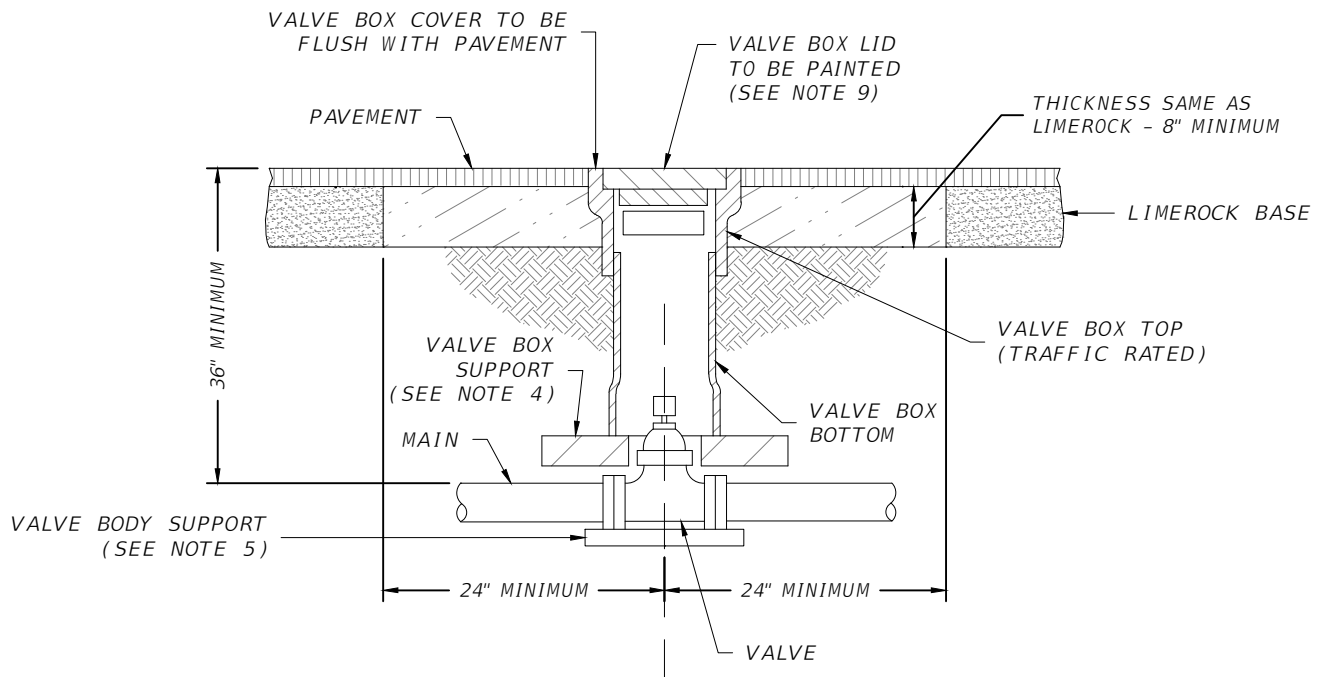
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## CONCRETE ENCASEMENT

SECTION:  
GENERAL

G-12

REVISION DATE:  
DEC 2020



### NOTES

1. WHERE ONE VALVE BOX EXTENSION IS REQUIRED USE STANDARD VALVE BOX EXTENSION.
2. WHERE MORE THAN ONE VALVE BOX EXTENSIONS ARE REQUIRED USE 6" D.I.P. CUT TO PROPER LENGTH SO VALVE BOX BOTTOM IS ONE CONTINUOUS SECTION.
3. VALVE BOX LID TO BE FURNISHED WITH THE WORD "WATER", FOR WATER MAIN INSTALLATION, "SEWER" FOR FORCE MAIN INSTALLATION, "REUSE" FOR REUSE MAIN INSTALLATION, OR "FIRE" FOR DEDICATED FIRE MAIN INSTALLATION.
4. FOR ALL VALVES USE SOLID COMMON BRICKS LAID FLAT: ONE (1) BRICK FOR 2"-6" LINES; TWO (2) BRICKS FOR 8"-10" LINES; FOUR (4) BRICKS FOR 12" LINES OR LARGER.
5. 4"x 8" x16" SOLID PRECAST CONCRETE BLOCK TO BE INSTALLED UNDERNEATH VALVE BODY FOR SUPPORT
6. FLOWABLE FILL OR CONCRETE CAN BE USED IN LIEU OF LIMEROCK IF APPROVED BY THE ENGINEER.
7. FOR ALL VALVE BOXES INSTALLED IN PAVEMENT USE NON-POP LID.
8. FOR ALL PRESSURE MAINS, TERMINATE LOCATING WIRE INSIDE VALVE BOX, SEE DETAIL G-15E.
9. PAINT LIDS IN BLUE FOR WATER; PURPLE FOR RECLAIM; GREEN FOR SEWER; RED FOR HYDRANT.



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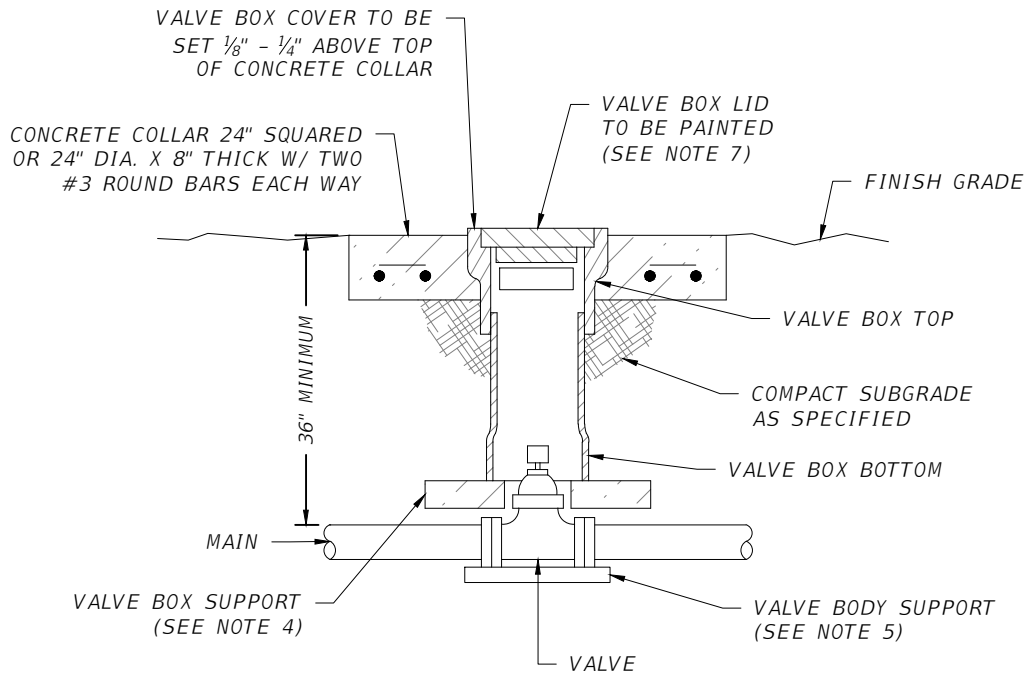
## VALVE BOX INSTALLATION

IN ROADWAYS OR AREAS SUBJECT TO TRAFFIC

SECTION:  
GENERAL

G-13

REVISION DATE:  
DEC 2020



### NOTES

1. WHERE ONE VALVE BOX EXTENSION IS REQUIRED USE STANDARD VALVE BOX EXTENSIONS.
2. WHERE MORE THAN ONE VALVE BOX EXTENSIONS ARE REQUIRED USE 6" D.I.P. CUT TO PROPER LENGTH SO VALVE BOX BOTTOM IS CONTINUOUS SECTION.
3. VALVE BOX LID TO BE FURNISHED WITH THE WORD "WATER". FOR WATER MAIN INSTALLATION "SEWER" FOR FORCE MAIN INSTALLATION, "REUSE" FOR REUSE MAIN INSTALLATION, OR "FIRE" FOR DEDICATED FIRE MAIN INSTALLATION.
4. FOR ALL VALVES USE SOLID COMMON BRICKS LAID FLAT: ONE (1) BRICK FOR 2"-6" LINES; TWO (2) BRICKS FOR 8"-10" LINES; FOUR (4) BRICKS FOR 12" LINES OR LARGER.
5. 4" x 8" x 16" SOLID PRECAST CONCRETE BLOCK TO BE INSTALLED UNDERNEATH VALVE BODY FOR SUPPORT.
6. FOR ALL PRESSURE MAINS, TERMINATE LOCATING WIRE INSIDE VALVE BOX, SEE DETAIL G-15E.
7. PAINT LIDS IN BLUE FOR WATER; PURPLE FOR RECLAIM; GREEN FOR SEWER; RED FOR HYDRANT.
8. PAINT BLUE "V" ON CURB FOR WATER VALVE LOCATION.



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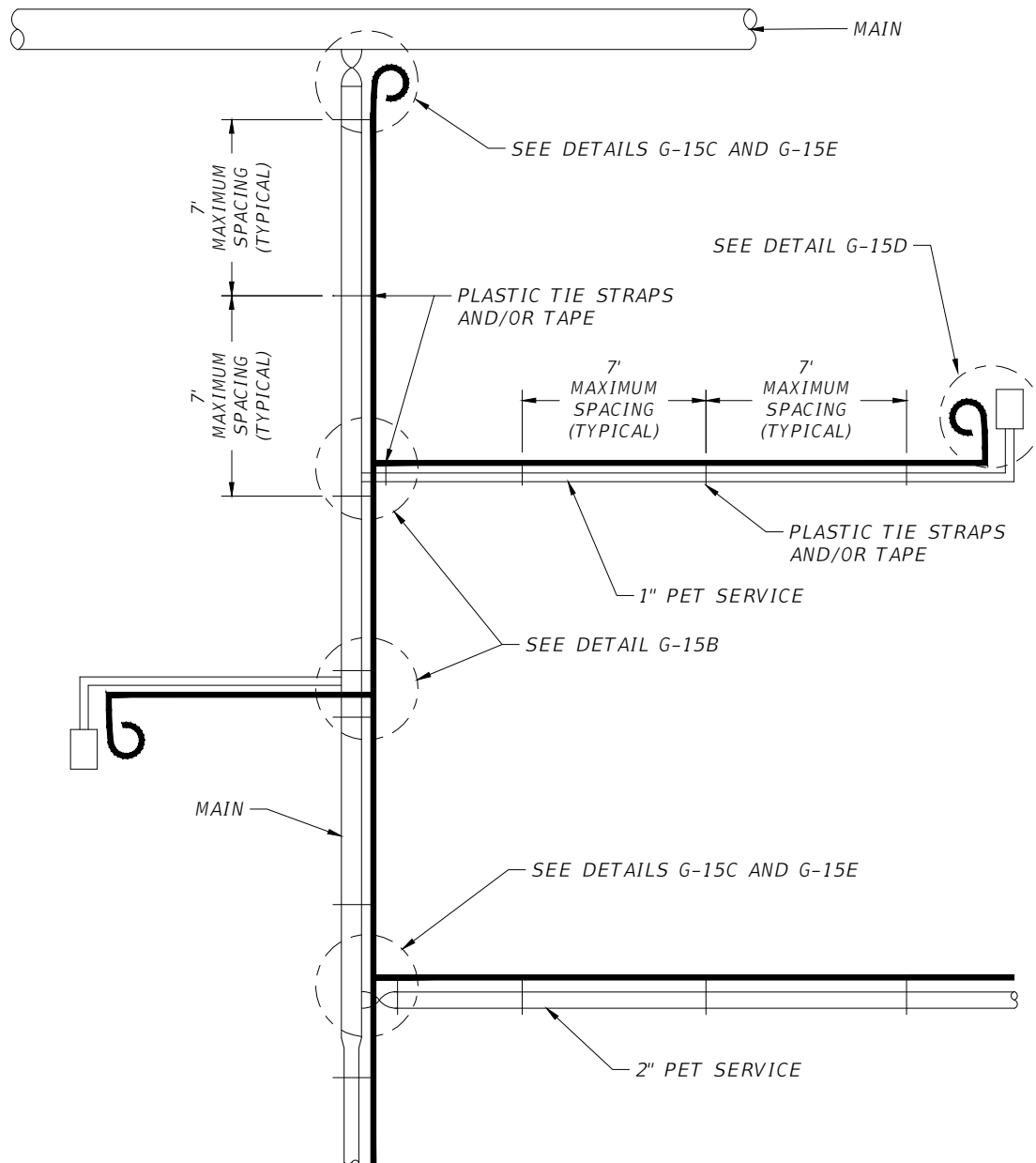
## VALVE BOX INSTALLATION

IN GRASS OR AREAS NOT SUBJECT TO TRAFFIC

SECTION:  
GENERAL

**G-14**

REVISION DATE:  
DEC 2020



#### NOTES

1. LOCATING WIRES TO BE INSTALLED IN BOTH THREE AND NINE O'CLOCK POSITIONS.
2. SECURE LOCATING WIRES TO MAIN BY USE OF PLASTIC TIE STRAPS AND/OR TAPE SPACED AT A MAXIMUM DISTANCE OF SEVEN FEET (7').
3. THE ENTIRE LOCATING SYSTEM SHALL BE SUBJECTED TO TESTING TO DETERMINE ITS RELIABILITY. WHERE INSTALLED UNDER PAVEMENT AREAS, TESTING SHALL BE DONE PRIOR TO PLACEMENT OF ASPHALT.
4. AFTER WIRE INSTALLATION THROUGH GROUND CLAMPS, WRAP ALL BARE WIRES WITH ELECTRICAL TAPE.
5. TERMINATE LOCATING WIRE AT ALL VALVE BOXES AND METER BOXES.



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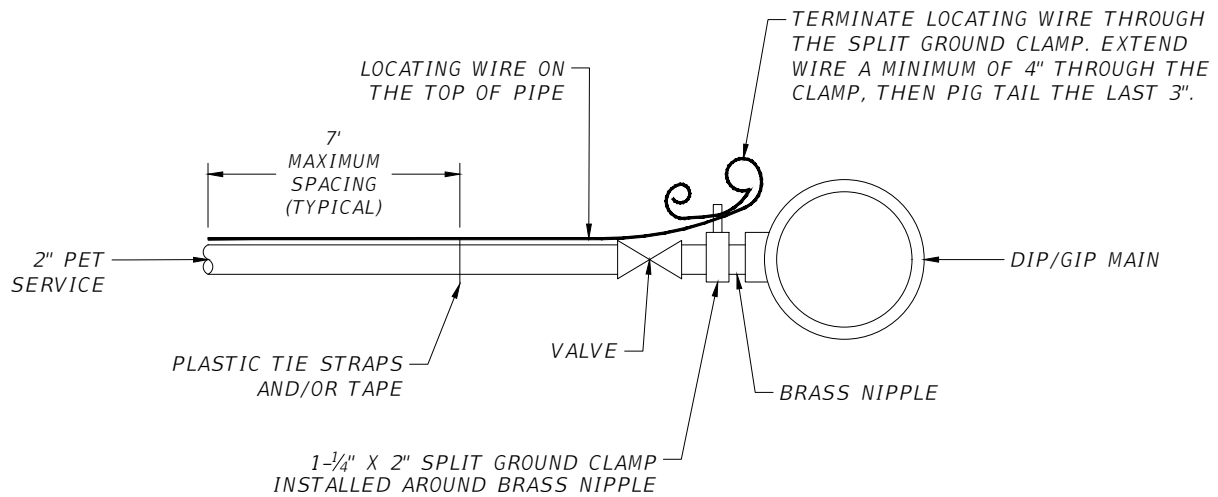
## LOCATING WIRE SYSTEM

SECTION:  
GENERAL

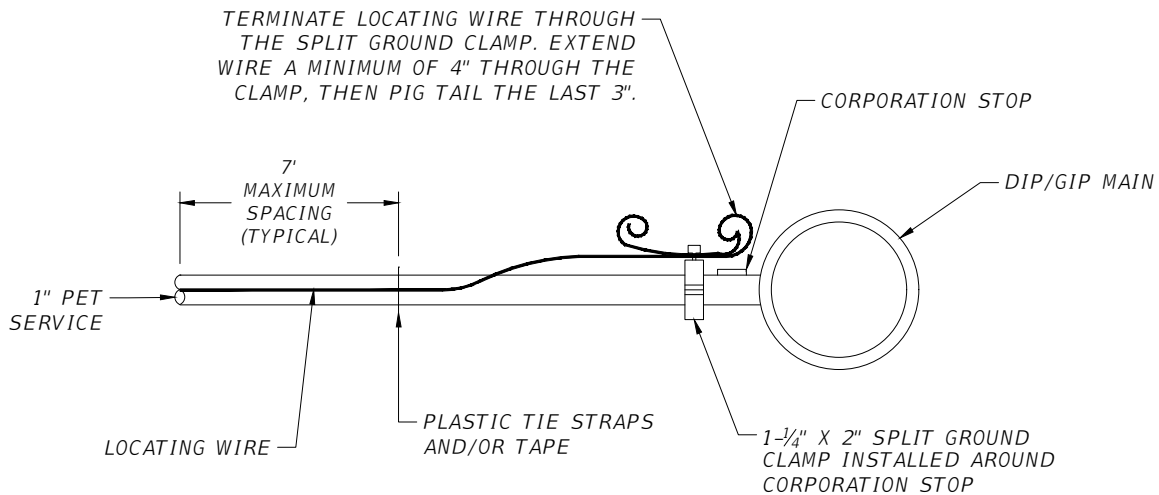
G-15A

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### 2" CONNECTION TO DIP/GIP MAINS



### 1" CONNECTION TO DIP/GIP MAINS



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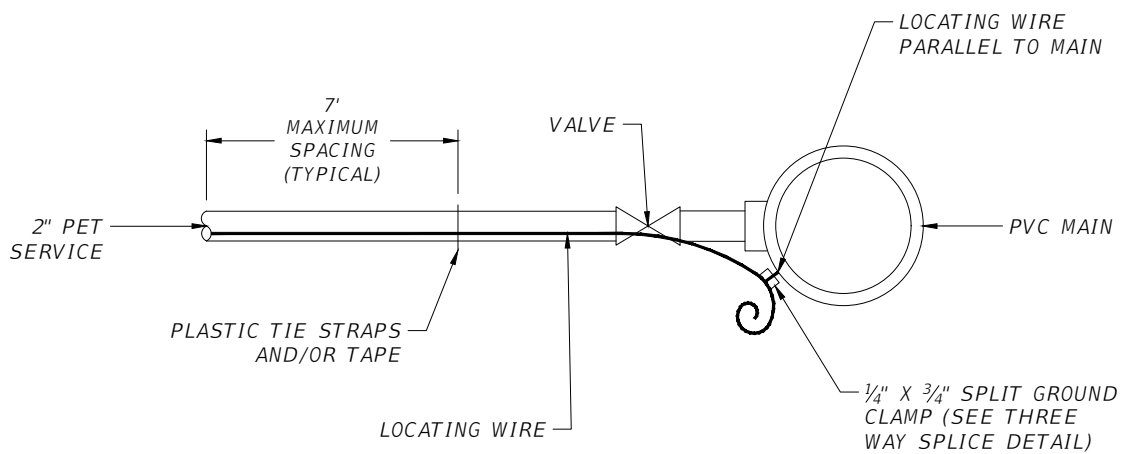
## LOCATING WIRE SYSTEM

SERVICE CONNECTION TO DIP/GIP MAIN

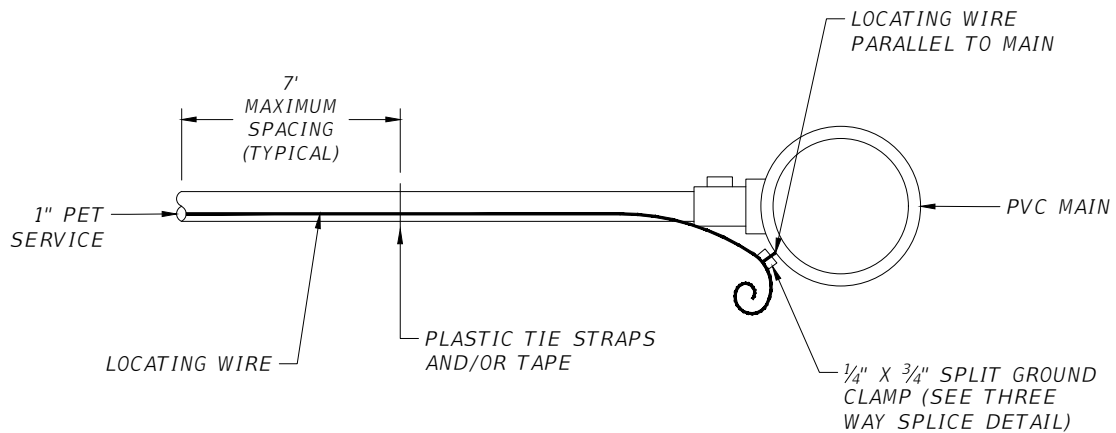
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2" CONNECTION TO PVC MAINS



1" CONNECTION TO PVC MAINS



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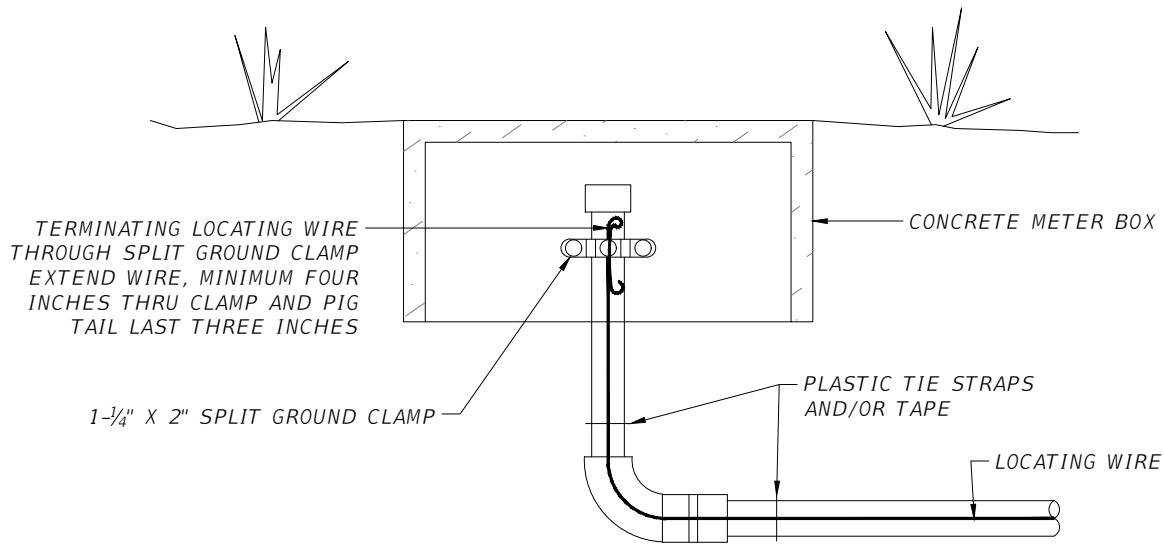
# LOCATING WIRE SYSTEM

SERVICE CONNECTION TO PVC MAIN

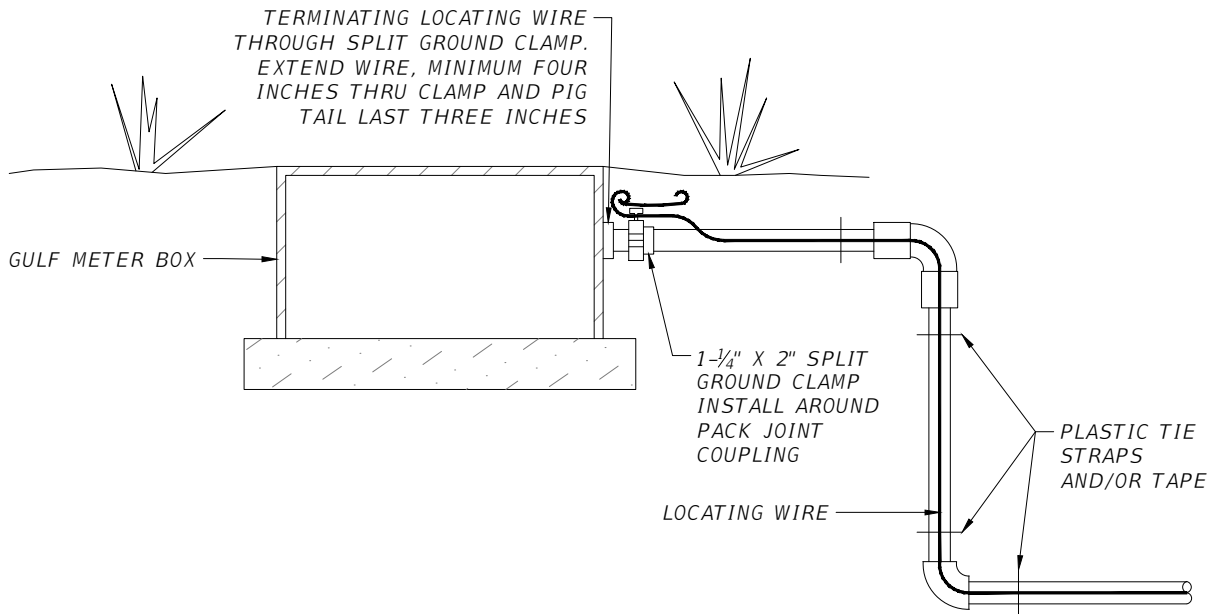
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### MULTIFAMILY SERVICE



### SINGLE FAMILY SERVICE



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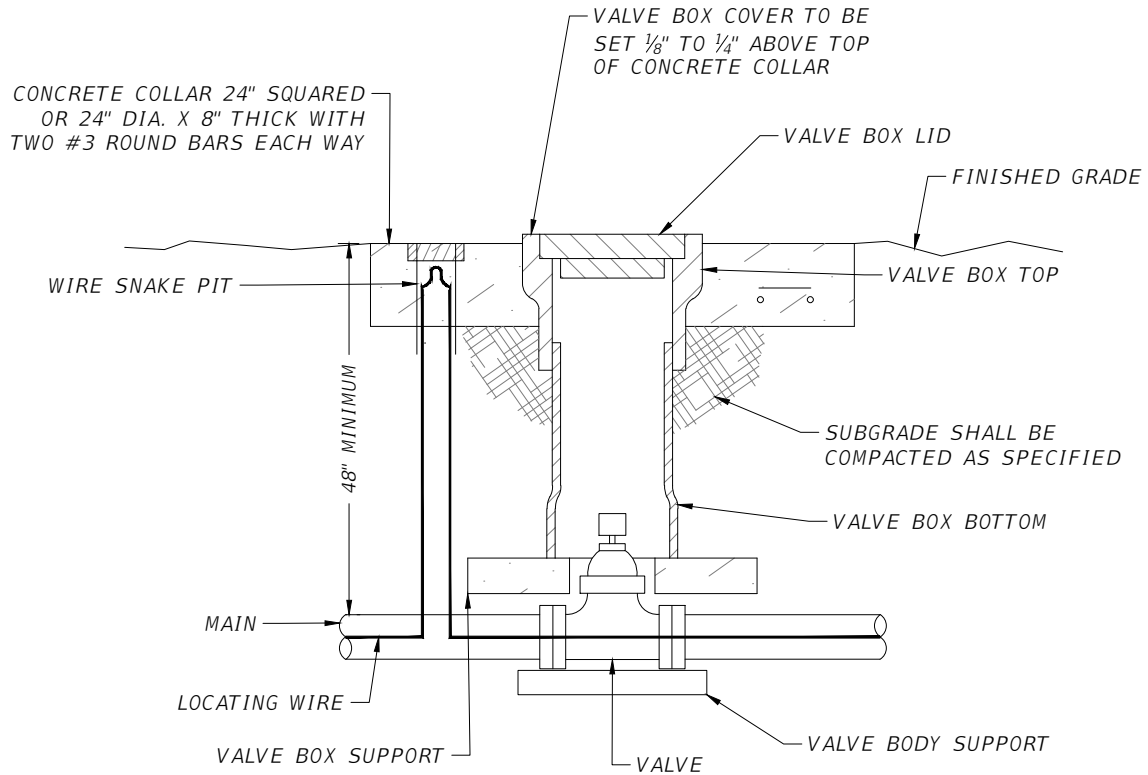
## LOCATING WIRE SYSTEM

TERMINATION AT METER BOX

SECTION:  
GENERAL

G-15D

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### NOTES

1. TERMINATE AT ALL VALVES.
2. ENSURE WIRE IS TO THE SIDE OF THE VALVE BOX SO THE VALVE CAN BE PROPERLY OPERATED.



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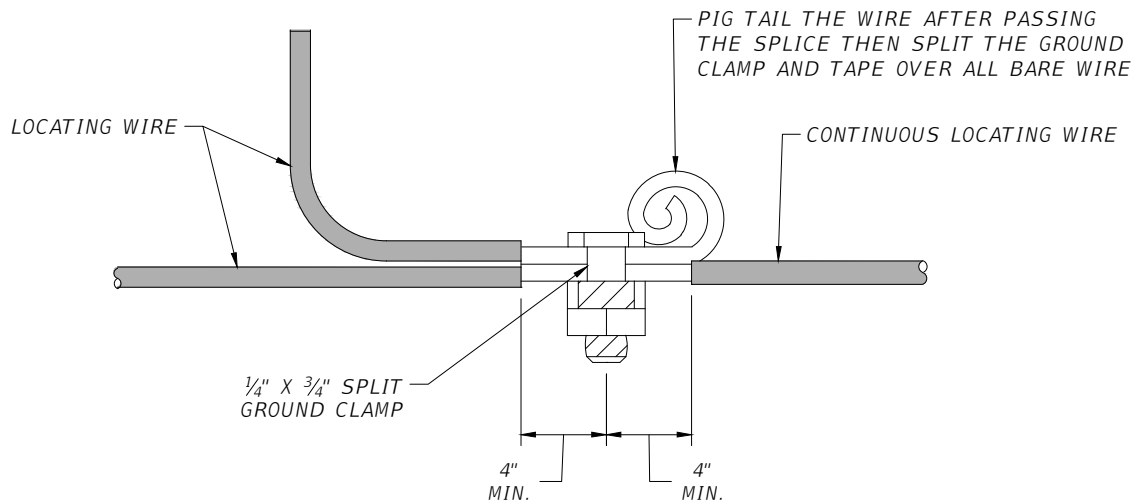
## LOCATING WIRE SYSTEM

TERMINATION AT VALVE BOX

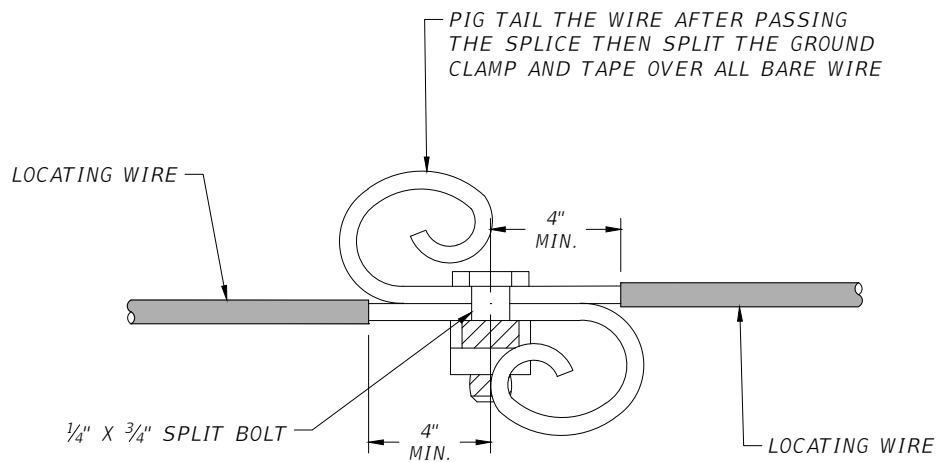
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**THREE WAY SPLICE**



**SINGLE SPLICE**



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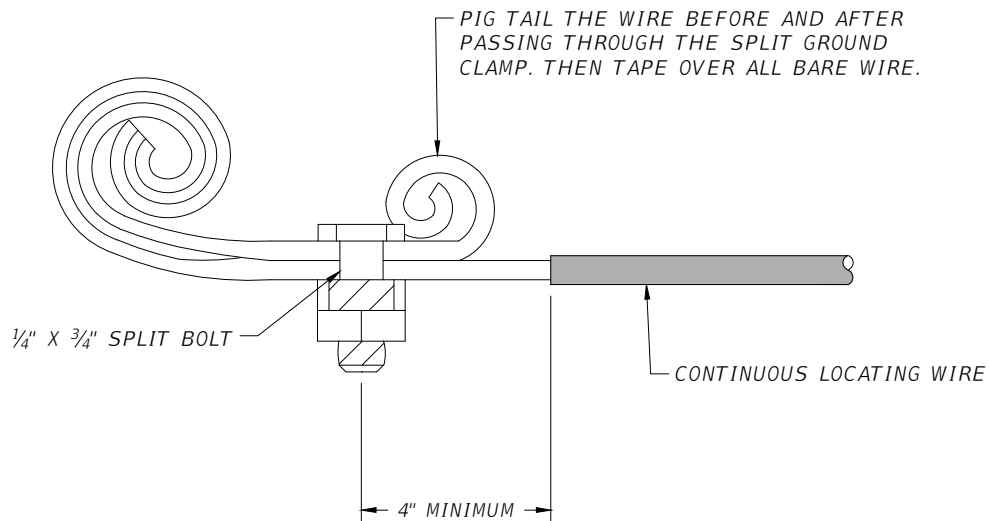
# LOCATING WIRE SYSTEM

SPLICING

SECTION:  
GENERAL

G-15F

REVISION DATE:  
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### NOTES

1. USE ONLY ONE STANDARD VALVE BOX EXTENSION.
2. VALVE BOX LID TO BE FURNISHED WITH THE WORD "WATER" FOR WATER MAIN INSTALLATION, "SEWER" FOR SEWER MAIN INSTALLATION OR "REUSE" FOR REUSE MAIN INSTALLATION.
3. MAXIMUM SPACING BETWEEN GROUNDING ROD IS 500 FEET.



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## LOCATING WIRE SYSTEM

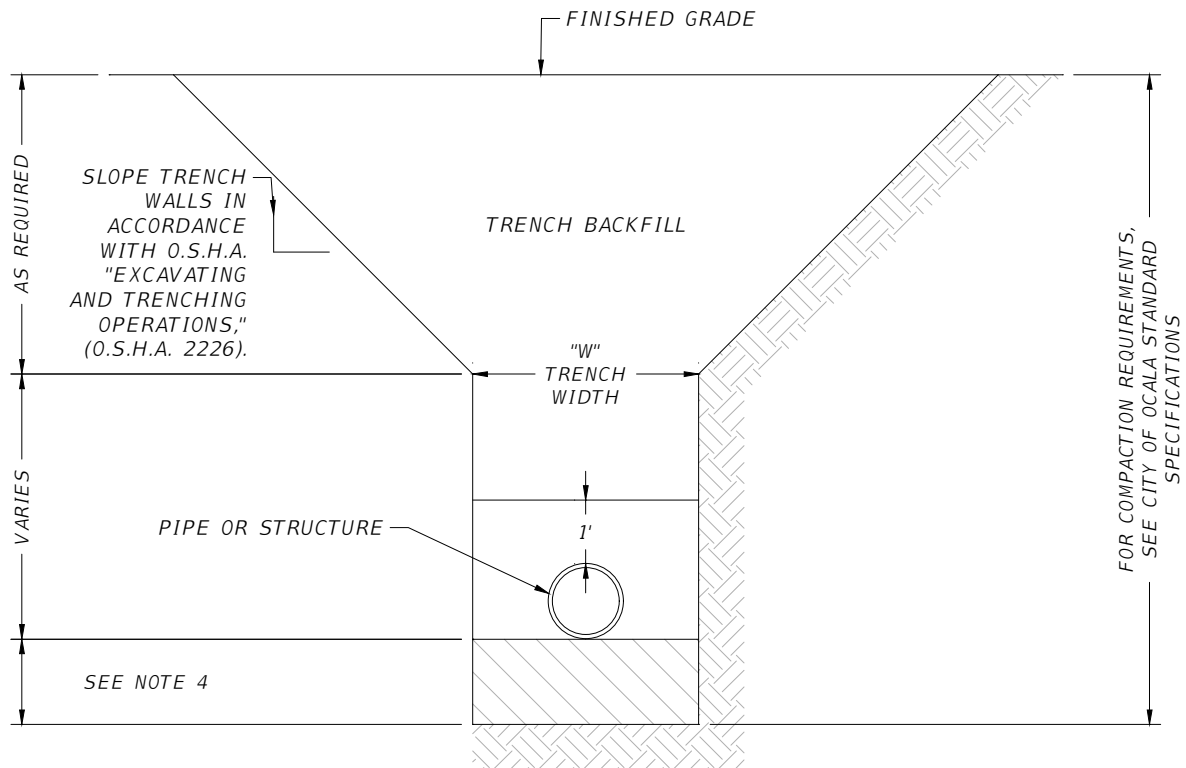
END TERMINATION

SECTION:  
GENERAL

G-15G

REVISION DATE:  
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1. DENSITY TESTS TO BE TAKEN AT EACH 6" OF COMPACTED FILL, NOT LESS THAN 100 FEET (100') APART AS DIRECTED BY THE ENGINEER, IN ACCORDANCE WITH F.D.O.T. STANDARD SPECIFICATIONS, LATEST REVISION.
2. IF THE CONTRACTOR HAS COMPACTION EQUIPMENT WITH WHICH THE REQUIRED DENSITY CAN BE OBTAINED IN THICKER LIFTS THAN PERMITTED ABOVE AND UPON SATISFACTORY EVIDENCE THAT THE PROPOSED EQUIPMENT WILL PRODUCE WORK EQUAL IN QUALITY TO THAT PRODUCED BY THE SPECIFIED METHODS, THE ENGINEER MAY PERMIT PLACEMENT OF A.A.S.H.T.O. GRANULAR MATERIAL SOIL GROUPS A-1, A-2, OR A-3 IN LIFTS UP TO A MAXIMUM OF 12" COMPACTED THICKNESS. THE CONTRACTOR WILL BE REQUIRED TO FURNISH EQUIPMENT AND LABOR TO EXCAVATE AND BACKFILL TEST PITS TO BE DUG FOR THE PERFORMANCE OF DENSITY TESTS.
3. USE OF THICK LIFT COMPACTION PROCEDURES WILL NOT BE ALLOWED FOR THE FIRST STAGE BACKFILLING (BENEATH THE HAUNCHES) OF PIPE AND ON SIDES OF PIPE.
4. REFER TO PROJECT PLANS AND SPECIFICATIONS, AND F.D.O.T. STANDARD SPECIFICATIONS FOR ROAD CONSTRUCTION, UNSUITABLE MATERIAL FOR UNDERCUTTING REQUIREMENTS.
5. REFER TO PROJECT PLANS AND SPECIFICATIONS, AND F.D.O.T. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE REPLACEMENT.



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## TRENCH BACKFILL

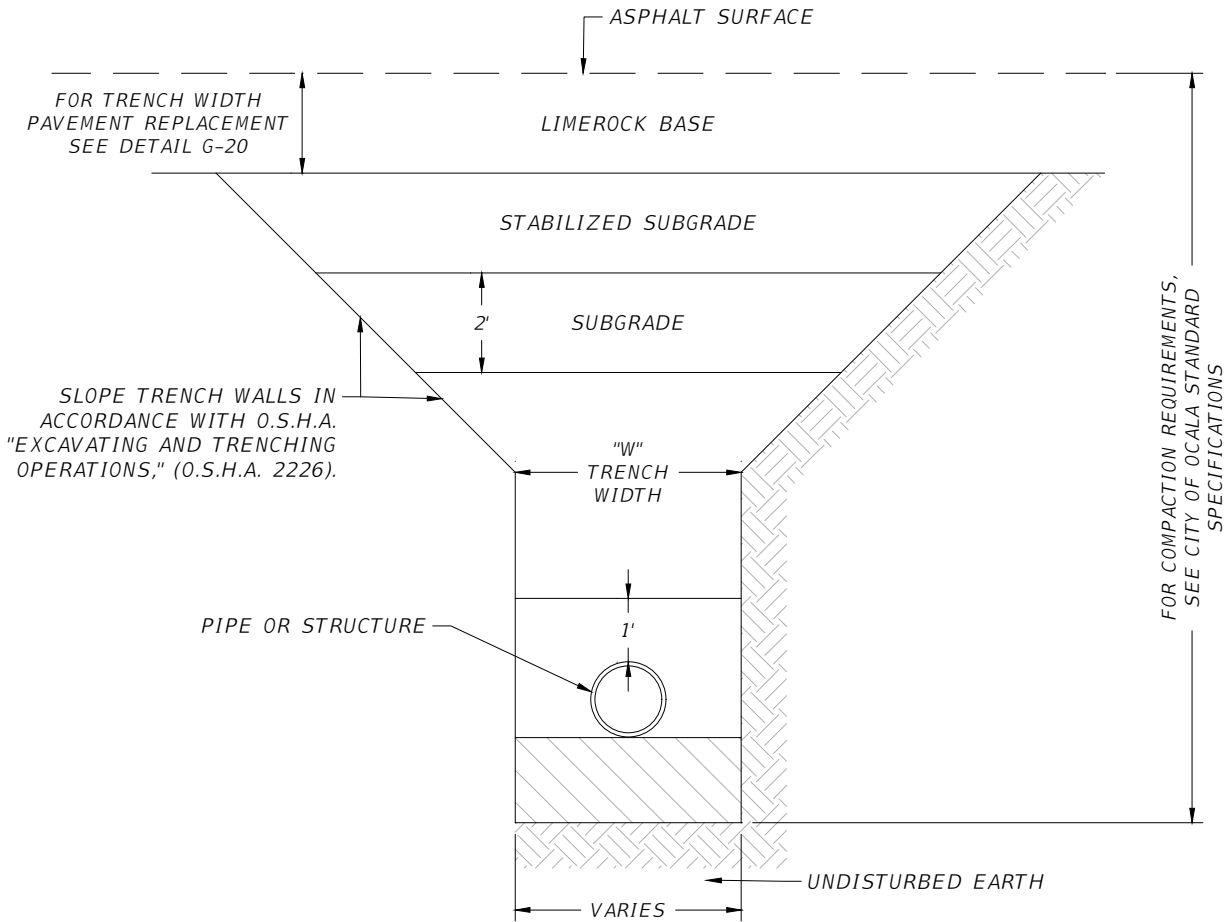
NOT WITHIN STREET RIGHT-OF-WAY

SECTION:  
GENERAL

G-17

REVISION DATE:  
DEC 2020





1. DENSITY TESTS TO BE TAKEN AT EACH 6" OF COMPACTED FILL, NOT LESS THAN 100 FEET (100') APART AS DIRECTED BY THE PROJECT ENGINEER, IN ACCORDANCE WITH F.D.O.T. MANUAL, LATEST REVISION.
2. IF THE CONTRACTOR HAS COMPACTION EQUIPMENT WITH WHICH THE REQUIRED DENSITY CAN BE OBTAINED IN THICKER LIFTS THAN PERMITTED ABOVE AND UPON SATISFACTORY EVIDENCE THAT THE PROPOSED EQUIPMENT WILL PRODUCE WORK EQUAL IN QUALITY TO THAT PRODUCED BY THE SPECIFIED METHODS, THE ENGINEER MAY PERMIT PLACEMENT OF A.A.S.H.T.O. GRANULAR MATERIAL SOIL GROUPS A-1, A-2, OR A-3 IN LIFTS UP TO A MAXIMUM OF 12" COMPACTED THICKNESS. THE CONTRACTOR WILL BE REQUIRED TO FURNISH EQUIPMENT AND LABOR TO EXCAVATE AND BACKFILL TEST PITS TO BE DUG FOR THE PERFORMANCE OF DENSITY TESTS.
3. USE OF THICK LIFT COMPACTION PROCEDURES WILL NOT BE ALLOWED FOR THE FIRST STAGE BACKFILLING (BENEATH THE HAUNCHES) OF PIPE AND ON SIDES OF PIPE.
4. REFER TO PROJECT PLANS AND SPECIFICATION, AND F.D.O.T. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, UNSUITABLE MATERIAL FOR UNDERCUTTING REQUIREMENTS.
5. REFER TO PROJECT PLANS AND SPECIFICATIONS, AND F.D.O.T. STANDARD SPECIFICATIONS FOR ROAD REPLACEMENT.
6. TRENCH SHORING AND TRENCH BOXES SHALL BE UTILIZED PER O.S.H.A. REQUIREMENTS FOR TRENCH SAFETY, 29 CFT 1926, SUBPART B.
7. THE 2 FOOT (2') SUBGRADE UNDER LIMEROCK AND STABILIZED SUBGRADE BASES MUST BE CLEAN FILL WITH NO PLASTICS PRESENT.



CITY ENGINEER'S OFFICE  
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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

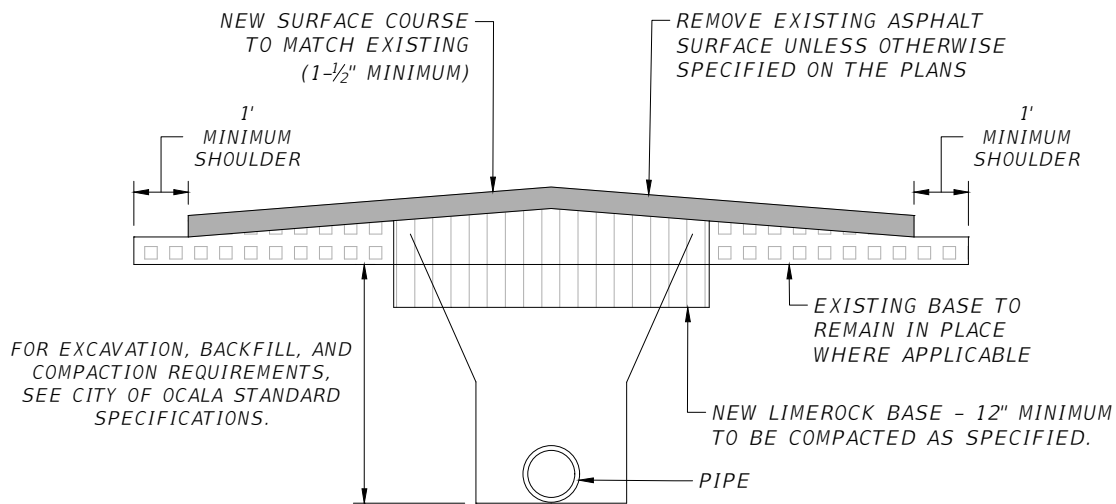
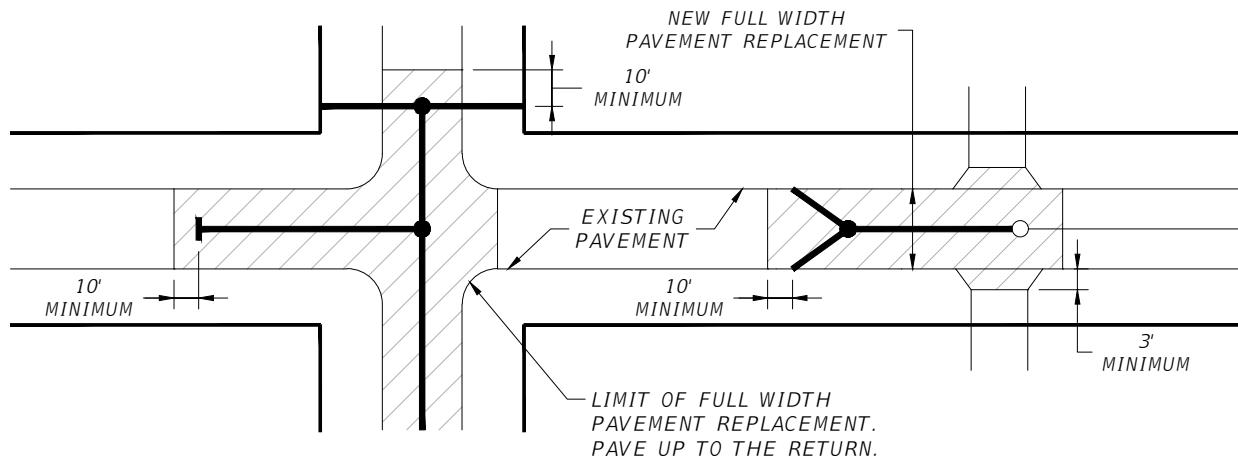
## TRENCH BACKFILL

UNTRAVELED WAY FOR ALL STREETS -  
PAVED AND UNPAVED

SECTION:  
GENERAL

G-18

REVISION DATE:  
DEC 2020



1. UNLESS OTHERWISE SPECIFIED, MATERIALS AND METHODS OF OPERATION REQUIRED TO INSTALL NEW AND REPLACEMENT PAVEMENT SHALL BE IN ACCORDANCE WITH THE LATEST APPLICABLE REQUIREMENTS AND SPECIFICATIONS FROM F.D.O.T. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
2. ALL EXISTING DRIVEWAYS AND ROADWAYS SHALL HAVE PAVEMENT RETURNS PAVED DURING THE ROAD PAVING OPERATION.
3. THE TYPE AND THICKNESS OF THE NEW SURFACE MATERIAL SHALL BE CONSISTENT WITH THAT OF THE EXISTING SURFACE. TYPICAL STREETS VARY FROM 1" TO 4" THICK. REGARDLESS, ALL CASES SHALL MEET THE MINIMUM STANDARDS ESTABLISHED BY THE PLANS AND SPECIFICATIONS. WHERE NO ASPHALT TYPE IS SPECIFIED, THE REPLACEMENT PAVEMENT SHALL BE 1-1/2" OF SUPERPAVE ASPHALT.



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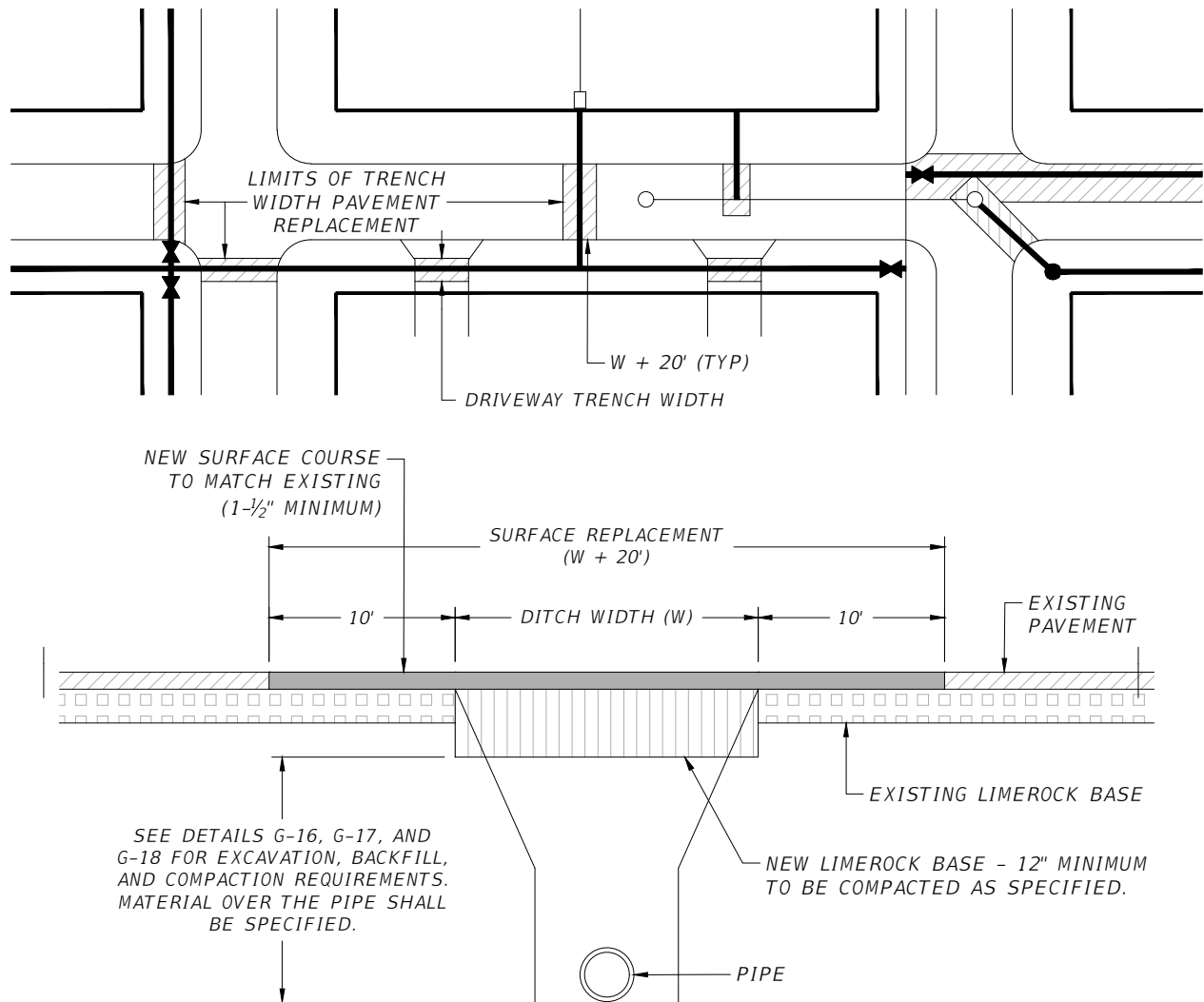
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## FULL WIDTH PAVEMENT REPLACEMENT

SECTION:  
GENERAL

G-19

REVISION DATE:  
DEC 2020



1. UNLESS OTHERWISE SPECIFIED, MATERIALS AND METHODS OF OPERATION REQUIRED TO INSTALL NEW AND REPLACEMENT PAVEMENT SHALL BE IN ACCORDANCE WITH THE LATEST APPLICABLE REQUIREMENTS AND SPECIFICATIONS OF F.D.O.T. STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.
2. PAVEMENT SHALL BE REMOVED TO NEATLY SAWED STRAIGHT EDGES. SAWCUTS SHALL BE MADE TO A MINIMUM DEPTH OF 1-1/2" (INCHES).
3. BACKFILL SHALL BE IN ACCORDANCE WITH SPECIFICATIONS AND F.D.O.T. STANDARD SPECIFICATIONS.
4. THE TYPE AND THICKNESS OF THE NEW SURFACE MATERIAL SHALL BE CONSISTENT WITH THAT OF THE EXISTING SURFACE. TYPICAL STREETS VARY FROM 1" TO 4" THICK. REGARDLESS, ALL CASES SHALL MEET THE MINIMUM STANDARDS ESTABLISHED BY THE PLANS AND SPECIFICATIONS. WHERE MATERIAL TYPE IS NOT SPECIFIED, THE REPLACEMENT PAVEMENT SHALL BE 1-1/2" OF SUPERPAVE ASPHALT.
5. MAINS UNDER PAVEMENT SHALL BE REPLACED WITH FULL LANE REPLACEMENT. NO SMALL ASPHALT PATCHES CONTAINED WITHIN A SINGLE LANE.



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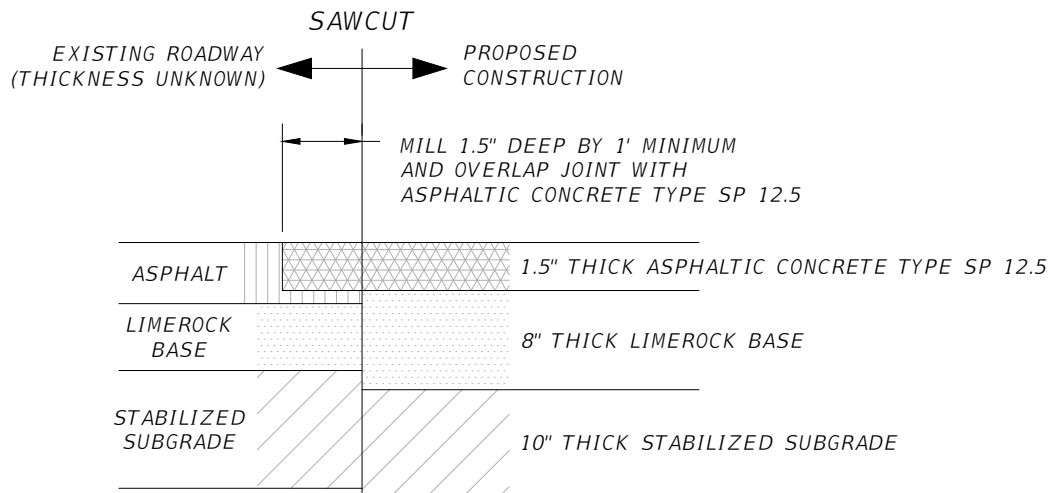
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## TRENCH WIDTH PAVEMENT REPLACEMENT

SECTION:  
GENERAL

**G-20**

REVISION DATE:  
DEC 2020



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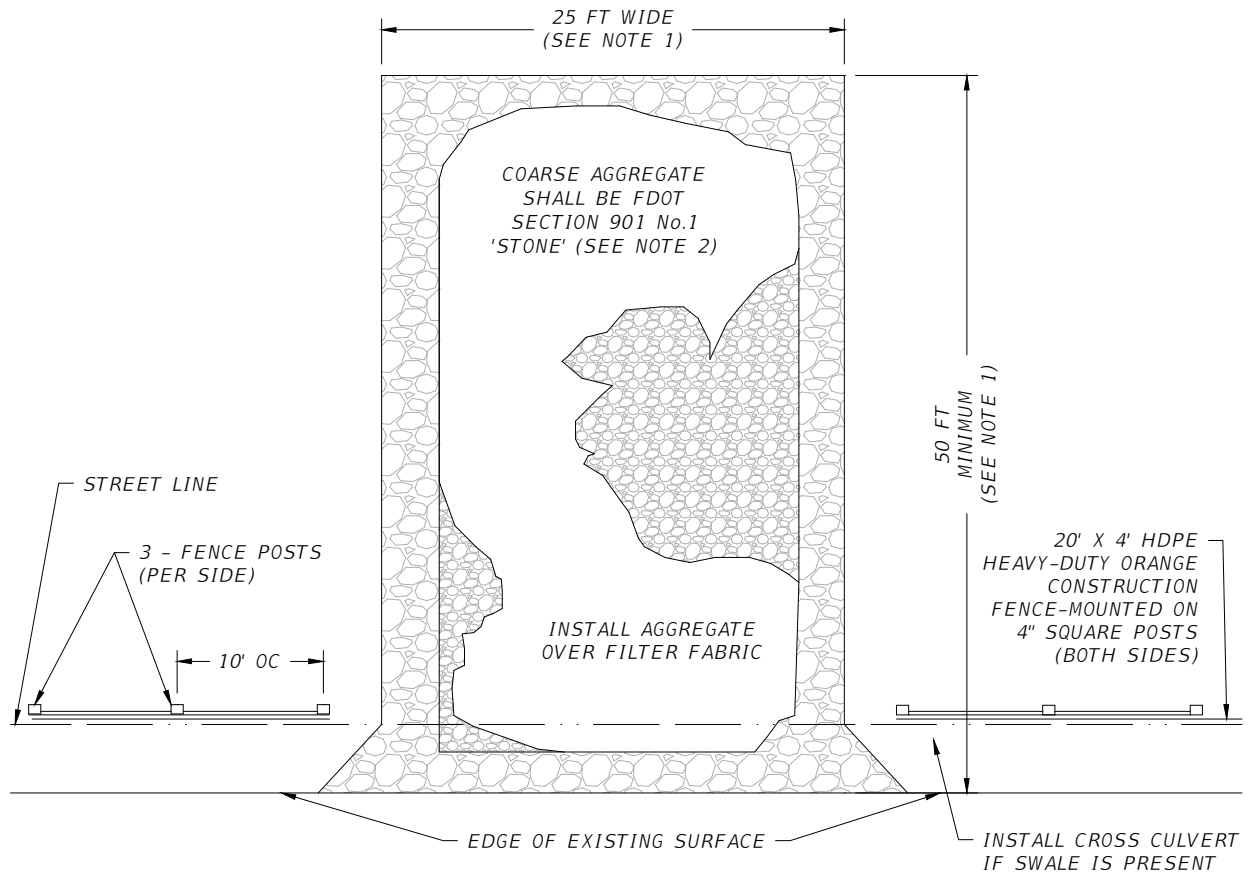
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

SAWCUT AND MATCH  
EXISTING PAVEMENT

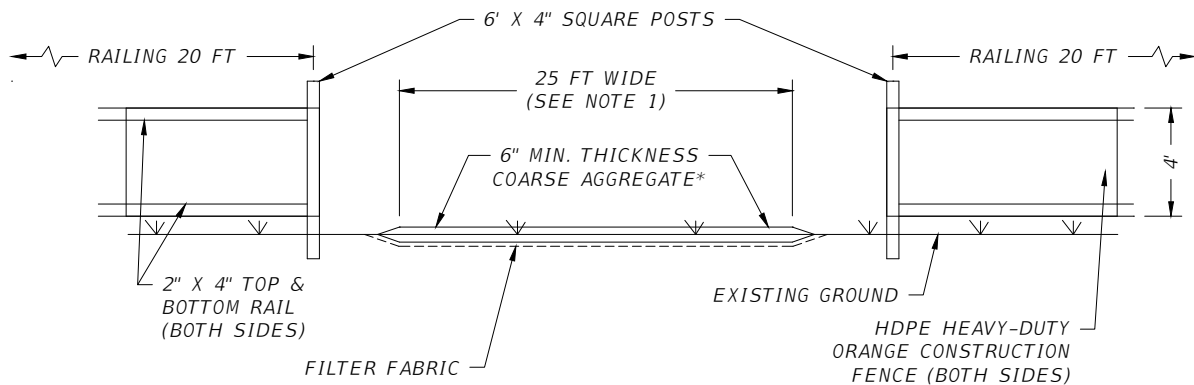
SECTION:  
GENERAL

G-21

REVISION DATE:  
DEC 2020



**PLAN**



**ELEVATION**

**NOTES:**

1. CITY MAY REDUCE THIS DIMENSION IF CONDITIONS PERMIT AND IF REQUESTED BY THE CONTRACTOR.
2. CITY MAY ALLOW NO. 57 STONE, OR CLEAN, WASHED RECYCLED CONCRETE MEETING THE MINIMUM SIZE OF NO. 1 STONE AS AN ALTERNATE IF REQUESTED BY THE CONTRACTOR.



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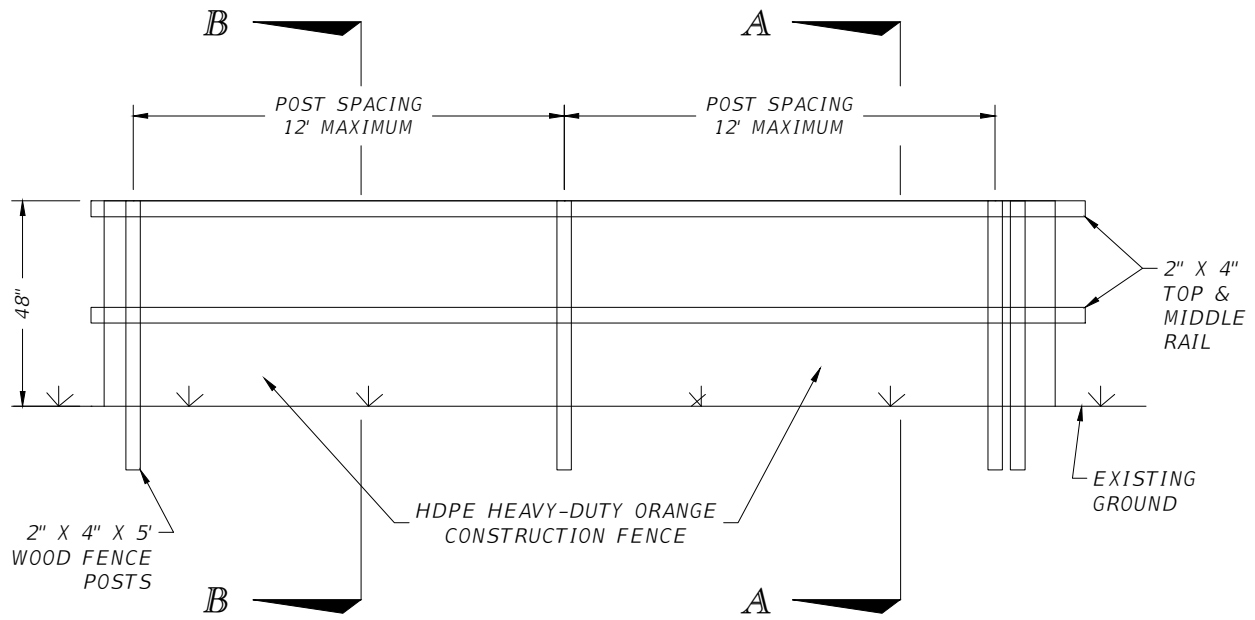
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

TYPICAL CONSTRUCTION  
ENTRANCE TRACKING  
PAD

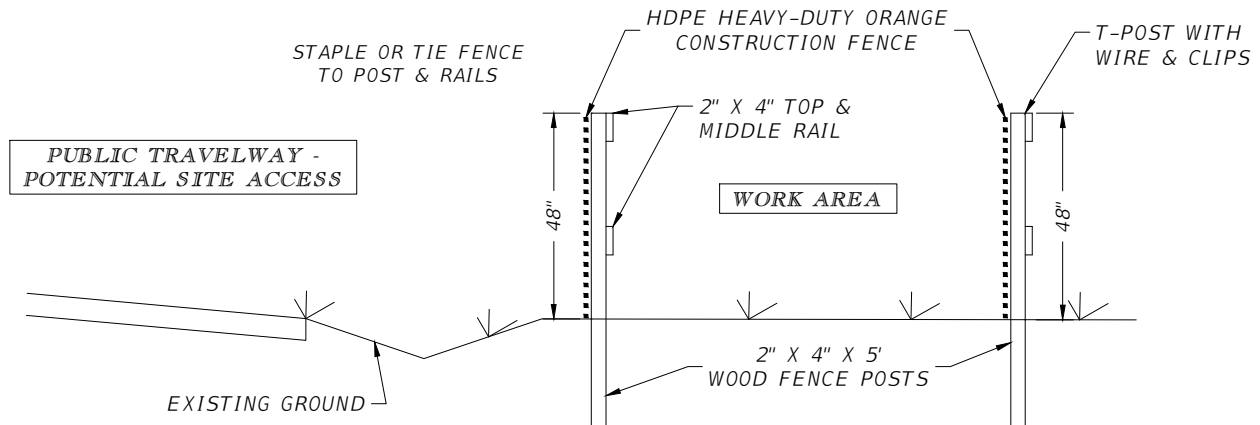
SECTION:  
GENERAL

**G-22**

REVISION DATE:  
DEC 2020



**ELEVATION**



**SECTION A**  
(OPTION WITH 2" X 4"  
POSTS AND RAILS)

**SECTION B**  
(OPTION WITH T-POSTS  
AND 16 GAUGE WIRES)

**NOTES:**

1. T-POSTS WITH 16 GAUGE TOP AND MIDDLE WIRES (SECTION B) ARE CITY STANDARD.
2. CITY MAY REQUIRE 2" X 4" WOOD POSTS & RAILS IN LIEU OF THE THE CITY STANDARD (SECTION B) IF REQUIRED BY SITE CONDITIONS.



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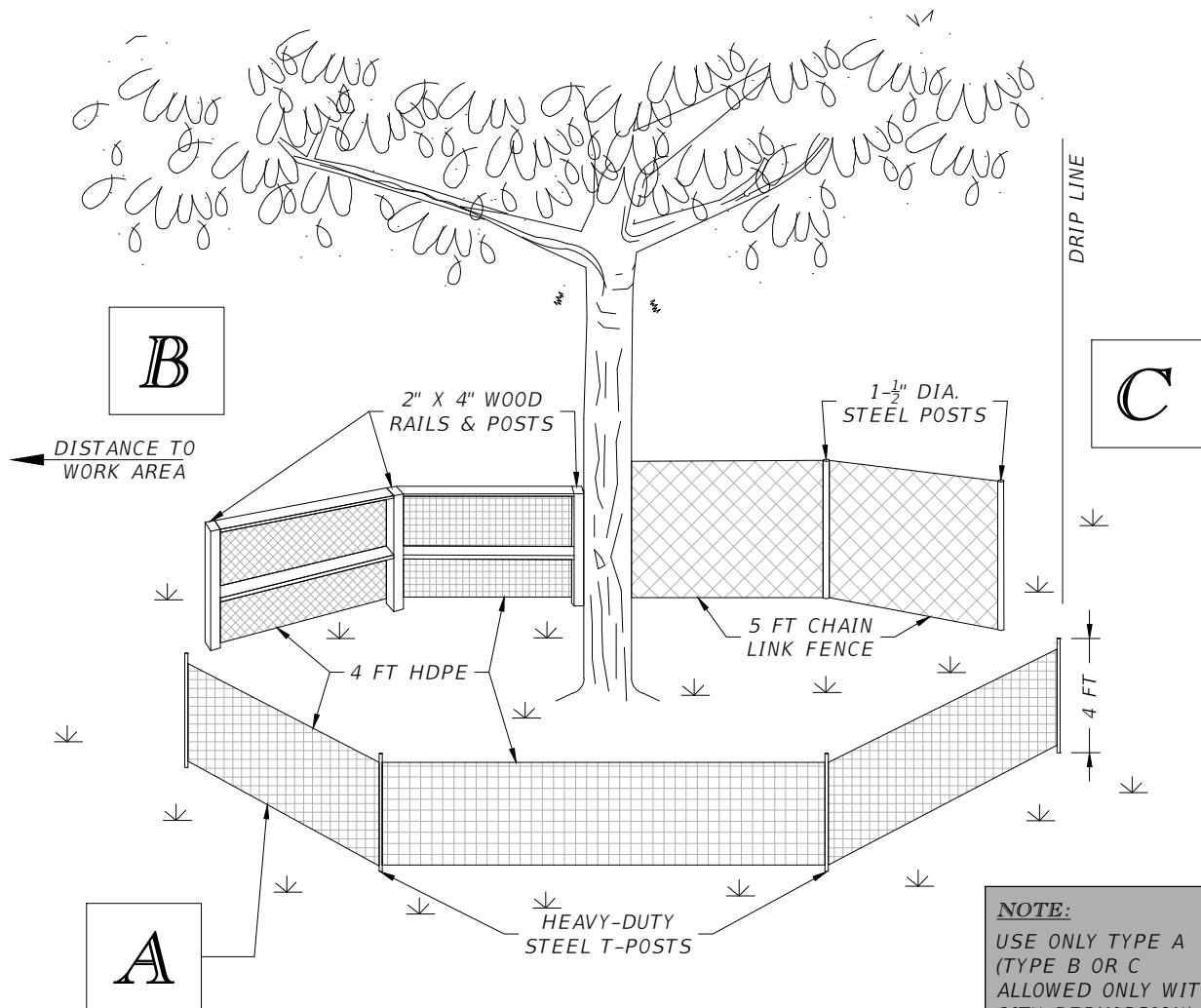
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**TYPICAL  
CONSTRUCTION  
BARRIER FENCE**

SECTION:  
GENERAL

**G-23**

REVISION DATE:  
DEC 2020



**TREE PROTECTION FENCE TYPE CHART**

FENCE TYPE	FENCE FABRIC MATERIAL	SET FENCE AT:	DISTANCE TO WORK AREA	FENCE HEIGHT (MIN.)	POST TYPE	POST SPACING (MAX.)	MIDDLE & TOP RAIL
<b>A</b> STANDARD	HDPE HEAVY-DUTY ORANGE CONSTRUCTION BARRIER	DRIP LINE	10 FEET OR MORE	4 FEET	H-DUTY T-POST	8 FEET	16-GAUGE WIRE
<b>B</b>	HDPE HEAVY-DUTY ORANGE CONSTRUCTION BARRIER	90% OF DRIP LINE	5 FEET	4 FEET	2" X 4" WOOD	12 FEET	2" X 4" WOOD
<b>C</b>	GALVANIZED STEEL CHAIN LINK	75% OF DRIP LINE	3 FEET OR LESS	5 FEET	1-1/2" DIA. STEEL	12 FEET	NONE



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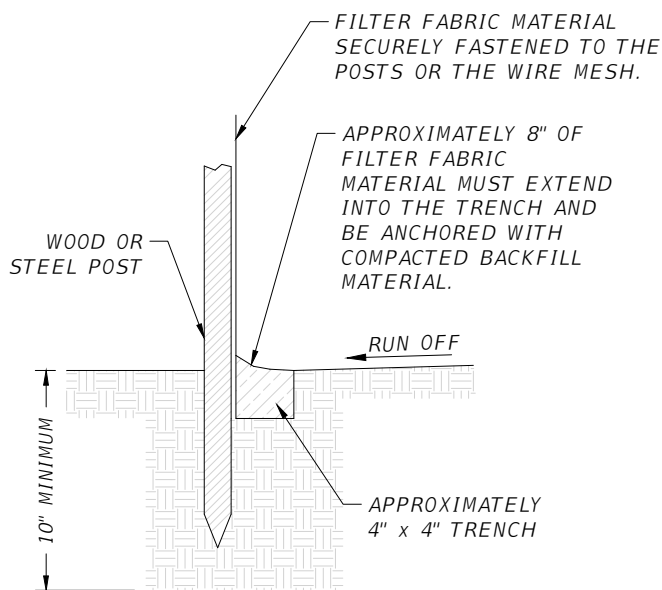
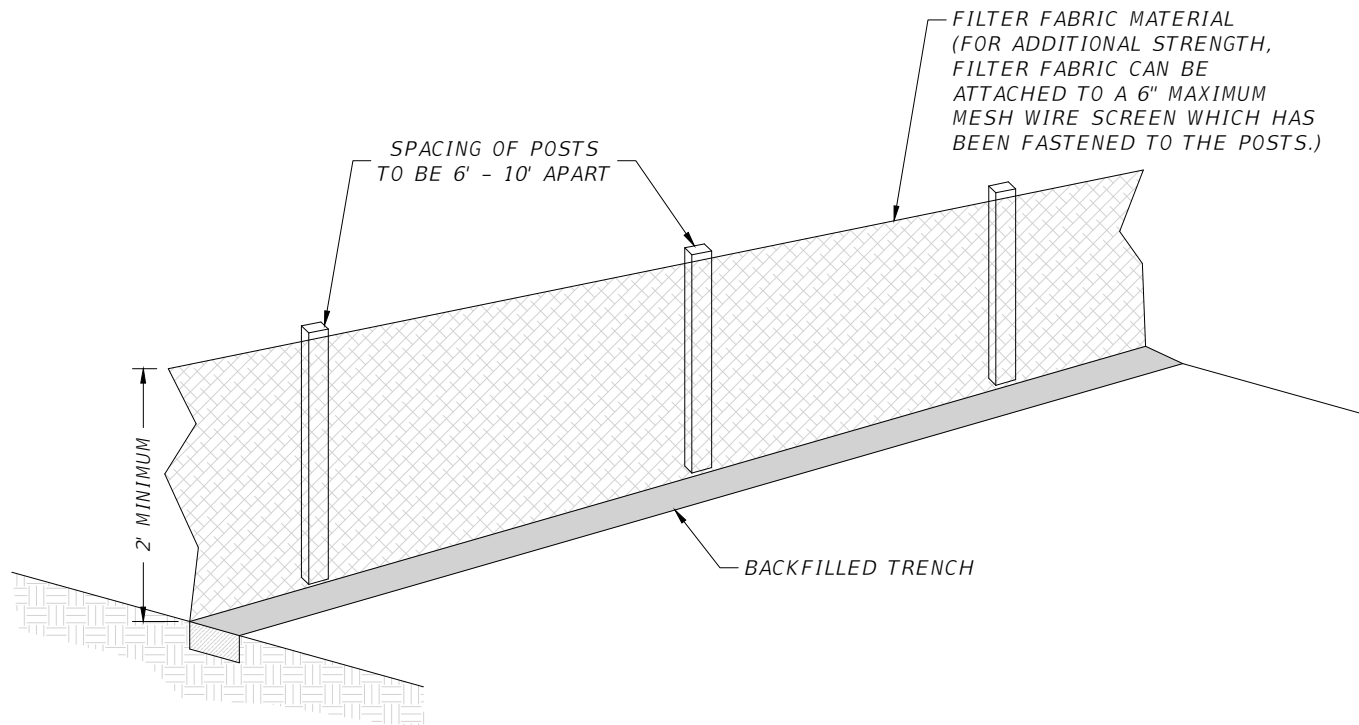
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# TYPICAL TREE PROTECTION

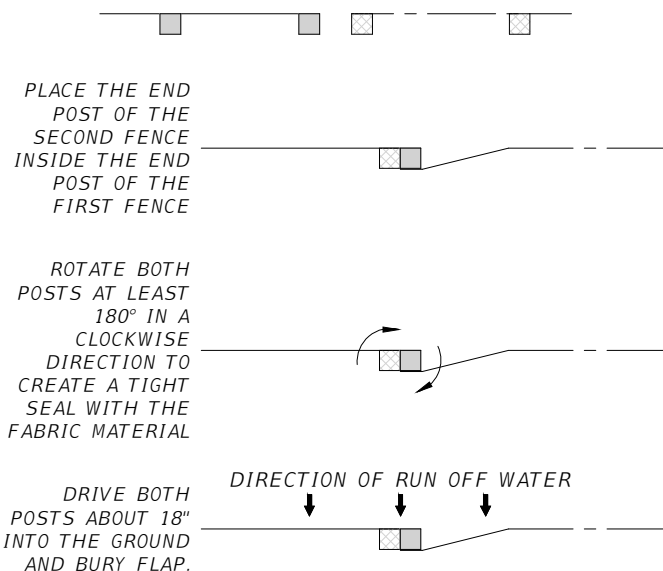
SECTION:  
GENERAL

**G-24**

REVISION DATE:  
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### ATTACHING TWO SILT FENCES



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STANDARD DETAILS  
FOR CONSTRUCTION

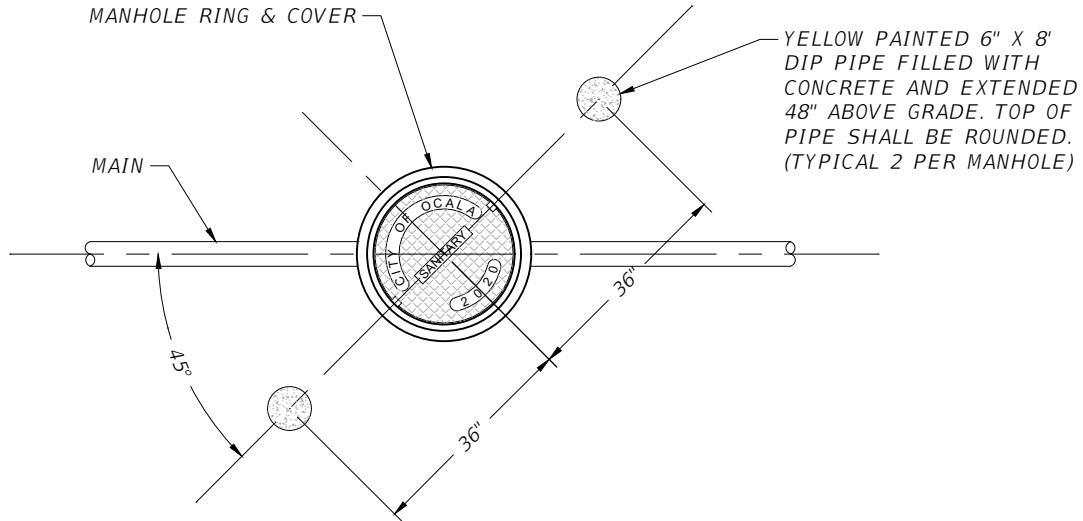
TYPICAL SILT  
FENCE

SECTION:  
GENERAL

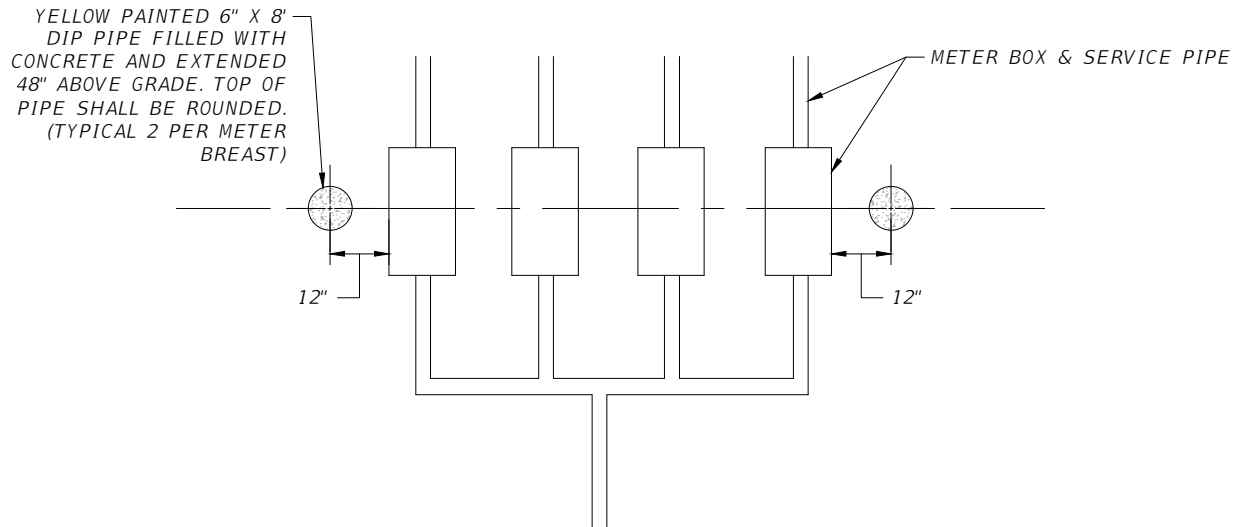
G-25

REVISION DATE:  
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### INSTALLATION AROUND A MANHOLE



### INSTALLATION AROUND A WATER METER BREAST



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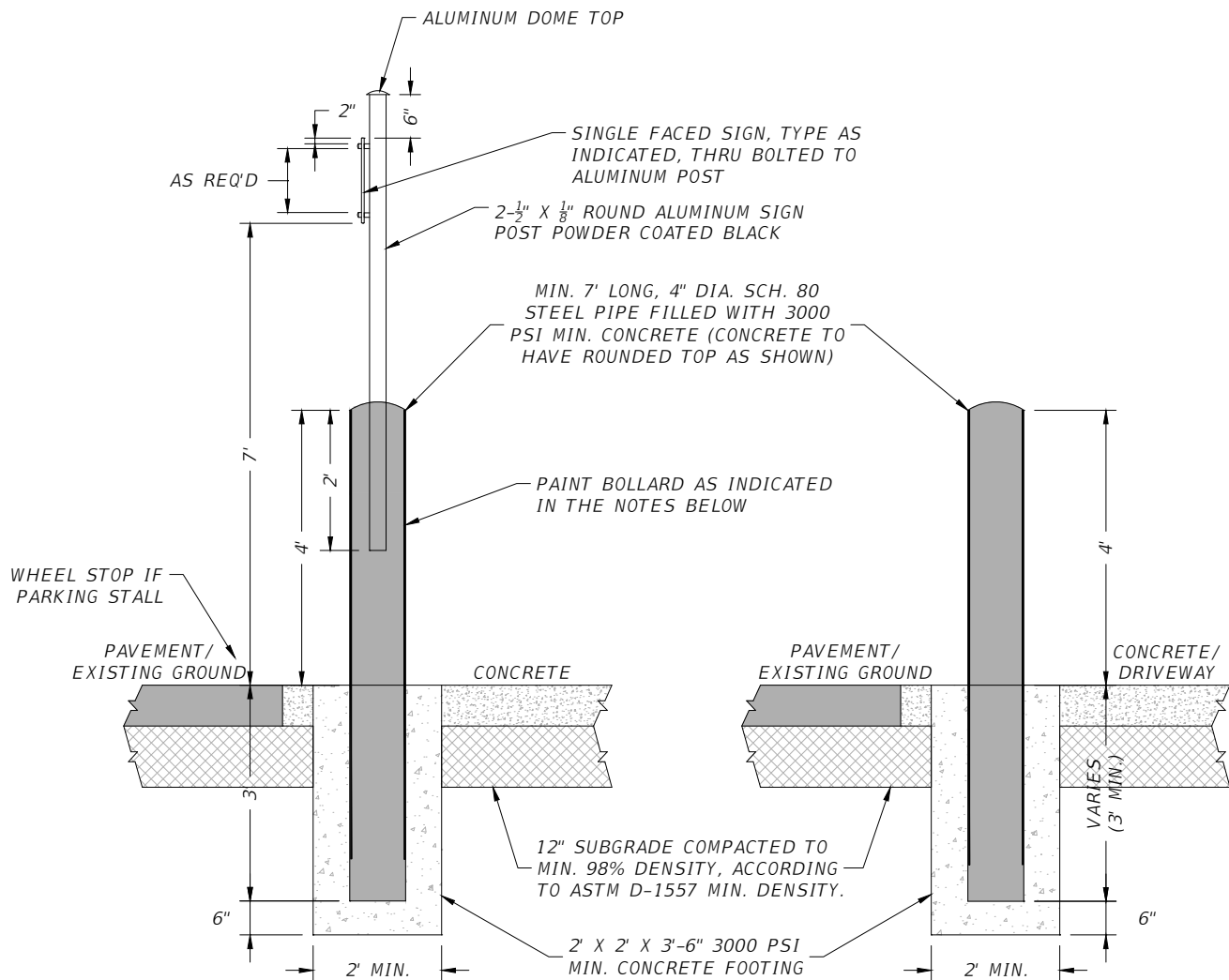
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**BOLLARD  
INSTALLATION**

SECTION:  
GENERAL

**G-26**

REVISION DATE:  
DEC 2020



**TYPE I: SIGN BOLLARD**

**TYPE II: BOLLARD**

**NOTES:**

<u>FOR BOLLARDS WITH:</u>	<u>PAINT COLOR:</u>
"NO PARKING - FIRE LANE" SIGN	SAFETY RED
"A.D.A. HANDICAP PARKING" SIGN	A.D.A. BLUE
NO SIGNAGE (TYPE II BOLLARD)	SAFETY YELLOW



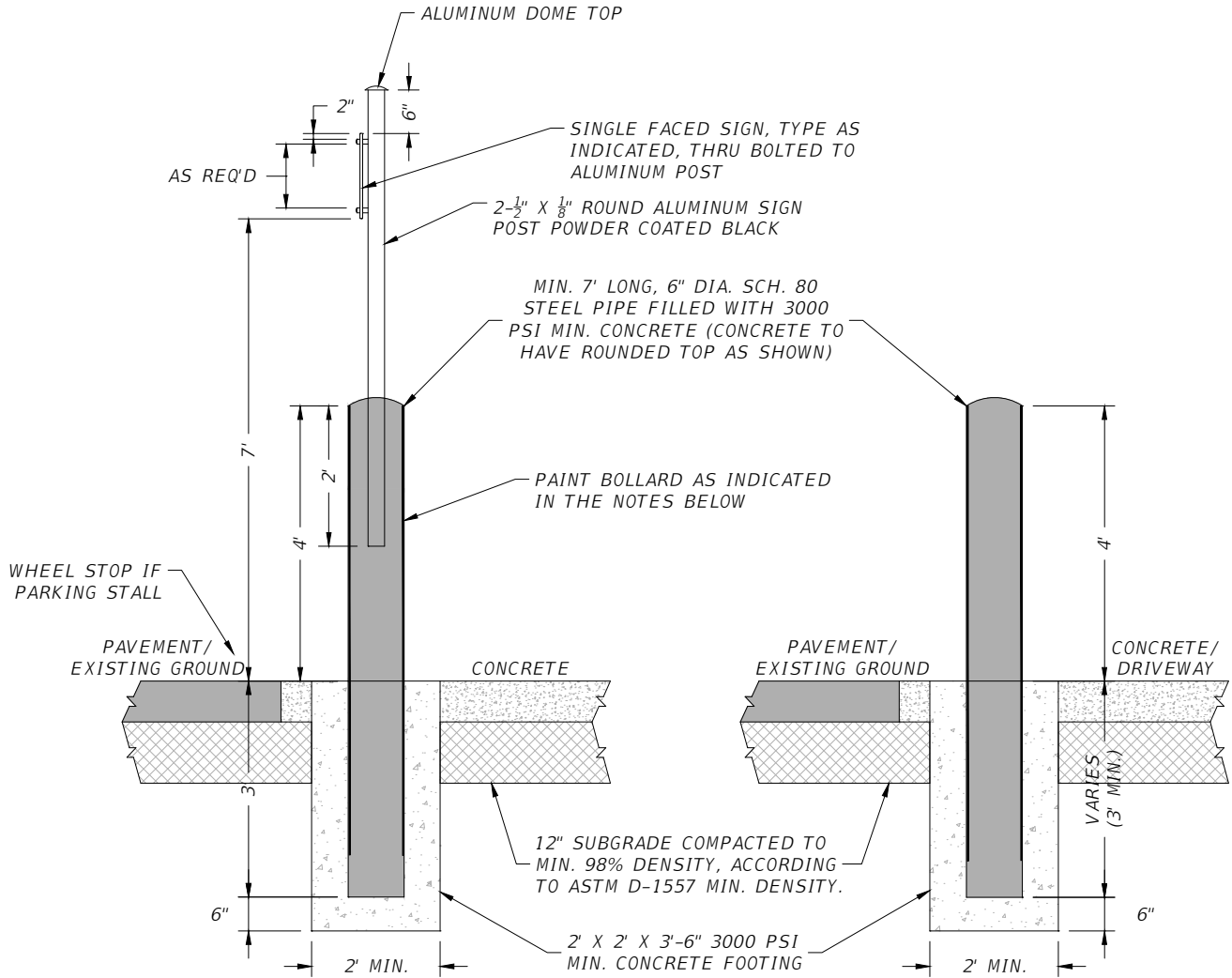
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OCALA, FLORIDA 34470

CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

4" BOLLARD  
TYPE I & II

SECTION:  
GENERAL

G-27



**TYPE I: SIGN BOLLARD**

**TYPE II: BOLLARD**

**NOTES:**

<u>FOR BOLLARDS WITH:</u>	<u>PAINT COLOR:</u>
"NO PARKING - FIRE LANE" SIGN	SAFETY RED
"A.D.A. HANDICAP PARKING" SIGN	A.D.A. BLUE
NO SIGNAGE (TYPE II BOLLARD)	SAFETY YELLOW



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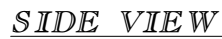
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

6" BOLLARD  
TYPE I & II

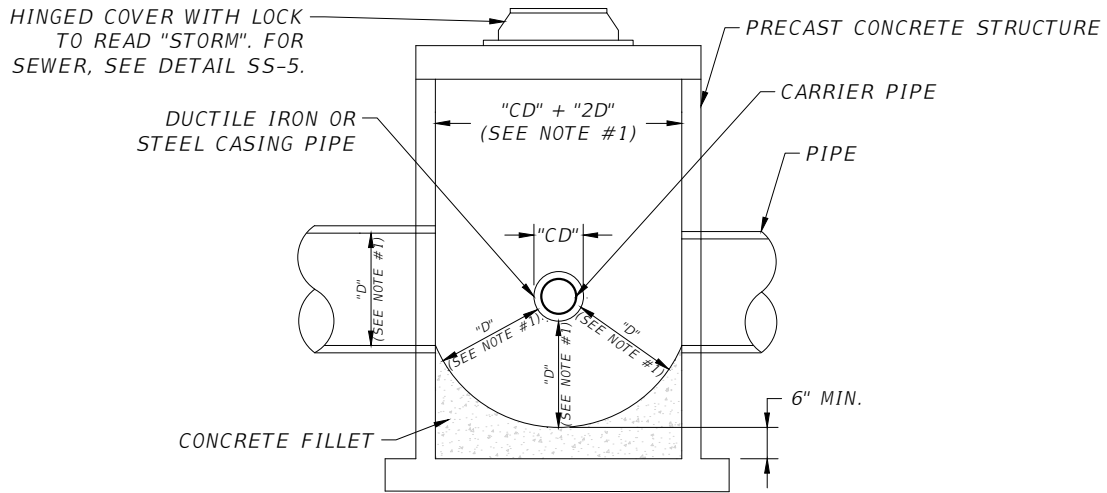
SECTION:  
GENERAL

G-28

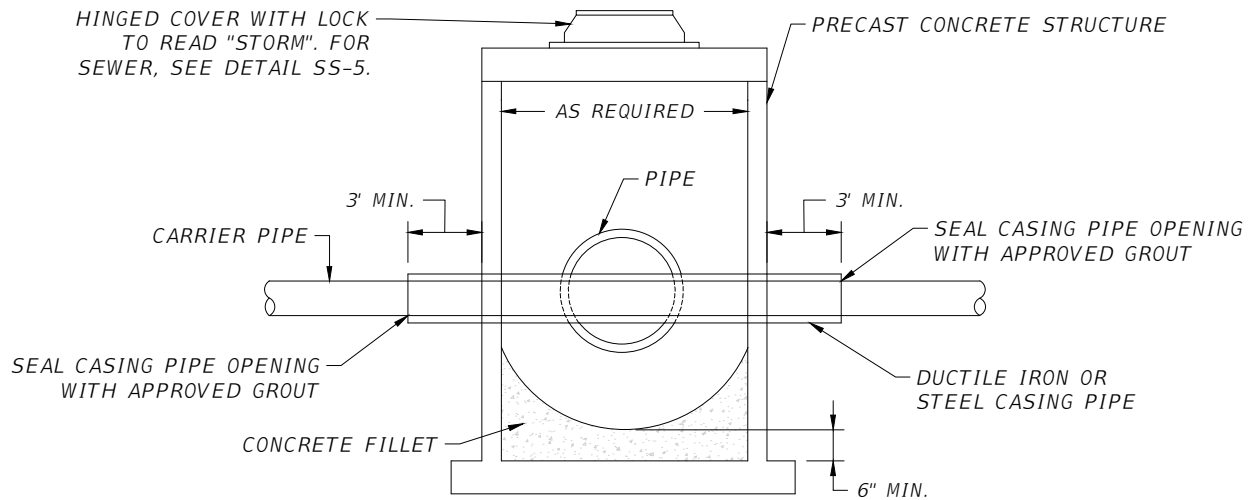
REVISION DATE:  
DEC 2020



1. FOR ALL ELLIPTICAL, ARCH OR OTHER NON-CIRCULAR PIPES "D" EQUALS THE EQUIVALENT CIRCULAR DIAMETER.
2. FOR EXISTING CARRIER PIPES USE STEEL CASING. CUT CASING AS REQUIRED, INSTALL AROUND CARRIER PIPE AND WELD CASING PIPE BACK TOGETHER TO THE SATISFACTION OF THE ENGINEER.
3. PROVIDE APPROVED CASING SPACERS AS REQUIRED.



**SIDE VIEW**



**SIDE VIEW**

**NOTES:**

1. FOR ALL ELLIPTICAL, ARCH OR OTHER NON-CIRCULAR PIPES "D" EQUALS THE EQUIVALENT CIRCULAR DIAMETER.
2. FOR EXISTING CARRIER PIPES USE STEEL CASING. CUT CASING AS REQUIRED, INSTALL AROUND CARRIER PIPE AND WELD CASING PIPE BACK TOGETHER TO THE SATISFACTION OF THE ENGINEER.
3. PROVIDE APPROVED CASING SPACERS AS REQUIRED.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**CONFLICT MANHOLE**

WITHOUT HOLE

SECTION:  
GENERAL

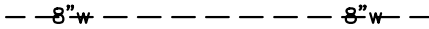
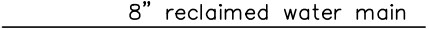








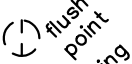

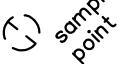



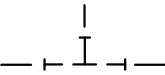

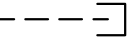

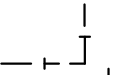

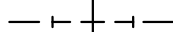



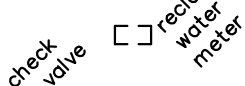

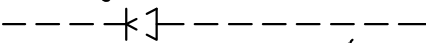

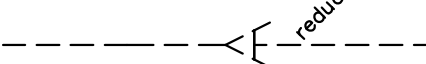

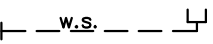

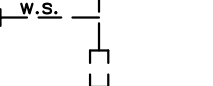
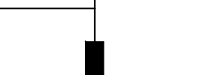
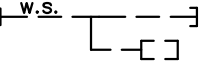

**G-30**

REVISION DATE:  
DEC 2020



**STANDARD DETAILS  
FOR CONSTRUCTION**

**RECLAIMED WATER DIVISION**

RECLAIMED WATER MAIN		
BUTTERFLY VALVE		
GATE VALVE		
AIR RELEASE VALVE		
SPRINKLER HEAD		
FLUSH POINT		
SAMPLING POINT		
FIRE HYDRANT		
TEE		
PLUG OR CAP		
BEND		
CROSS		
PUMPING STATION		
RECLAIMED WATER METER		
CHECK VALVE		
REDUCER		
RECLAIMED WATER SERVICE (SINGLE)		
RECLAIMED WATER SERVICE (DOUBLE)		
BLOW OFF		



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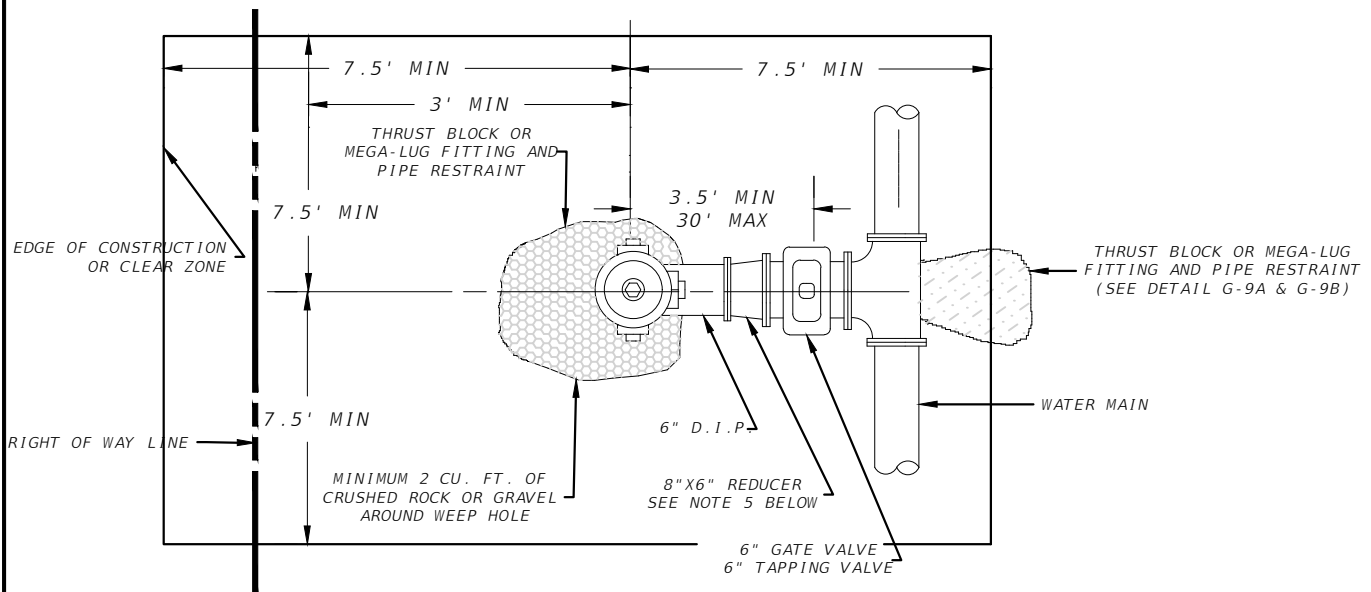
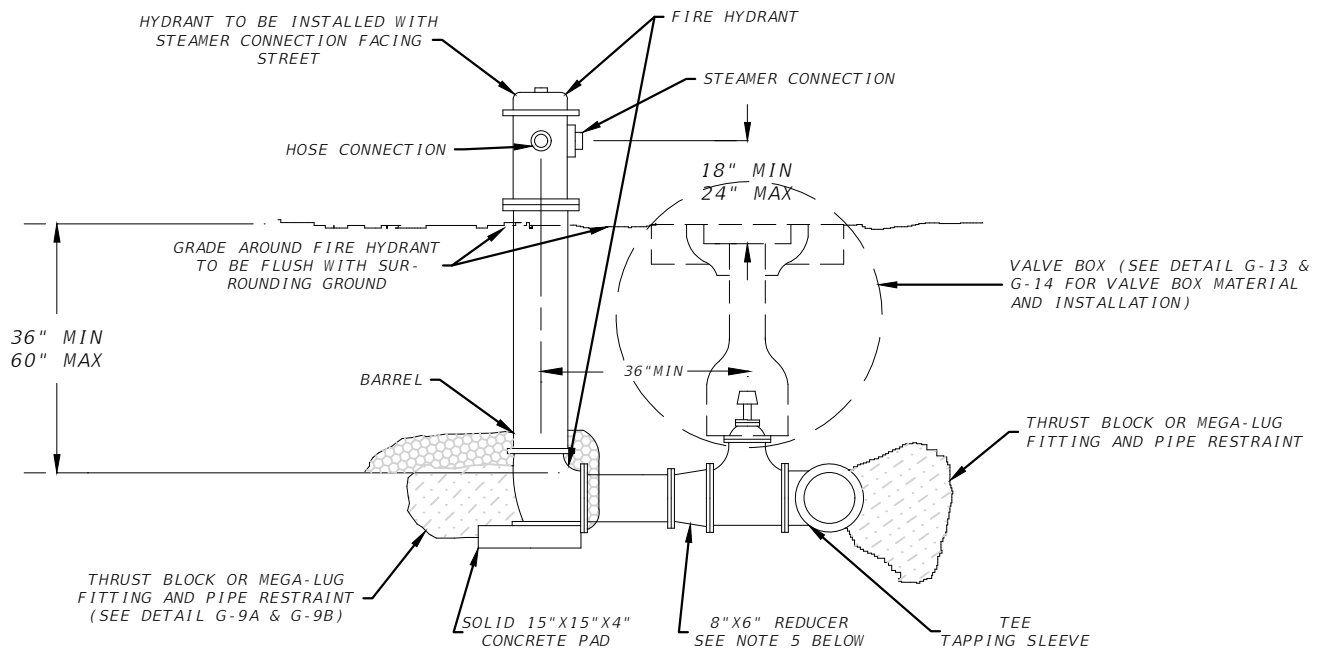
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# RECLAIMED WATER LEGEND

SECTION:  
RECLAIMED  
WATER

RW-1

REVISION DATE:  
DEC 2020



### NOTES

1. NO MORE THAN ONE BARREL SECTION SHALL BE ALLOWED WHEN ADJUSTING HYDRANT TO FINISHED GRADE. HYDRANT EXTENSIONS ARE TO BE SAME MANUFACTURER AS HYDRANT. MAXIMUM LENGTH OF EXTENSION SHALL BE 24".
2. NEW FIRE HYDRANTS TO BE FACTORY PAINTED REUSE "PURPLE"
3. PROVIDE ONE BLUE REFLECTIVE PAVEMENT MARKER (RPM) IN THE CENTER OF THE CLOSEST VEHICLE TRAVEL LANE AND DIRECTLY OPPOSITE THE HYDRANT LOCATION.
4. FOR NEW HYDRANT INSTALLATION WHERE THE HYDRANT WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM THE WATER MAIN, SEE "TYPE C" FIRE HYDRANT INSTALLATION.



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## RECLAIMED WATER FIRE HYDRANT ASSEMBLY

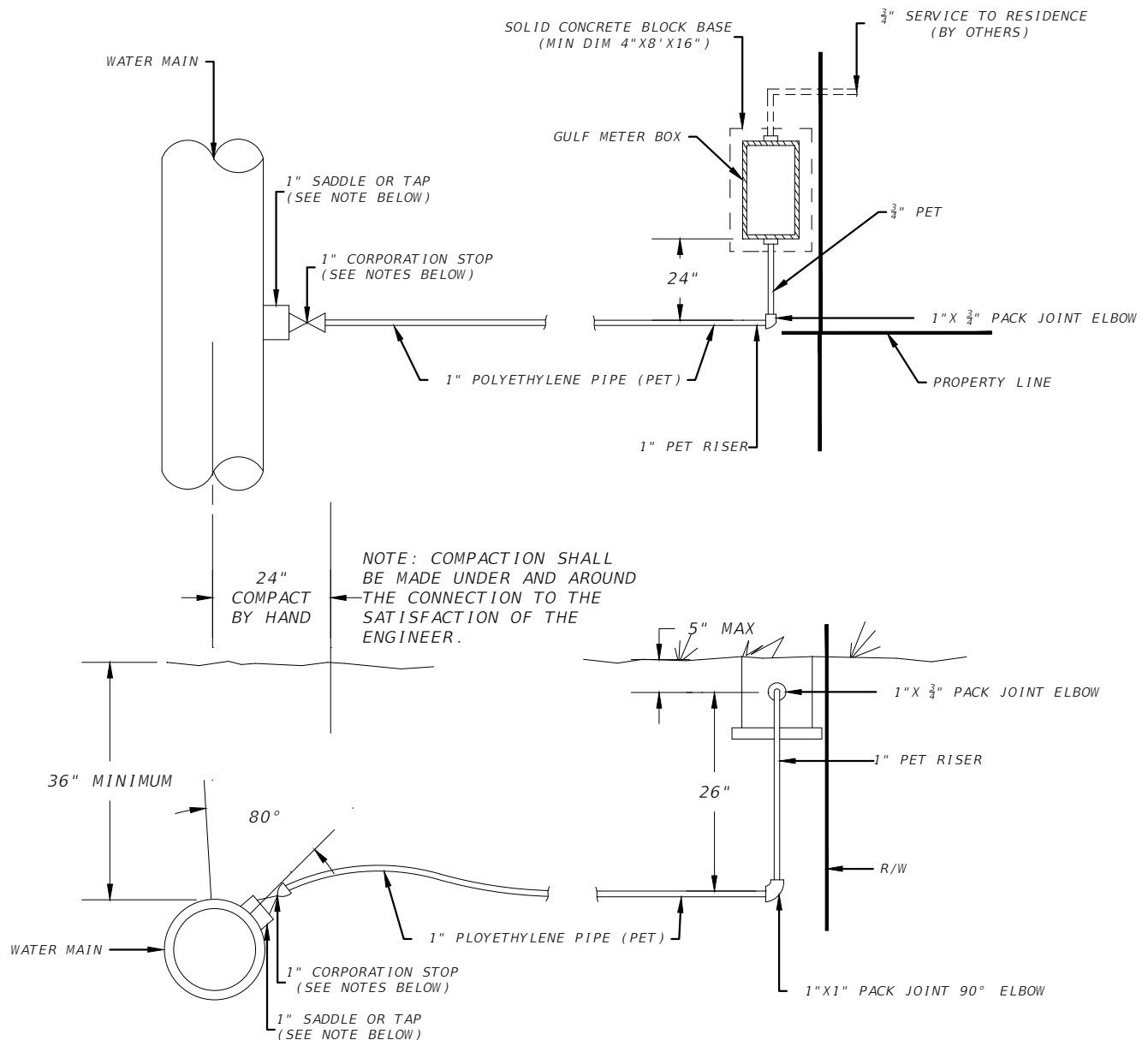
PERPENDICULAR TO MAIN

SECTION:  
RECLAIMED  
WATER

RW-2

REVISION DATE:  
DEC 2020





### NOTES

1. METER BOXES SET IN PAVEMENT SHALL BE POLYMERE CONCRETE WITH COVER AND METER READERS LID.
2. WATER SERVICE TO BE INSTALLED WITH SOLID COPPER LOCATING WIRE. SEE DETAIL G-15 FOR LOCATING WIRE INSTALLATION.
3. ON NEW 2" PVC WATER MAINS, A 2" x 1" TAPPING SADDLE AND 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS.
4. ON NEW OR EXISTING WATER MAINS WITH A DIAMETER OF 6" OR LARGER, A 1" TAP SHALL BE MADE INTO THE MAIN AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS. (SADDLE FOR PVC)
5. THE BRASS EXPANSION CONNECTION SUPPLIED WITH THE METER BOX SHALL BE DELIVERED TO THE INSPECTOR AT THE TIME OF FINAL INSPECTION.
6. LONG SERVICES UNDER PAVEMENT REQUIRE 2" CASING OF PVC, HDPE OR STEEL.



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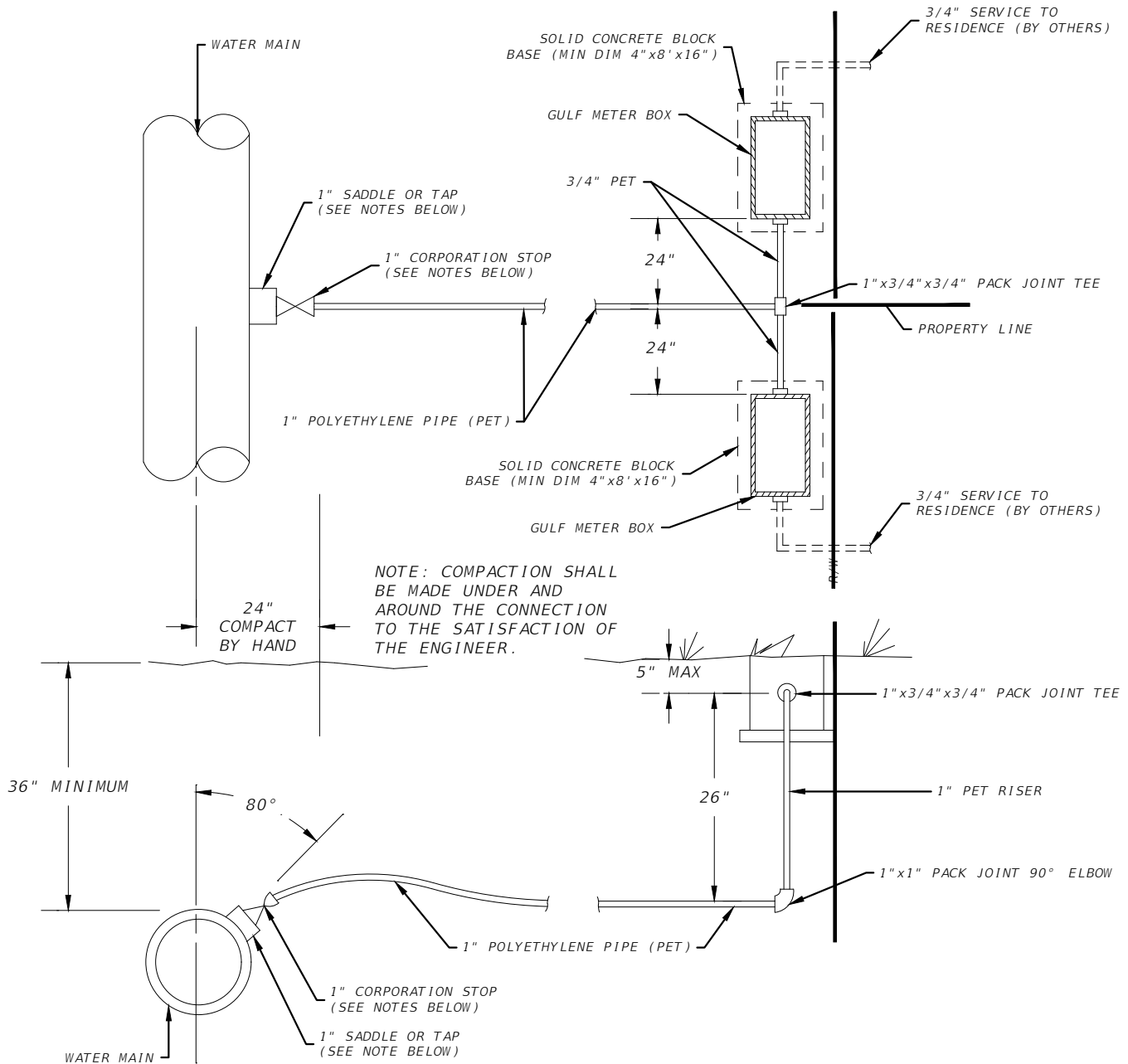
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**SINGLE 1" X 3/4"**  
**RESIDENTIAL**  
**RECLAIMED WATER**  
**SERVICE**

SECTION:  
RECLAIMED  
WATER

**RW-3**

REVISION DATE:  
DEC 2020



### NOTES

1. METER BOXES SET IN PAVEMENT SHALL BE POLYMERE CONCRETE WITH COVER AND METER READERS LID.
2. WATER SERVICE TO BE INSTALLED WITH SOLID COPPER LOCATING WIRE. SEE DETAIL G-15 FOR LOCATING WIRE INSTALLATION.
3. ON NEW 2" PVC WATER MAINS, A 2" X 1" TAPPING SADDLE AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS.
4. ON NEW OR EXISTING WATER MAINS WITH A DIAMETER LARGER THAN 2", A 1" TAP SHALL BE MADE INTO THE MAIN AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS. (SADDLE FOR PVC)
5. THE BRASS EXPANSION CONNECTION SUPPLIED WITH THE METER BOX SHALL BE DELIVERED TO THE INSPECTOR AT THE TIME OF FINAL INSPECTION.
6. LONG SERVICES UNDER PAVEMENT REQUIRE 2" CASING OF PVC, HDPE OR STEEL.



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OCALA, FLORIDA 34470

CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

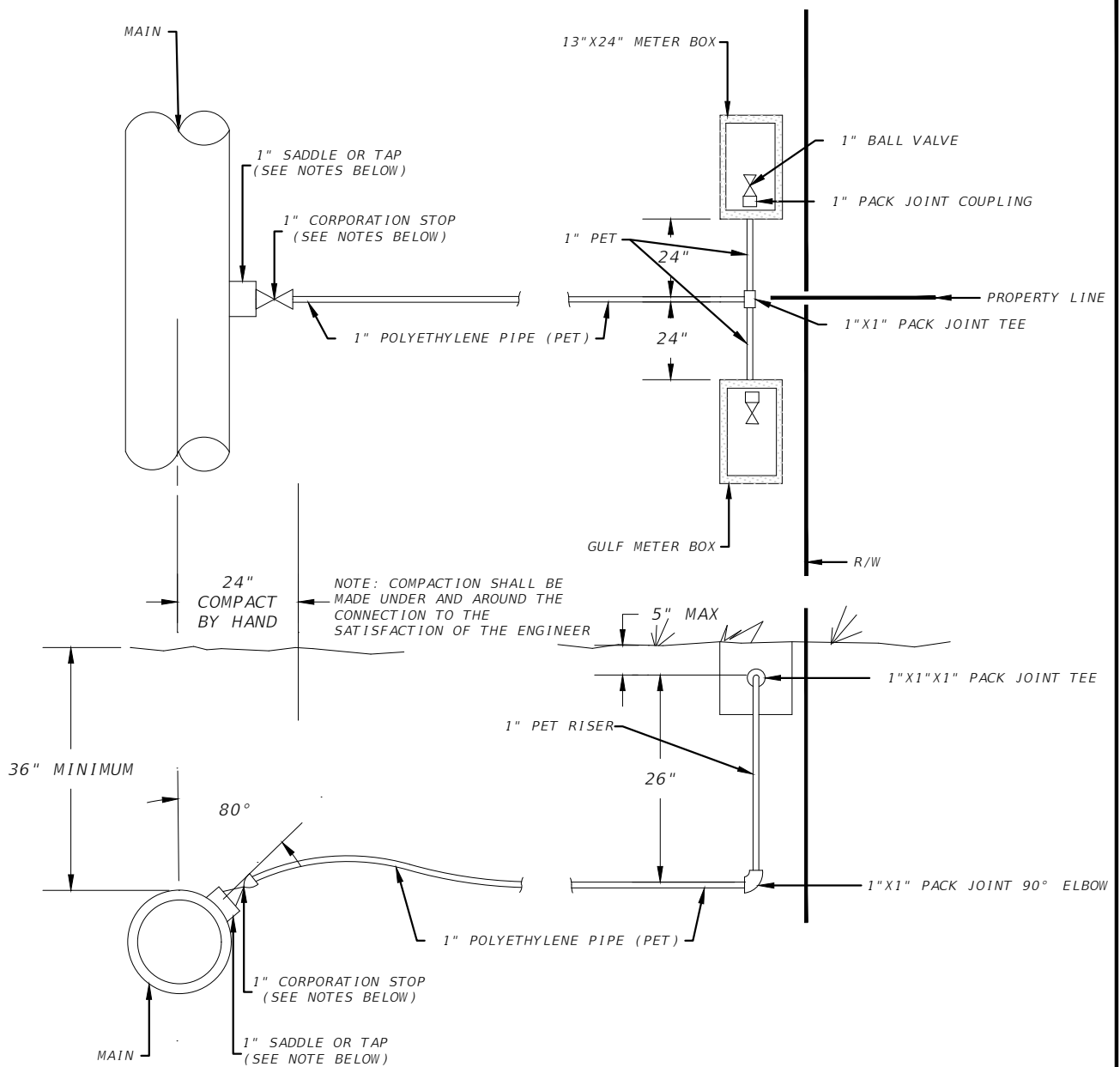
DOUBLE 1" X  $\frac{3}{4}$ "  
RESIDENTIAL  
RECLAIMED WATER  
SERVICE

SECTION:  
RECLAIMED  
WATER

RW-4

REVISION DATE:  
DEC 2020





### NOTES

1. METER BOXES SET IN PAVEMENT SHALL BE POLYMERE CONCRETE WITH COVER AND METER READERS LID.
2. WATER SERVICE TO BE INSTALLED WITH SOLID COPPER LOCATING WIRE. SEE DETAIL G-15 FOR LOCATING WIRE INSTALLATION.
3. ON NEW 2" PVC WATER MAINS, A 2" X 1" TAPPING SADDLE AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS.
4. ON NEW OR EXISTING WATER MAINS WITH A DIAMETER LARGER THAN 2", A 1" TAP SHALL BE MADE INTO THE MAIN AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS.
5. LONG SERVICES UNDER PAVEMENT REQUIRE 2" CASING OF PVC, HDPE OR STEEL.



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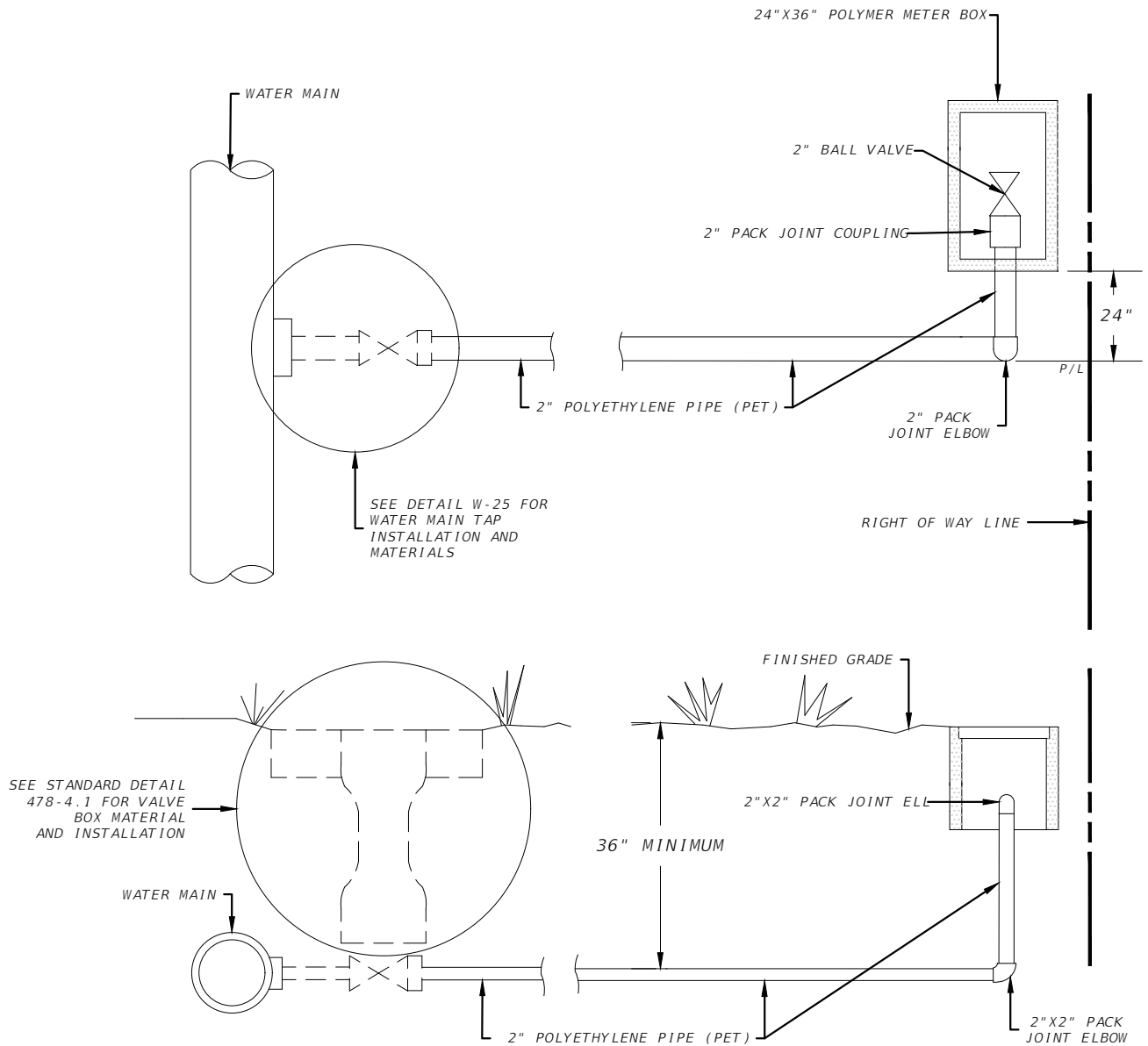
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

DOUBLE 1" RESIDENTIAL  
RECLAIMED WATER  
SERVICE

SECTION:  
RECLAIMED  
WATER

RW-6

REVISION DATE:  
DEC 2020



### NOTES

1. WATER SERVICE TO BE INSTALLED WITH A SOLID COPPER LOCATING WIRE SEE DETAIL G-15 FOR LOCATING WIRE INSTALLATION.
2. LONG SERVICES UNDER PAVEMENT REQUIRE 4" CASING OF PVC, HDPE OR STEEL.



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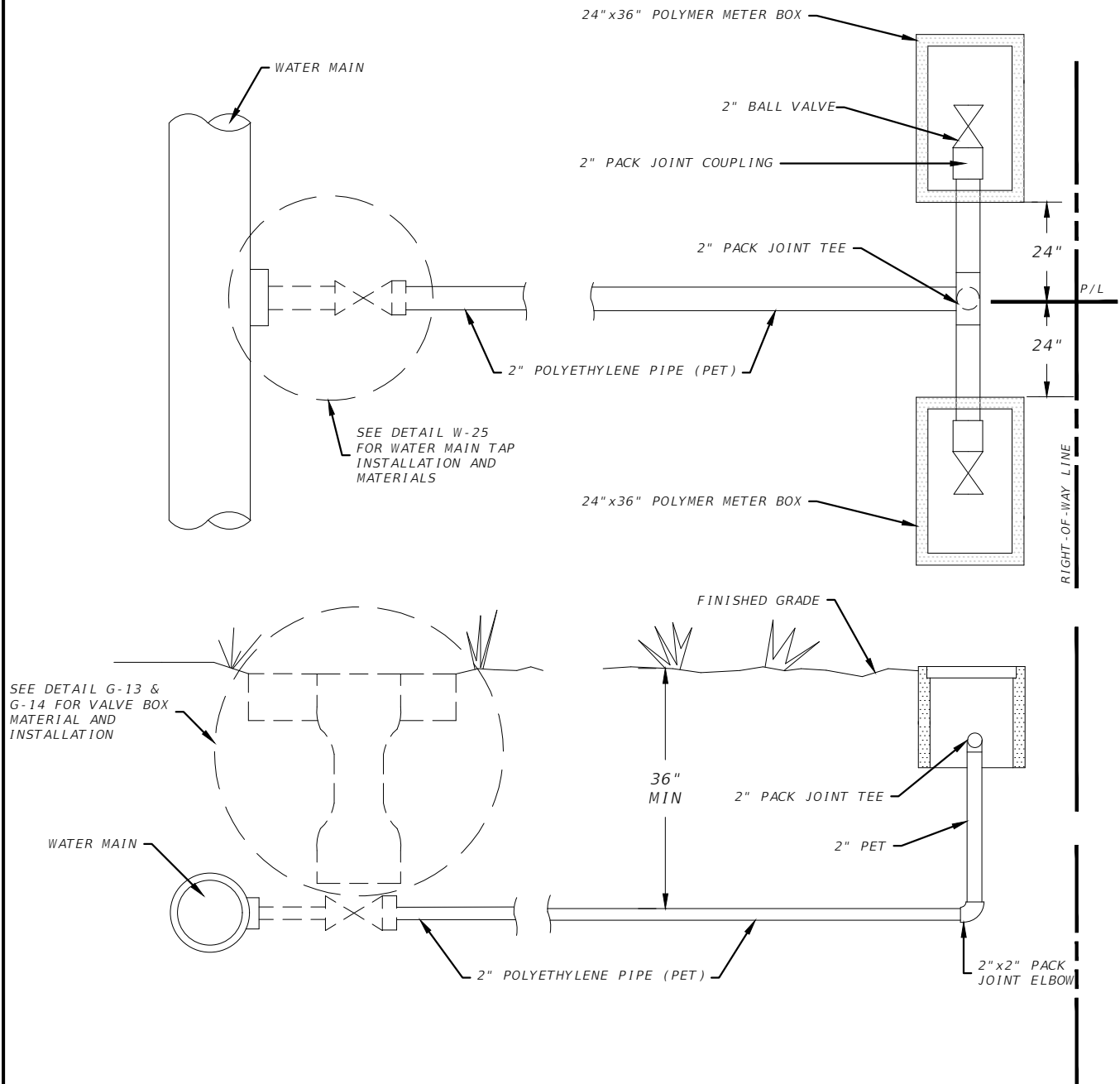
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**SINGLE 2" COMMERCIAL  
RECLAIMED WATER  
SERVICE**

SECTION:  
RECLAIMED  
WATER

**RW-7**

REVISION DATE:  
DEC 2020



### NOTES

1. WATER SERVICE TO BE INSTALLED WITH A SOLID COPPER LOCATING WIRE SEE DETAIL G-15 FOR LOCATING WIRE INSTALLATION.
2. LONG SERVICES UNDER PAVEMENT REQUIRE 4" CASING OF PVC, HDPE OR STEEL.



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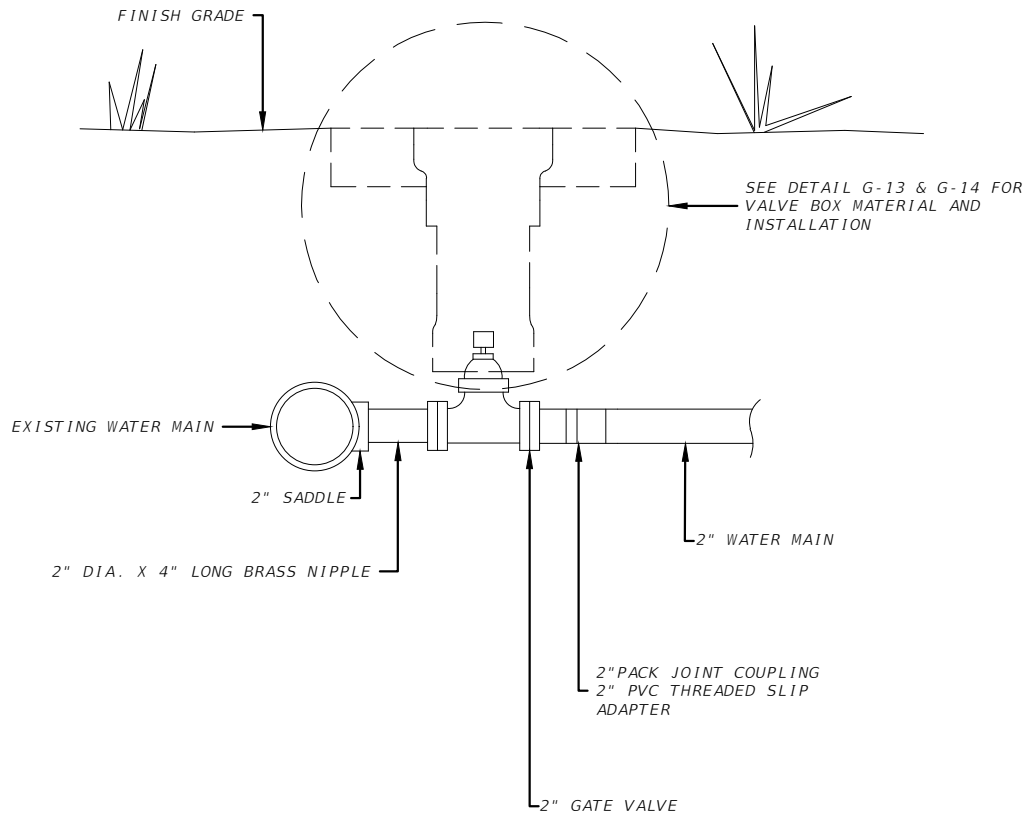
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## DOUBLE 2" COMMERCIAL RECLAIMED WATER SERVICE

SECTION:  
RECLAIMED  
WATER

RW-8

REVISION DATE:  
DEC 2020



### NOTES

1. PRESSURE TEST ALL SADDLES & VALVES PRIOR TO TAPPING.
2. PRESSURE TEST AS SPECIFIED.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

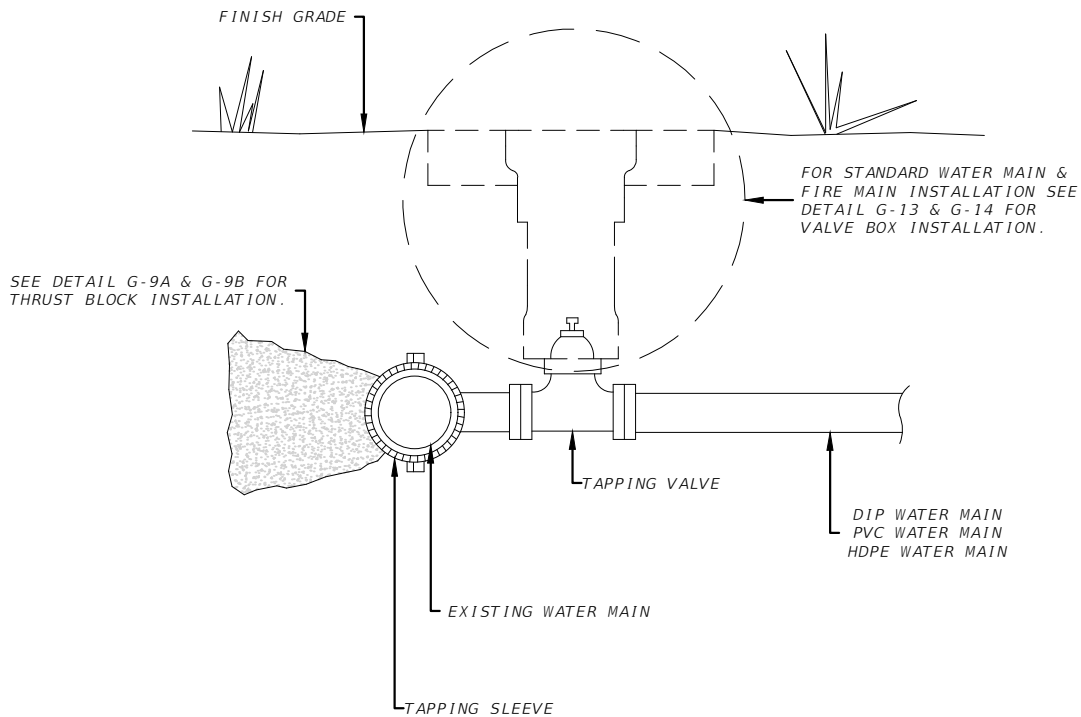
## RECLAIMED WATER MAIN TAP

2" PVC/PET TO EXISTING MAIN

SECTION:  
RECLAIMED  
WATER

RW-9

REVISION DATE:  
DEC 2020



### NOTES

1. PRESSURE TEST ALL SADDLES AND VALVES PRIOR TO WET TAP.
2. PRESSURE TEST SHALL BE PERFORMED AS SPECIFIED.
3. ALL WATER MAIN TAPS TO INCLUDE, TAPPING SLEEVE AND VALVE. THRUST BLOCK ONLY FOR ALL WATER MAIN TAPS TO INCLUDE, TAPPING SLEEVE AND VALVE. THRUST BLOCK ONLY FOR SIZE ON SIZE PIPES (EXAMPLE: 6" ON 6").



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## RECLAIMED WATER MAIN TAP

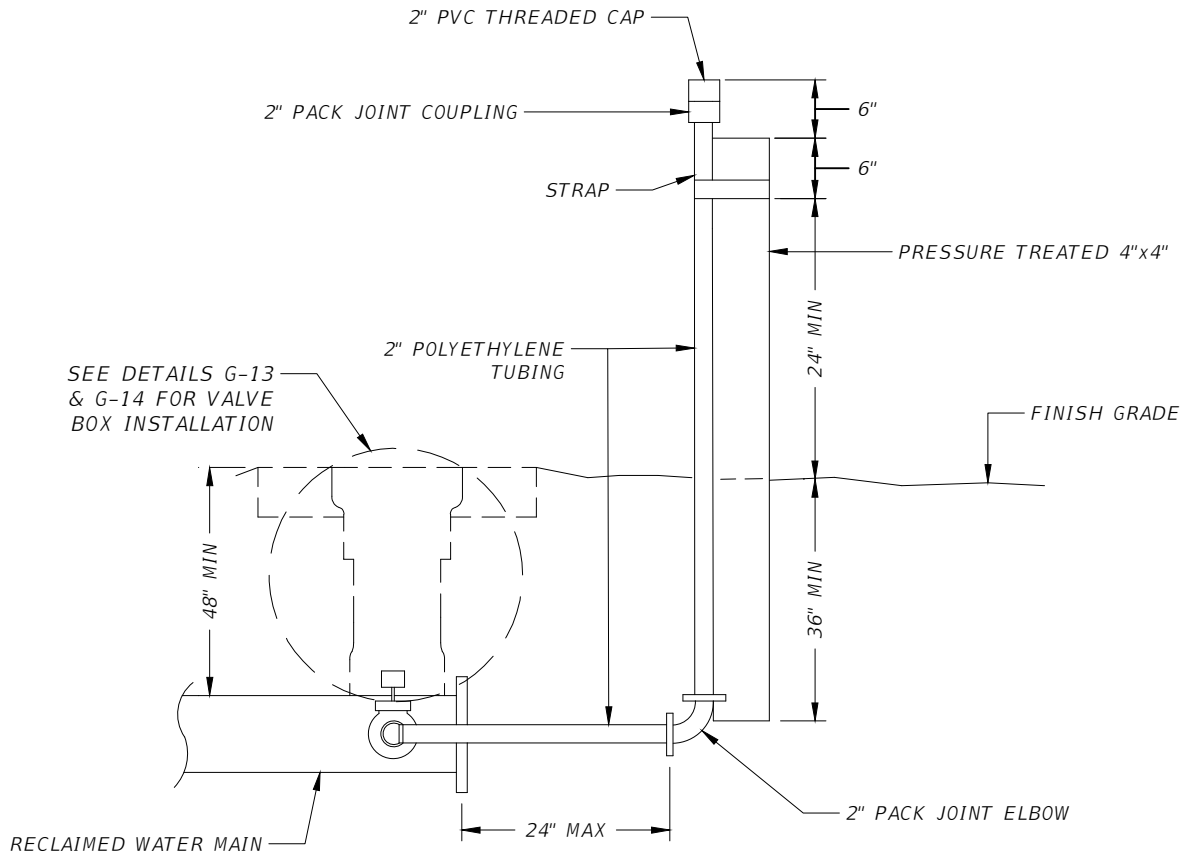
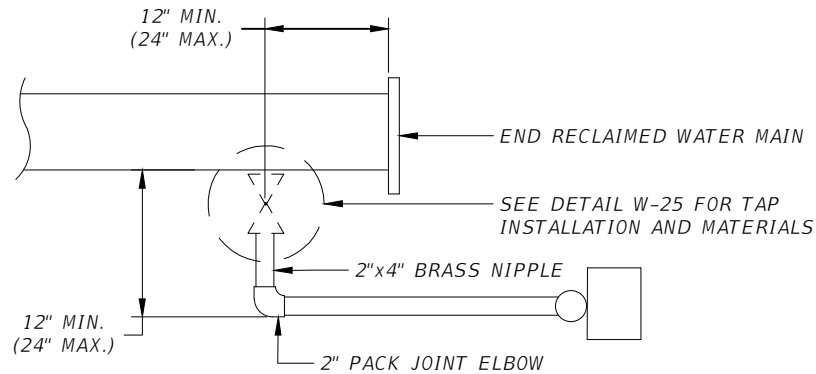
4" AND ABOVE

SECTION:  
RECLAIMED  
WATER

RW-10

REVISION DATE:  
DEC 2020





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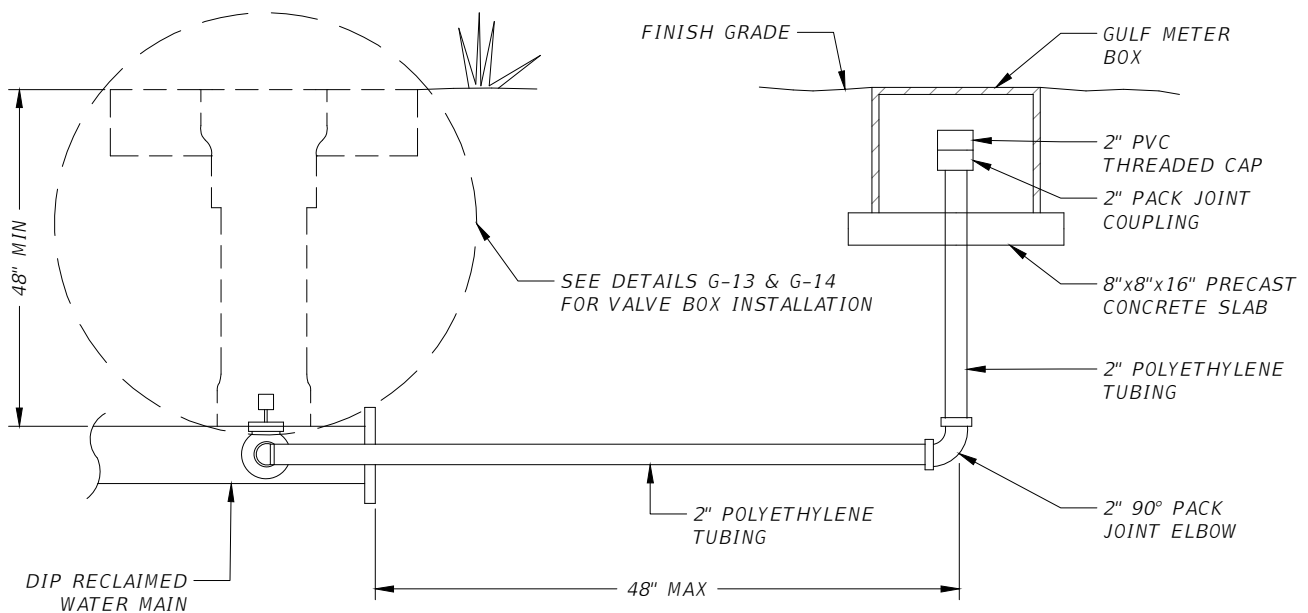
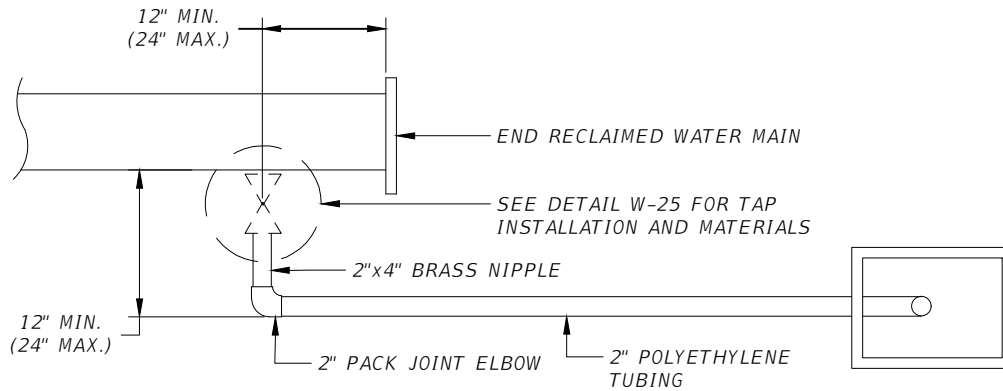
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# RECLAIMED WATER TEMPORARY BLOWOFF ASSEMBLY

SECTION:  
RECLAIMED  
WATER

RW-11

REVISION DATE:  
DEC 2020



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# RECLAIMED WATER PERMANENT BLOWOFF ASSEMBLY

SECTION:  
RECLAIMED  
WATER

RW-12

REVISION DATE:  
DEC 2020



# **STANDARD DETAILS FOR CONSTRUCTION**

## **SEWER DIVISION**

SANITARY SEWER MAIN	— 8"SS — — — — — 8"SS —	8" SS
SANITARY SEWER MANHOLE		
PLUG VALVE		
AIR RELEASE VALVE		
SANITARY SEWER CLEANOUT		
SANITARY SEWER SERVICE		
TEE		
PLUG OR CAP		
BEND		
WYE		
REDUCER		



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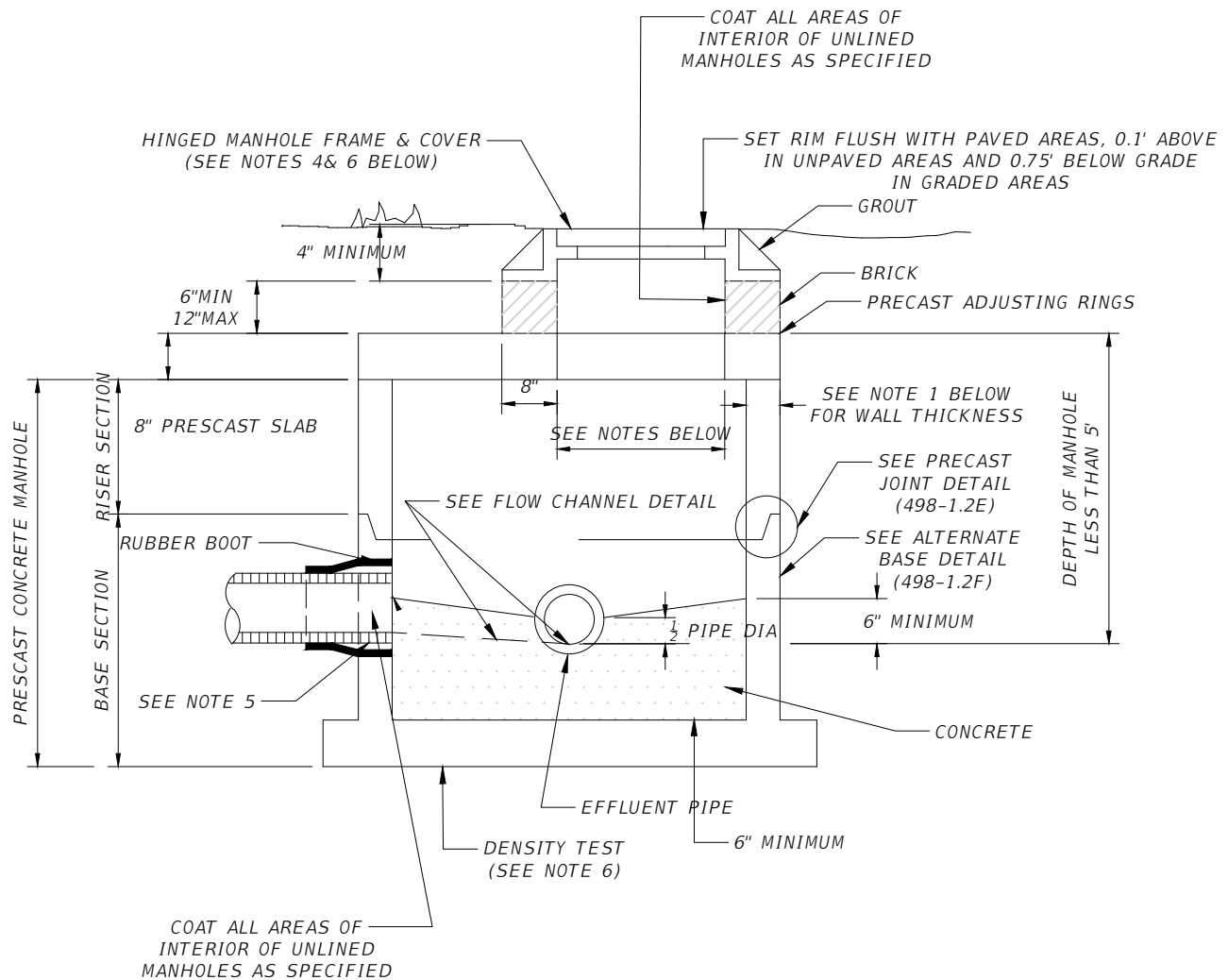
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# SEWER SYSTEM LEGEND

SECTION:  
SEWER

SS-1

REVISION DATE:  
DEC 2020



### NOTES

1. MINIMUM WALL THICKNESS SHALL BE FIVE INCHES (5") OR 1/12 THE INSIDE DIAMETER, WHICHEVER IS GREATER.
2. THE INTERIOR, EXTERIOR, JOINTS AND GROUTED AREAS SHALL BE COATED AS SPECIFIED WHERE FORCE MAINS ARE TO BE CONNECTED OR THE MANHOLE LIES IMMEDIATELY UPSTREAM FROM THE WET WELL THE COMPLETE INSIDE OF THE MANHOLE SHALL BE LINED AS SPECIFIED ON THE PLANS. LINING SHALL BE HDPE.
3. MANHOLES SHALL BE FURNISHED WITH FACTORY INSTALLED BOOTS TO CONNECT SEWER PIPES TO MANHOLES.
4. MANHOLE TO BE INSTALLED WITH 24" HINGED RING AND COVER.
5. FILL ANNULAR VOID BETWEEN PIPE AND RUBBER BOOT WITH GROUT AND FLUSH WITH MANHOLE WALLS.
6. EACH MANHOLE INSTALLED SHALL HAVE ONE COMPACTION DENSITY TEST AS SPECIFIED.
7. LIMEROCK WILL BE PLACED AROUND RING AND COVER TO BOTTOM OF ASPHALT.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

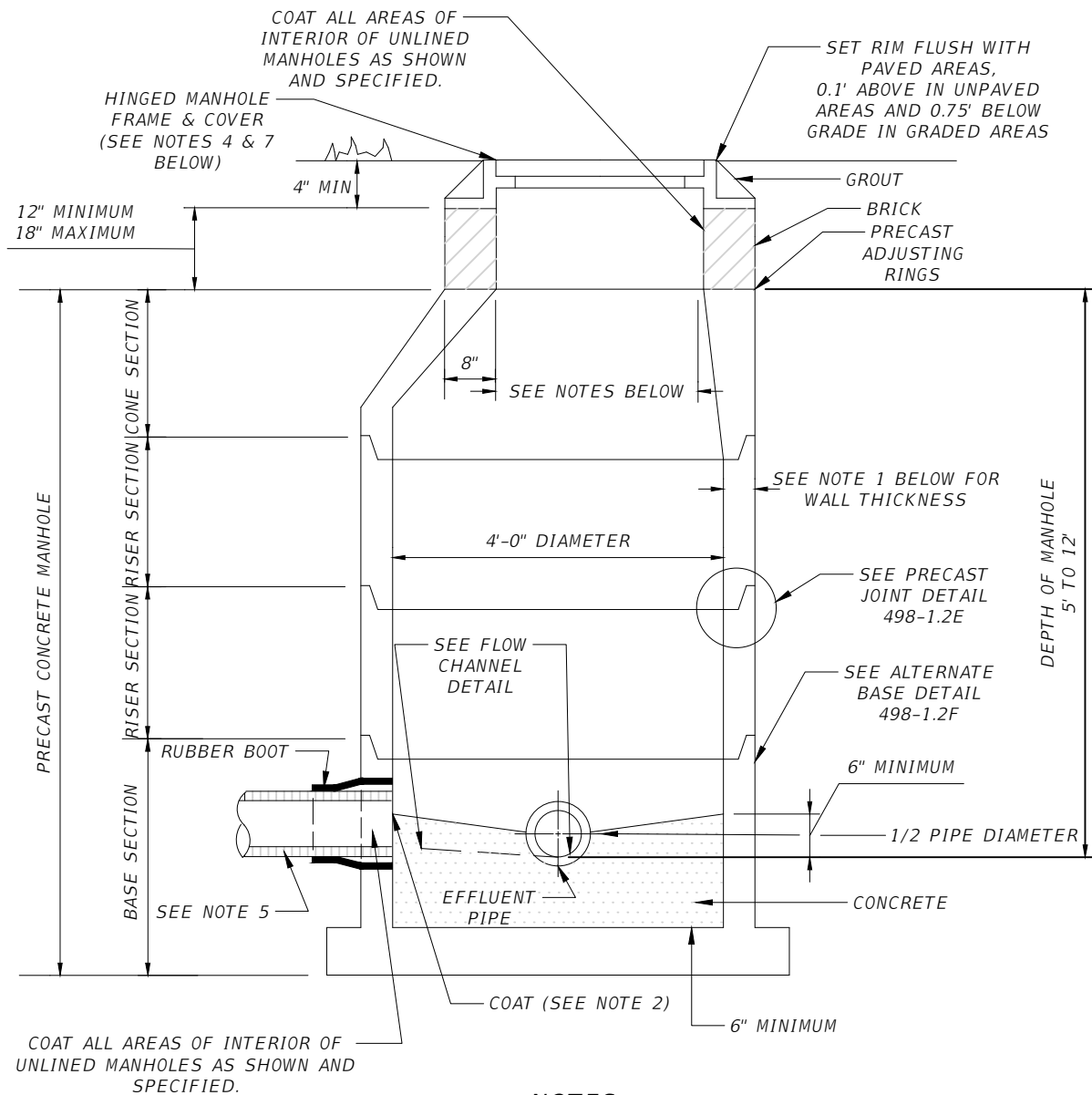
PRECAST CONCRETE  
MANHOLE

LESS THAN 5' DEPTH

SECTION:  
SEWER

SS-2

REVISION DATE:  
DEC 2020



### NOTES

1. MINIMUM WALL THICKNESS SHALL BE FIVE INCHES (5") OR 1/12 THE INSIDE DIAMETER, WHICHEVER IS GREATER.
2. THE INTERIOR, EXTERIOR, JOINTS AND GROUTED AREAS SHALL BE COATED AS SPECIFIED. WHERE FORCE MAINS ARE TO BE CONNECTED OR THE MANHOLE LIES IMMEDIATELY UPSTREAM FROM THE WET WELL THE COMPLETE INSIDE OF THE MANHOLE SHALL BE LINED AS SHOWN AND SPECIFIED.
3. MANHOLES SHALL BE FURNISHED WITH FACTORY INSTALLED BOOTS TO CONNECT SEWER PIPES TO MANHOLES.
4. MANHOLE TO BE INSTALLED WITH 24" HINGED RING AND COVER.
5. FILL ANNULAR VOID BETWEEN PIPE AND RUBBER BOOT WITH GROUT AND FLUSH WITH MANHOLE WALL.
6. LIMEROCK WILL BE PLACED AROUND RING & COVER TO BOTTOM OF ASPHALT.
7. EACH MANHOLE INSTALLED SHALL HAVE ONE COMPACTION DENSITY TEST AS SPECIFIED.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

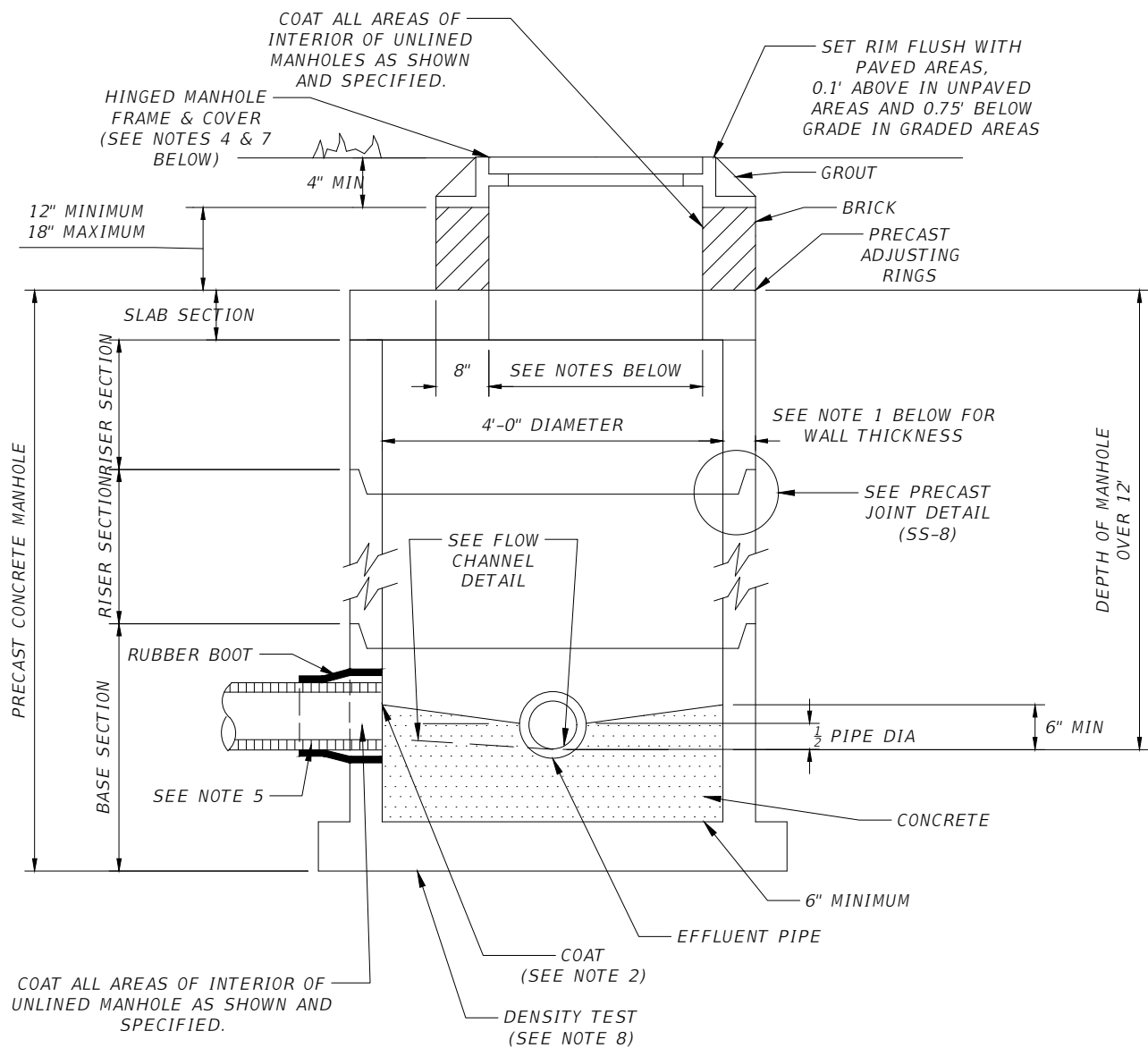
## PRECAST CONCRETE MANHOLE

5' TO 12' DEPTH

SECTION:  
SEWER

SS-3

REVISION DATE:  
DEC 2020



### NOTES

1. MINIMUM WALL THICKNESS SHALL BE FIVE INCHES (5") TO A DEPTH OF TEN FEET (10'). WALL THICKNESS SHALL BE INCREASED TO EIGHT INCHES (8") AT TEN FEET BELOW GRADE.
2. THE INTERIOR, EXTERIOR, JOINTS AND GROUTED AREAS SHALL BE COATED WITH TWO (2) COATS OF BITUMASTIC SEALER. WHERE FORCE MAINS ARE TO BE CONNECTED OR THE MANHOLE LIES IMMEDIATELY UPSTREAM FROM THE WET WELL THE COMPLETE INSIDE OF THE MANHOLE SHALL BE LINED AS SHOWN AND SPECIFIED.
3. MANHOLES SHALL BE FURNISHED WITH FACTORY INSTALLED BOOTS TO CONNECT SEWER PIPES TO MANHOLES.
4. MANHOLE TO BE INSTALLED WITH 32" OR 36" HINGED RING AND COVER.
5. FILL ANNULAR SPACE BETWEEN PIPE AND BOOT WITH GROUT AND FLUSH WITH WALL OF MANHOLE.
6. LIMEROCK WILL BE PLACED AROUND RING AND COVER TO BOTTOM OF ASPHALT.
7. EACH MANHOLE INSTALLED SHALL HAVE ONE COMPACTION DENSITY TEST AS SPECIFIED.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

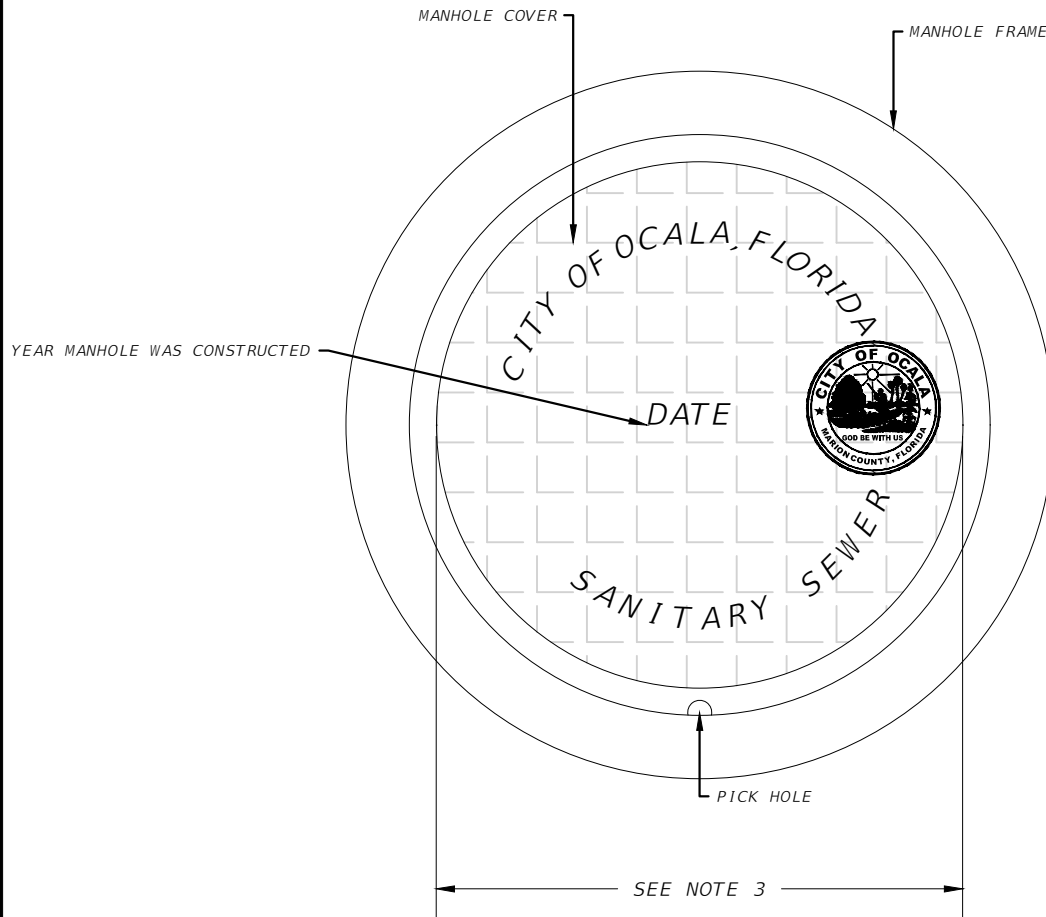
PRECAST CONCRETE  
MANHOLE

OVER 12' DEPTH

SECTION:  
SEWER

SS-4

REVISION DATE:  
DEC 2020



### NOTES

1. MANHOLE COVER SHALL BE LETTERED WITH THE WORDS "SANITARY SEWER" AND THE YEAR THE MANHOLE WAS CONSTRUCTED.
2. CITY OF OCALA IDENTIFICATION LABEL SHALL BE BOLTED ON COVER.
3. UNLESS OTHERWISE SPECIFIED MANHOLE COVERS SHALL BE 24" DIAMETER AND 32" DIAMETER DEPENDING ON DEPTH.
4. ALL MANHOLE COVERS SHALL BE FURNISHED WITH HINGES AND LOCKING DEVICE.
5. WHERE MANHOLE COVERS ARE NOT INSTALLED IN CENTER OF TWO WAY TRAFFIC, HINGED SIDE OF COVER TO BE INSTALLED TOWARDS ONCOMING TRAFFIC.
6. STANDARD, USE ON ALL MANHOLES.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**SEWER HINGED  
MANHOLE COVER**

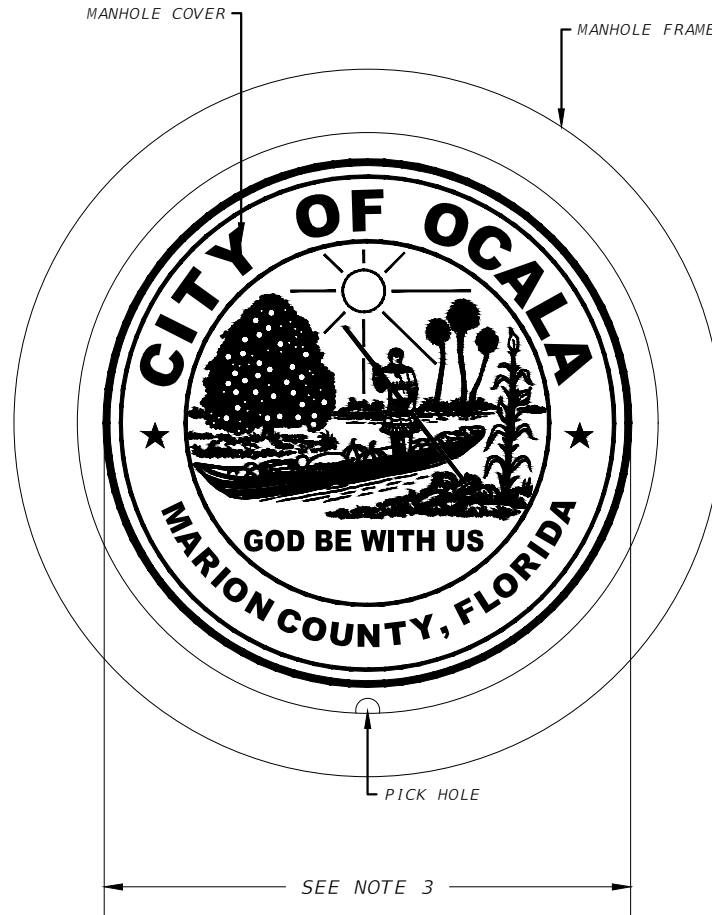
STANDARD

SECTION:  
SEWER

**SS-5A**

REVISION DATE:  
DEC 2020





### NOTES

1. CITY OF OCALA IDENTIFICATION LABEL SHALL BE BOLTED ON COVER.
2. UNLESS OTHERWISE SPECIFIED MANHOLE COVERS SHALL BE 24" DIAMETER AND 32" DIAMETER DEPENDING ON DEPTH.
3. ALL MANHOLE COVERS SHALL BE FURNISHED WITH HINGES AND LOCKING DEVICE.
4. WHERE MANHOLE COVERS ARE NOT INSTALLED IN CENTER OF TWO WAY TRAFFIC, HINGED SIDE OF COVER TO BE INSTALLED TOWARDS ONCOMING TRAFFIC.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

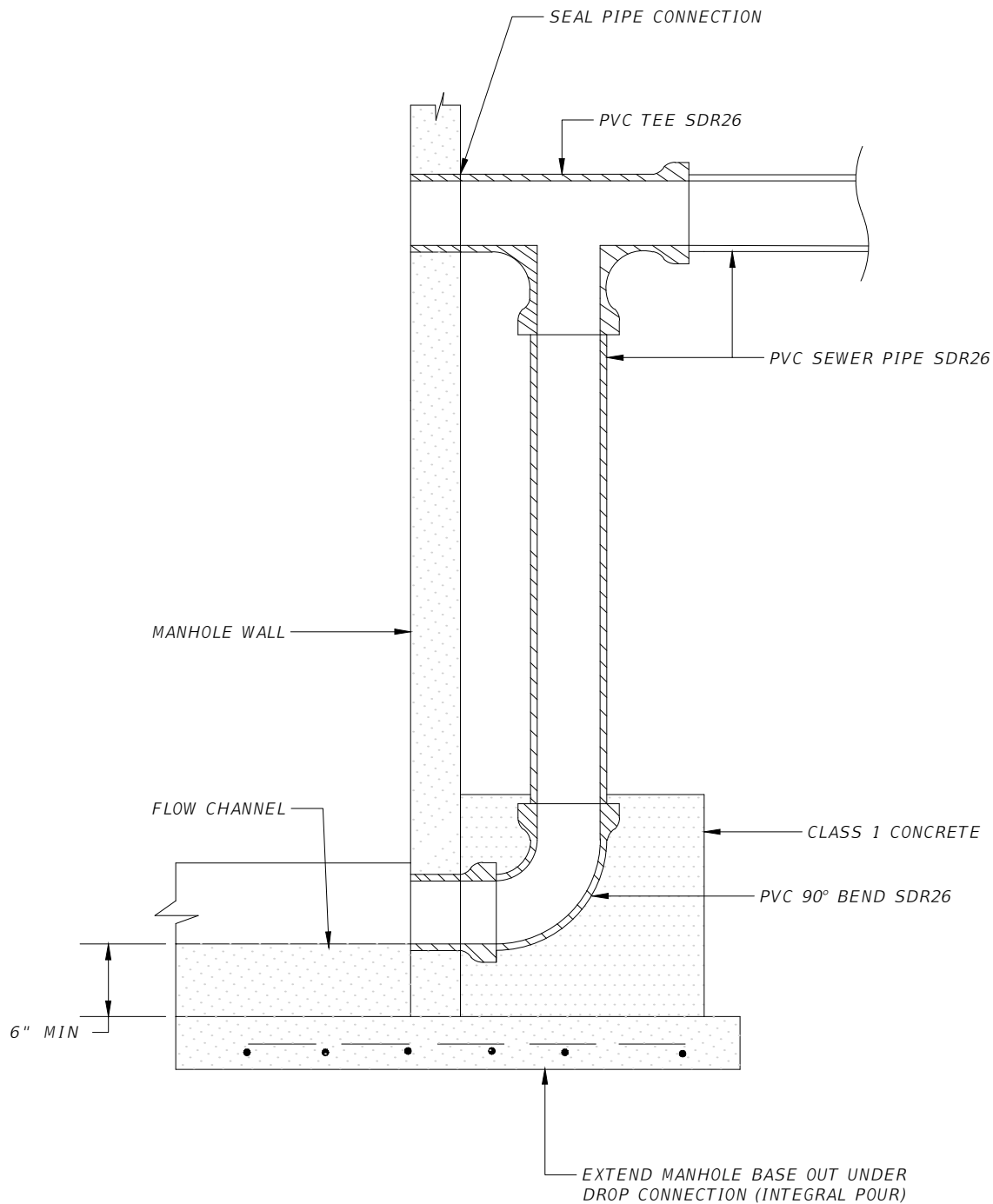
**SEWER HINGED  
MANHOLE COVER**

DECORATIVE

SECTION:  
SEWER

**SS-5B**

REVISION DATE:  
DEC 2020



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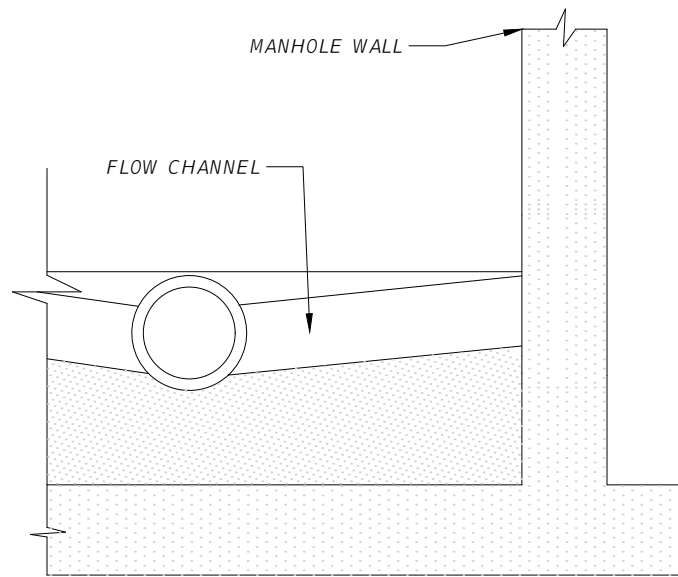
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## SEWER MANHOLE DROP CONNECTION

SECTION:  
SEWER

SS-6

REVISION DATE:  
DEC 2020



**NOTES**

MANHOLE BASES SHALL BE FORMED OF CLASS I CONCRETE WHILE THE MANHOLES ARE UNDER CONSTRUCTION.



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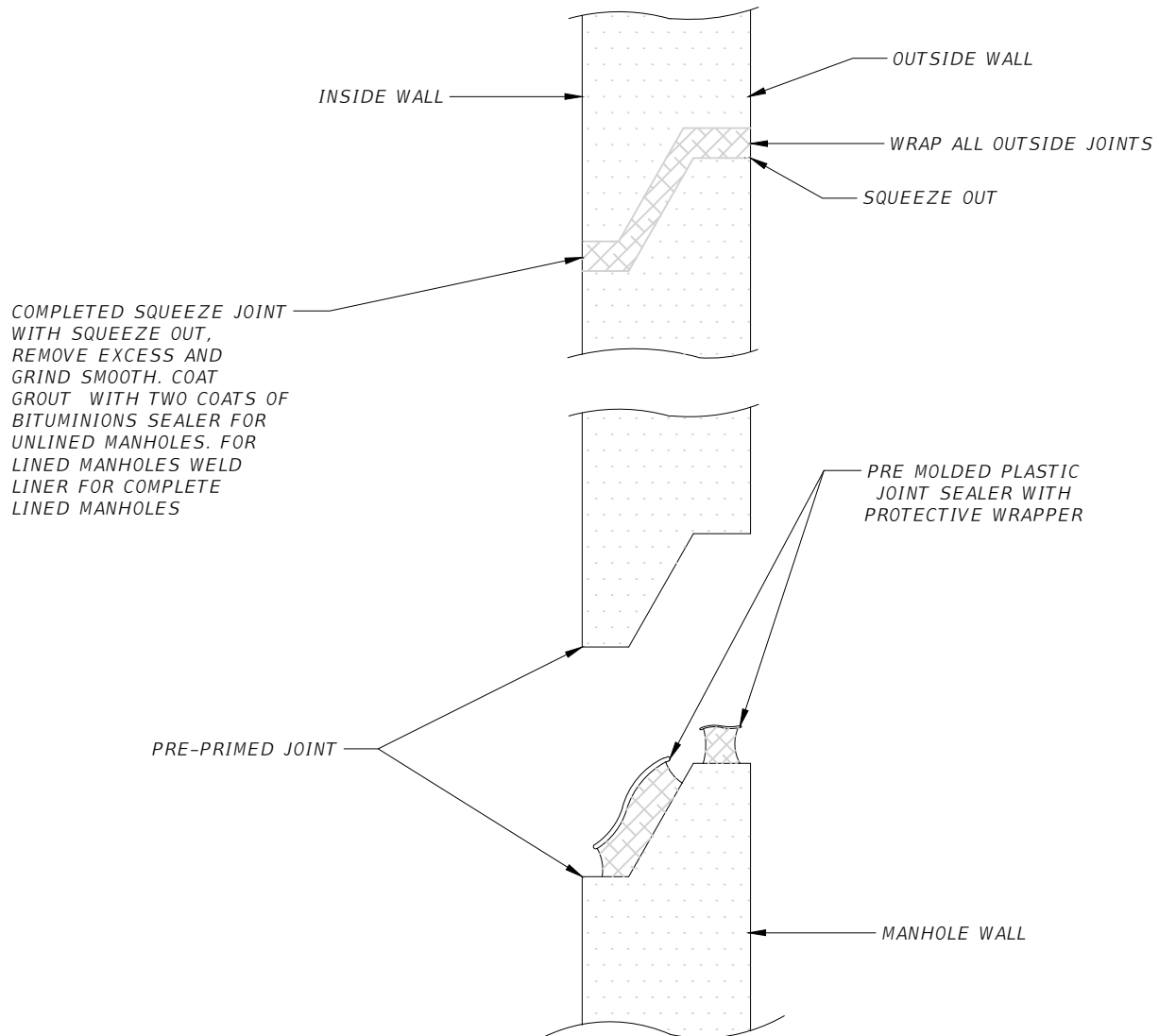
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

SEWER MANHOLE  
STUBOUT

SECTION:  
SEWER

SS-7

REVISION DATE:  
DEC 2020



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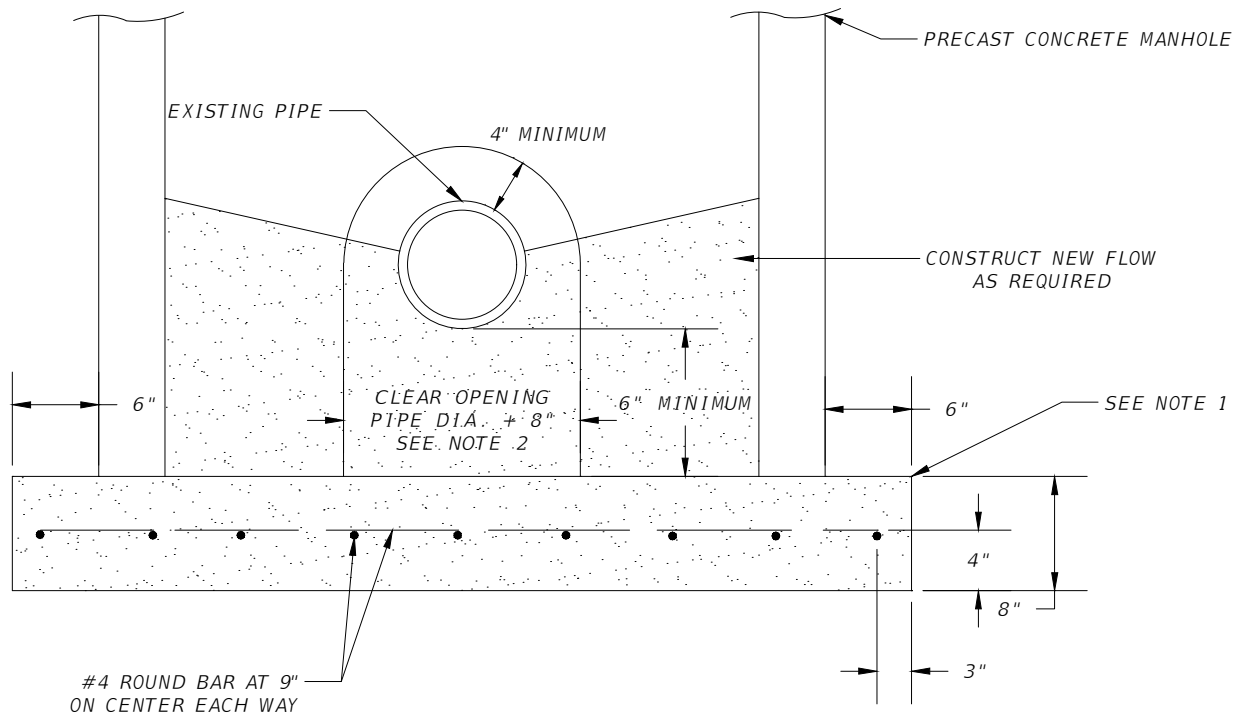
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## SEWER MANHOLE JOINT CONSTRUCTION

SECTION:  
SEWER

SS-8

REVISION DATE:  
DEC 2020



### NOTES

1. MANHOLE BASE CAN BE EITHER CAST IN PLACE AS SHOWN OR PRECAST BY AN APPROVED PRECASTER.
2. FILL VOID WITH BRICK AND GROUT AS APPROVED BY THE ENGINEER.
3. MANHOLE MUST BE LEAK OR AIR TESTED AS SPECIFIED.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

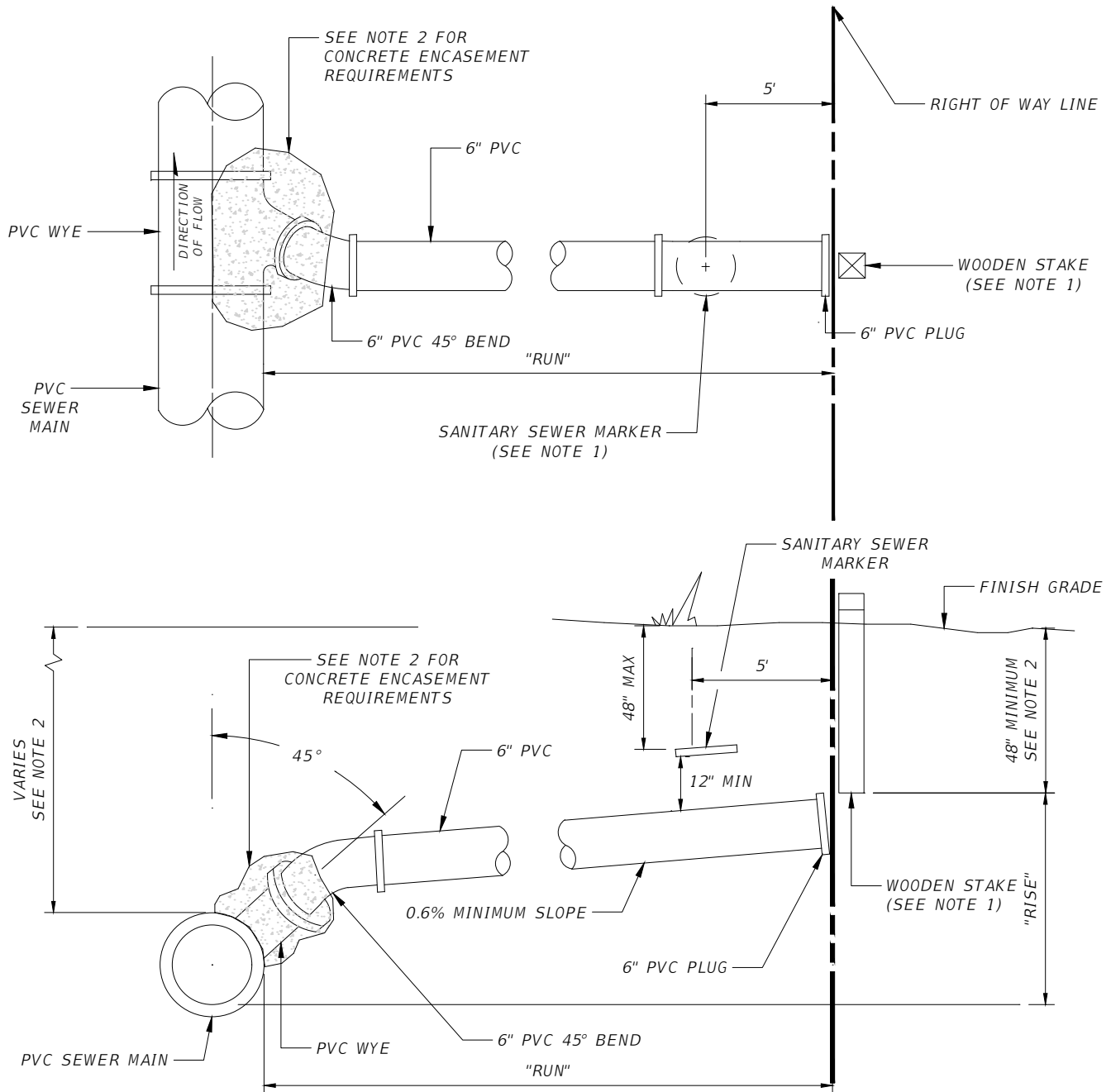
## SEWER DOGHOUSE MANHOLE

BASE CONSTRUCTION

SECTION:  
SEWER

SS-9

REVISION DATE:  
DEC 2020



### NOTES

1. SEWER SERVICE TO BE REFERENCED AS INDICATED ON DETAIL SS-12
2. FOR ANY SEWER SERVICES WHERE THE PIPE SLOPE EQUALS OR EXCEEDS A 1:5 (Rise/Run) OR 20% SLOPE, ENCASE SEWER WYE AND BEND IN CONCRETE. CONCRETE ENCASEMENT TO BE 2 CUBIC FEET MINIMUM WHERE REQUIRED.



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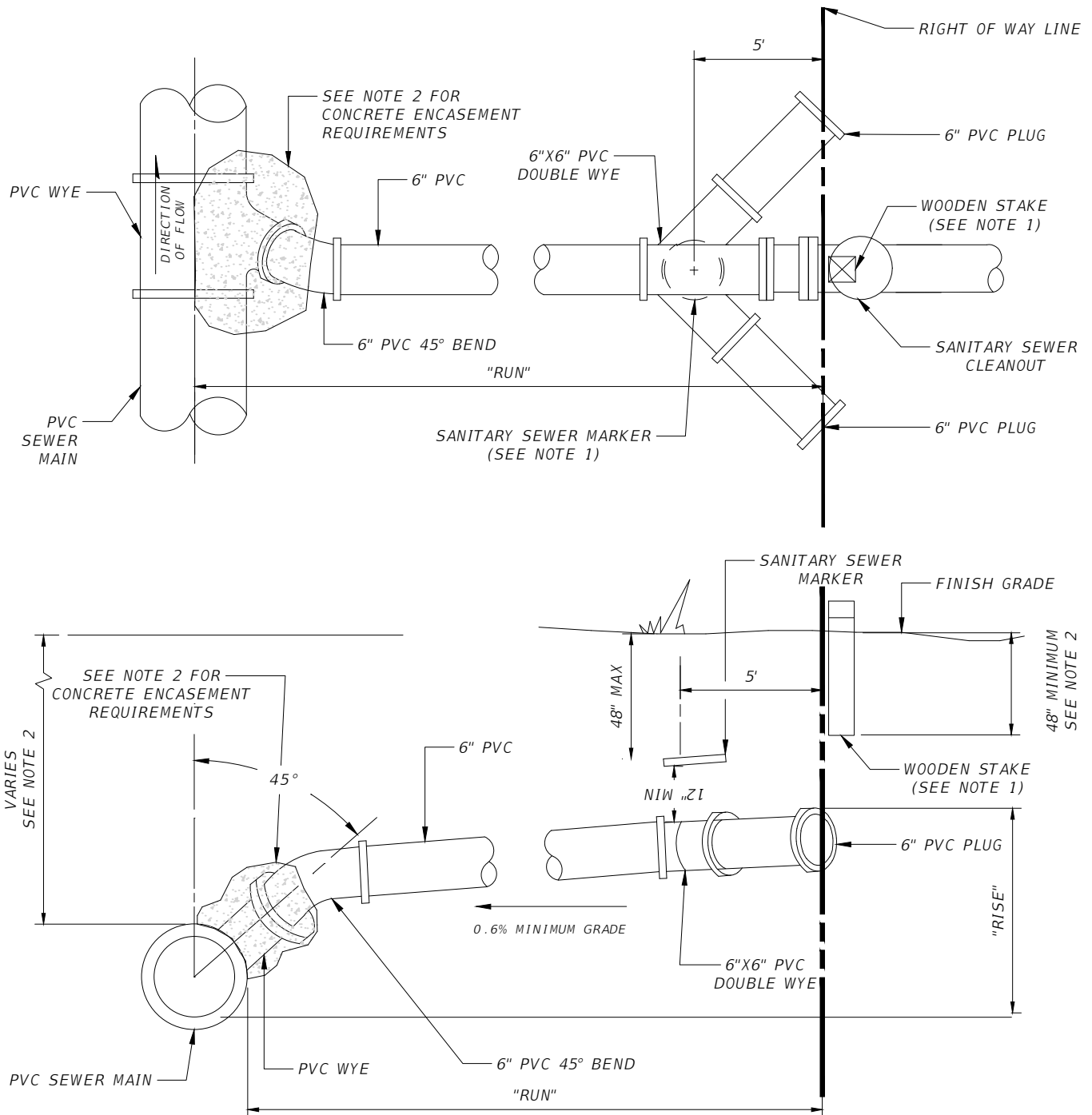
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## SINGLE SEWER SERVICE CONNECTION

SECTION:  
SEWER

SS-10

REVISION DATE:  
DEC 2020



### NOTES

1. SEWER SERVICE TO BE REFERENCED AS INDICATED IN DETAIL SS-12
2. FOR ANY SEWER SERVICES WHERE THE PIPE SLOPE EQUALS OR EXCEEDS A 1:5 (Rise/Run) OR 20% SLOPE, ENCASE SEWER WYE AND BEND IN CONCRETE. CONCRETE ENCASEMENT TO BE 2 CUBIC FEET MINIMUM WHERE REQUIRED.
3. DOUBLE SEWER SERVICES SHALL ONLY BE INSTALLED IN SPECIAL CASES AS DESIGNATED BY THE WATER AND SEWER ENGINEER.



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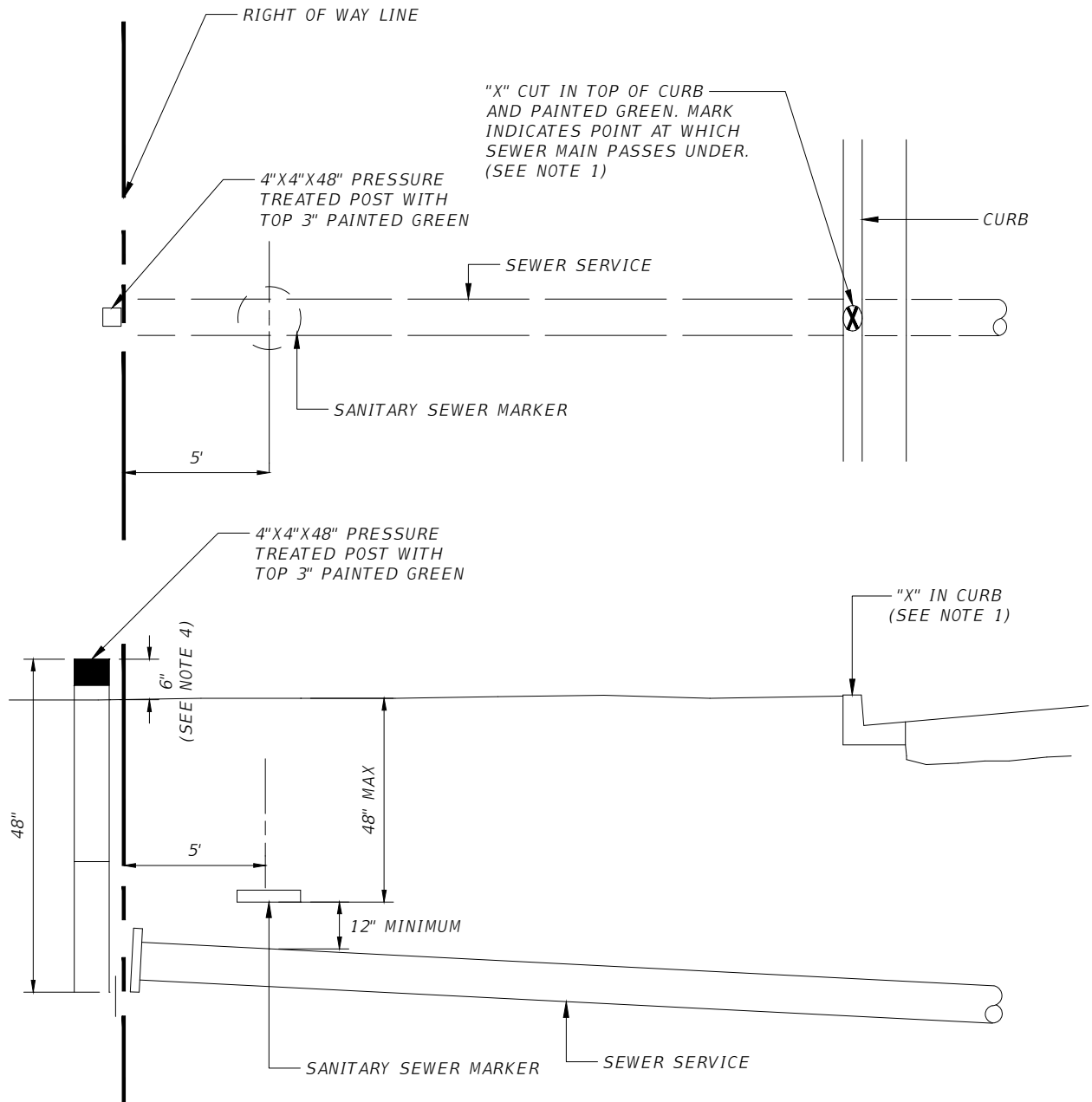
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## DOUBLE SEWER SERVICE CONNECTION

SECTION:  
SEWER

SS-11

REVISION DATE:  
DEC 2020



### NOTES

1. WHERE NO CURB AND GUTTER EXIST, THE SEWER SERVICE SHALL BE REFERENCED BY PLACING A NAIL & DISC AND AT THE EDGE OF PAVEMENT. IN GRADED ROADS ONLY THE SEWER MARKER AND 4x4 SHALL BE REQUIRED
2. ALL SEWER MAINS SHALL BE TELEVISED ACCURATELY LOCATING WYE LOCATIONS.
3. GRAPHIC ASBUILTS SHALL ACCURATELY LOCATE ALL WYES AND SERVICES.
4. IN AREAS WHERE EXISTING DWELLINGS OR BUSINESSES ARE PRESENT TOP OF POST TO BE FLUSH WITH FINISH GRADE.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

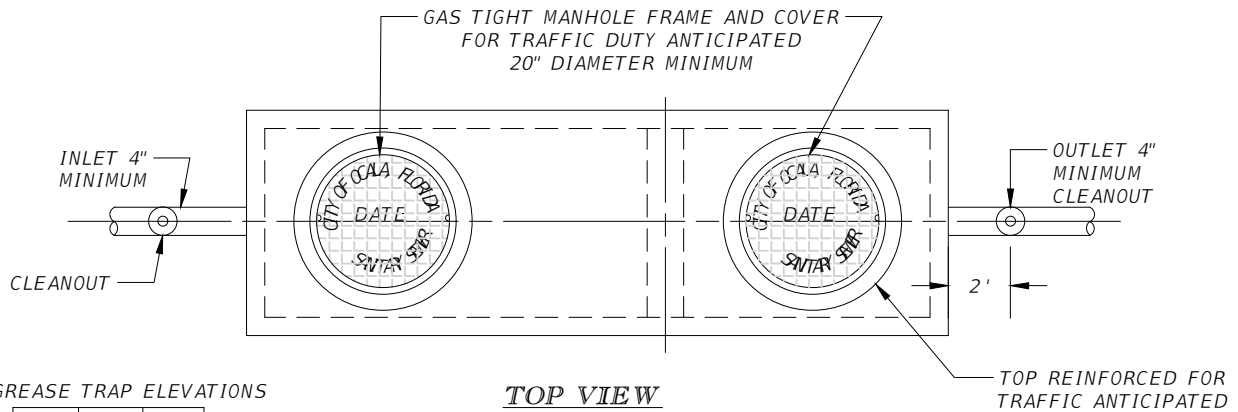
SEWER SERVICE  
REFERENCING

SECTION:  
SEWER

SS-12

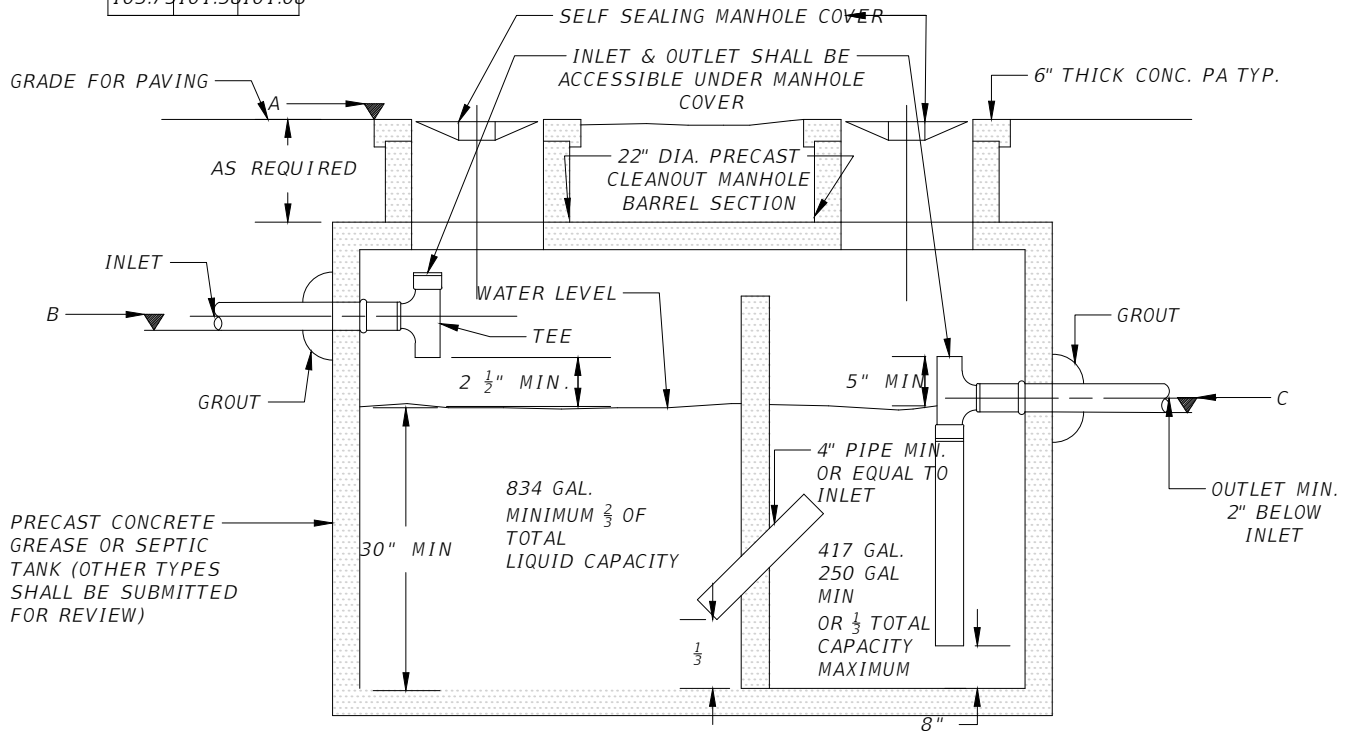
REVISION DATE:  
DEC 2020





GREASE TRAP ELEVATIONS

A	B	C
103.75	101.58	101.08



NOTE:  
STRUCTURAL DESIGN OF GREASE TRAP SHALL BE IN ACCORDANCE WITH CHAPTER 10d-6 OF THE FLORIDA ADMINISTRATIVE CODES.

**DESIGN CALCULATIONS**

$(S) \times (GS) \times (HR/12) \times (LF) = \text{EFFECTIVE CAPACITY OF GREASE TRAP IN GALLONS}$

(S) = NUMBER OF SEATS IN DINING AREA  
(GS) = GALLONS OF WASTE WATER PER SEAT (USE 25 GALLONS)

(HR) = NUMBER OF HOURS ESTABLISHMENT IS OPEN  
(LF) = LOADING FACTOR-(2.0 WITH INTERSTATE HIGHWAYS, 1.5 OTHER FREEWAYS, 1.25 RECREATIONAL AREAS, 1.0 MAIN HIGHWAYS AND 0.75 OTHER HIGHWAYS)

**NOTES**

1. ACCESS FOR MONITORING THE INLET AND OUTLET PIPE FITTINGS OR BAFFLES SHALL BE PROVIDED FROM MANHOLES. CLEANOUTS SHALL BE INSTALLED BEFORE THE FIRST GREASE INTERCEPTOR AND WITHIN TWO FEET AFTER THE LAST INTERCEPTOR IN THE SERIES.
2. GREASE INTERCEPTOR (OR INTERCEPTORS) SHALL BE DESIGNED TO PRODUCE A CLARIFIED EFFLUENT ACCEPTABLE TO CITY OF OCALA STANDARDS. FOR ADDITIONAL INFORMATION, CALL CITY WASTEWATER MONITORING SUPERVISOR AT 629-8421.

**GREASE TRAP DETAIL (1250 GALLONS)**



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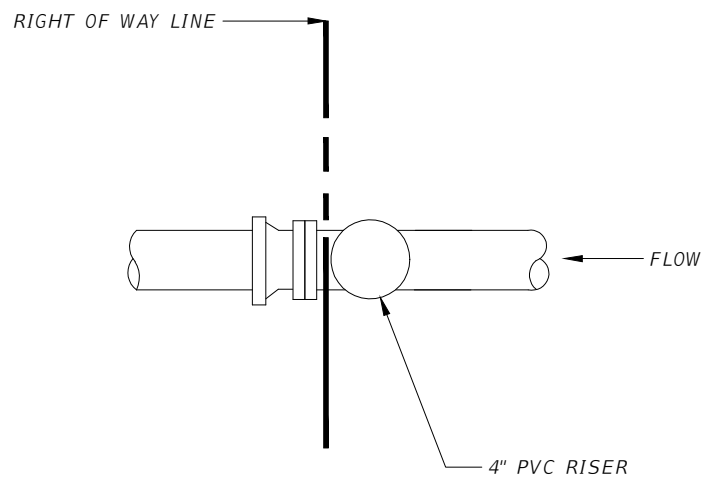
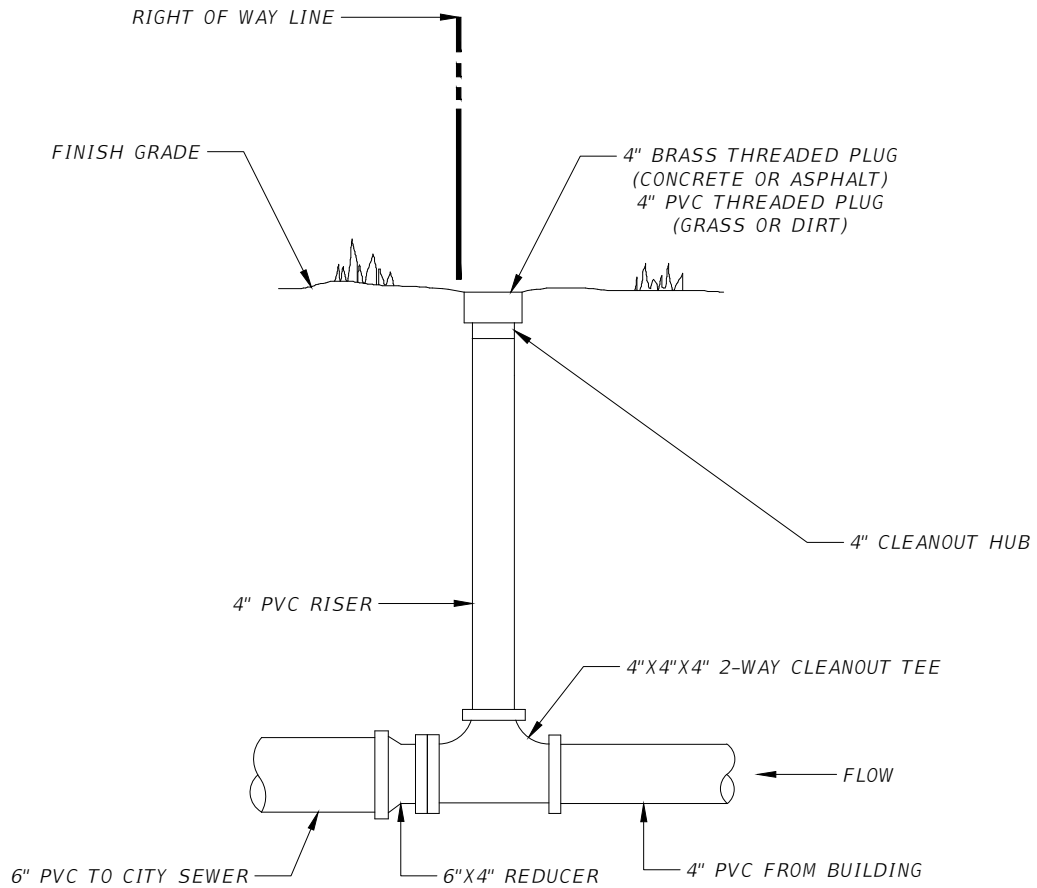
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**GREASE OIL SEPARATOR**

SECTION:  
SEWER

**SS-13**

REVISION DATE:  
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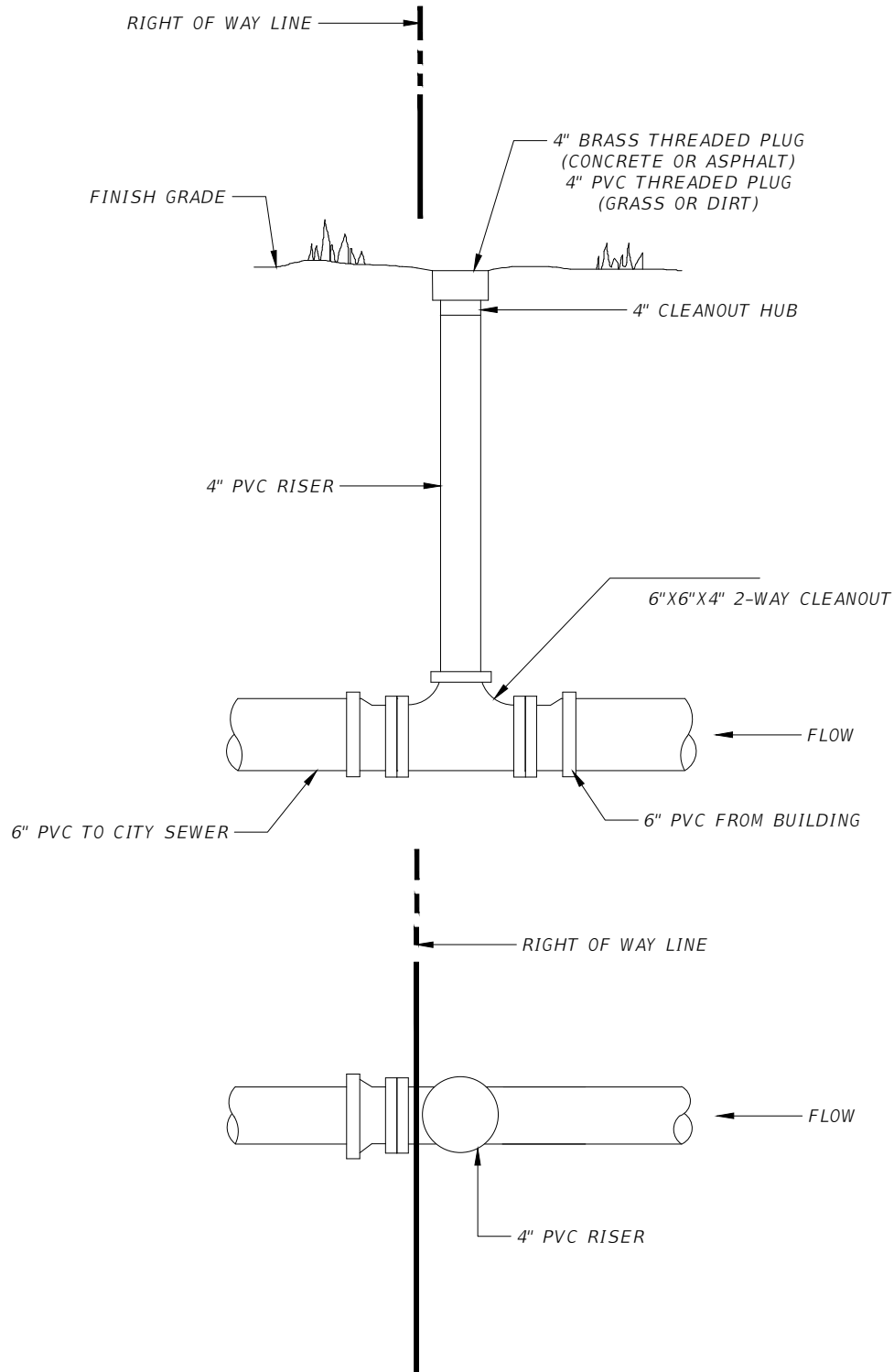
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## RESIDENTIAL SEWER CLEANOUT

SECTION:  
SEWER

SS-14

REVISION DATE:  
DEC 2020



#### NOTES

1. ALL CLEANOUTS ON SITE NEED TO HAVE CONCRETE PADS.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

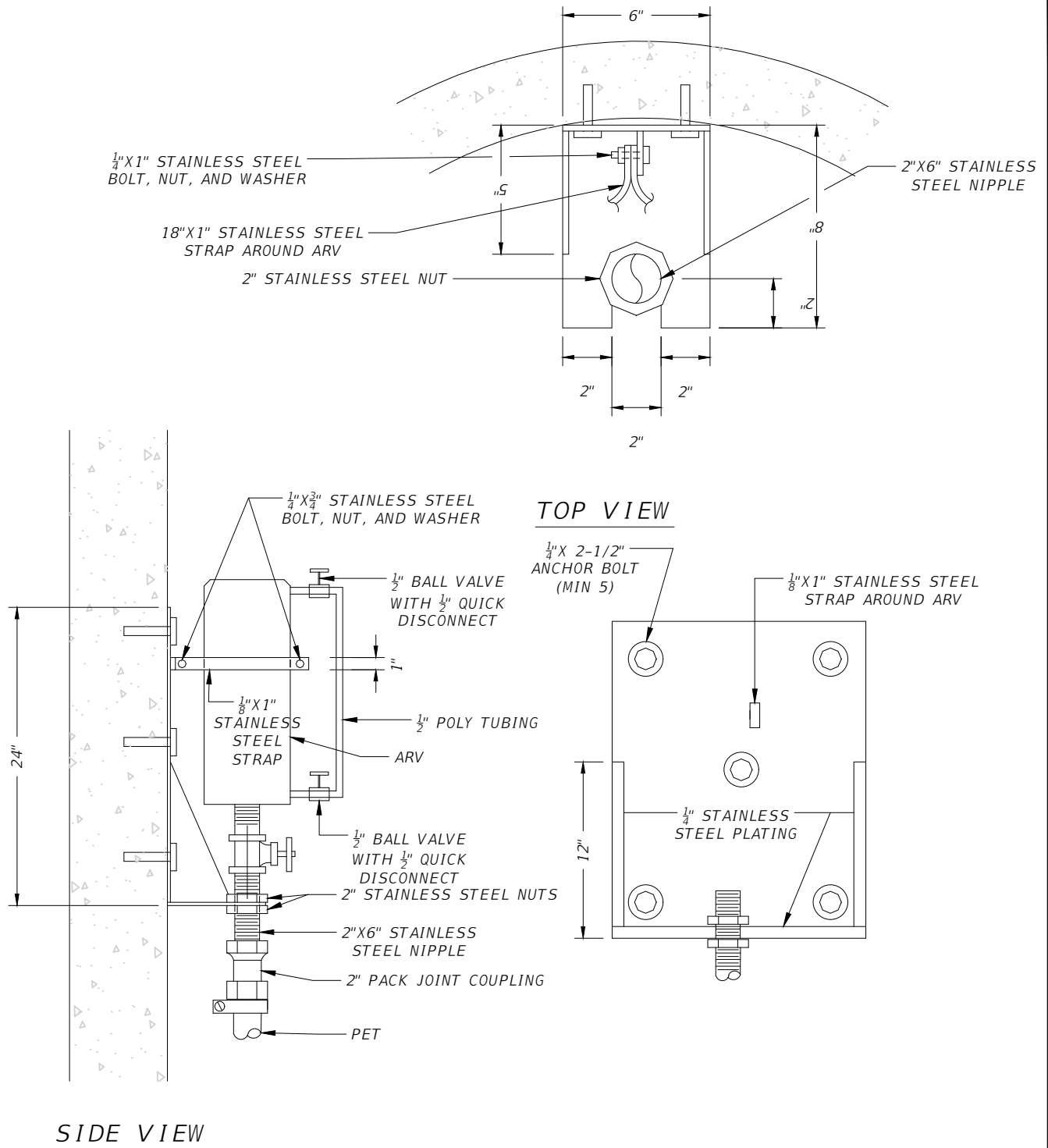
## COMMERCIAL SEWER CLEANOUT

SECTION:  
SEWER

**SS-15**

REVISION DATE:  
DEC 2020





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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

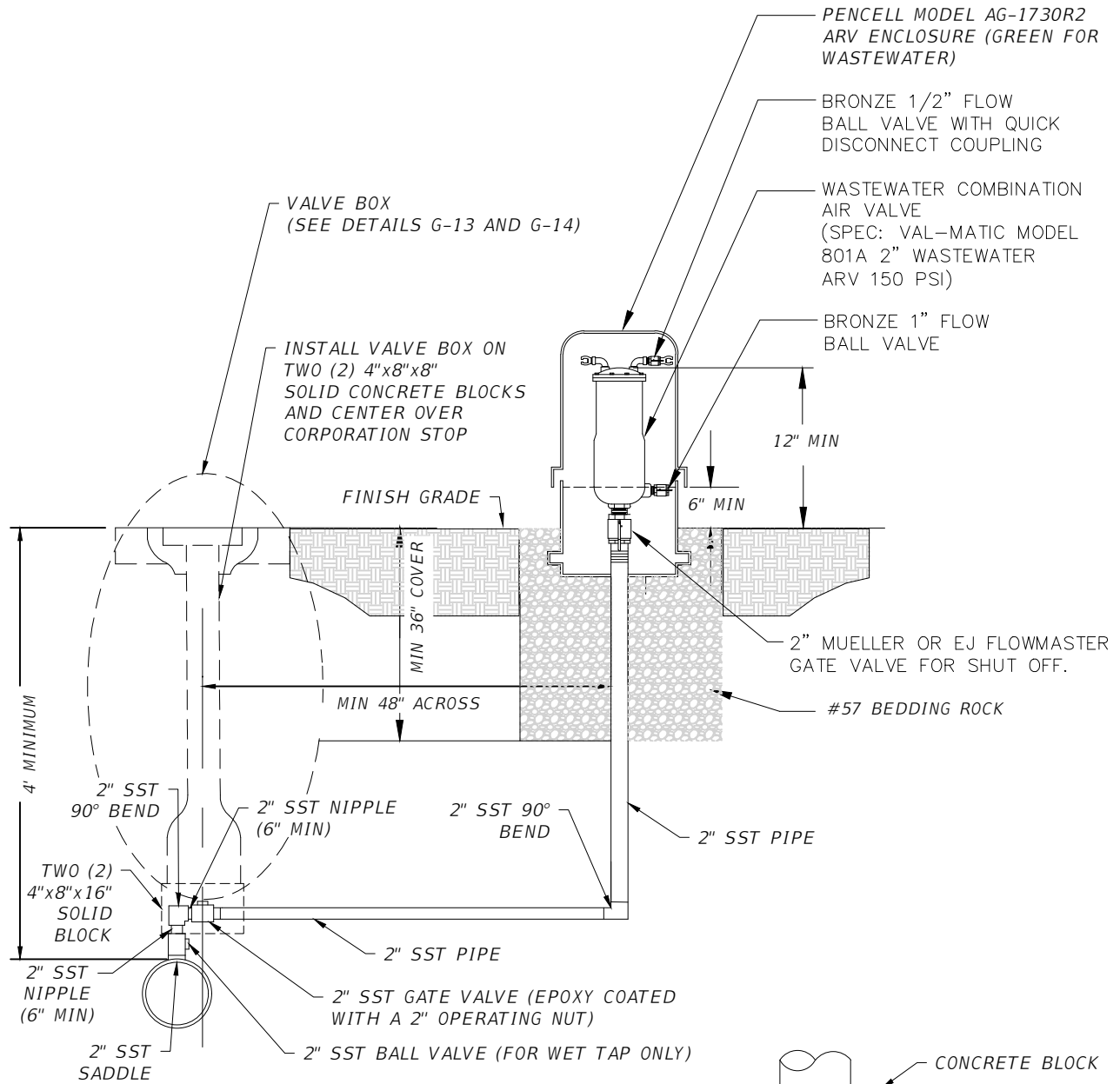
# AIR RELEASE VALVE ASSEMBLY

SUPPORT BRACKET

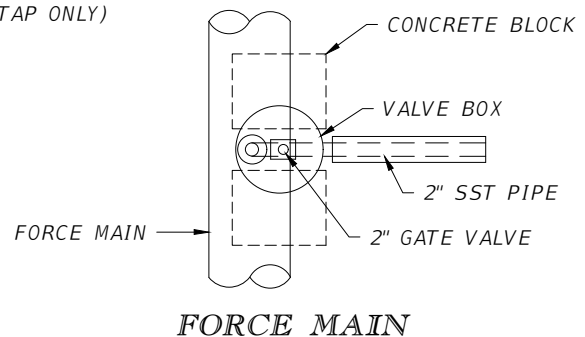
SECTION:  
SEWER

SS-16B

REVISION DATE:  
DEC 2020



**ABOVE GRADE AIR  
RELEASE VALVE ASSEMBLY**



CITY ENGINEER'S OFFICE  
1805 NE 30TH AVE, BLDG #600  
OCALA, FLORIDA 34470

CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

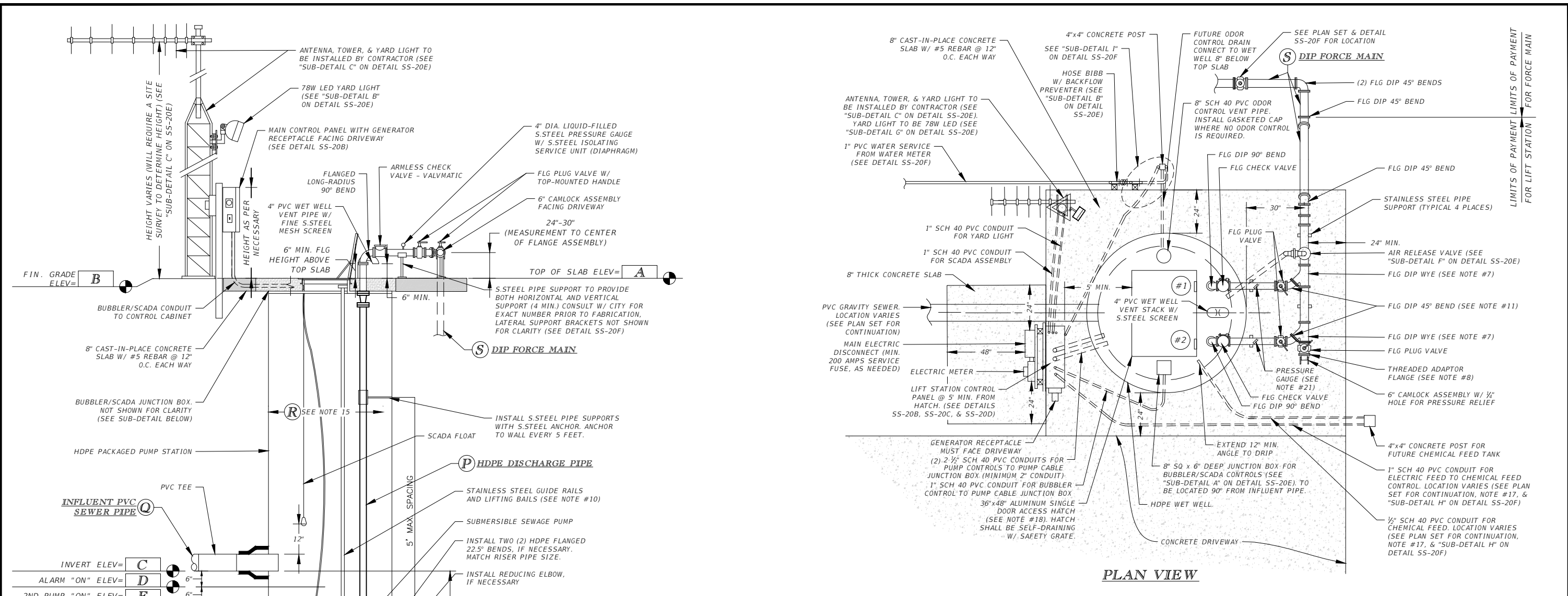
**AIR RELEASE  
VALVE ASSEMBLY**

ABOVE GROUND

SECTION:  
SEWER

**SS-17**

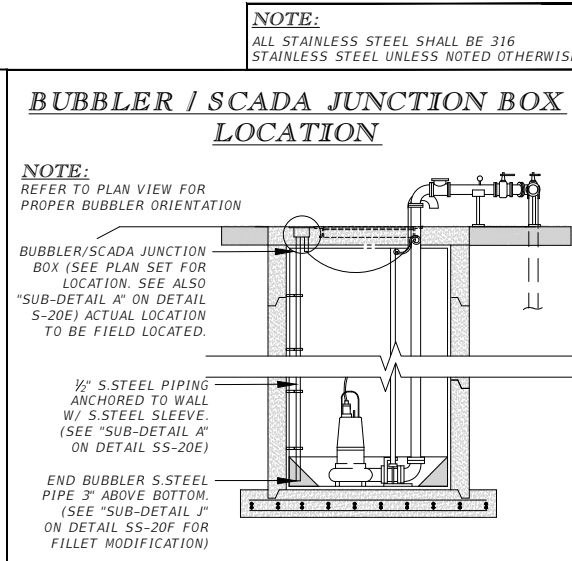
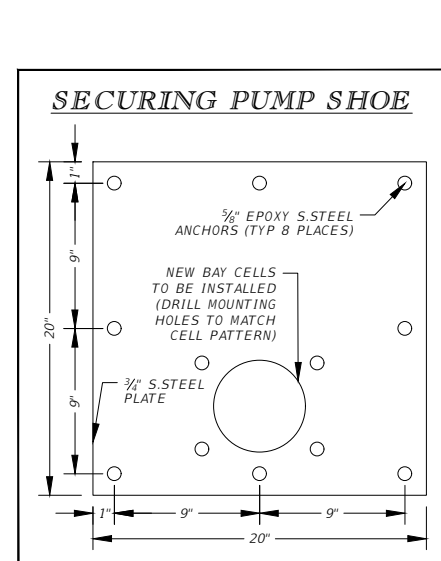
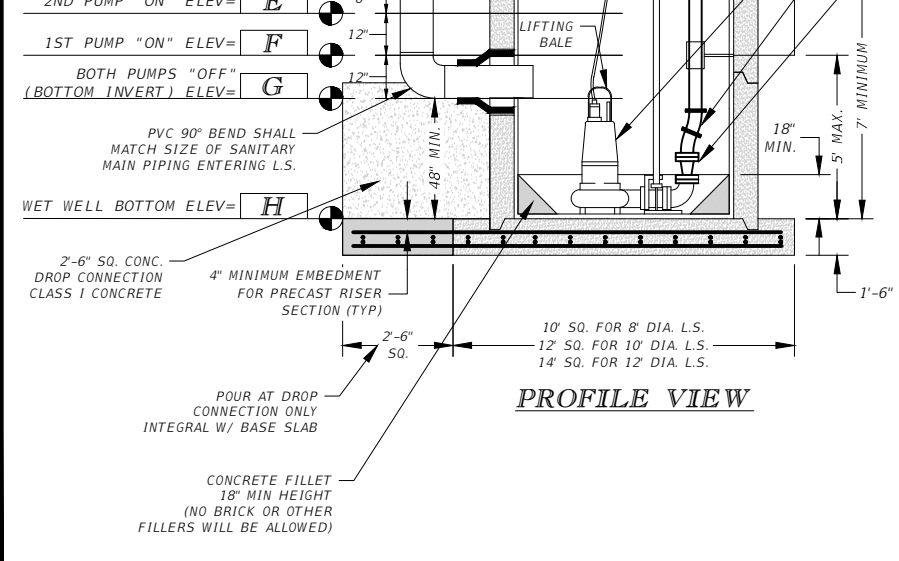
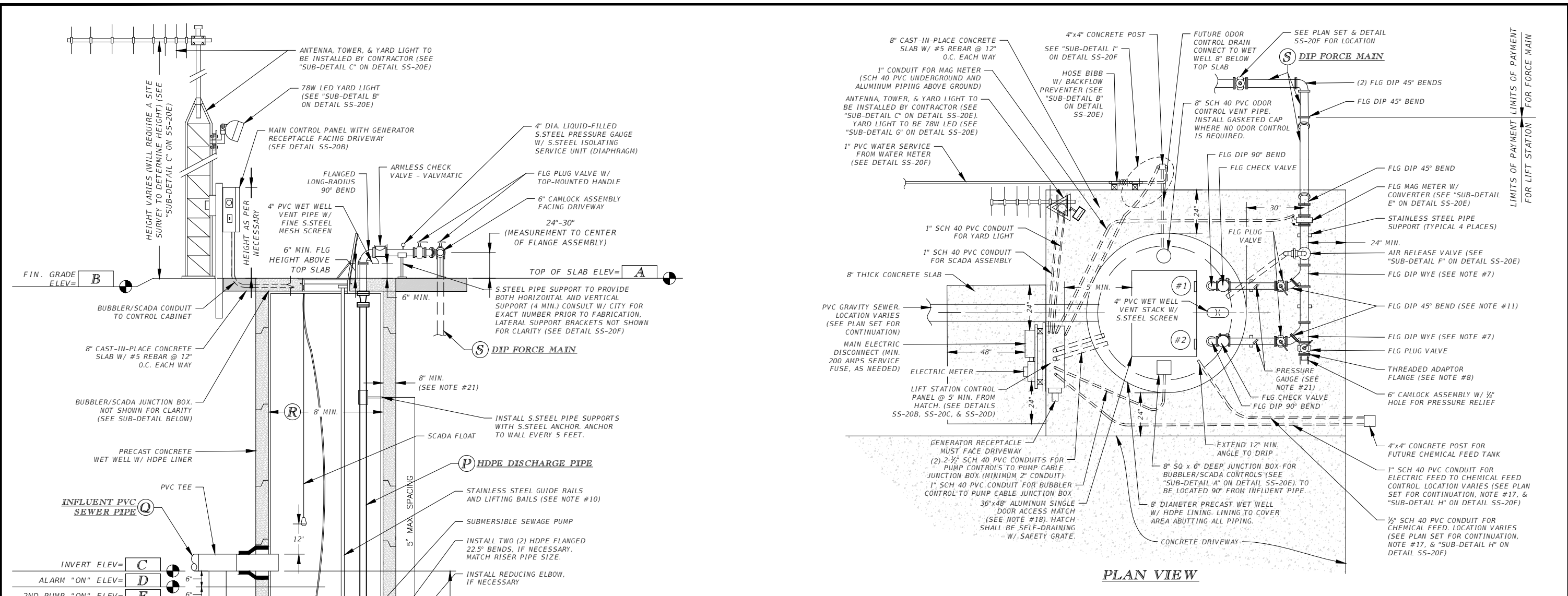
REVISION DATE:  
DEC 2020



**NOTE:**  
ALL STAINLESS STEEL SHALL BE 316 STAINLESS STEEL UNLESS NOTED OTHERWISE.

**NOTES**

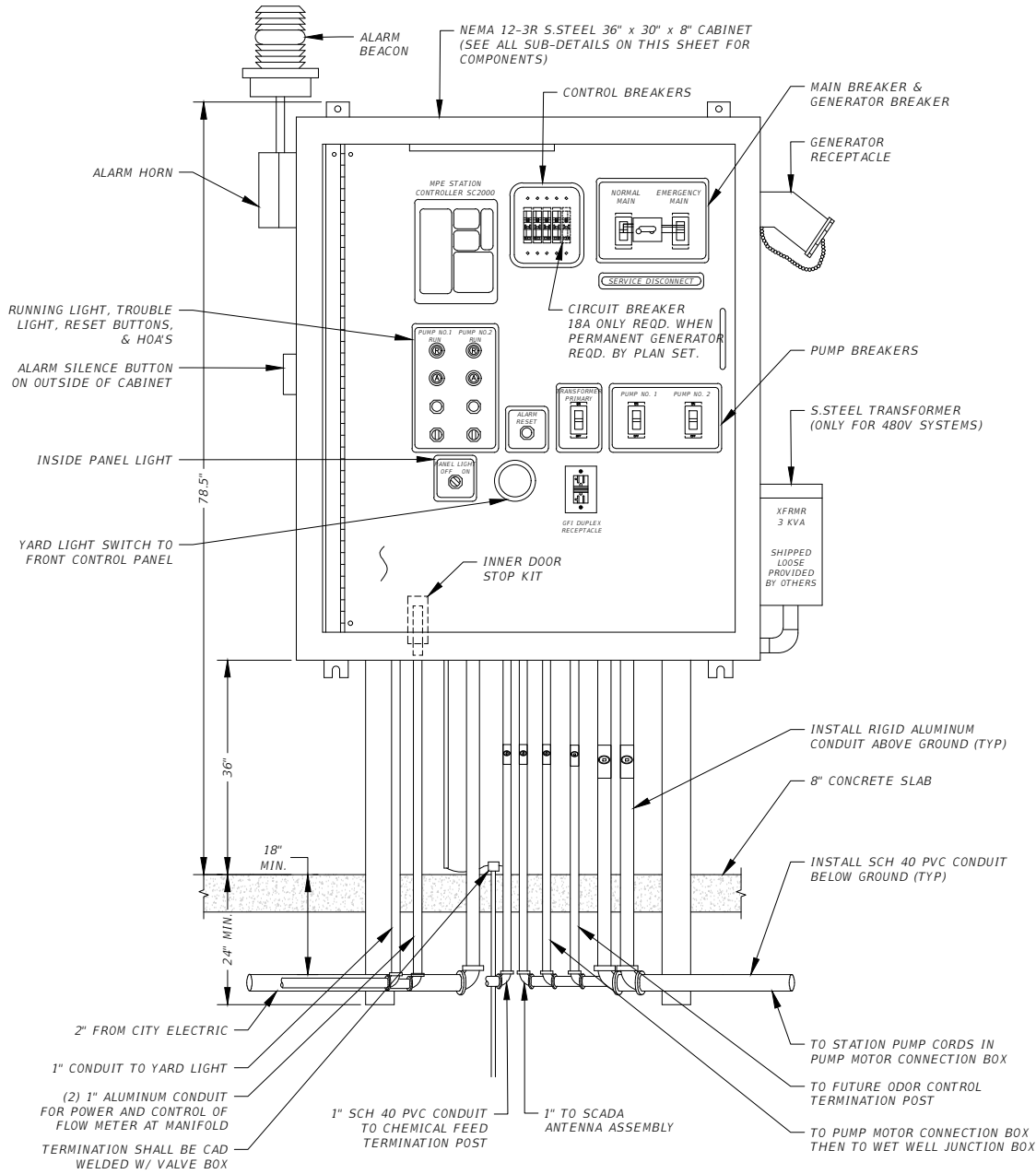
- REFER TO DETAIL SS-20E FOR ELEVATIONS "A" THROUGH "H", DIAMETERS "P" THROUGH "S" AND PUMP SPECIFICATIONS.
- REFER TO DETAIL SS-20E OR PROJECT PLAN, WHEN PROVIDED, FOR ADDITIONAL REQUIREMENTS.
- WET WELL, UNDER SIDE OF SLAB, AND ALL EXPOSED INTERIOR SURFACES AND JOINTS SHALL BE COATED OR LINED AS CALLED FOR IN THE PROJECT SPECIFICATIONS. LINING SHALL ABUT ALL PIPING.
- ALL ABOVEGROUND FITTINGS SHALL BE FLANGED. HARDWARE AND FITTINGS SHALL BE 316 STAINLESS STEEL.
- USE NON-SHRINK GROUT WHEN ASSEMBLING PRE-CAST SECTIONS IN LIEU OF PREMOLDED PLASTIC JOINT SEALER.
- FILL ANNULAR VOID BETWEEN PIPE AND RUBBER BOOT WITH GROUT AND FLUSH WITH THE STRUCTURE WALL.
- BRANCH LINE OF WYE SHALL BE SAME DIAMETER AS DISCHARGE PIPE. MAIN LINE SHALL BE SAME DIAMETER AS FORCE MAIN.
- ADAPTER FLANGE SHALL BE SAME DIAMETER AS FORCE MAIN AND FURNISHED WITH NPT THREADS FOR CAMLOCK ASSEMBLY.
- ALL ABOVEGROUND FLANGE ASSEMBLIES, PIPE, FITTINGS AND FASTENERS SHALL BE PAINTED AS SPECIFIED IN SECTION 499-11-99-04. ALL FITTINGS WITHIN WET WELL SHALL BE STAINLESS STEEL. ALL PIPING 3" OR LARGER IN WET WELL AND ABOVEGROUND SHALL BE COATED AS SPECIFIED IN SECTION 499-11-99-05. PIPING 3" OR LARGER SHALL BE RED PRIMED AND EPOXY COATED. PRIMER TO BE "FACTORY APPLIED" COATING. AFTER ASSEMBLY APPLY TWO COATS OF PRIMER AND TWO COATS OF FINISH URETHANE.
- GUIDE RAILS, LIFTING BALES AND OTHER PUMP APPURTENANCES SHALL BE FURNISHED BY PUMP MANUFACTURER OR DESIGNATED REPRESENTATIVE. GUIDE RAILS SHALL BE CONTINUOUS WITH NO SPLICES OR FLANGES. HOWEVER, IF THERE IS A NEED TO INCREASE LENGTH BY SPLICING, THEN THE SPLICING MUST BE KEPT ON TOP AND NOT SUBMERGED IN WATER.
- ALL PIPE FITTINGS SHALL BE FLANGED FITTINGS. ALL PIPES SHALL BE SPOOL FLANGED PIPING.
- ALL ABOVEGROUND CONDUIT SHALL BE RIGID ALUMINUM. ALL BELOWGROUND CONDUIT SHALL BE SCH 40 PVC.
- WET WELL SHALL BE SUBJECTED TO WATER LEAKAGE TESTING AS SPECIFIED.
- CONTRACTOR SHALL CONDUCT A PRE-LIFT STATION CONSTRUCTION MEETING ON-SITE WITH CITY PERSONNEL FOR FINAL APPROVAL OF THE EQUIPMENT LOCATIONS.
- FOR STATIONS BELOW 101 GPM, PROVIDE 6' WETWELL MINIMUM. FOR STATIONS BELOW 41 GPM, PROVIDE 5' WETWELL MINIMUM.
- NOT ALL PUMP STATIONS WILL REQUIRE CHEMICAL FEED OR ODOR CONTROL. IF REQUIRED, SEE PROJECT SITE PLAN FOR TANK LOCATIONS. PROVIDE NEGATIVE SLOPE TO WET WELL FROM OUTSIDE WET WELL WALL TO PIPE END (REFER TO DETAIL SS-21 ODOR CONTROL).
- CONTROL PANEL SHALL BE STAINLESS STEEL.
- TOP SLAB PENETRATIONS SHALL BE SUCH THAT ALL PENETRATIONS SHALL MAINTAIN A MINIMUM OF 3" OF CONCRETE AROUND PENETRATIONS.
- ONE HALF TAP WITH STAINLESS STEEL BALL VALVE AND CLOSE NIPPLE. THE OTHER HALF TO 1/4" STAINLESS STEEL REDUCER AND GEL FILL PRESSURE GAUGE (2" MINIMUM AND 0-100 PSI).



- NOTE:**  
ALL STAINLESS STEEL SHALL BE 316 STAINLESS STEEL UNLESS NOTED OTHERWISE.
- NOTES**
- REFER TO DETAIL SS-20E FOR ELEVATIONS "A" THROUGH "H", DIAMETERS "P" THROUGH "S" AND PUMP SPECIFICATIONS.
  - REFER TO DETAIL SS-20E OR PROJECT PLAN, WHEN PROVIDED, FOR ADDITIONAL REQUIREMENTS.
  - WET WELL, UNDER SIDE OF SLAB, AND ALL EXPOSED INTERIOR SURFACES AND JOINTS SHALL BE COATED OR LINED AS CALLED FOR IN THE PROJECT SPECIFICATIONS. LINING SHALL ABUT ALL PIPING.
  - ALL ABOVEGROUND FITTINGS SHALL BE FLANGED. HARDWARE AND FITTINGS SHALL BE 316 STAINLESS STEEL.
  - USE NON-SHRINK GROUT WHEN ASSEMBLING PRE-CAST SECTIONS IN LIEU OF PREMOLDED PLASTIC JOINT SEALER.
  - FILL ANNULAR VOID BETWEEN PIPE AND RUBBER BOOT WITH GROUT AND FLUSH WITH THE STRUCTURE WALL.
  - BRANCH LINE OF WYE SHALL BE SAME DIAMETER AS DISCHARGE PIPE. MAIN LINE SHALL BE SAME DIAMETER AS FORCE MAIN.
  - ADAPTER FLANGE SHALL BE SAME DIAMETER AS FORCE MAIN AND FURNISHED WITH NPT THREADS FOR CAMLOCK ASSEMBLY.
  - ALL ABOVEGROUND FLANGE ASSEMBLIES, PIPE, FITTINGS AND FASTENERS SHALL BE PAINTED AS SPECIFIED IN SECTION 499-11-99-04. ALL FITTINGS WITHIN WET WELL SHALL BE STAINLESS STEEL. ALL PIPING 3" OR LARGER IN WET WELL AND ABOVEGROUND SHALL BE COATED AS SPECIFIED IN SECTION 499-11-99-05. PIPING 3" OR LARGER SHALL BE RED PRIMED AND EPOXY COATED. PRIMER TO BE "FACTORY APPLIED" COATING. AFTER ASSEMBLY APPLY TWO COATS OF PRIMER AND TWO COATS OF FINISH URETHANE.
  - GUIDE RAILS, LIFTING BALES AND OTHER PUMP APPURTENANCES SHALL BE FURNISHED BY PUMP MANUFACTURER OR DESIGNATED REPRESENTATIVE. GUIDE RAILS SHALL BE CONTINUOUS WITH NO SPLICES OR FLANGES. HOWEVER, IF THERE IS A NEED TO INCREASE LENGTH BY SPLICING, THEN THE SPLICING MUST BE KEPT ON TOP AND NOT SUBMERGED IN WATER.
  - ALL PIPE FITTINGS SHALL BE FLANGED FITTINGS. ALL PIPES SHALL BE SPOOL FLANGED PIPING.
  - ALL ABOVEGROUND CONDUIT SHALL BE RIGID ALUMINUM. ALL BELOWGROUND CONDUIT SHALL BE SCH 40 PVC.
  - WET WELL SHALL BE SUBJECTED TO WATER LEAKAGE TESTING AS SPECIFIED.
  - CONTRACTOR SHALL CONDUCT A PRE-LIFT STATION CONSTRUCTION MEETING ON-SITE WITH CITY PERSONNEL FOR FINAL APPROVAL OF THE EQUIPMENT LOCATIONS.
  - FOR STATIONS PUMPING MORE THAN 1,000 GPM CONTRACTOR SHALL PROVIDE (YASKAWA) VARIABLE FREQUENCY DRIVES.
  - NOT ALL PUMP STATIONS WILL REQUIRE CHEMICAL FEED OR ODOR CONTROL. IF REQUIRED, SEE PROJECT SITE PLAN FOR TANK LOCATIONS. PROVIDE NEGATIVE SLOPE TO WET WELL FROM OUTSIDE WET WELL WALL TO PIPE END (REFER TO DETAIL SS-21 ODOR CONTROL).
  - FOR PUMPS 27-HP OR MORE, INCREASE HATCH SIZE TO 36"x60". HATCH SHALL OPEN TO RISER PIPES.
  - CONTROL PANEL SHALL BE STAINLESS STEEL.
  - TOP SLAB PENETRATIONS SHALL BE SUCH THAT ALL PENETRATIONS SHALL MAINTAIN A MINIMUM OF 3" OF CONCRETE AROUND PENETRATIONS.
  - WET WELL WALLS SHALL BE MINIMUM 8" THICK OR 1/2 OF WET WELL DIAMETER, WHICHEVER IS GREATER.
  - ONE HALF TAP WITH STAINLESS STEEL BALL VALVE AND CLOSE NIPPLE. THE OTHER HALF TO 1/4 STAINLESS STEEL REDUCER AND GEL FILL PRESSURE GAUGE (2" MINIMUM AND 0-100 PSI).

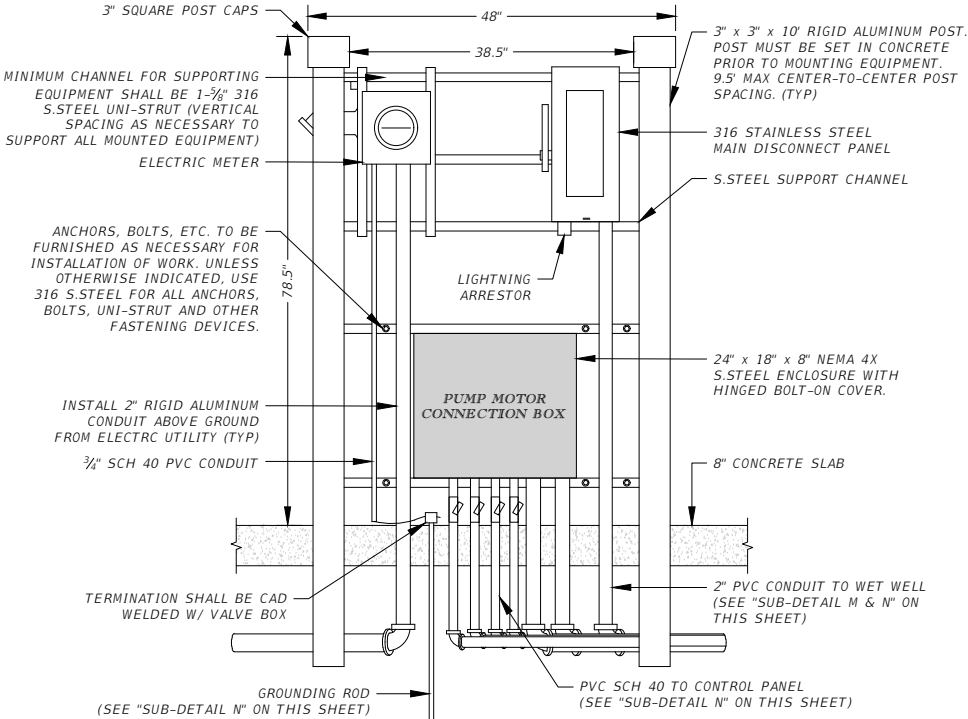


CABINET COMPONENTS AND LAYOUT

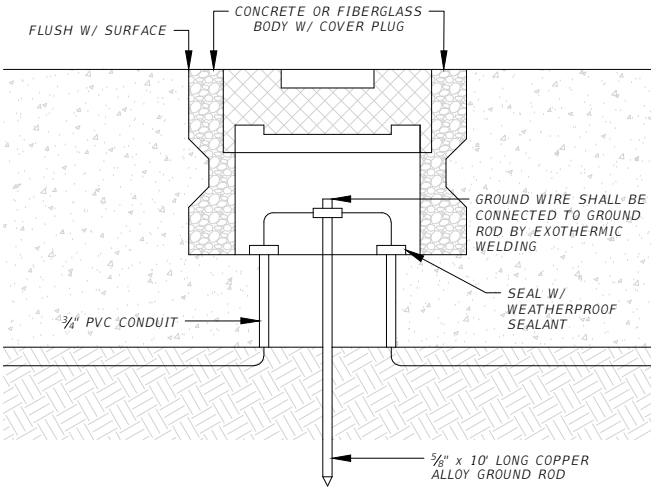


- NOTES:
1. NO TOP PENETRATIONS IN METER/MAIN/CONTROL CABINET/ETC.
  2. ANCHORS, BOLTS, ETC. TO BE FURNISHED AS NECESSARY FOR INSTALLATION OF WORK.
  3. UNLESS OTHERWISE INDICATED, USE 316 STAINLESS STEEL FOR ALL ANCHOR, BOLTS, UNI-STRUT, AND OTHER FASTENING DEVICES.

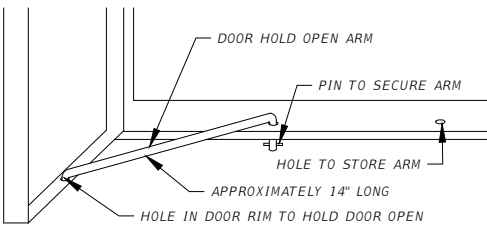
SUB-DETAIL L



SUB-DETAIL N  
(GROUNDING ROD)

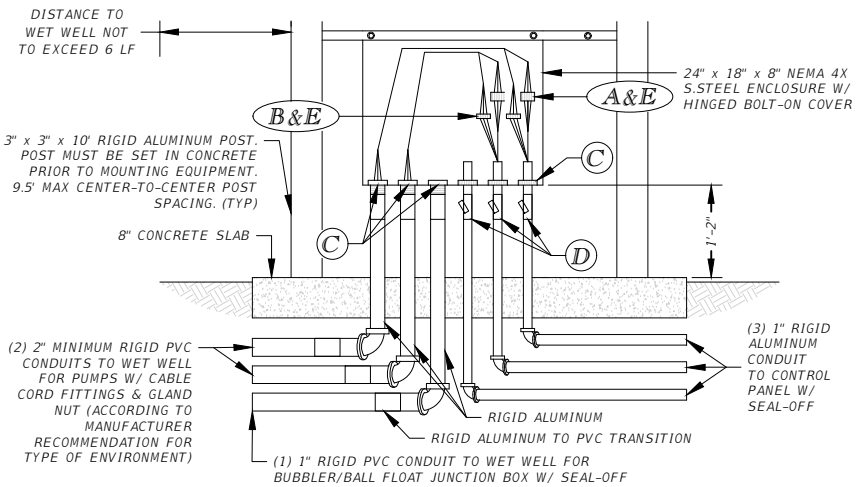


SUB-DETAIL O

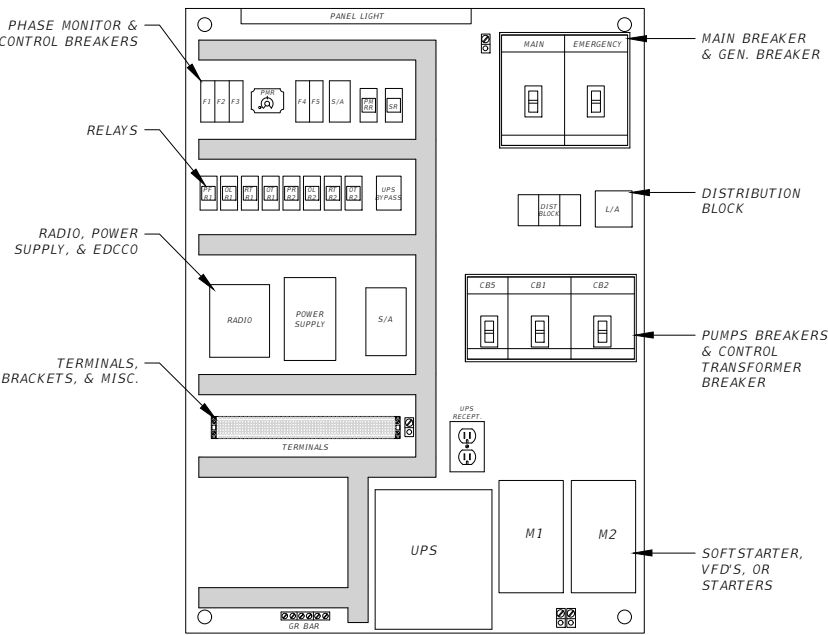


- NOTES:
1. FURNISH HOLD OPEN ARMS FOR DOOR FRONT AND DEAD FRONT.
  2. OUTER DOOR SHOULD BE HELD OPEN AT APPROXIMATELY 100° TO CABINET. INNER DOOR TO BE APPROXIMATELY 90°.
  3. BRING ALL I/O FROM MPE TO TERMINAL STRIP FOR FUTURE USE.
  4. PROVIDE SINGLE 120 VOLT OUTLET FOR GENERATOR BATTERY CHARGER AND A STANDARD TWIST LOCK FOR THE START CIRCUIT ON GENERATOR.

SUB-DETAIL M  
(PUMP MOTOR CONNECTION BOX CONDUITS)



TYPICAL CABINET BACK PANEL



"SUB-DETAIL M" LEGEND

A	6-POLE POWER INSULATED TERM BLOCK PANEL MOUNT (ALLEN BRADLEY BULLETIN 1492) SIZED AS REQUIRED
B	6-CIRCUIT CONTROL INSULATED TERM BLOCK PANEL MOUNT (ALLEN BRADLEY BULLETIN 1492)
C	CABLE CORD FITTING WITH GLAND NOT & NEOPRENE BUSHING. SIZES AS NECESSARY FOR PUMP CABLES.
D	CONDUIT SEAL
E	COAT WITH CLEAR URETHANE SEAL ELECTRICAL/ELECTRONIC INSULATOR AS CRC 'U' 01049



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

STANDARD SANITARY  
SEWER LIFT STATION

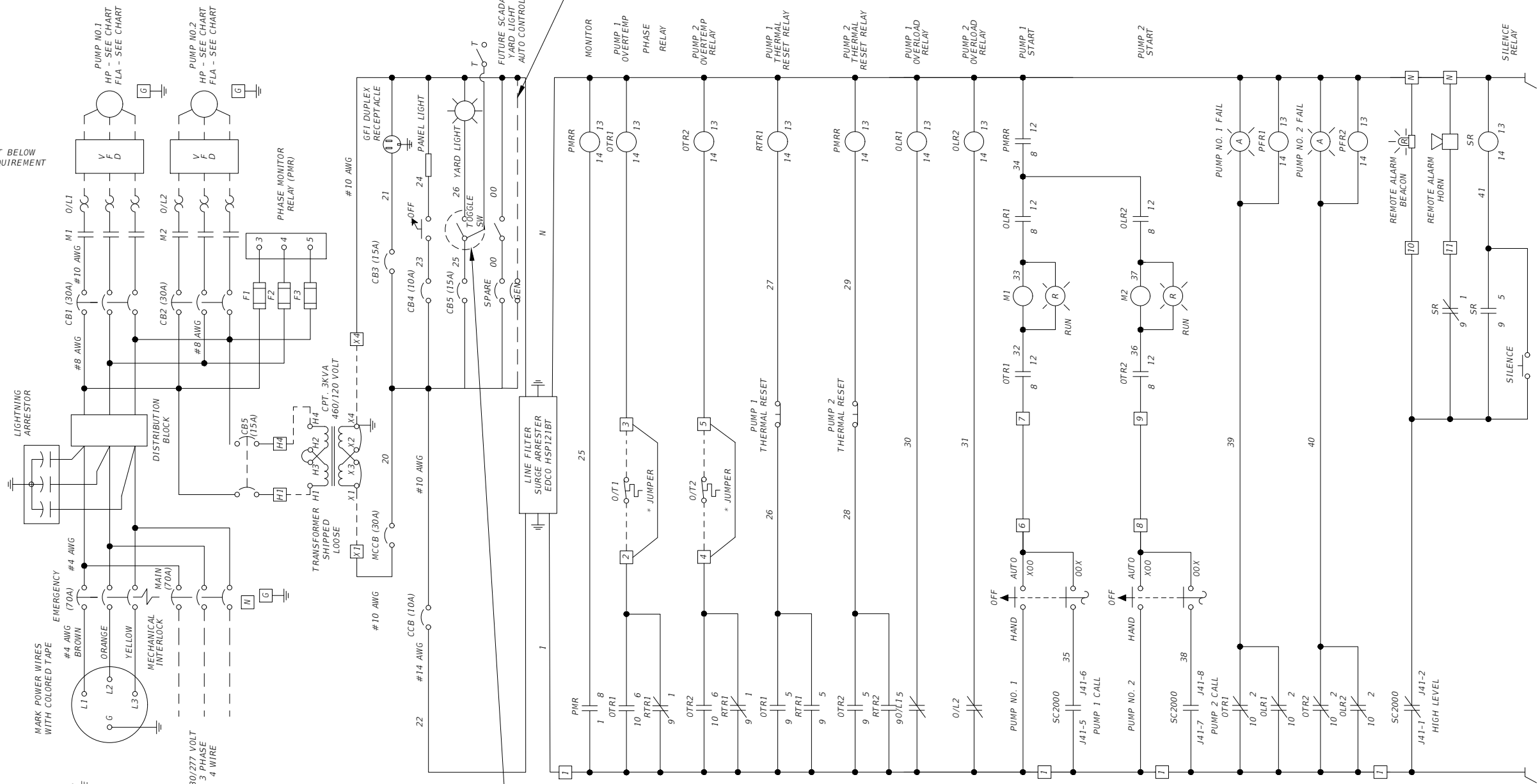
CABINET COMPONENTS

SECTION:  
SEWER

SS-20A

REVISION DATE:  
DEC 2020

SEE CHART BELOW  
FOR VFD REQUIREMENT



**NOTE:**  
INSTALL SWITCH ON DEAD FRONT  
PANEL WITH ALL OTHER HOA.

CIRCUIT BREAKER ONLY REQUIRED  
WHEN PERMANENT GENERATOR IS  
REQUIRED ON PLAN SET. OTHERWISE,  
DELETE FROM PROJECT.

### LEGEND

- CB1 = CONTROL BREAKER MAIN
- CB2 = CONTROL BREAKER TWO
- CB3 = CONTROL BREAKER THREE
- CB4 = CONTROL BREAKER FOUR
- MCB1 = MOTOR CIRCUIT BREAKER ONE
- MCB2 = MOTOR CIRCUIT BREAKER TWO
- M1 = MOTOR STARTER ONE / PUMP #1
- M2 = MOTOR STARTER TWO / PUMP #2
- H = HAND OPERATION
- O = OFF
- A = AUTOMATIC
- R8 = PHASE LOSS MONITOR
- P1 = DIGITAL CONTROL / MOTOR #1

- P2 = DIGITAL CONTROL / MOTOR #2
- SS1 = SELECTOR SWITCH / MOTOR #1
- SS2 = SELECTOR SWITCH / MOTOR #2
- GRD = GROUND
- P.B. = PUSH BUTTON
- A = PHASE 1 (A) OF LINE - BLACK
- B = PHASE 2 (B) OF LINE - RED
- C = PHASE 3 (C) OF LINE - BLUE
- NEUTRAL = NEUTRAL OF SERVICE LINE
- PLM = PHASE LOSS MONITOR
- AUX = AUXILIARY TERMINAL SCREW ON LINE  
TOP OF MOTOR STARTER "A" PHASE
- L1-5 = CIRCUIT BREAKER TWO / LINE AFTER  
PHASE LOSS
- \$ = CIRCUIT SWITCH LEVITON WALL TYPE
- TSR = THERMAL SWITCH RELAY

- N.O. = NORMALLY OPEN
- (Light symbol) = LIGHT
- (Alarm horn symbol) = ALARM HORN
- (Ground fault symbol) = GROUND FAULT CIRCUIT INTERRUPTOR
- (Motor symbol) = MOTOR STARTER COIL
- (Push button symbol) = PUSH BUTTON - MOMENTARY
- (Transformer symbol) = TRANSFORMER
- (Fuse symbol) = FUSE
- (Float switch symbol) = FLOAT SWITCH
- (Multiple wires symbol) = MULTIPLE WIRES @ SAME TERMINATION
- (Digital control relay symbol) = DIGITAL CONTROL RELAY
- (Temperature sensor symbol) = TEMPERATURE SENSOR
- (Lock out slide switch symbol) = LOCK OUT SLIDE SWITCH



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## STANDARD SANITARY SEWER LIFT STATION

ELECTRICAL LAYOUT

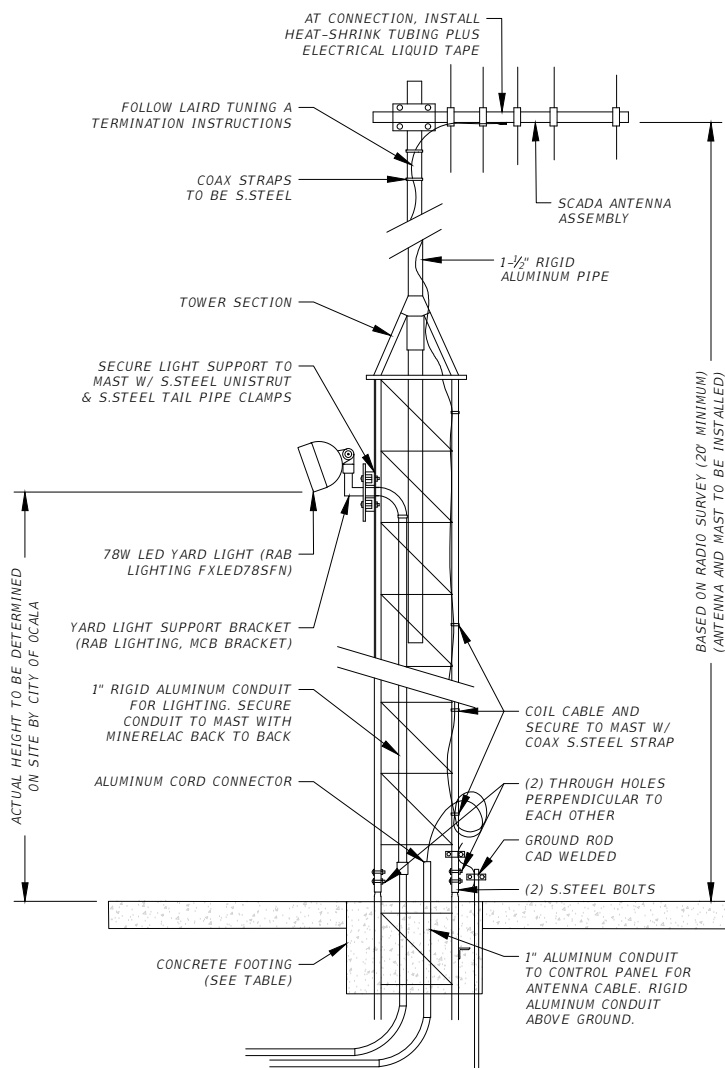
SECTION:  
SEWER

SS-20B

REVISION DATE:  
DEC 2020

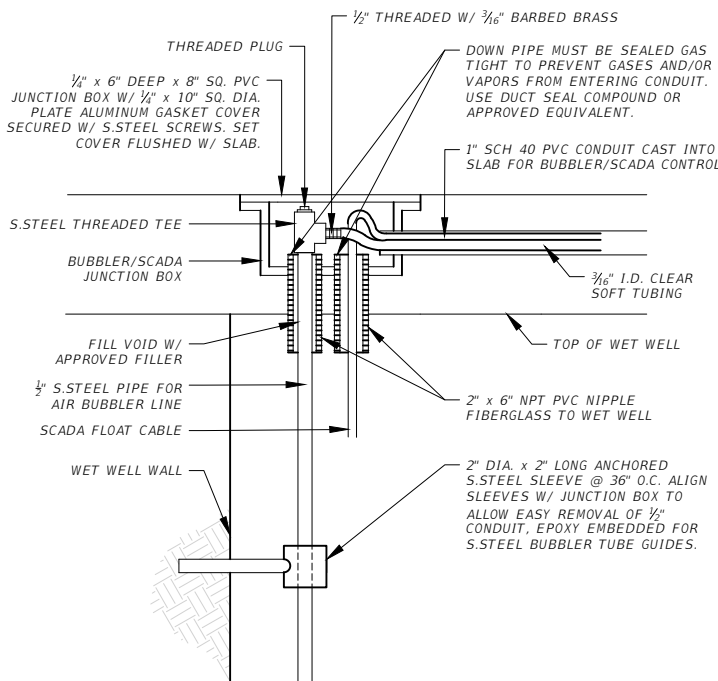


SUB-DETAIL C

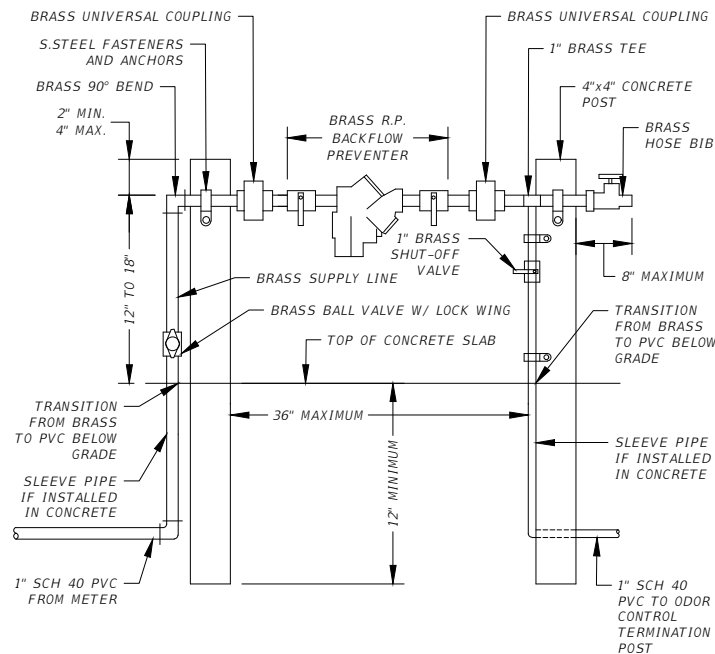


<b>CONCRETE FOOTING DIMENSIONS AND REINFORCEMENT</b>		
<b>ANTENNA HEIGHT</b>	<b>SLAB SIZE &amp; THICKNESS</b>	<b>REBAR REQUIRED</b>
20 Ft	3' x 3' x 3'	2 MATS, #5 @ 12 IN.
30 Ft	3' x 3' x 4'	3 MATS, #5 @ 12 IN.
40 Ft	4' x 4' x 4'	3 MATS, #5 @ 12 IN.
50 Ft	4' x 4' x 5'	3 MATS, #5 @ 12 IN.
60 Ft	5' x 5' x 5'	4 MATS #5 @ 12 IN.
70 Ft	5' x 5' x 6'	4 MATS, #5 @ 12 IN.
80 Ft	6' x 6' x 6'	4 MATS, #5 @ 12 IN.

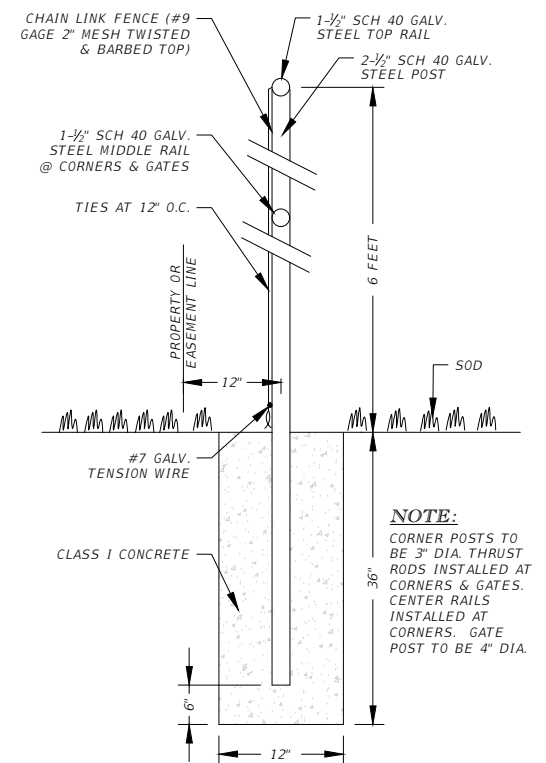
SUB-DETAIL A



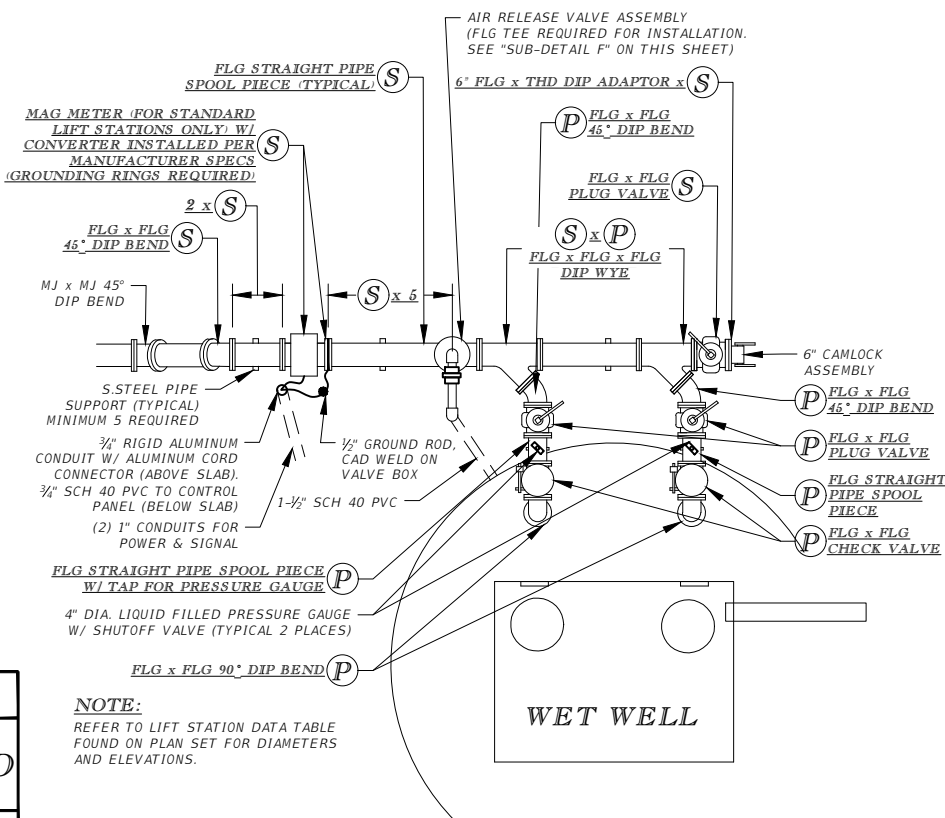
SUB-DETAIL B



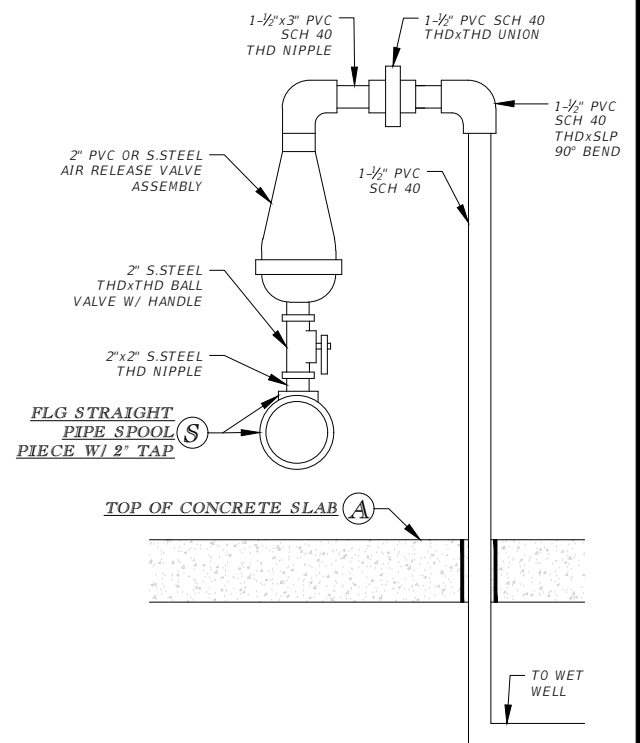
SUB-DETAIL D



SUB-DETAIL E



*SUB-DETAIL F*



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

STANDARD SANITARY  
SEWER LIFT STATION

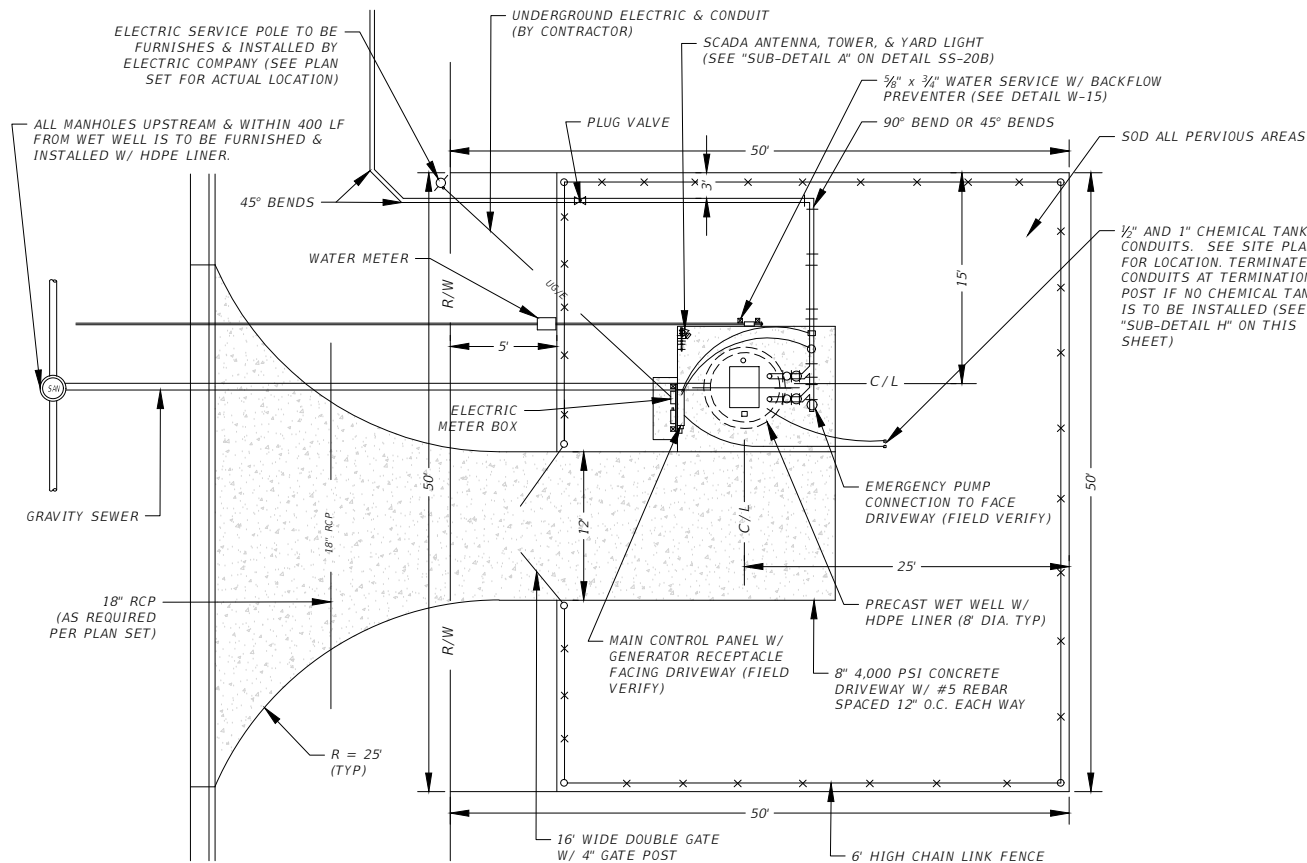
### ADDITIONAL SUB-DETAILS

SECTION:  
SEWER

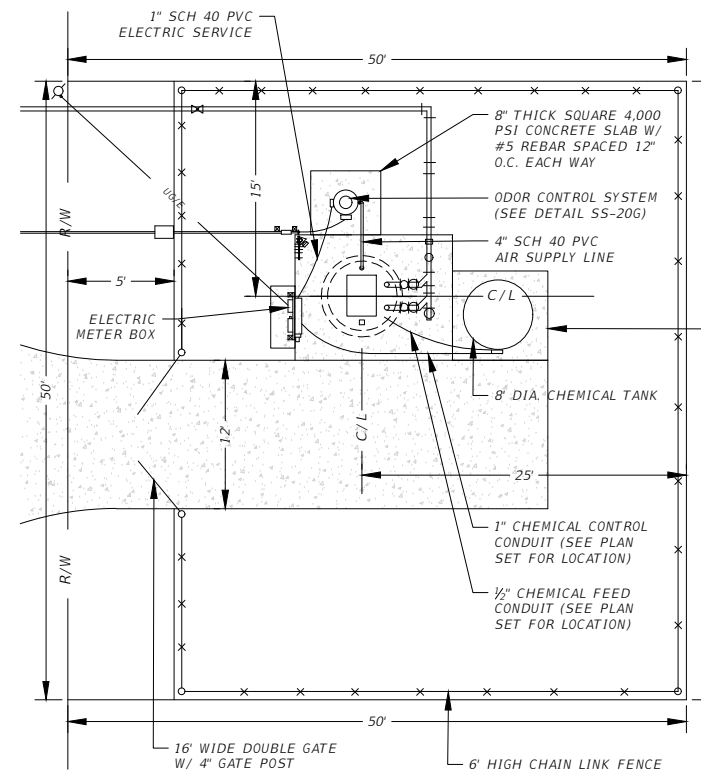
SS-20D

REVISION DATE:  
DEC 2020

TYPICAL SITE PLAN FOR LIFT STATION

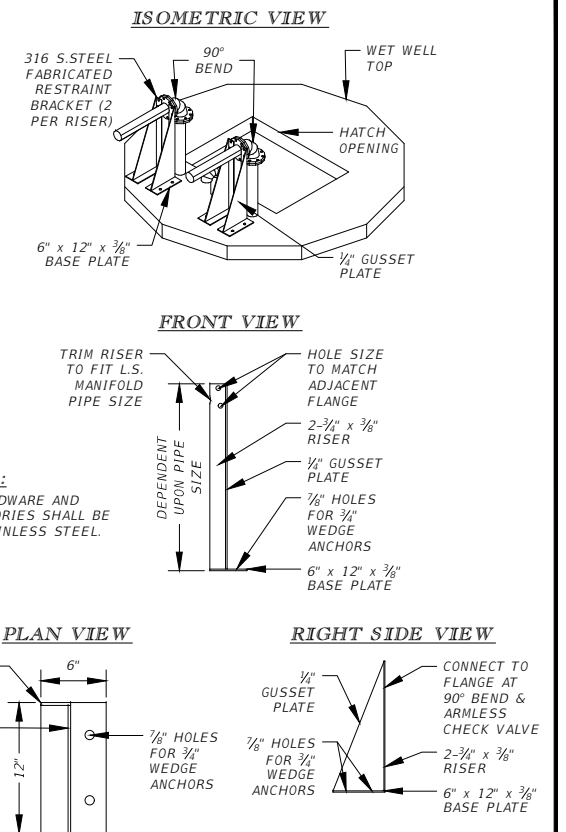


TYPICAL ODOR CONTROL  
AND/OR CHEMICAL TANK PLAN



**NOTE:**  
WHERE NO ODOR  
CONTROL AND/OR  
CHEMICAL TANK,  
THEN FEED TANK  
IS INSTALLED (SEE  
"SUB-DETAIL H" ON  
THIS SHEET)

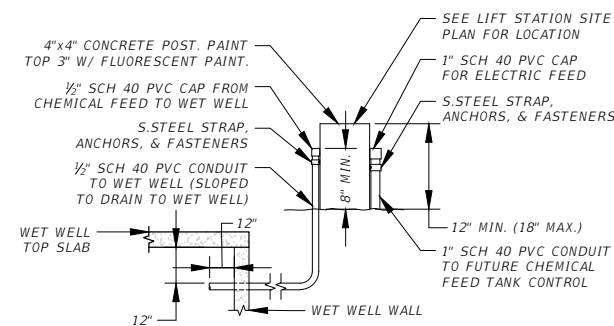
SUB-DETAIL K  
(LATERAL RESTRAINT BRACKETS)



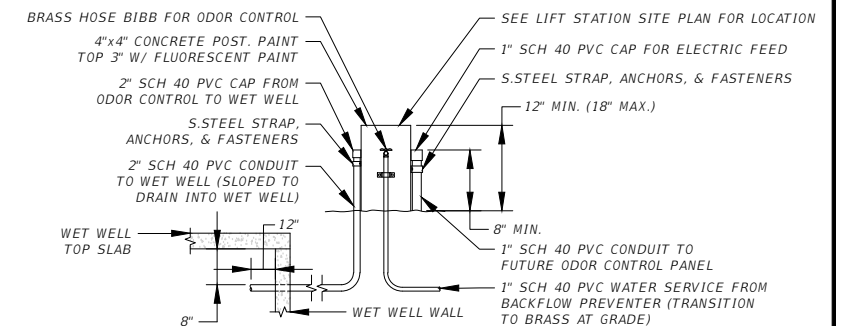
TYPICAL LIFT STATION DATA TABLE  
(SEE PLAN SET FOR ACTUAL LIFT STATION DATA TABLE)

LIFT STATION DATA						
PUMP SPECIFICATIONS		(*) ELEVATIONS			(*) DIAMETERS	
PUMP MANUF.		TOP OF SLAB	A		PUMP DISCHARGE	P
PUMP MODEL #		FINISH GRADE	B		INFLUENT PIPE	Q
PUMP SIZE		INFLUENT INVERT	C		WETWELL	R
GPM		ALARM ON	D		FORCE MAIN	S
TDH		2ND PUMP ON	E			
HP		1ST PUMP ON	F			
RPM		BOTH PUMPS OFF	G			
IMPELLER		WETWELL BOTTOM	H			
POWER		F.M. DISCHARGE	I			
LINER SYSTEM		F.M. HIGH POINT	J			
(*) REFER TO THE CITY OF OCALA STANDARD SPECIFICATIONS & STANDARD DETAILS SS-20A THROUGH SS-20G						

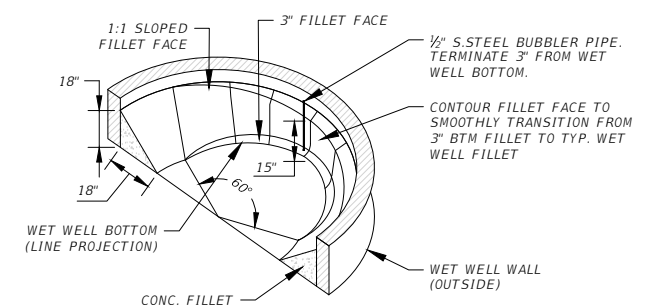
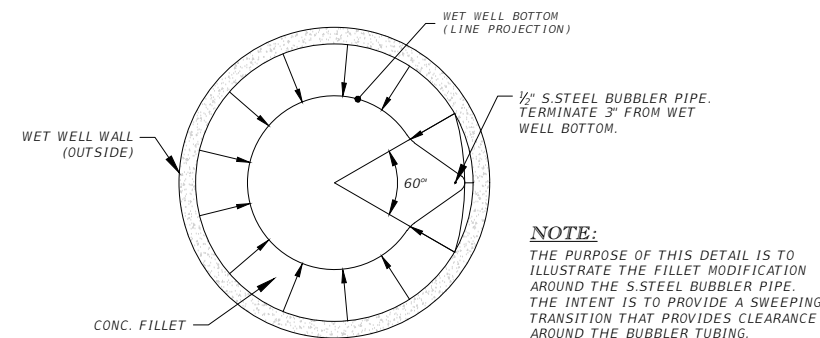
SUB-DETAIL H  
(CHEMICAL FEED TANK CONDUIT TERMINATION)



SUB-DETAIL I  
(ODOR CONTROL CONDUIT TERMINATION)



SUB-DETAIL J  
(CONCRETE FILLET MODIFICATION)



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# STANDARD SANITARY SEWER LIFT STATION

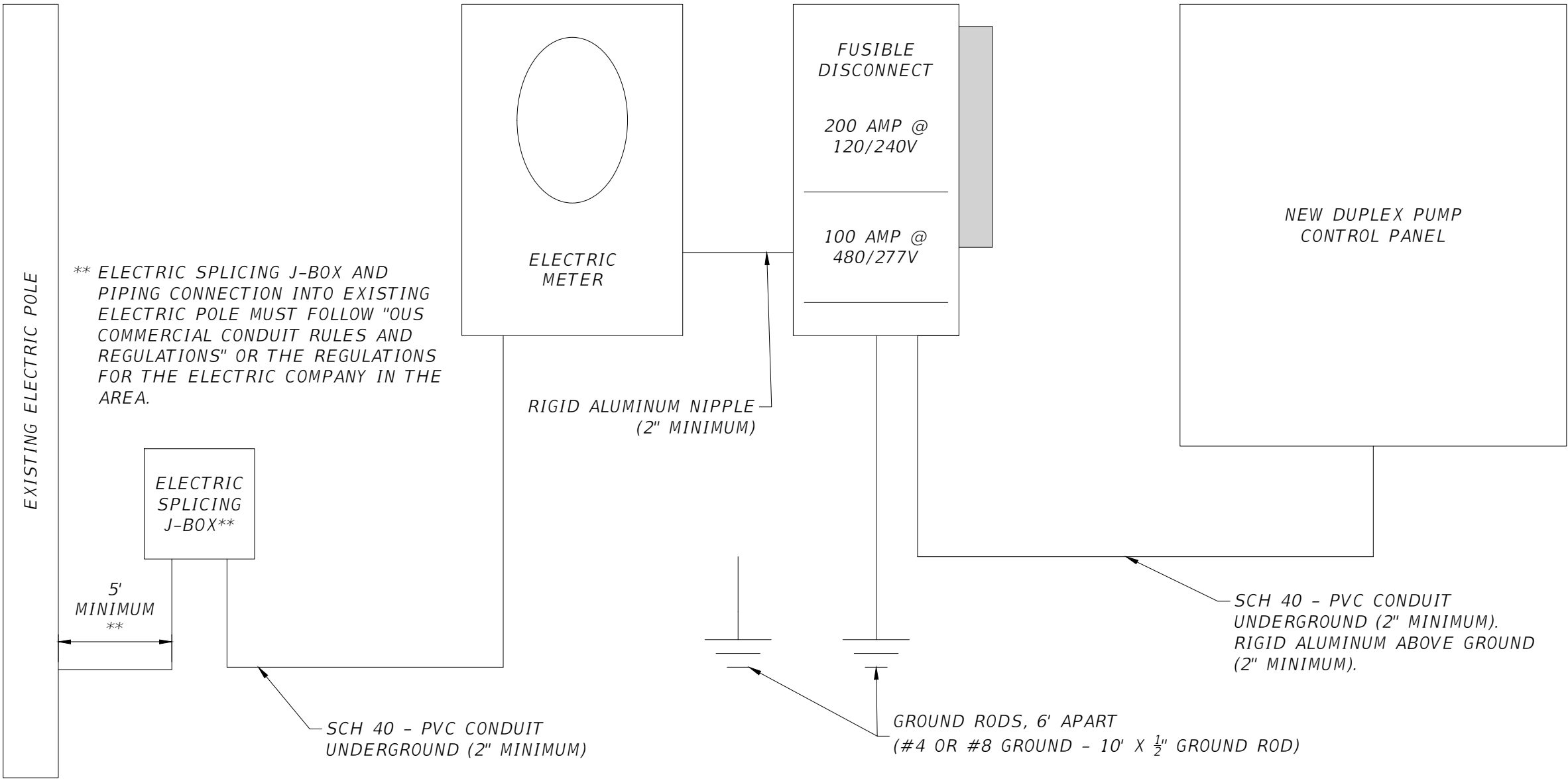
## SITE PLAN LAYOUT

SECTION:  
SEWER

SS-20E

REVISION DATE:  
DEC 2020

LOCATION:



NOTES:

1. ALL PIPE SIZES ARE PROJECT SPECIFIC AND ARE SUBJECT TO CHANGE PER THE PLAN SET.
2. ANY DISTANCES NOT LISTED ABOVE ARE PROJECT SPECIFIC AND ARE TO BE DETERMINED BASED ON THE PLAN SET.
3. 3-PHASE 120/240V ARE TO HAVE A MINIMUM SERVICE OF 200 AMPS. 3-PHASE 480/277V ARE TO HAVE A MINIMUM SERVICE OF 100 AMPS.

SCOPE OF WORK:




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STANDARD SANITARY  
SEWER LIFT STATION

ELECTRICAL RISER DIAGRAM WORKSHEET

SECTION:  
SEWER

SS-20F

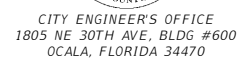
REVISION DATE:  
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1. EXHAUST FAN (7.75" O.D. SLIP INLET)
2. NUTRIENT TANK
3. NUTRIENT FEED LINE
4. WATER CONTROL CABINET
5. WATER FEED LINE
6. INLET AIR SAMPLE PORT
7. WATER INLET CONNECTION (1.00" UNIVERSAL FLANGE)
8. MAIN ACCESS FLANGE
9. ACCESS PORTS (TYP. OF 3)
10. ELECTRICAL CONTROL PANEL
11. SYSTEM DRAIN (2.00" CONNECTION)
12. STACK OUTLET FLANGE - 12.00" I.D.
13. SLOPED CONCRETE EQUIPMENT PAD
14. ID TAG
15. POSITIONING EYES (TYP. OF 4)
16. ANCHOR LUGS (TYP. OF 4)
17. OUTLET AIR SAMPLE PORT
18. HOSE BIBB

NOTES:

1. SHIPPING WEIGHT: ~5,500 lbs (INCLUDES MEDIA)  
OPERATING WEIGHT: ~8,000 lbs  
2. PLACE ON SLOPED CONCRETE, 0.0625" PER FOOT FROM FAN TO DRAIN  
3. SERVICE REQUIREMENTS:  
ELECTRICAL: 460 VAC, 3 PH, 60 HZ, 11.3 FLA  
POTABLE WATER: 1.00" LINE (30 PSI MIN.)  
4. BACKFLOW PREVENTER, IF REQUIRED, PROVIDED BY OTHERS.  
5. 7.00" (MIN.) BAROMETRIC P-TRAP ON DRAIN, PROVIDED BY OTHERS.  
6. UNIT IS TO BE INSTALLED (BY CONTRACTOR) ON 0.25" THICK NEOPRENE  
RUBBER SHEET OF 60 DUROMETER (PROVIDED BY EQVQA).



CITY OF OCALA  
STANDARD DETAILS  
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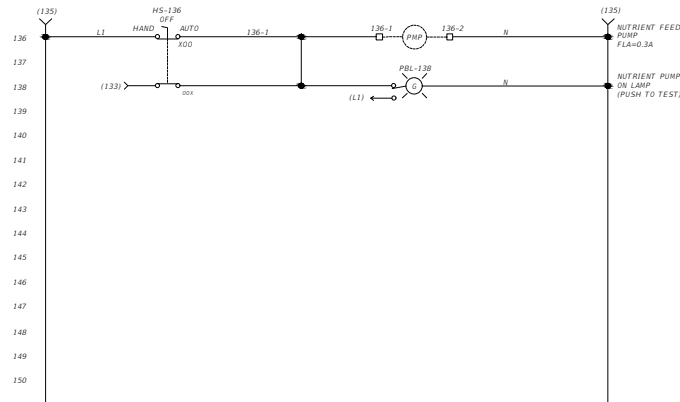
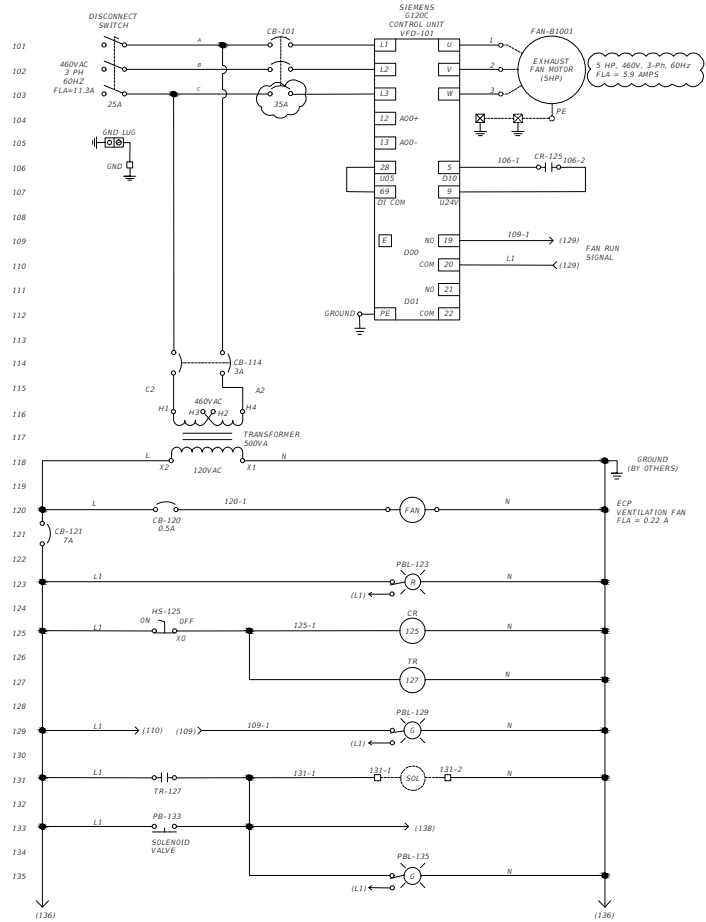
# STANDARD SANITARY SEWER LIFT STATION

## ODOR CONTROL

SECTION:  
SEWER

SS-21A

REVISION DATE:  
DEC 2020



ELECTRICAL PANEL SPECIFICATION

CONSTRUCTION:

- ENCLOSURE: NEMA 3R, FRP
- WIRING: 14 AWG CLASS MTW OR THHN MINIMUM
- INTERNAL LAYOUT MAY BE DIFFERENT FROM AS-BUILT PANEL

HARDWARE:

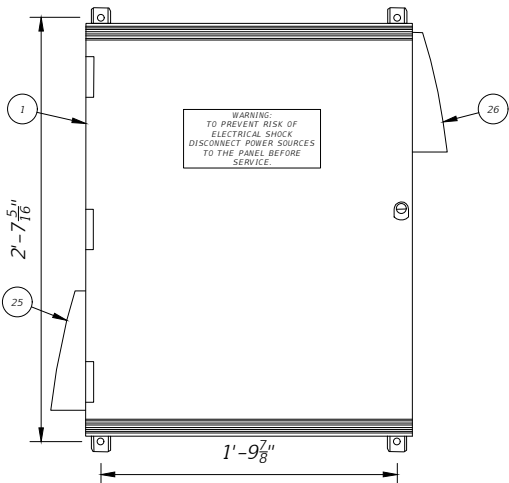
- 316 SS

INTRINSICALLY SAFE CONSTRUCTION:

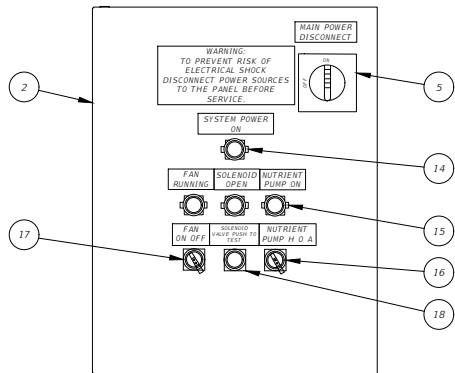
- ALL INTRINSICALLY SAFE CIRCUITS TO BE RUN IN SEPARATE CONDUIT AND SEPARATED FROM NON-INTRINSICALLY SAFE CIRCUIT ACCORDING TO NEC ARTICLES 500 AND 504.
- ALL WIRE DUCTS CONTAINING INTRINSICALLY SAFE CIRCUITS SHALL BE LABELED AS SUCH.

LABELS AND NAMEPLATES:

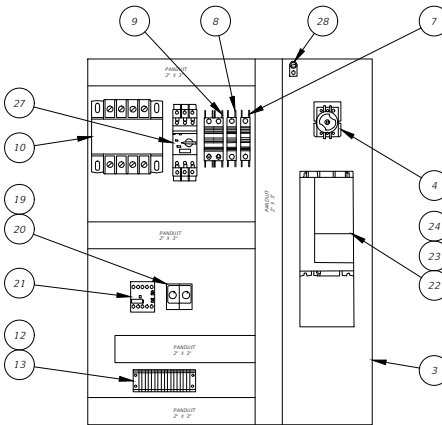
- PANEL INTERIOR SHALL HAVE LABEL INDICATING VOLTAGES, PHASES, AND AMPERE SERVICE REQUIREMENTS NEXT TO DISCONNECT SWITCH.
- NAMEPLATES SHALL BE BLACK, SELF-ADHESIVE LAMICOID WITH WHITE LETTERING.
- ALL COMPONENTS SHALL BE LABELED WITH PRINTED STICKERS PLACED ABOVE COMPONENT ON BACK PANEL.
- ALL WIRES/CABLES TO BE LABELED WITH SELF-LAMINATING LABELS.
- ALL TERMINAL BLOCK LABELS TO BE MACHINE PRINTED.
- WIRING TO TERMINAL BLOCKS TO BE DONE SUCH THAT ALL FIELD WIRING IS ON A COMMON SIDE OF THE TERMINAL STRIP.



ELECTRICAL CONTROL PANEL FRONT



ELECTRICAL CONTROL PANEL SWING OUT PANEL LAYOUT



ELECTRICAL CONTROL PANEL BACK PANEL LAYOUT

PART NO.	QTY	PART DESCRIPTION	MAT'L	MFR	CATALOG NO.
1	1	Enclosure, NEMA 4X, 30" x 24" x 12" Deep	FRP	Hoffman	UU756030
2	1	Enclosure, Swing-Out Panel, 30" x 24"	Steel	Hoffman	UU7560SP
3	1	Enclosure Backpanel, 30" x 24"	Steel	Hoffman	A30P24
4	1	Rotary Type Disconnect Switch, 25 A	Misc	Siemens	LBR3025
5	1	Rotary Switch Door Handle, NEMA 4X	Misc	Siemens	LBRH3
6	1	Rotary Type Shaft, 12" Long (not shown)	Misc	Siemens	LBRS305
7	1	1-Pole Circuit Breaker, 7A, Trip Curve D	Misc	Allen-Bradley	1489-M1D070
8	1	1-Pole Circuit Breaker, 0.5A, Trip Curve D	Misc	Allen-Bradley	1489-M1D005
9	1	2-Pole Circuit Breaker, 3A, Trip Curve D	Misc	Allen-Bradley	1489-M2D030
10	1	Transformer, 500VA	Misc	Siemens	MT0500A
11	1	Grounding Bar (not shown)	Misc	Square-D	PK15GTA
12	1	Terminal End Clamps	Misc	Phoenix Contact	D-UK 4/10 (30 03 02 0)
13	1	Terminal Block	Misc	Phoenix Contact	UK 5 N (30 04 36 2)
14	1	Pilot Lamp, Push to Test, 30mm, Class 52, Red Lens, 120 VAC with LED	Misc	Siemens	52BT6G2AB
15	1	Pilot Lamp, Push to Test, 30mm, Class 52, Green Lens, 120 VAC with LED	Misc	Siemens	52BT6G3AB
16	1	3-Position Selector Switch, 30mm, Class 52, 2N.O./2N.C.	Misc	Siemens	52SX2CABA2
17	1	2-Position Selector Switch, 30mm, Class 52, 1N.O./1N.C.	Misc	Siemens	52SX2AABA1
18	1	Switch Pushbutton (Solenoid Valve)	Misc	Siemens	52PX8A1K
19	1	Relay Timer Recycle SPDT	Misc	ATC	422AR100-S0X
20	1	Relay Base, 8-Pin, Plug In (not shown)	Misc	ATC	000-825-85-00
21	1	Relay, 3 N.O./1N.C.	Misc	Siemens	3RH11 31-1AK60
22	1	VFD Power Module, 5.0 HP, FSB Frame, 380-480 VAC, Unfiltered (VFD-101)	Misc	Siemens	6SL3210-1PE21-1UL0
23	1	VFD Communications Module, Ethernet (VFD-101)	Misc	Siemens	6SL3243-0BB30-1FA0
24	1	Basic Operator Panel (BOP-2) (VFD-101)	Misc	Siemens	6SL3255-0AA00-4CA1
25	1	Filter Fan	Misc	Hoffman	A0FF118
26	1	Exhaust Filter	Misc	Hoffman	A0EFG118
27	1	3-Pole Motor Starter Protector/Circuit Breaker, 35A (CB-101)	Misc	Siemens	LGG3B035L
28	1	Grounding Lug for Incoming Power	Copper	Thomas & Betts	L70
29	1	Wire, 14 G, MTW, Stranded, Black, Red, White, Green (not shown)	Copper		
30	1	Wire, 12 G, MTW, Stranded, Brown, Orange, Yellow (not shown)	Copper		
31	1	Wire, 10 G, MTW, Stranded, Brown, Orange, Yellow (not shown)	Copper		

NOTES:

- ALL 120 VAC POWERED TERMINAL CONNECTIONS TO BE LOCATED ON A SEPARATE TERMINAL STRIP.
- ALL 24VDC POWERED TERMINAL CONNECTIONS TO BE LOCATED ON A SEPARATE TERMINAL STRIP.
- ALL INTRINSICALLY SAFE TO BE KEPT SEPARATE FROM OTHER ELECTRICAL CIRCUITS.
- ALL 4-20 mA TERMINAL CONNECTIONS TO BE LOCATED ON A SEPARATE TERMINAL STRIP AND TO BE SHIELDED CABLE.
- ALL pH AND ORP SENSOR TERMINAL CONNECTIONS TO BE LOCATED ON SEPARATE TERMINAL STRIP AND TO BE SHIELDED CABLE.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

STANDARD SANITARY  
SEWER LIFT STATION

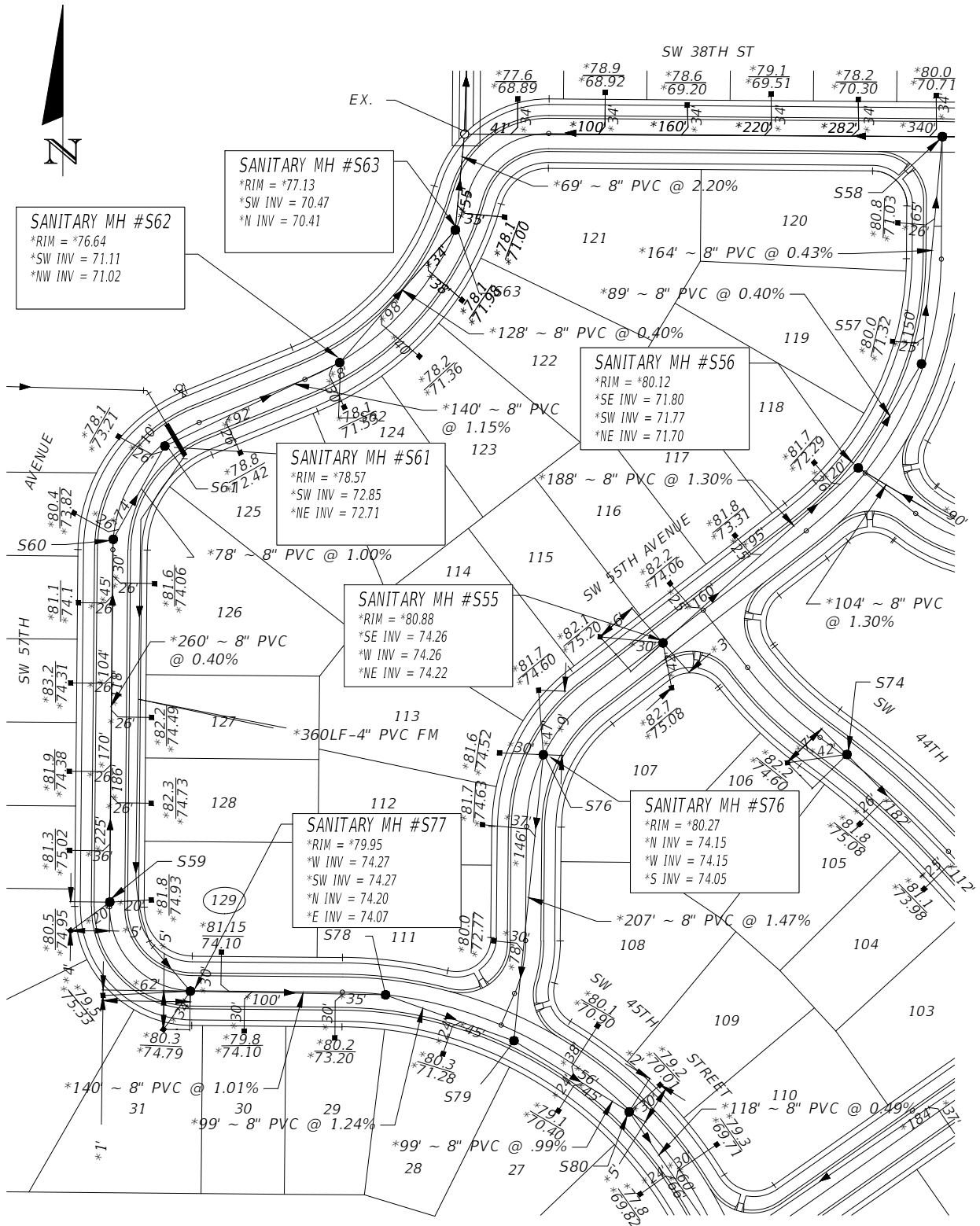
SECTION:  
SEWER

SS-21B

ODOR CONTROL ELECTRICAL

REVISION DATE:  
DEC 2020





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CITY OF OCALA  
 STANDARD DETAILS  
 FOR CONSTRUCTION

TYPICAL SEWER ASBUILT  
 DRAWING

SECTION:  
 SEWER

SS-22

REVISION DATE:  
 DEC 2020



**STANDARD DETAILS  
FOR CONSTRUCTION**

**STORMWATER DIVISION**

# ITEM

# EXISTING

# PROPOSED

DITCH BOTTOM INLET



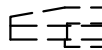
CURB INLET  
(SINGLE SIDED)



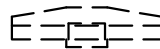
CURB INLET  
(DOUBLE SIDED)



CURB INLET WITH  
GRATE INLET  
(SINGLE SIDED)



CURB INLET WITH  
GRATE INLET  
(DOUBLE SIDED)



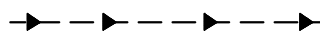
DRAINAGE FLOW



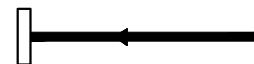
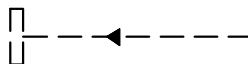
SWALE



STORM PIPE



END WALL



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CITY OF OCALA  
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FOR CONSTRUCTION

STORM DRAINAGE  
SYSTEM LEGEND

SECTION:  
STORM

SW-1

REVISION DATE:  
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1. ATTACHED SKIMMER TO THE REAR AND SIDE WALLS OF THE STRUCTURE W/(2) 1/4" ANCHOR BOLT (TYP).



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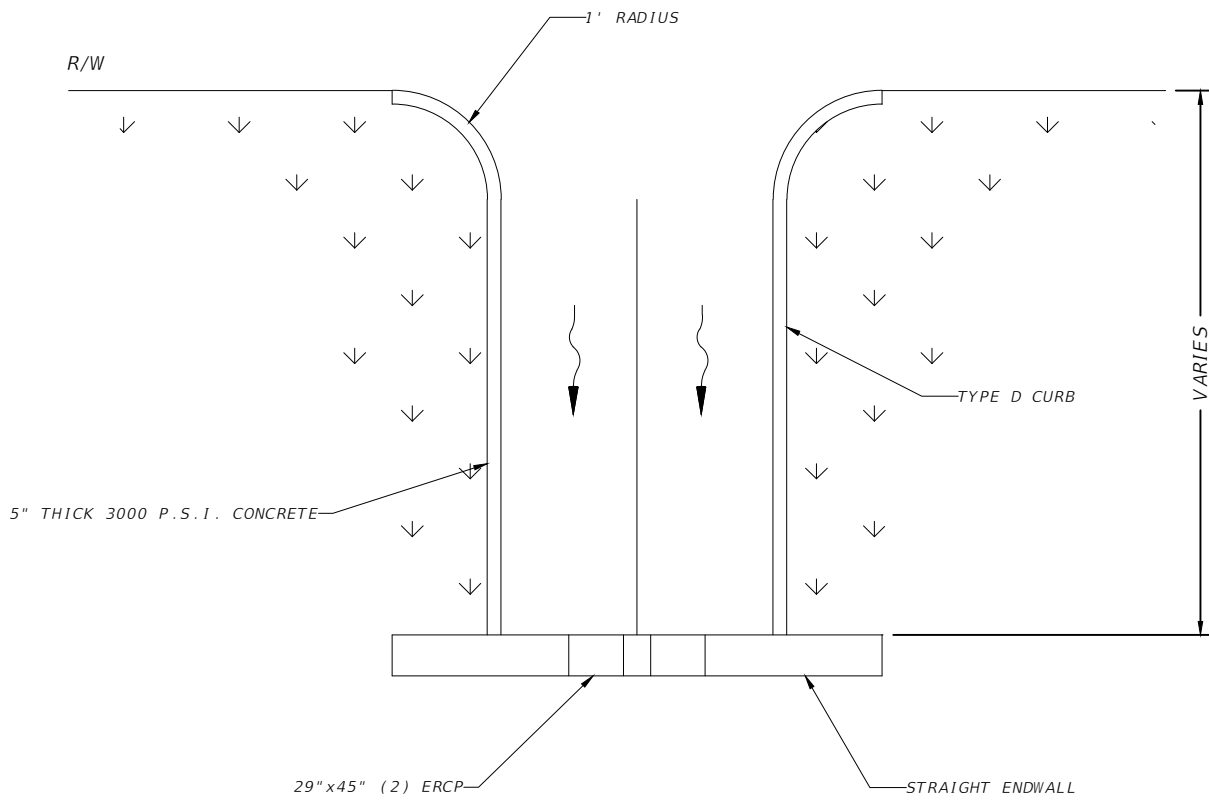
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# TYPICAL ALUMINUM SKIMMER

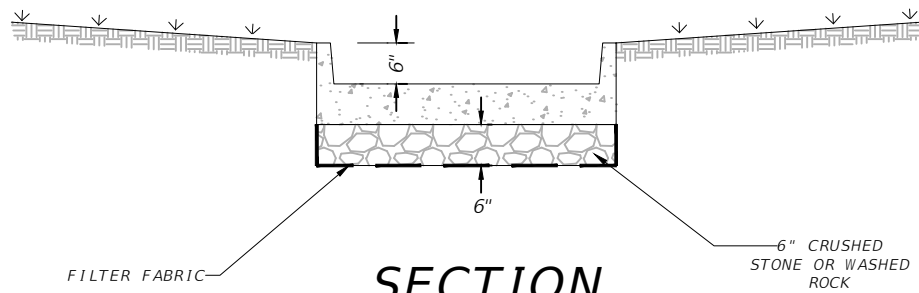
SECTION:  
STORM

SW-2

REVISION DATE:  
DEC 2020



**PLAN**



**SECTION**



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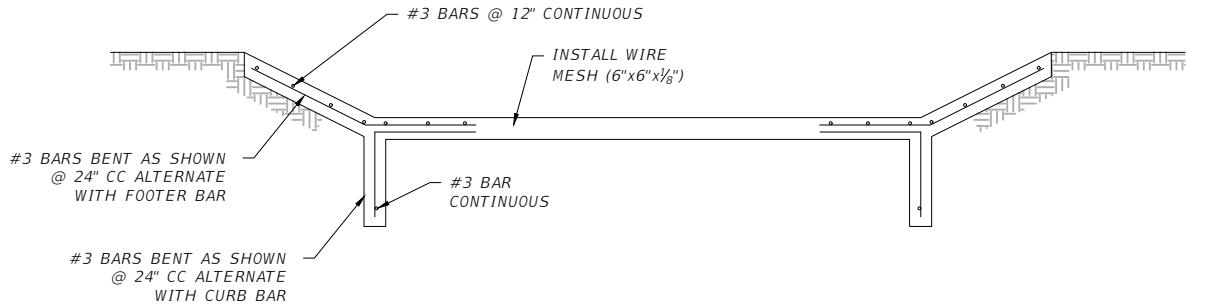
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**TYPICAL CONCRETE  
FLUME**

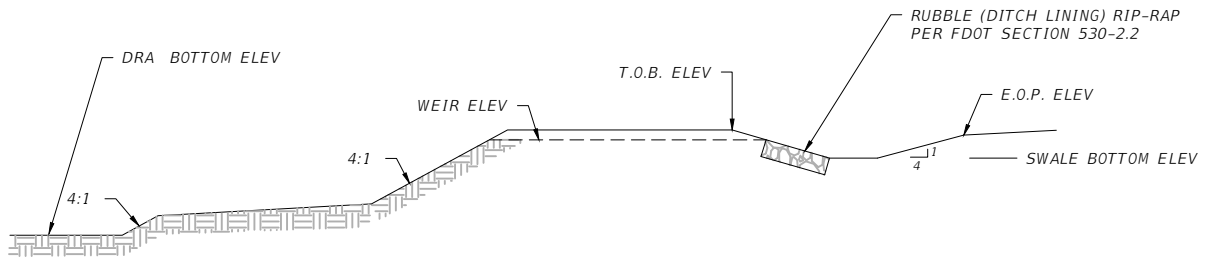
SECTION:  
STORM

**SW-3**

REVISION DATE:  
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## SECTION



## PROFILE (SECTION F-F)



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CITY OF OCALA  
STANDARD DETAILS  
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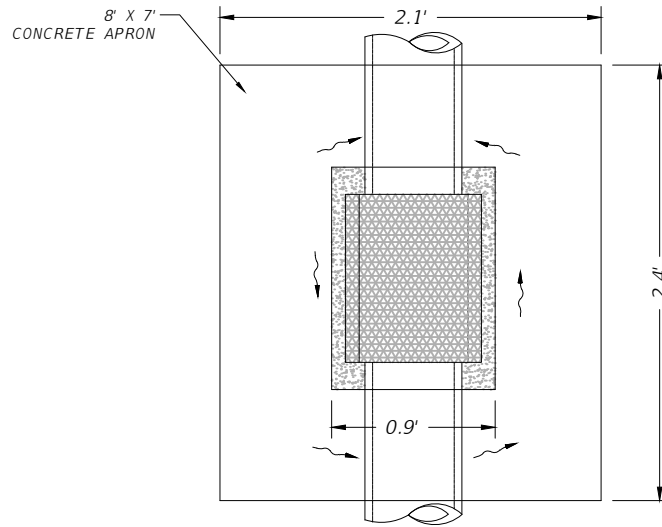
TYPICAL CONCRETE WEIR

SECTION:  
STORM

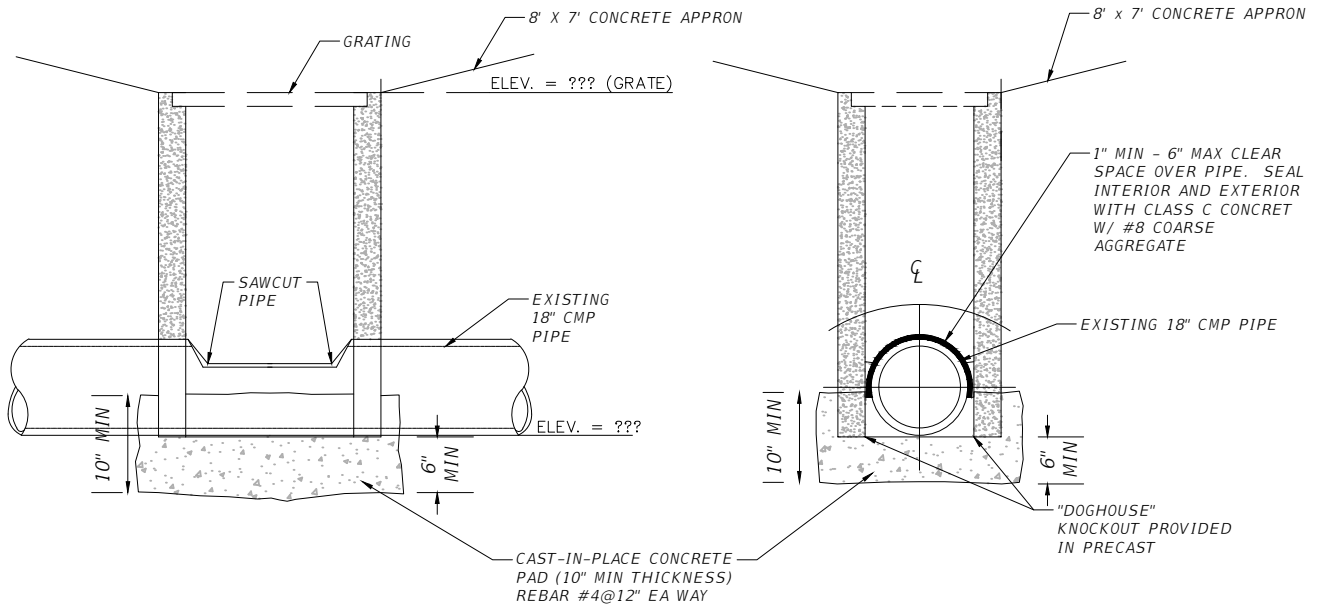
SW-4

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~> FLOW ARROW (TYPICAL)



PLAN VIEW



SIDE VIEW

FRONT VIEW



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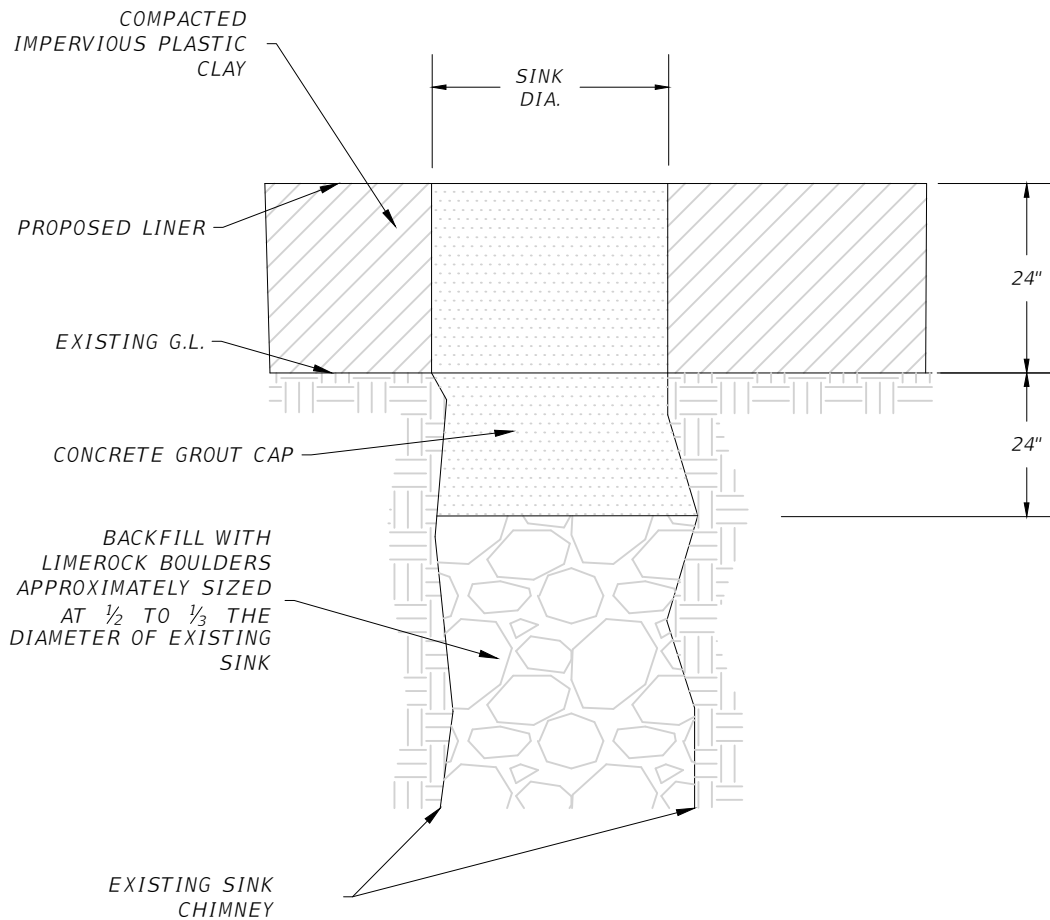
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

DOGHOUSE MANHOLE

SECTION:  
STORM

SW-5

REVISION DATE:  
DEC 2020



## SOLUTION CHANNEL PLAN AT DRA

IF A SOLUTION CHANNEL IS EVIDENT AFTER EXCAVATING TO SLIGHTLY MORE THAN THREE FEET BELOW PROPOSED POND BOTTOM, ALLOW FOR PLASTIC CLAY PLACEMENT PLUS THREE FEET OF A-3 SAND AND FILL SOLUTION CHANNEL IN ACCORDANCE WITH TYPICAL SINK CHIMNEY REPAIR DETAIL.



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# KARST

SINK CHIMNEY REPAIR

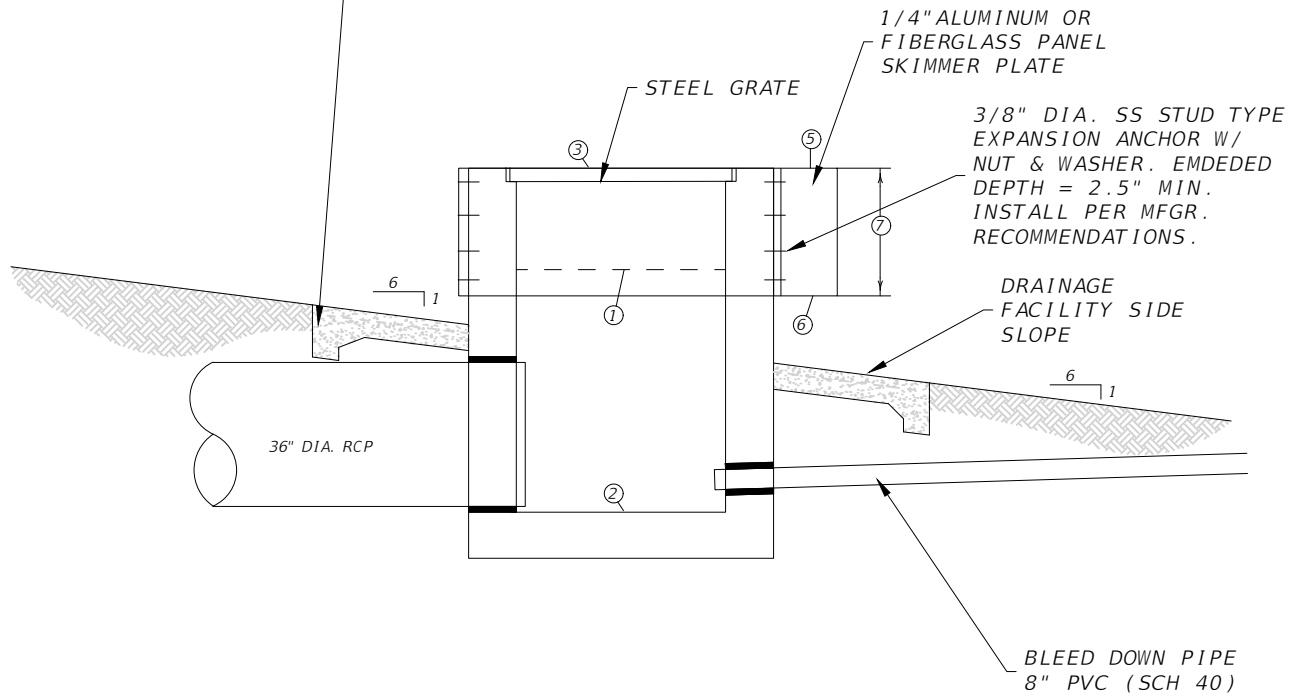
SECTION:  
STORM

SW-6

REVISION DATE:  
DEC 2020



6" THICK CONCRETE COLLAR TO EXTEND AROUND ENTIRE STRUCTURE 1.5 FEET. REINFORCED WITH 6"X6"X1.4X1.4 W.W.M. MATCH CONCRETE COLLAR TO THE DRAINAGE FACILITY SIDE SLOPE.



## SCHEDULE FOR OUTFALL CONTROL BOX WITH SKIMMER

BOX	① DISCHARGE ELEVATION	② SUMP ELEVATION	③ TOP OF STRUCTURE	④ WEIR LENGTH	INLET TYPE	⑤ TOP OF SKIMMER ELV.	⑥ BOTTOM OF SKIMMER ELV.	⑦ SKIMMER SIZE
POND	XX.XX	XX.XX	XX.XX	A X FT	FDOT E W/ STEEL GRATE	XX.XX	XX.XX	XX"
				B X FT				
				C X FT				



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CITY OF OCALA  
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OUTLET  
STRUCTURE

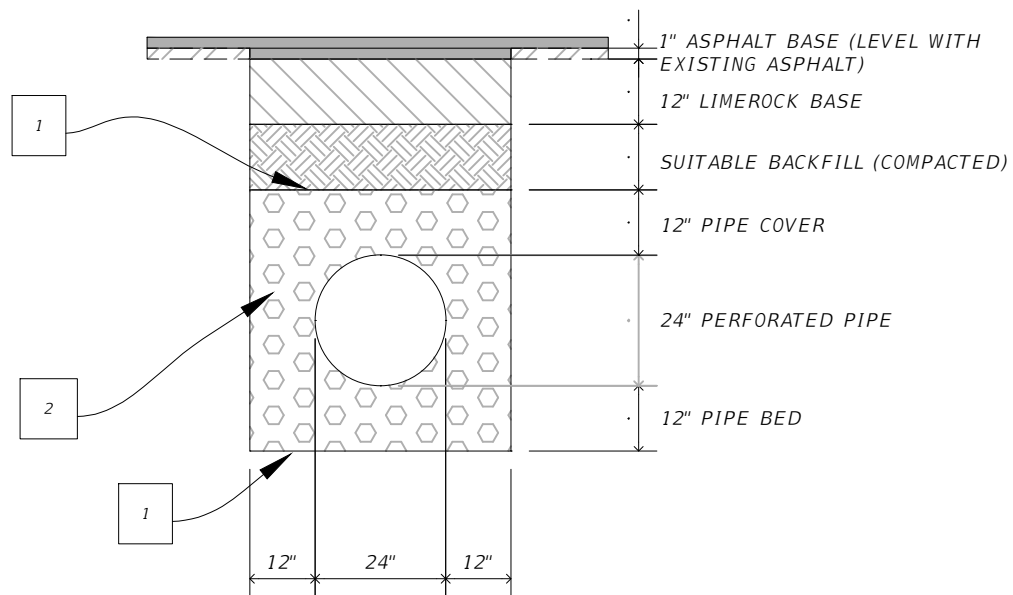
WITH COLLAR

SECTION:  
STORM

SW-7

REVISION DATE:  
DEC 2020

- KEY
- 1) FILTER FABRIC, WRAPPING  
TRENCH ONLY
  - 2) WELL GRADED STONE #57  
GRANULAR & SMALLER  
PARTICLE SIZE. COMPACT TO  
MIN. 90% STANDARD DENSITY  
PER AASHTO T99



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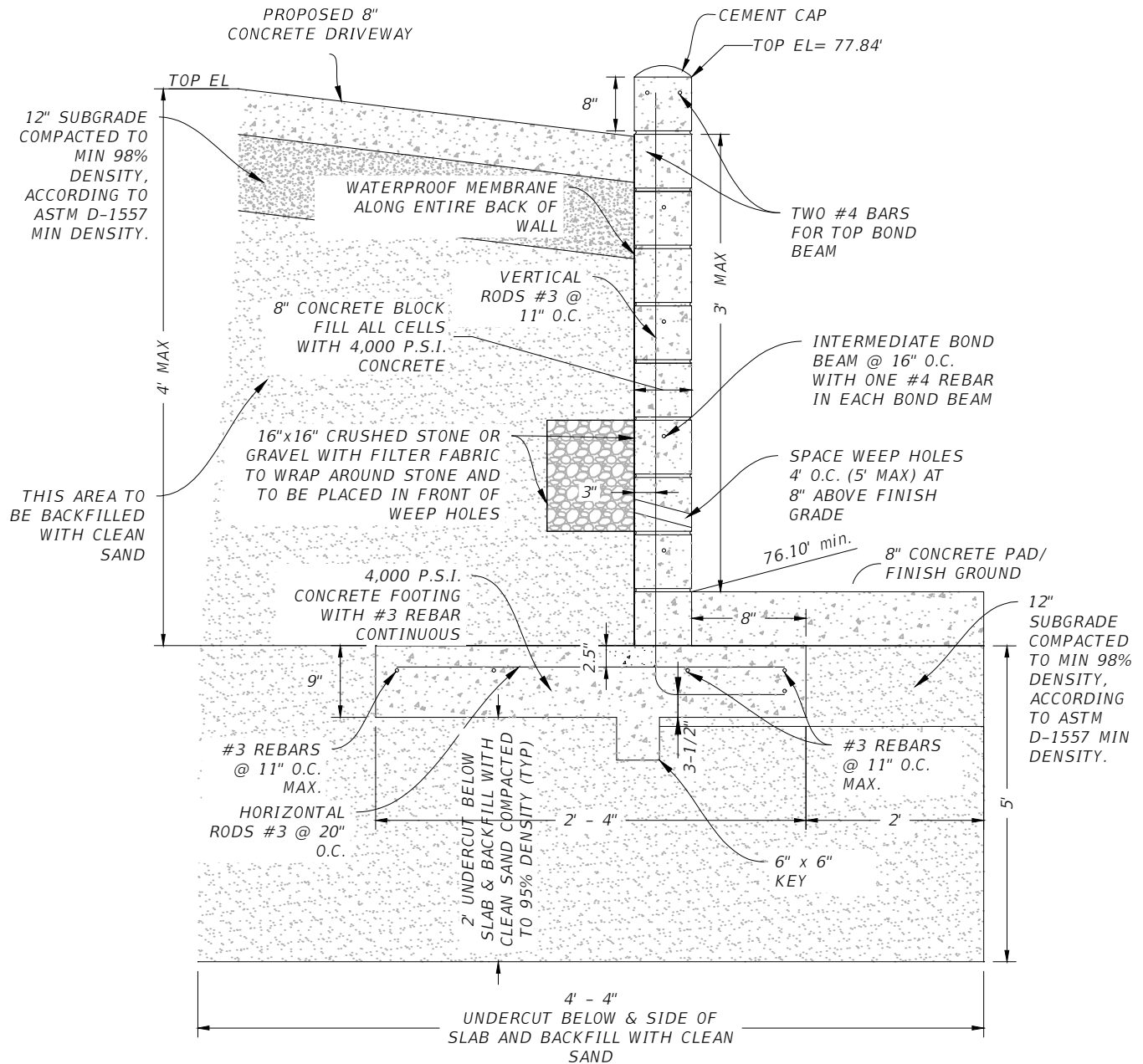
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## FILTRATION TRENCH

SECTION:  
STORM

SW-8

REVISION DATE:  
DEC 2020



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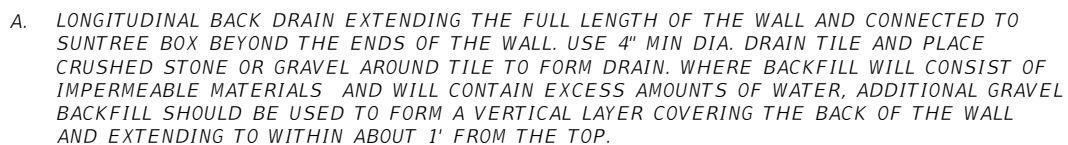
# CITY OF OCALA STANDARD DETAILS FOR CONSTRUCTION

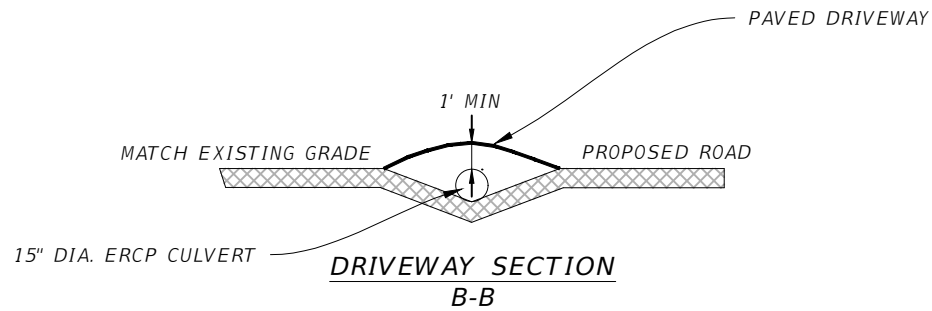
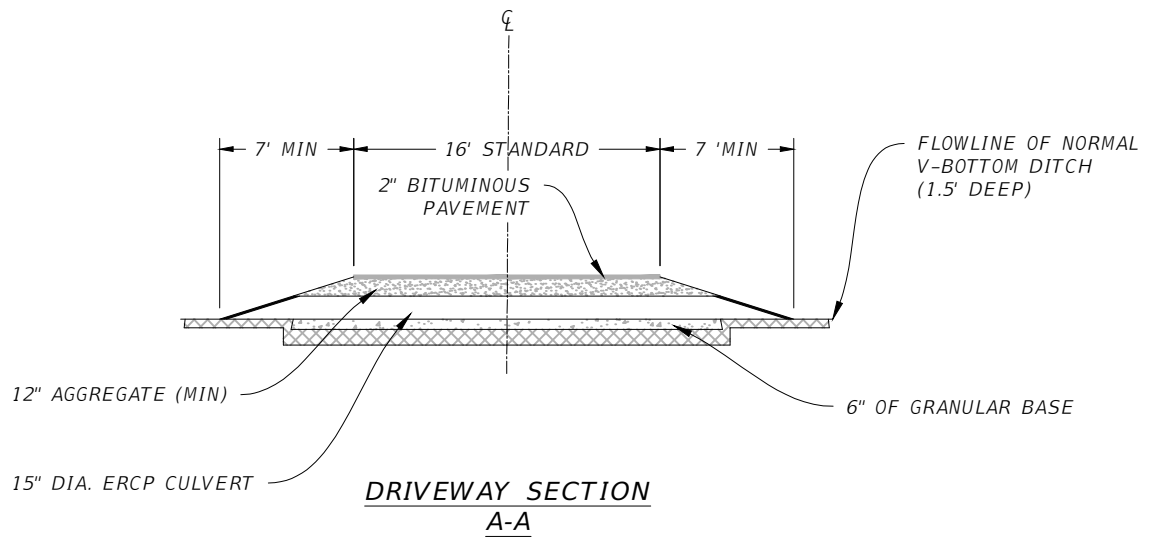
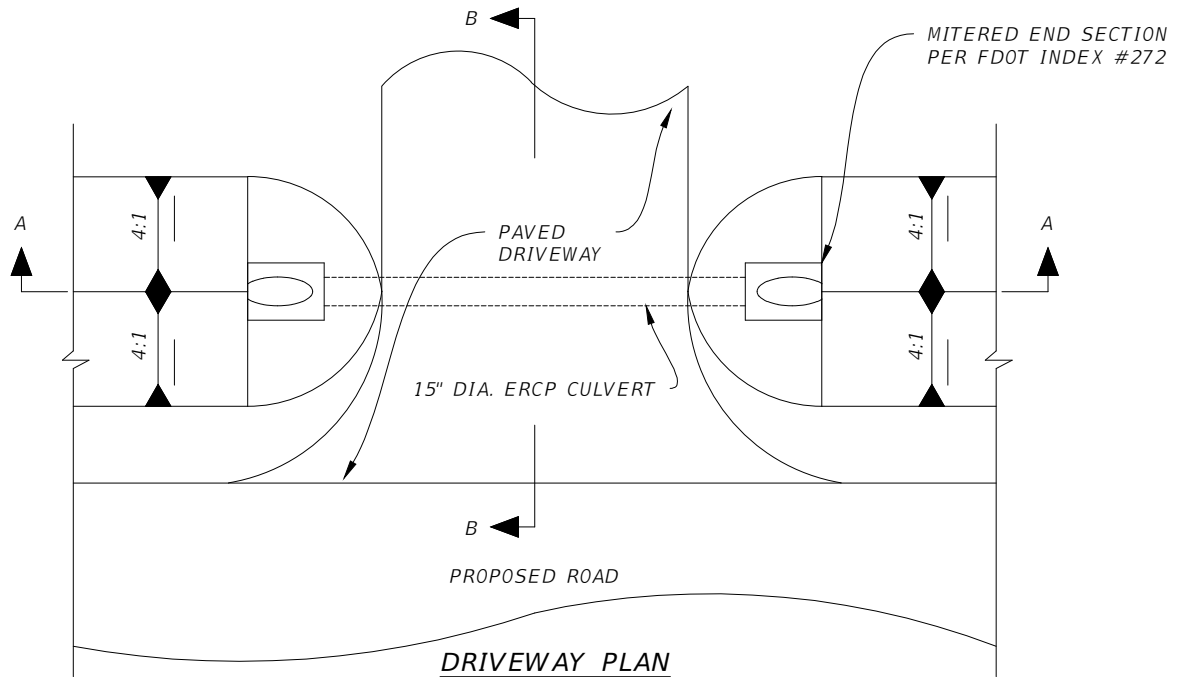
## 8" RETAINING WALL

SECTION:  
STORM

SW-9

REVISION DATE:  
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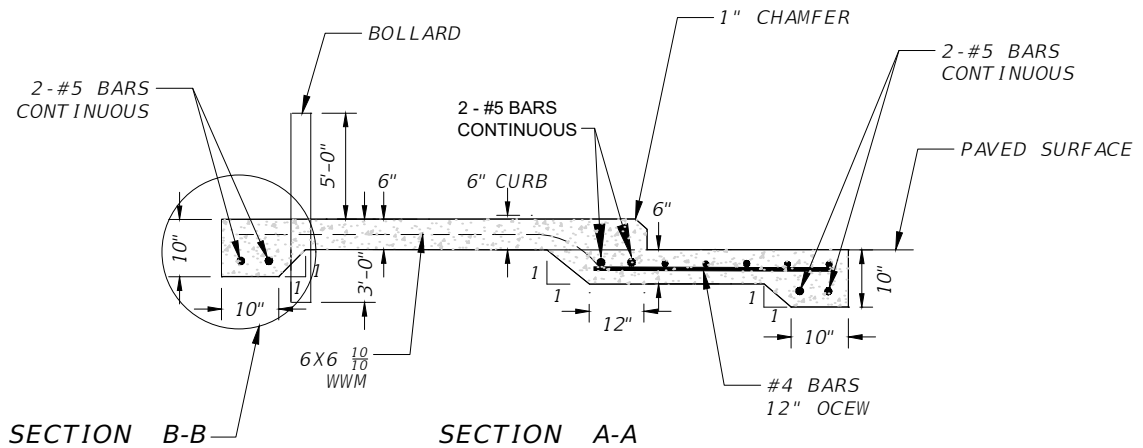
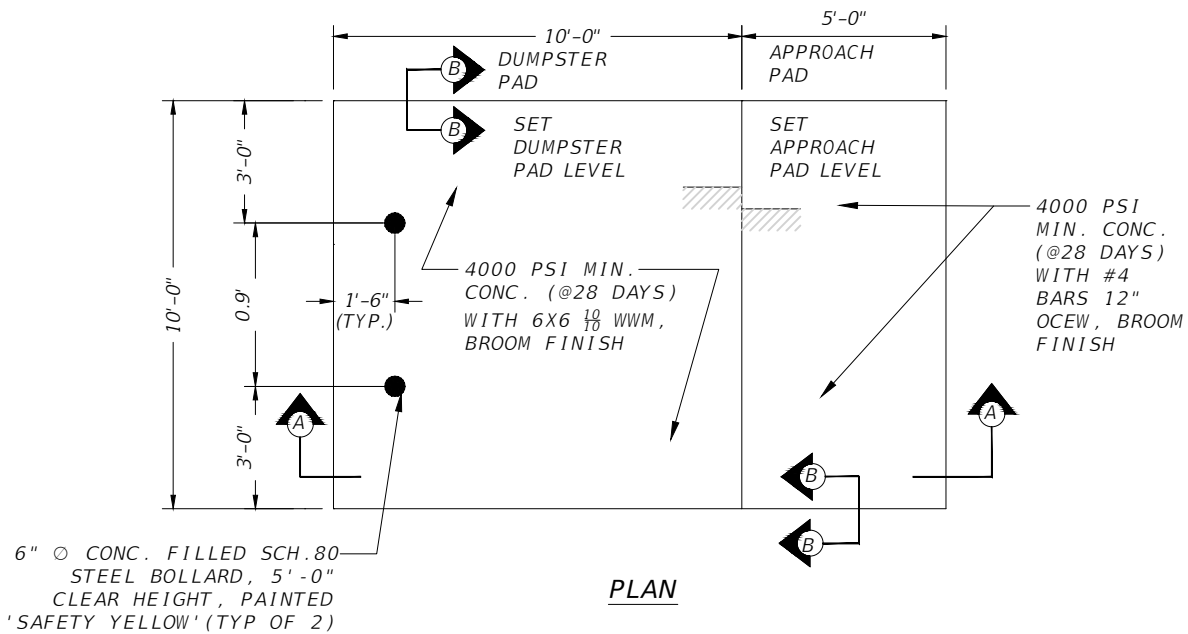
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## TYPICAL DRIVEWAY CULVERT

SECTION:  
STORM

**SW-11**

REVISION DATE:  
DEC 2020



**NOTES:**

1. DUMPSTER PAD IS FOR ALL GENERAL PURPOSES INCLUDING RESTAURANT DRY RECYCLABLES APPLICATIONS.
2. USE DETAIL SW-12B FOR DUMPSTER PADS FOR RESTAURANT FOOD-WASTE APPLICATIONS ONLY.
3. ENGINEER SHALL USE THE CURRENT VERSION OF THE FL. BUILDING CODE AND PREPARE A COMPLETE STRUCTURAL DESIGN FOR THE DUMPSTER PAD AND APPROACH PAD MEETING THE MINIMUM CRITERIA SET FORTH IN THIS CITY STANDARD.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

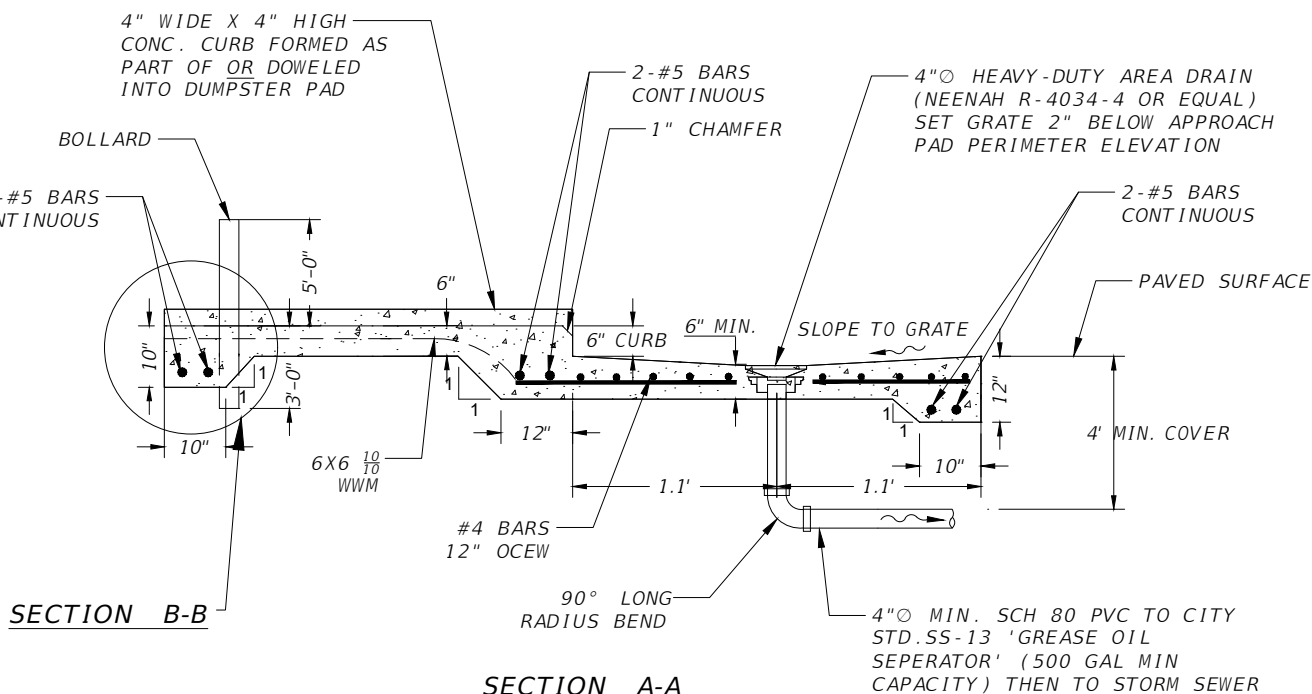
TYPICAL DUMPSTER PAD

GENERAL USE

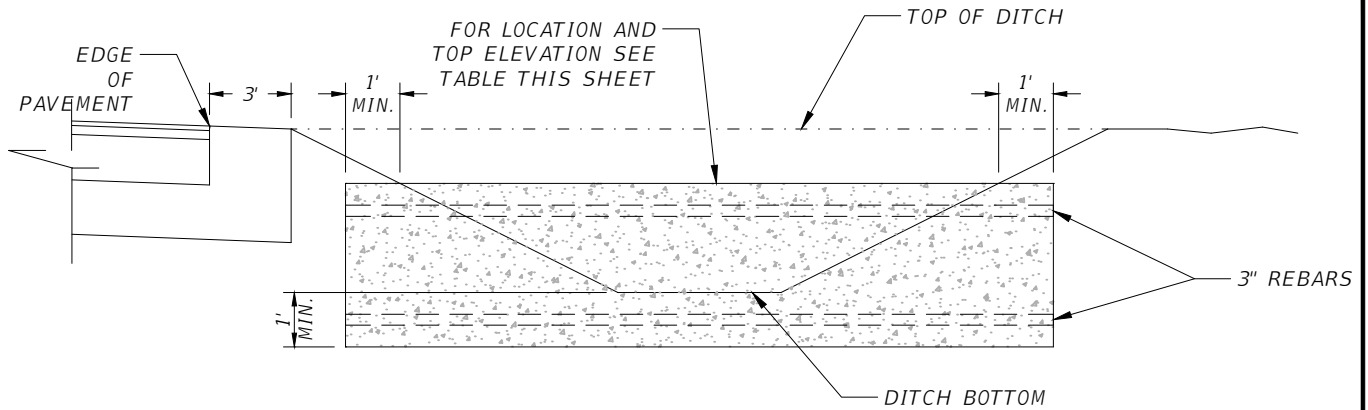
SECTION:  
STORM

SW-12A

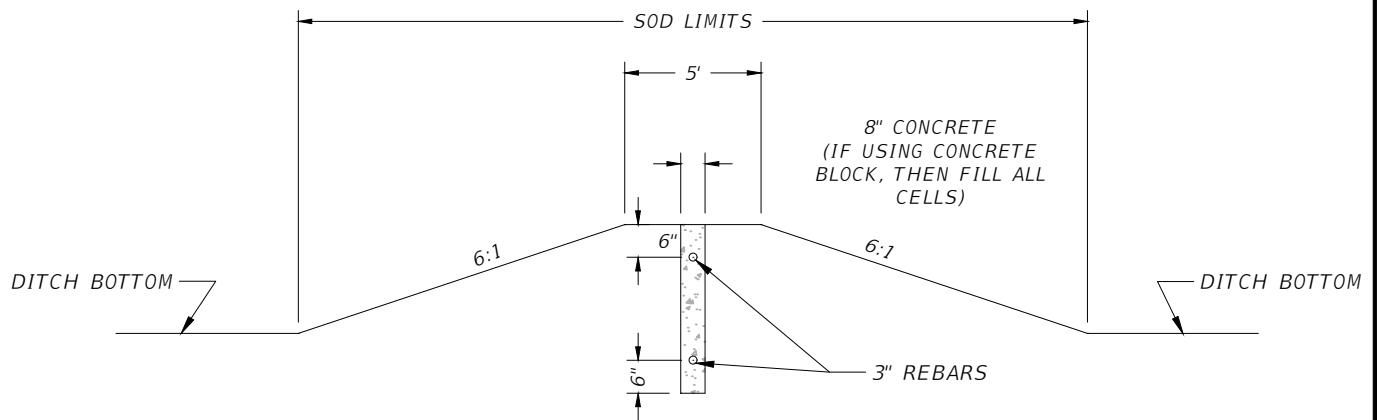
REVISION DATE:  
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REVISION DATE:  
DEC 2020



**FRONT VIEW**



**SIDE VIEW**



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**TYPICAL DITCH BLOCK**

SECTION:  
STORM

**SW-13**

REVISION DATE:  
DEC 2020





**STANDARD DETAILS  
FOR CONSTRUCTION**

**TRANSPORTATION DIVISION**

# ITEM

# EXISTING

# PROPOSED

TRAFFIC CONTROL BOX



STREET SIGN



LOOP DETECTOR



PEDESTRIAN LIGHT



DISABLED PARKING



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## TRAFFIC LEGEND

SECTION:  
TRANSPORTATION

T-1

REVISION DATE:  
DEC. 2020

ITEM	EXISTING	PROPOSED
CENTERLINE		
BASELINE		
RIGHT OF WAY PROPERTY LINE		
EASEMENT LINE		
RIGHT OF WAY LINE		
STATIONING ALONG C/L OR B/L		
FENCE (CHAIN LINK)		
FENCE (WIRE)		
FENCE (WOOD)		
FENCE (BLOCK/ BRICK)		
FENCE (STONE)		
TREE		
EDGE OF WOODED AREA		
HEDGE		
POWER POLE (WOOD)		
POWER POLE (CONCRETE)		
POWER POLE (METAL)		
GUY WIRE & ANCHOR		
CONTOUR LINE		
MAIL BOX		
BUILDING		
RAILROAD TRACKS		



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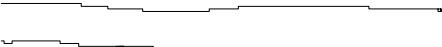



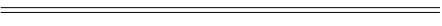








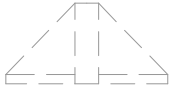
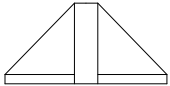
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# STREET LEGEND

SECTION:  
TRANSPORTATION

T-2A

REVISION DATE:  
DEC. 2020

ITEM	EXISTING	PROPOSED
PAVED ROAD		
DIRT ROAD		
CURB & GUTTER		
DROP CURB & GUTTER		
DRIVEWAY (CONCRETE)		
DRIVEWAY (ASPHALT)		
DRIVEWAY (DIRT OR LIMEROCK)		
PAVEMENT REMOVAL & REPLACEMENT		
PAVEMENT REMOVAL		
HANDICAP RAMP		



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# CITY OF OCALA STANDARD DETAILS FOR CONSTRUCTION

## STREET LEGEND

SECTION:  
TRANSPORTATION

T-2B

REVISION DATE:  
DEC. 2020

## ITEM

## EXISTING

## PROPOSED

BURIED TELEPHONE  
CABLE

— — — BT (200PR) — — —

———— BT (200PR) ————

GAS MAIN

— — — — 6" gas — — — —

———— 6" gas ————

UNDERGROUND  
CABLE TELEVISION

— — — - UG(CATV) - — — —

———— UG(CATV) ————



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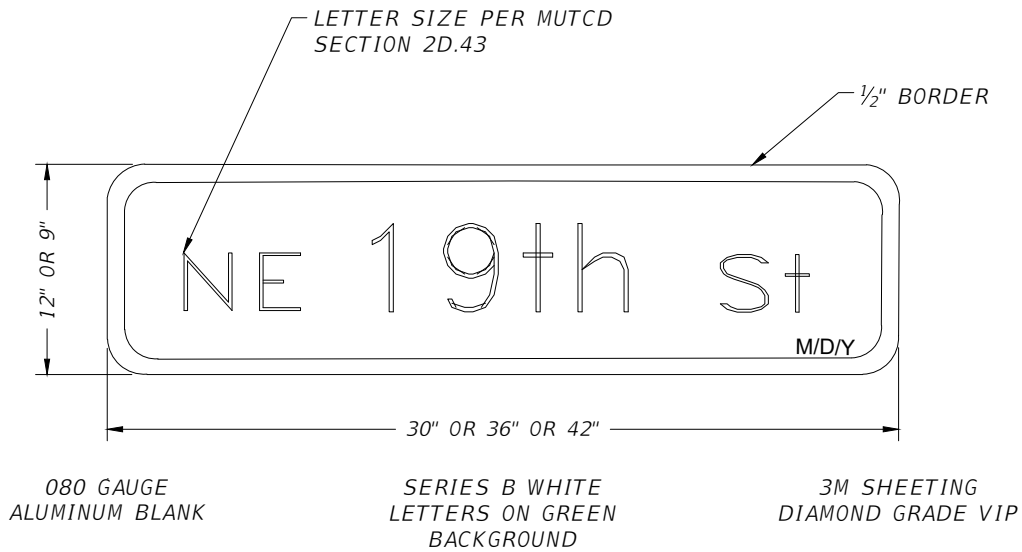
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# STREET LEGEND

SECTION:  
TRANSPORTATION

T-2C

REVISION DATE:  
DEC. 2020



### NOTES

1. 12 INCH USED WITH 36" STOP SIGN APPROACHING A 4 - LANE ROADWAY
2. PRIVATE ROAD STREET SIGNS SHALL BE WHITE BACKGROUND WITH GREEN LETTERS



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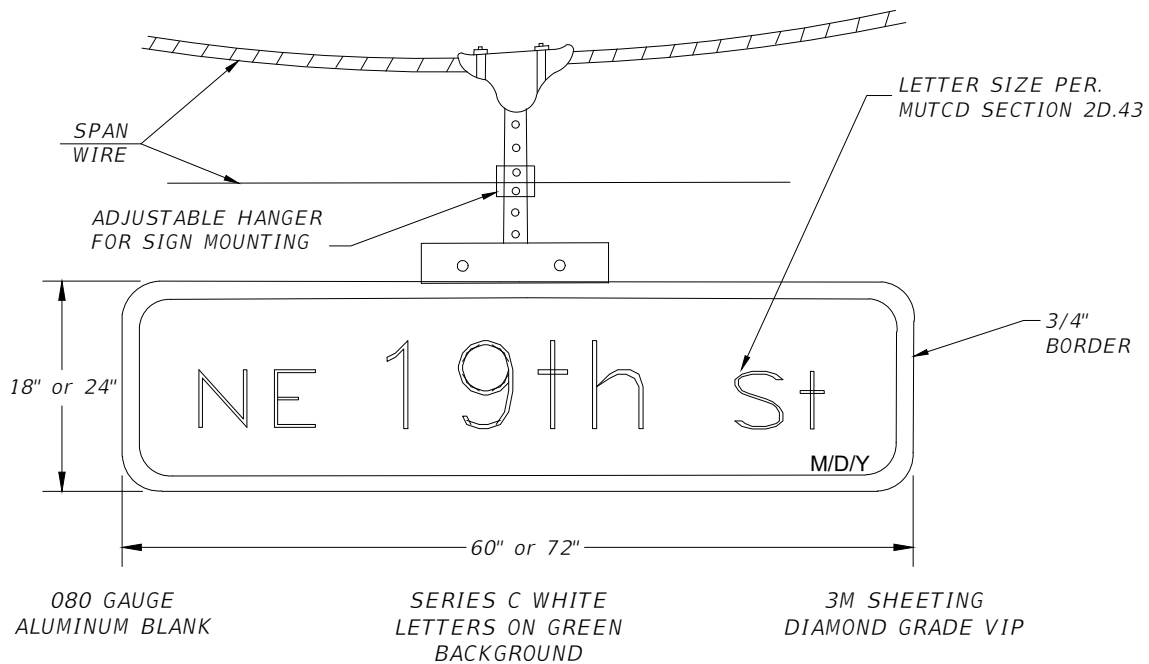
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**STREET NAME  
QUADRANT SIGN**

SECTION:  
TRANSPORTATION

**T-3**

REVISION DATE:  
DEC. 2020



## ELEVATION

## NOTES

1. ANGLE SPAN 1 SIGN BRACKET DOUBLE FACE SIGN.
2. BOX SPAN 2 SIGN BRACKETS SINGLE FACE SIGN.



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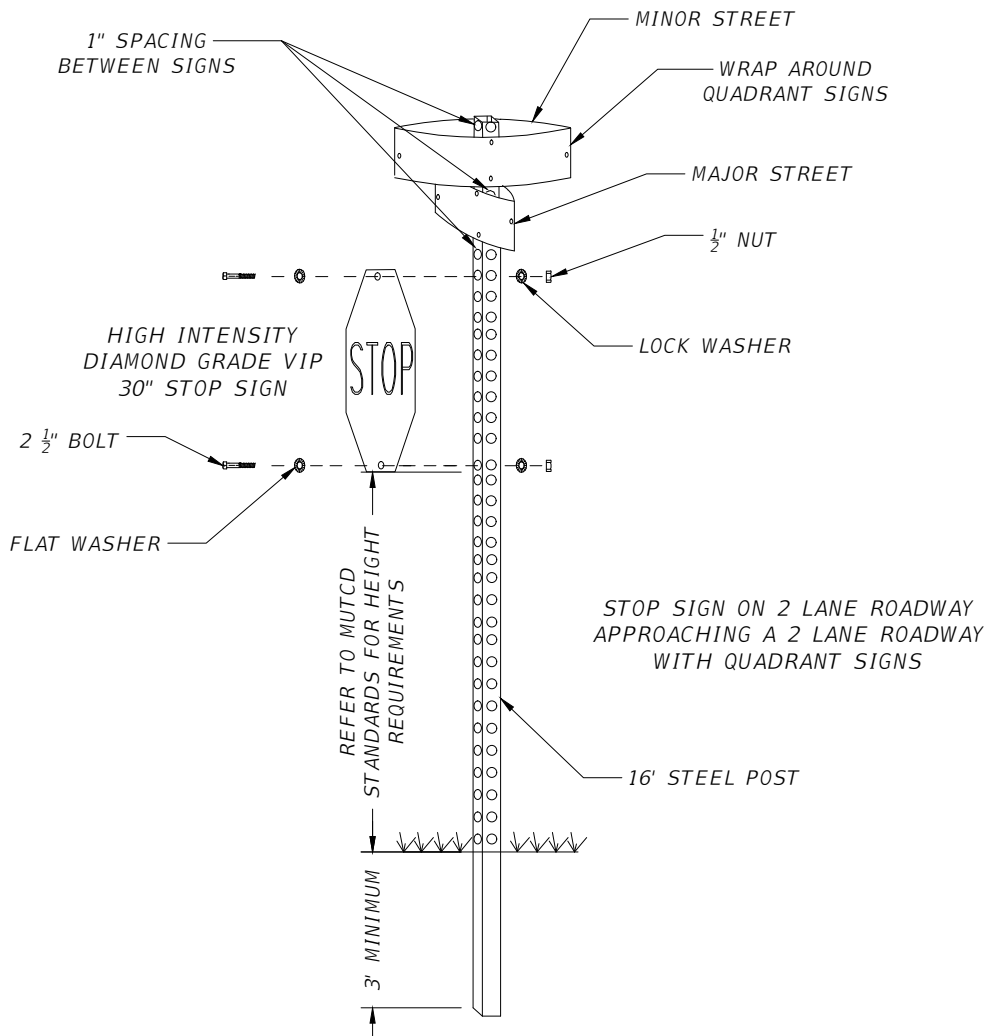
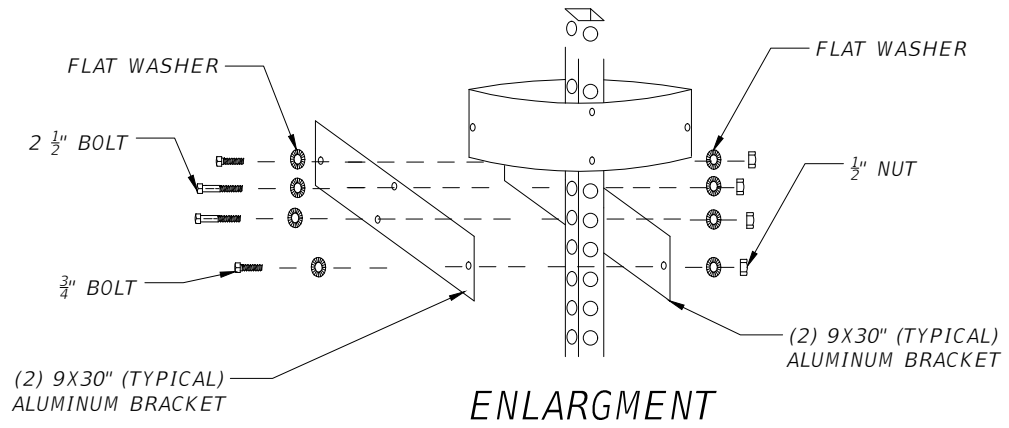
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# OVERHEAD STREET NAME SIGN

SECTION:  
TRANSPORTATION

T-4

REVISION DATE:  
DEC. 2020



**PLAN**



CITY ENGINEER'S OFFICE  
1805 NE 30TH AVE, BLDG #600  
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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**STREET NAME  
SIGN AND POST**

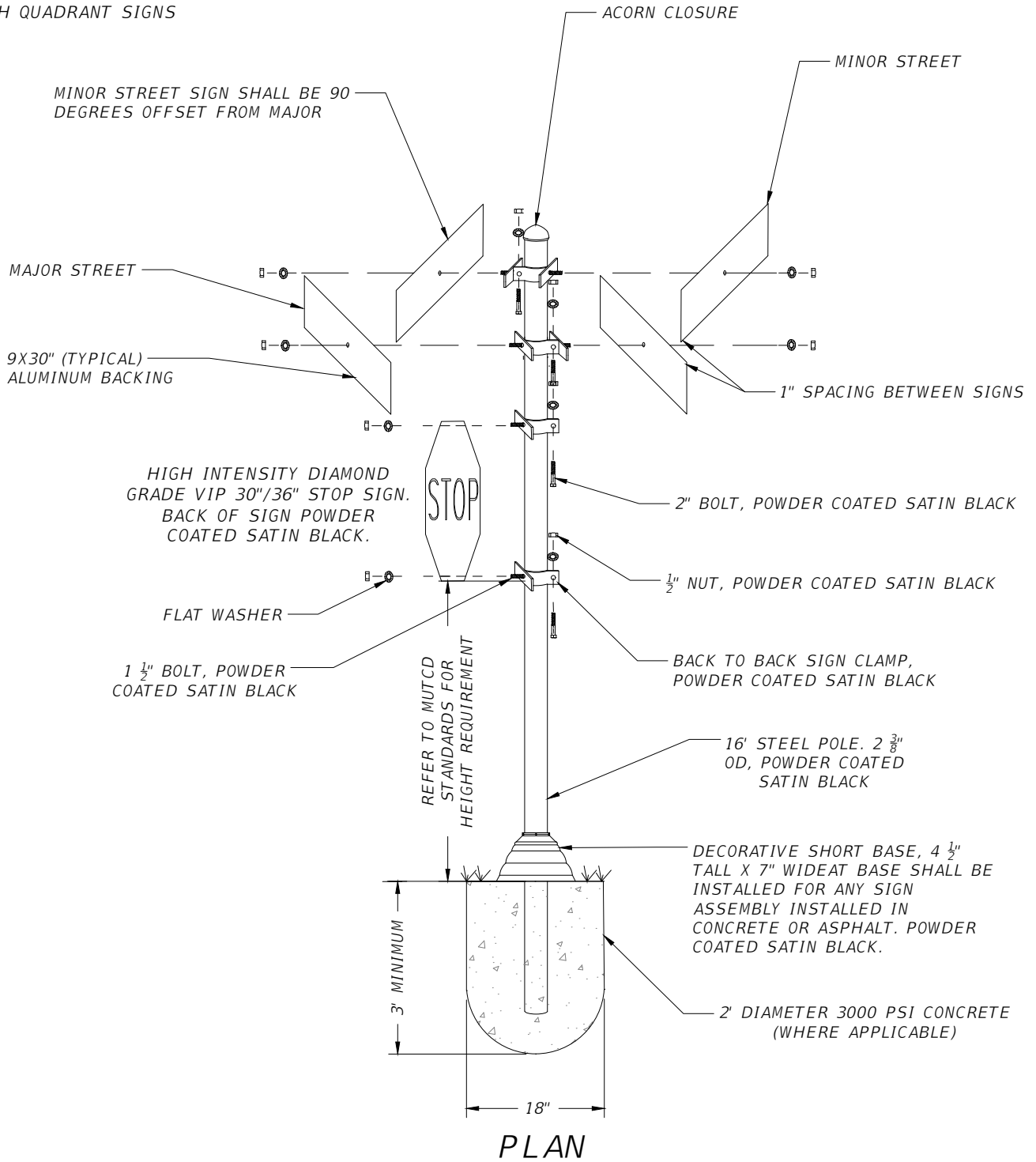
SECTION:  
TRANSPORTATION

**T-5**

REVISION DATE:  
DEC. 2020



STOP SIGN ON 2 LANE ROADWAY  
APPROACHING A 2 LANE ROADWAY  
WITH QUADRANT SIGNS



\* HISTORIC STREET NAME SIGNS

1. APPROPRIATE VECTOR GRAPHICS FOR EACH RESPECTIVE HISTORIC DISTRICT SHALL BE INSTALLED ON THE LEFT-HAND SIDE OF EACH FACE.
2. ALL HISTORIC DISTRICT STREET SIGNS SHALL BE HIGH INTENSITY DIAMOND GRADE VIP, POWDER COATED BLACK WITH BROWN BACKGROUND AND VECTOR GRAPHIC WITH WHITE LETTERS.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# HISTORIC / DECORATIVE SIGN POST

SECTION:  
TRANSPORTATION

T-6

REVISION DATE:  
DEC. 2020

<i>J</i>	<i>F</i>	<i>M</i>	<i>A</i>	<i>M</i>	<i>J</i>
<i>19</i>	<i>OCALA, FLA.</i>				<i>24</i>
<i>20</i>	<b>WARNING</b> <hr/> UP TO \$250.00 FINE FOR TAMPERING WITH THIS SIGN FLA. STATUTES CHPTS. 316.0775 & 316.655				<i>25</i>
<i>21</i>					<i>26</i>
<i>22</i>					<i>27</i>
<i>23</i>	<i>TRAFFIC DIV.</i>				<i>28</i>
<i>J</i>	<i>A</i>	<i>S</i>	<i>O</i>	<i>N</i>	<i>D</i>



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

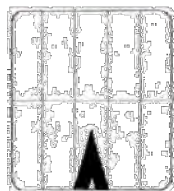
*BIRTH DATE  
STICKER*

SECTION:  
TRANSPORTATION

*T-7*

REVISION DATE:  
DEC. 2020

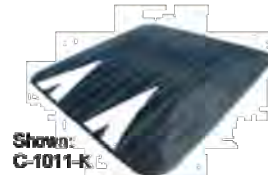
## RKP Series



**C-1010-1-K**

### Average 85th percentile speeds

**After**  
**24 h**



Showing:  
C-1011-K

**Kits include all installation hardware and resin.**

### 78" x 80" - 10 Unit - Speed Cushion Kits

C-1010-K	78" x 80" - No Arrows	530 lbs.
C-1010-1-K	78" x 80" - One Arrow	530 lbs.
C-1011-K	78" x 80" - Two Arrows	530 lbs.
C-1012-K	78" x 80" - Four Arrows	530 lbs.

### 78" x 120" - 15 Unit - Speed Cushion Kits

ST-1000-K	78" x 120" - No Arrows	870 lbs.
ST-1000A-K	78" x 120" - Two Arrows	870 lbs.

**Additional RKP Kit patterns can be designed by utilizing individual components**

### Speed Cushlon / Table Components

Cushion / Table Components		Wt.
RKP- RC	Right Corner	42 lbs.
RKP- C	Left Corner	42 lbs.
RKP- LC	Ramp without Arrow	55 lbs.
RKP- CA	Ramp with Arrow	55 lbs.
RKP- CE	Center Extender	68 lbs.
RKP- SE	Angled Side Extender	44 lbs.



### Common Layout Patterns Include



### Configuration Chart

**Shown in nominal dimensions, these suggested layouts provide effective speed reductions and greatly reduce hazardous water damming.**

**Minimizes emergency vehicle delays.**

**A trained traffic control specialist, planner or designer should be retained for more precise placement.**

[illegible]RKP  
78" x 80"

## Road Kare International

530 Jesse St. Grand Prairie, TX 75051

Phone 972.623.9885 Toll Free 800.942.9305 Fax 972.641.0851

mail: [sales@roadkare.com](mailto:sales@roadkare.com)

website: [www.roadkare.com](http://www.roadkare.com)

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050911



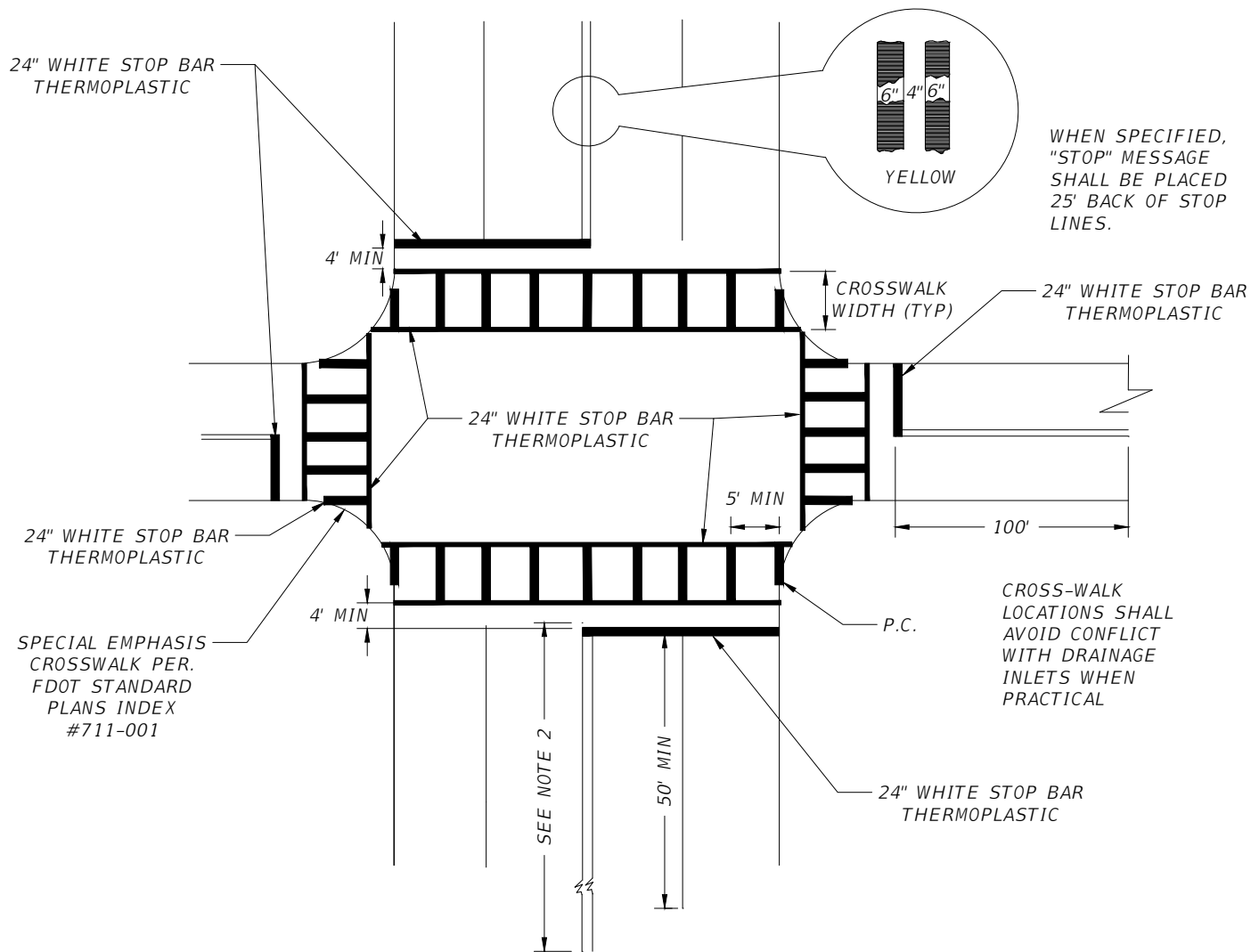
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## SPEED CUSHION

SECTION:  
TRANSPORTATION

*T-8*

REVISION DATE:  
DEC. 2020



## PLAN

## NOTES

1. WHEN CURB CUT RAMPS ARE PRESENT, REFER TO FDOT STANDARD PLANS INDEX 522-002 FOR CROSS-WALK WIDTHS.
2. CENTER LINES ON ROADWAY APPROACHES SHALL BE 6" YELLOW THERMOPLASTIC AND SHALL BE EXTENDED BACK FROM STOP BAR 50' FOR TWO LANE ROADWAYS AND 100' FOR FOUR LANE ROADWAYS.
3. HANDICAP RAMPS SHALL COMPLY WITH DETAIL C-3 OR FDOT INDEX #304.



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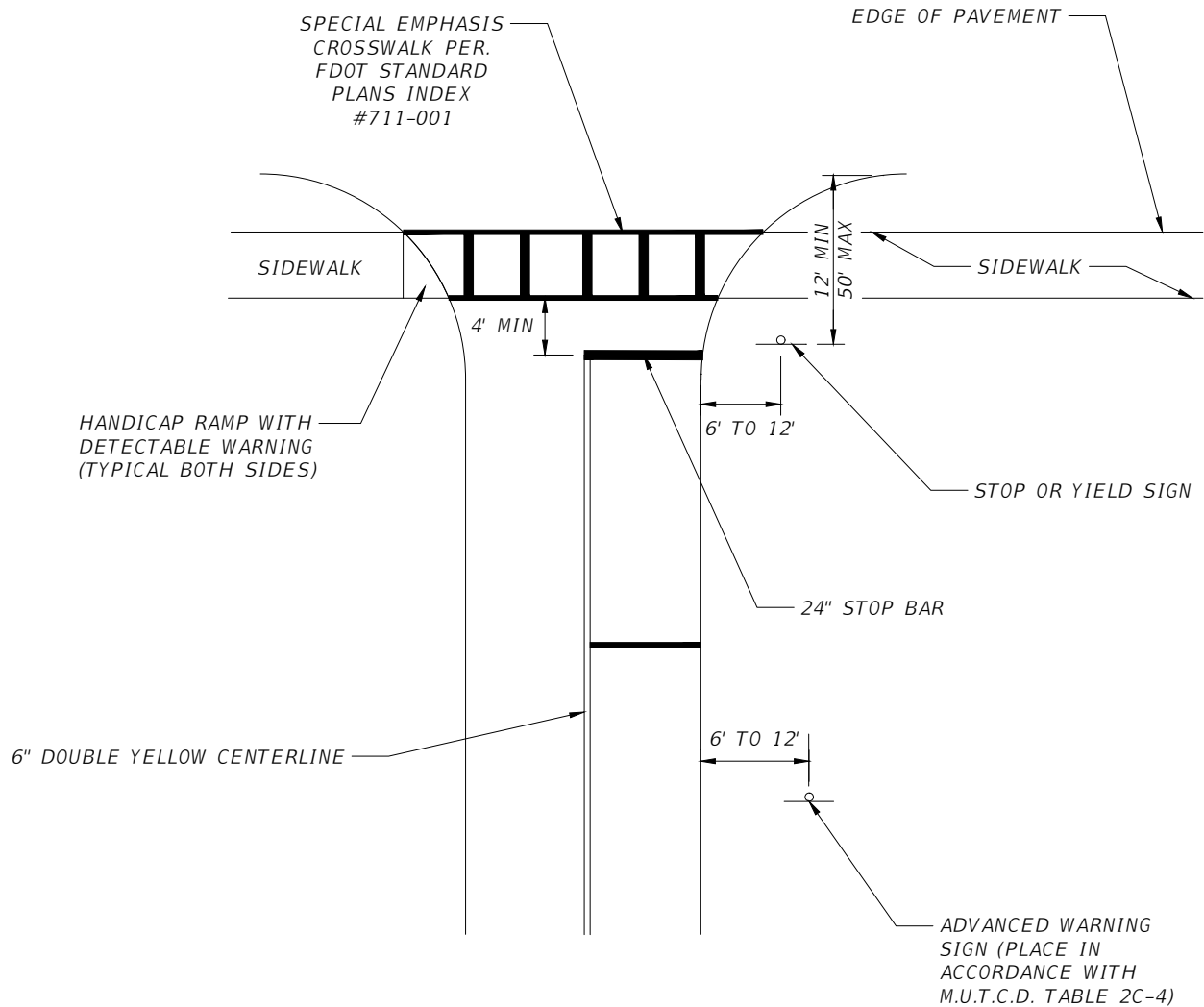
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# FOUR-WAY INTERSECTION PAVEMENT MARKINGS

SECTION:  
TRANSPORTATION

T-9

REVISION DATE:  
DEC. 2020



## PLAN

## NOTES

1. WHEN CURB CUT RAMPS ARE PRESENT, REFER TO FDOT STANDARD PLANS INDEX 522-002 FOR CROSS-WALK WIDTHS.
2. CENTER LINES ON ROADWAY APPROACHES SHALL BE 6" YELLOW THERMOPLASTIC AND SHALL BE EXTENDED BACK 50' MINIMUM FOR TWO LANE ROADWAYS AND 100' MINIMUM FOR FOUR LANE ROADWAYS.
3. HANDICAP RAMPS SHALL COMPLY WITH DETAIL C-3 OR FDOT INDEX #304.



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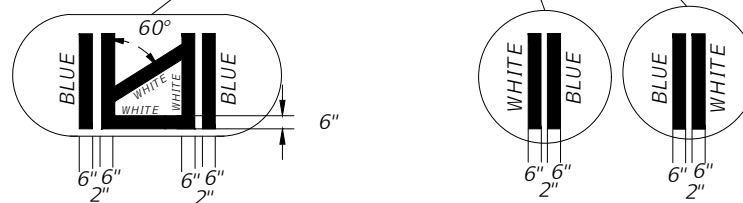
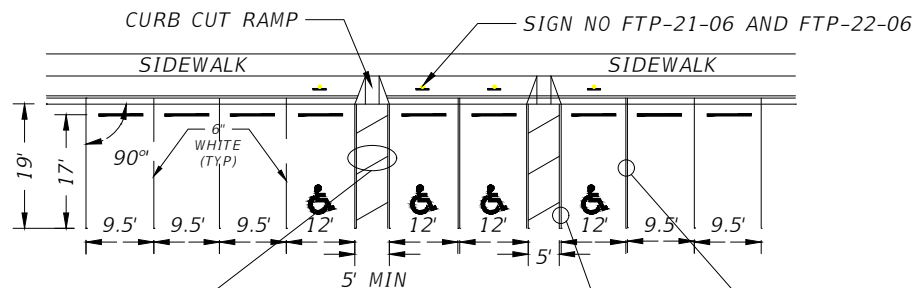
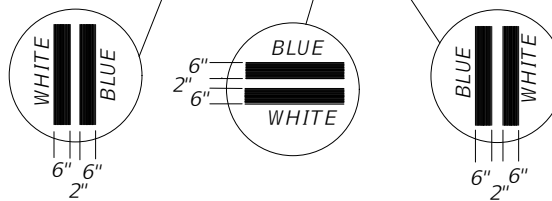
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

# T-INTERSECTION PAVEMENT MARKINGS

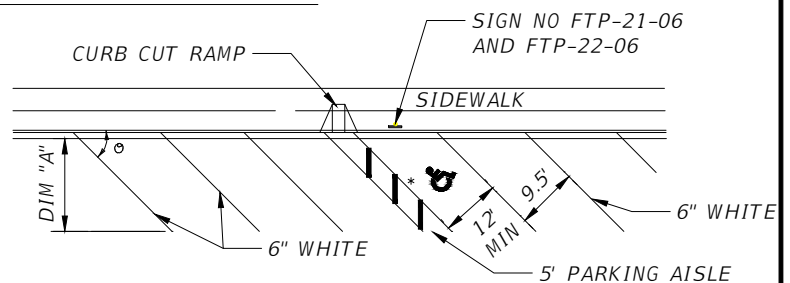
SECTION:  
TRANSPORTATION

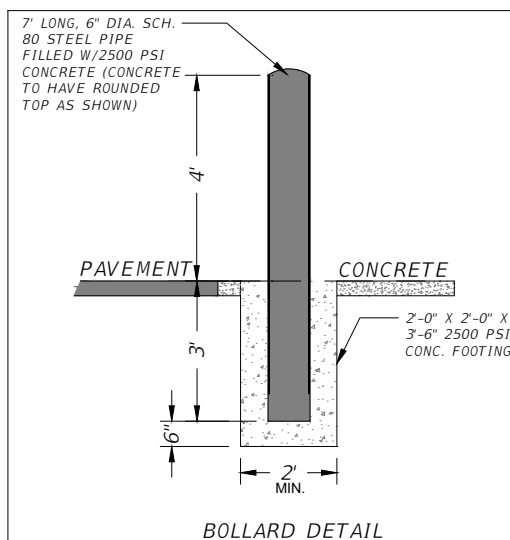
T-10

REVISION DATE:  
DEC. 2020



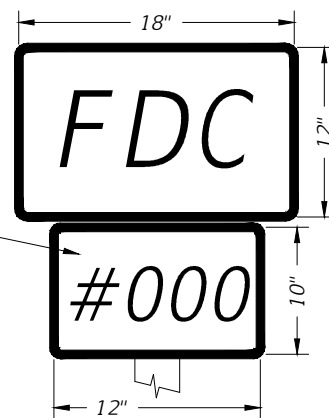
DIMENSIONS		ACCESS ISLE WIDTH	
$\Delta^\circ$	"A"	One-Way	Two-Way
20°	15	12	22
30°	17.5	12	22
40°	19	12	22
45°	20	13	22
50°	20.5	14	22
60°	21	18	22
70°	21	19	22
80°	20.5	24	24
90°	19	24	24





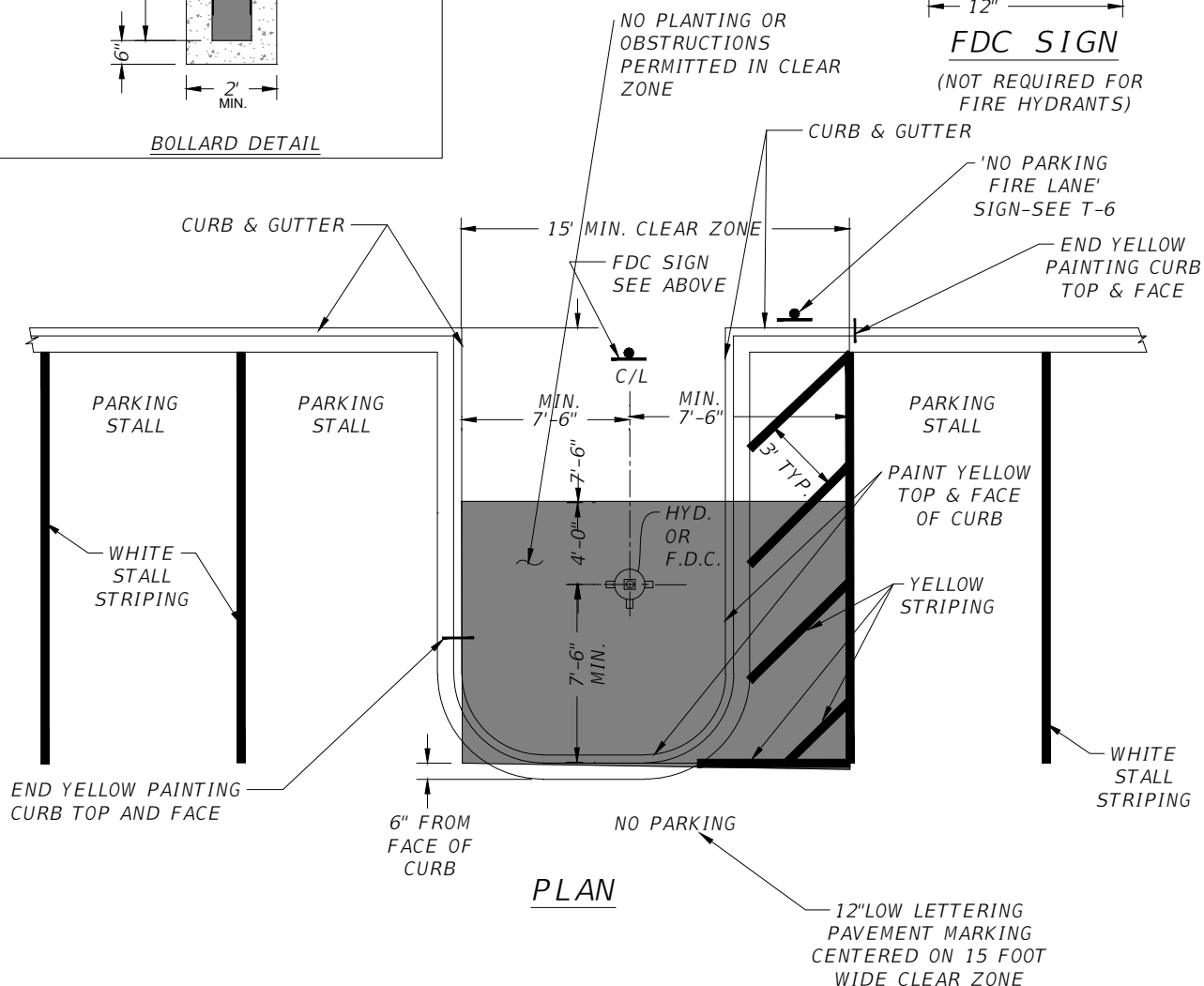
BOTH SIGNS SHALL HAVE A RED BACKGROUND WITH WHITE RED BORDER & RED LETTERS

INSERT (BUILDING OR UNIT) NUMBER SERVED BY F.D.C.



**FDC SIGN**

(NOT REQUIRED FOR FIRE HYDRANTS)



### NOTES

1. FIRE HYDRANT AND FDC CLEAR ZONE MUST BE A MINIMUM OF 15 FEET WIDE CENTERED ON THE HYDRANT OR FDC.
2. ALL CLEAR ZONE FIRE LANE PAVEMENT STRIPING SHALL BE 6 INCH WIDE FDOT SAFETY YELLOW. FIRE LANE DIAGONAL PAVEMENT STRIPING SHALL BE SPACED 3 FEET ON CENTER.
3. ALL CLEAR ZONE CURB TOP & FACE PAINT SHALL BE FDOT SAFETY YELLOW.
4. FDC SIGN SHALL BE 0.05 INCH GAUGE ANODIZED ALUMINUM. SIGN BACKGROUND TO BE RED REFLECTIVE MATERIAL. SIGN LETTERS (SERIES "C") AND BORDER TO BE WHITE REFLECTIVE TYPE MATERIAL.
5. IF NO CURB & GUTTER IS PRESENT, INSTALL TWO (2) 4" BOLLARDS (SEE BOLLARD DETAIL, THIS SHEET).



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STANDARD DETAILS  
FOR CONSTRUCTION

**FIRE HYDRANT / FDC  
CLEAR ZONE**

SECTION:  
TRANSPORTATION

**T-12**

REVISION DATE:  
DEC. 2020



FRONT VIEW

WHITE BACKGROUND WITH  
RED LETTERS AND BORDER



FRONT VIEW

WHITE BACKGROUND WITH  
RED LETTERS AND BORDER

### NOTES

1. MATERIAL: ANODIZED ALUMINUM, GAUGE: 0.08 INCHES.
2. SIGN SURFACE BACKGROUND: TO BE COVERED WITH WHITE REFLECTIVE TYPE MATERIAL.
3. SIGN SURFACE LETTERS AND BORDER: RED REFLECTIVE TYPE MATERIAL.
4. FIRE LANE SIGN LETTERS ARE 2.0" AND 3.0", SERIES "C" AS SHOWN.
5. SPRINKLER FIRE ALARM SIGN LETTERS ARE TO BE 1.5" AND 3.0", SERIES "C" AS SHOWN.
6. SPRINKLER FIRE ALARM SIGN TO BE MOUNTED ON BUILDING ABOVE ALARM.
7. SIGN POST BOLLARDS SHALL COMPLY WITH CITY STANDARD DETAIL C-6.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

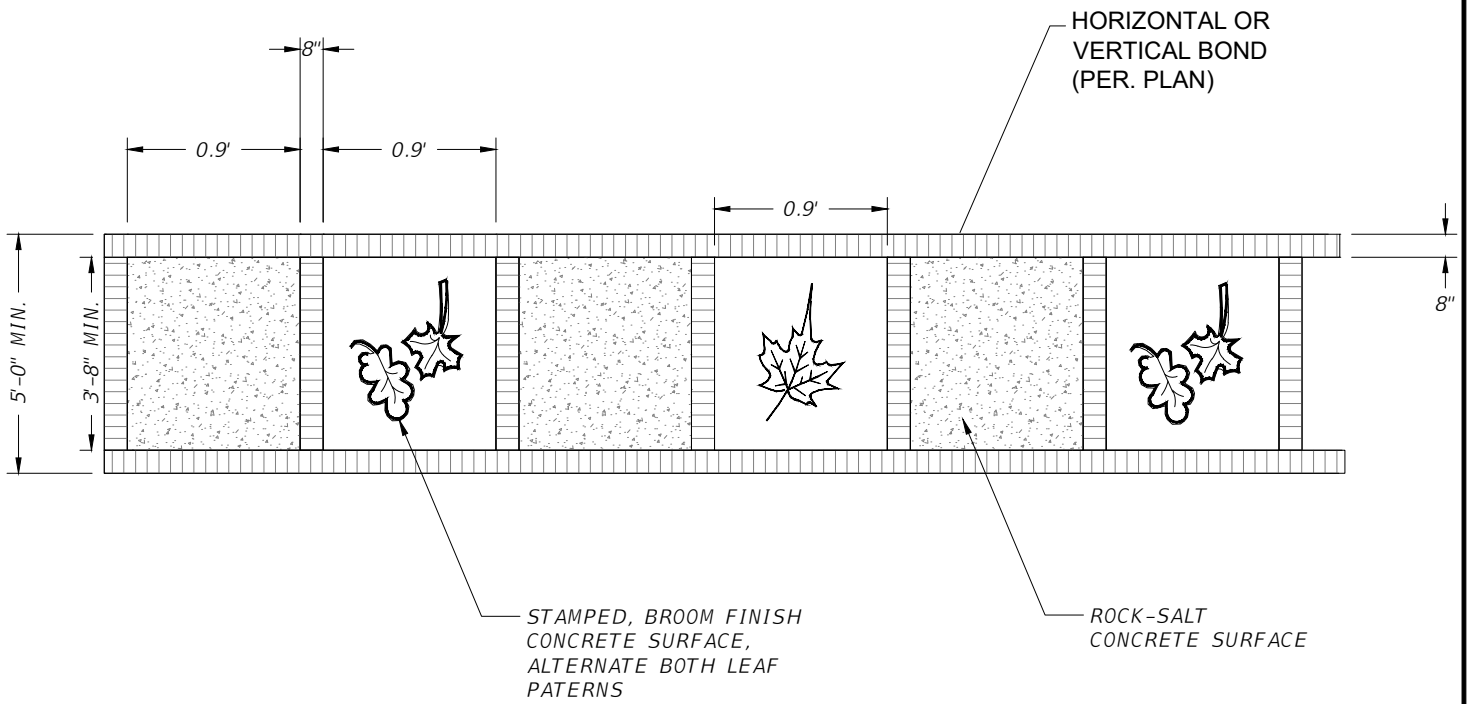
**FIRE DEPARTMENT  
SIGNING**

SECTION:  
TRANSPORTATION

**T-13**

REVISION DATE:  
DEC. 2020





SIDEWALK PLAN VIEW



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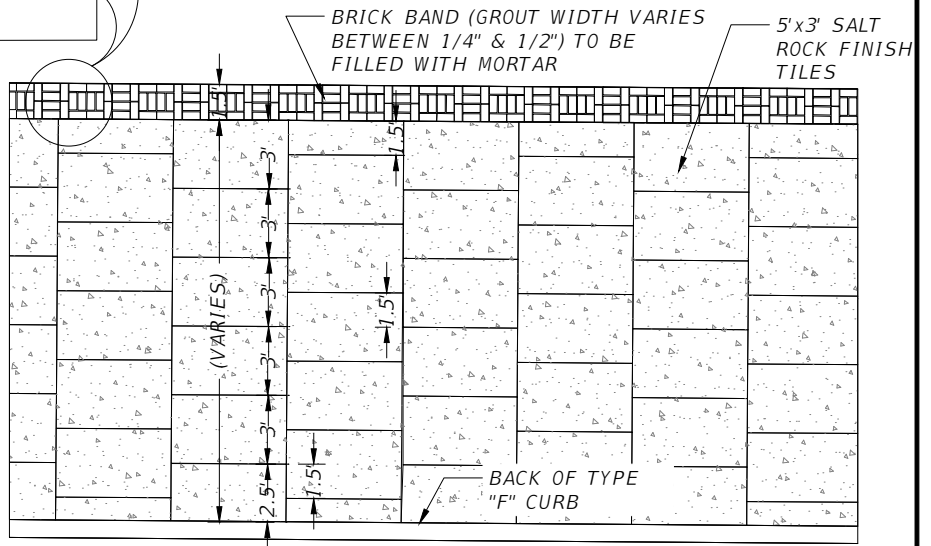
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

ROCK SALT AND LEAF  
STAMPED DECORATIVE  
SIDEWALK

SECTION:  
TRANSPORTATION

T-14

REVISION DATE:  
DEC. 2020



EXISTING BUILDING

EXPANSION JOINT SEAL BETWEEN BUILDING & SIDEWALK

4" THICK CONCRETE UNDER BRICK

BRICK BAND

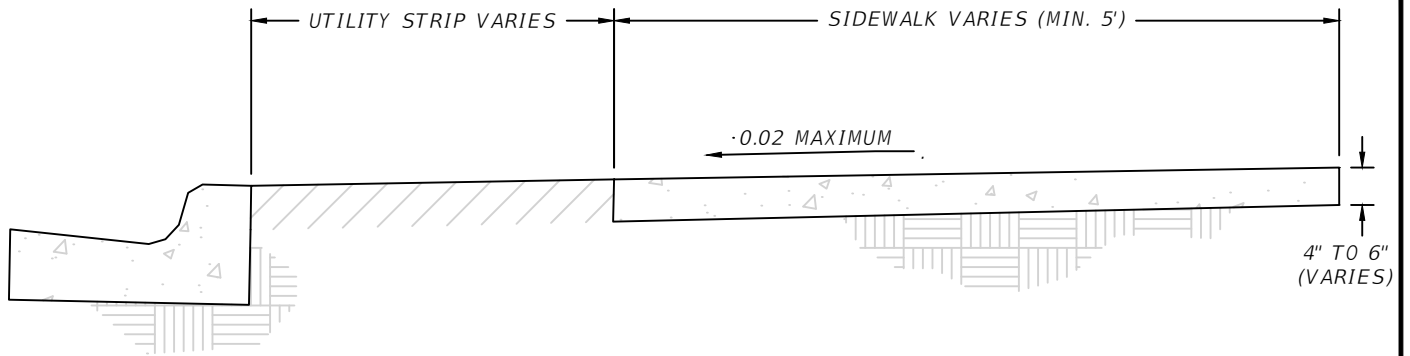
BRICK BAND (GROUT WIDTH VARIES BETWEEN 1/4" & 1/2") TO BE FILLED WITH MORTAR

5'x3"x4" THICK SALT ROCK FINISH TILES

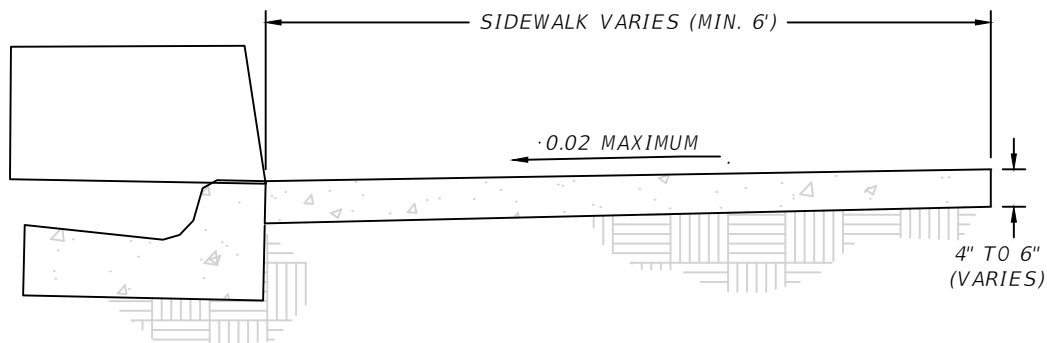
4"

4"

REVISION DATE:  
DEC. 2020



SECTION A-A



SECTION B-B

NOTES

1. CONSTRUCT SIDEWALK IN ACCORDANCE WITH FDOT STANDARD SPECIFICATION 522. USE 6" (3000 PSI) FIBER REINFORCED CONCRETE FOR SIDEWALKS AND CURB RAMPS LOCATED WITHIN CURB RETURNS.
2. 4" TO 6" (3000 PSI CONCRETE TO BE USED IN ACCORDANCE WITH FDOT STANDARD PLANS, INDEX 522-001.
3. CONSTRUCTION OF CONCRETE SIDEWALKS PER FDOT STANDARD PLANS, INDEX 522-001.



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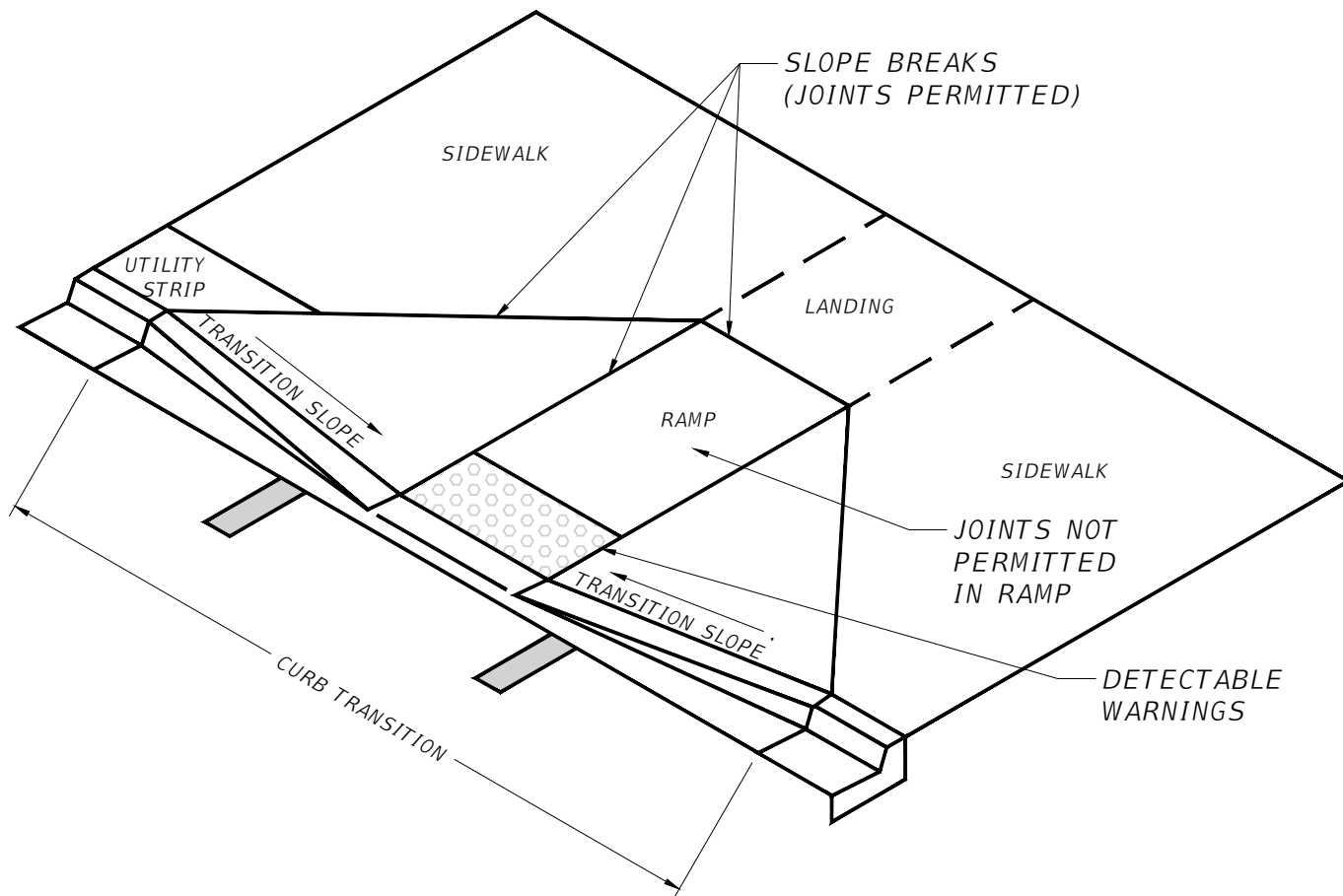
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**TYPICAL CONCRETE  
SIDEWALK**

SECTION:  
TRANSPORTATION

**T-16**

REVISION DATE:  
DEC. 2020



### NOTES

1. PLACEMENT OF ADA DETECTABLE WARNING SURFACES TO CONFORM WITH FDOT STANDARD PLANS INDEX 522-002.
2. COLOR "BRICK RED" SHALL BE USED IN DESIGNATED HISTORIC AREAS. MATERIAL MUST MEET CRITERIA OUTLINED IN FDOT STANDARD SPECIFICATIONS, SECTION 527.



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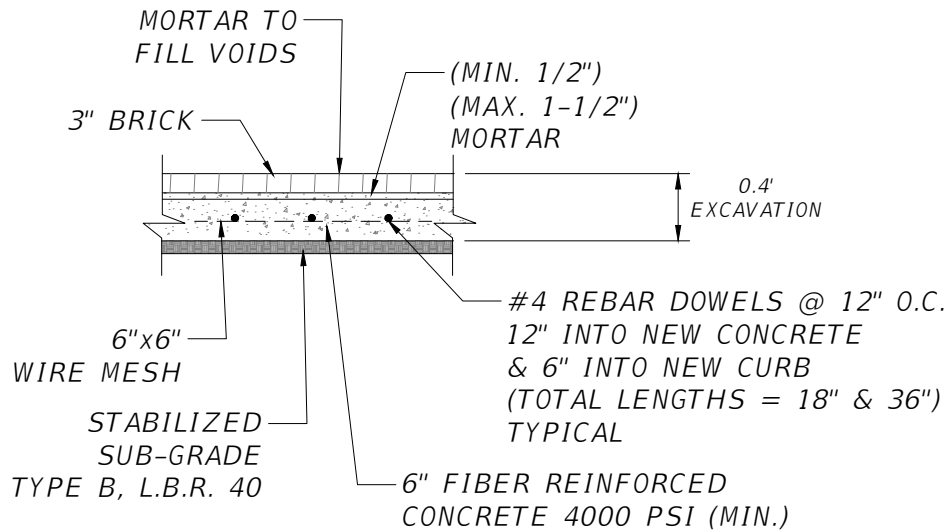
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## BRICK-COLORED DETECTABLE WARNING SURFACE

SECTION:  
TRANSPORTATION

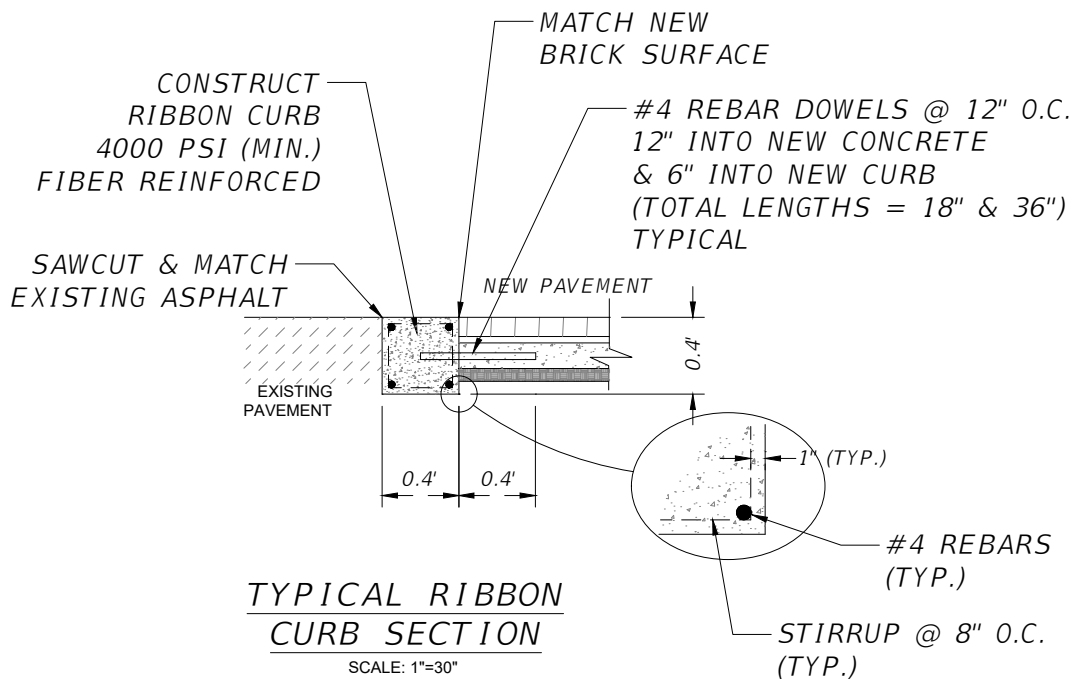
T-17

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TYPICAL BRICK  
INTERSECTION SECTION

SCALE: 1"=30"



TYPICAL RIBBON  
CURB SECTION

SCALE: 1"=30"



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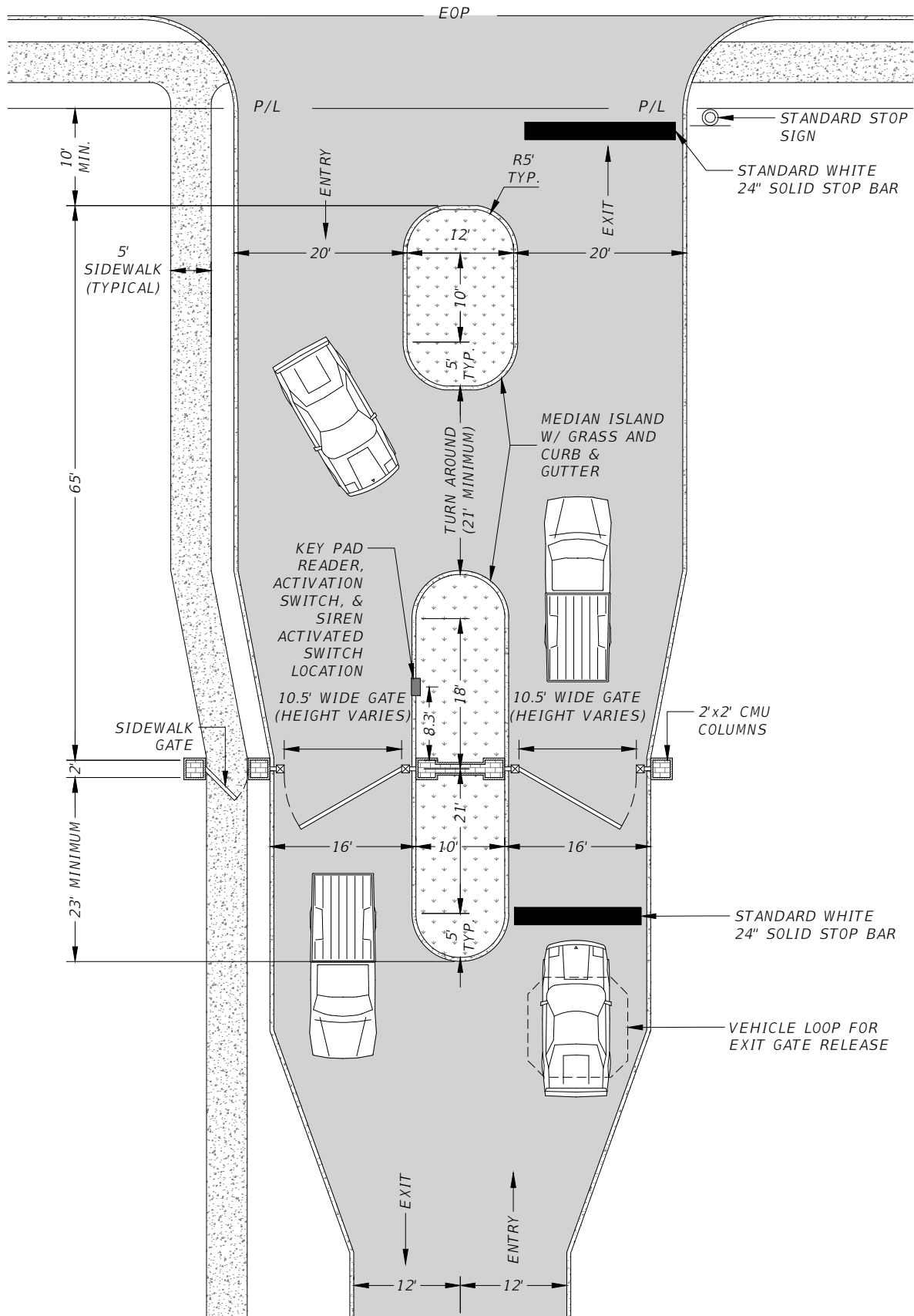
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**TYPICAL BRICK  
ROADWAY**

SECTION:  
TRANSPORTATION

**T-18**

REVISION DATE:  
DEC. 2020



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

TYPICAL  
SUBDIVISION GATE

SECTION:  
TRANSPORTATION

T-19

REVISION DATE:  
DEC. 2020



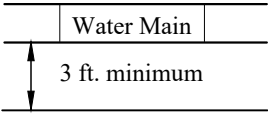
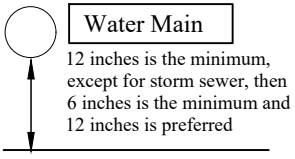
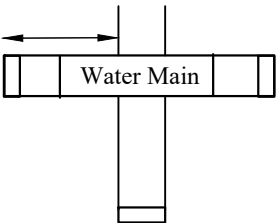
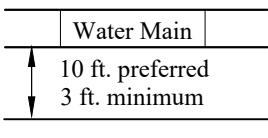
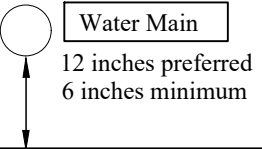
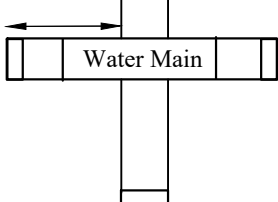
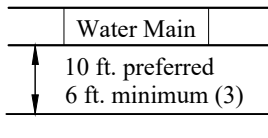
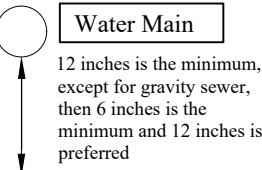
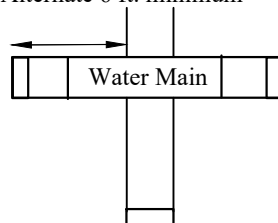
**STANDARD DETAILS  
FOR CONSTRUCTION**

**WATER DIVISION**

WATER MAIN		
BUTTERFLY VALVE		
GATE VALVE		
AIR RELEASE VALVE		
SPRINKLER HEAD		
FLUSH POINT		
SAMPLING POINT		
FIRE HYDRANT		
TEE		
PLUG OR CAP		
BEND		
CROSS		
PUMPING STATION		
WATER METER		
CHECK VALVE		
REDUCER		
WATER SERVICE (SINGLE)		
WATER SERVICE (DOUBLE)		
BLOW OFF		



# LOCATION OF PUBLIC WATER SYSTEM MAINS IN ACCORDANCE WITH F.A.C. RULE 62-555.314

Other Pipe	Horizontal Separation	Crossings (1)	Joint Spacing @ Crossings (Full Joint Centered)
<b>Storm Sewer, Stormwater Force Main, Reclaimed Water (2)</b>			
<b>Vacuum Sanitary Sewer</b>			
<b>Gravity or Pressure Sanitary Sewer, Sanitary Sewer Force Main, Reclaimed Water (4)</b>			
<b>On-Site Sewage Treatment &amp; Disposal System</b>	10 ft. minimum		

1. Water main should cross above other pipe. When water main must be below other pipe, the minimum separation is 12 inches.
2. Reclaimed water regulated under Part III of Chapter 62-610, F.A.C.
3. 3 Ft. for gravity sanitary sewer where the bottom of the water main is laid at least 6 inches above the top of the gravity sanitary sewer.
4. Reclaimed water not regulated under Part III of Chapter 62-610, F.A.C.

Disclaimer - This document is provided for your convenience only.  
Please refer to F.A.C. Rule 62-555.314 for additional construction requirements.



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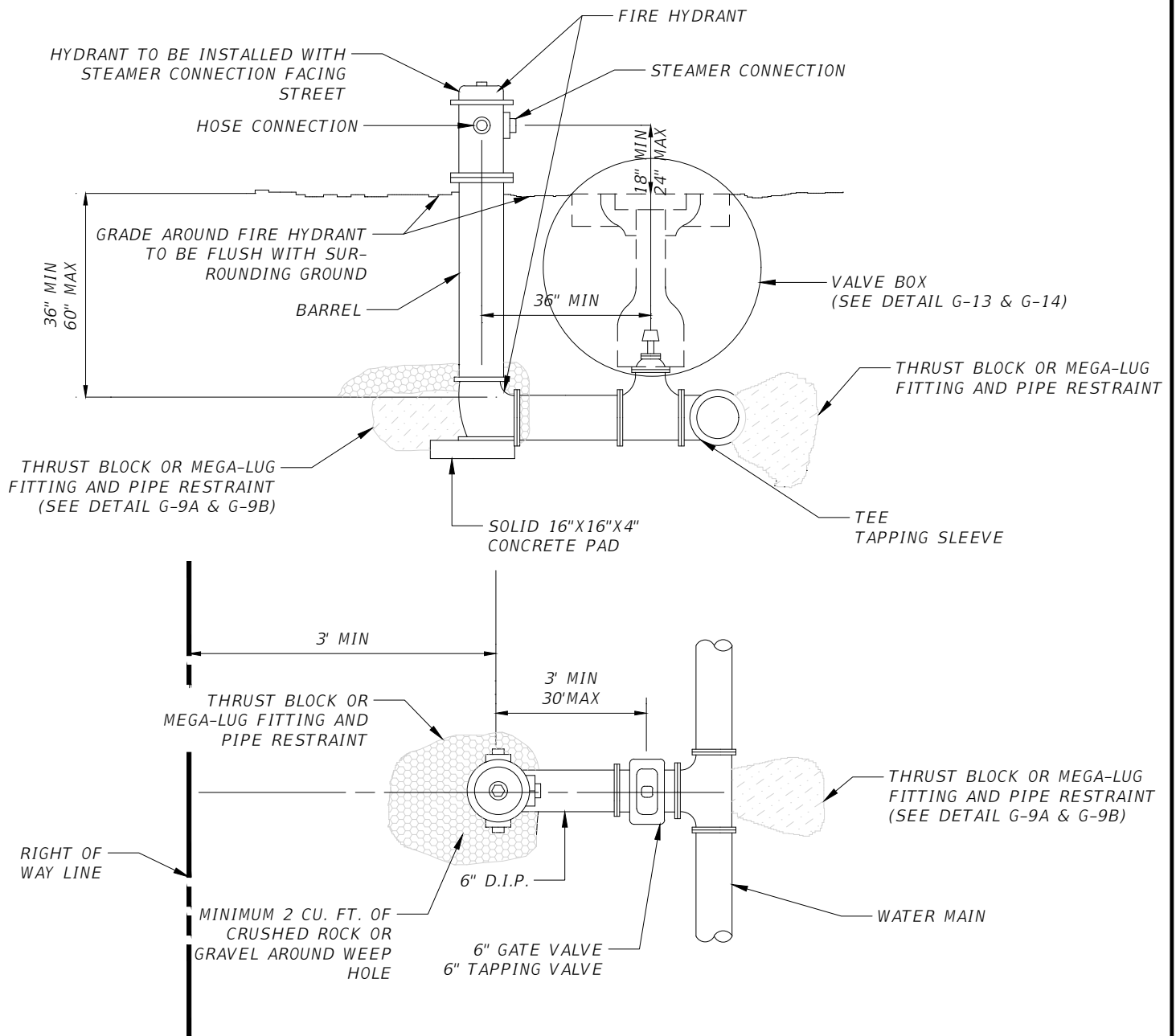
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

SEPARATION OF  
WATER MAINS

SECTION:  
WATER

W-2

REVISION DATE:  
DEC. 2020



### NOTES

1. NO MORE THAN ONE BARREL SECTION SHALL BE ALLOWED WHEN ADJUSTING HYDRANT TO FINISHED GRADE. HYDRANT EXTENSIONS ARE TO BE SAME MANUFACTURER AS HYDRANT. MAXIMUM LENGTH OF EXTENSION SHALL BE 24".
2. NEW HYDRANTS TO BE INSTALLED WITH "OUT OF SERVICE" MARKER. INSTALL ON HYDRANT UNTIL HYDRANT IS CLEARED AND ACCEPTED BY FIRE DEPARTMENT.
3. NEW FIRE HYDRANTS TO BE FACTORY PAINTED RED. EXISTING HYDRANTS THAT REQUIRE REPAINTING TO BE PRESSURE WASHED (3000 PSI) TO REMOVE ALL LOOSE DEBRIS, PAINT OR OTHER FOREIGN MATERIALS. REPAINT HYDRANT TO IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. FINISH PAINT TO BE POLYURETHANE, "SAFETY RED".
4. PROVIDE ONE BLUE REFLECTIVE PAVEMENT MARKER (RPM) IN THE CENTER OF THE CLOSEST VEHICLE TRAVEL LANE AND DIRECTLY OPPOSITE THE HYDRANT LOCATION.
5. ALL HYDRANT ASSEMBLIES INCLUDE A HYDRANT TO GRADE.



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CITY OF OCALA  
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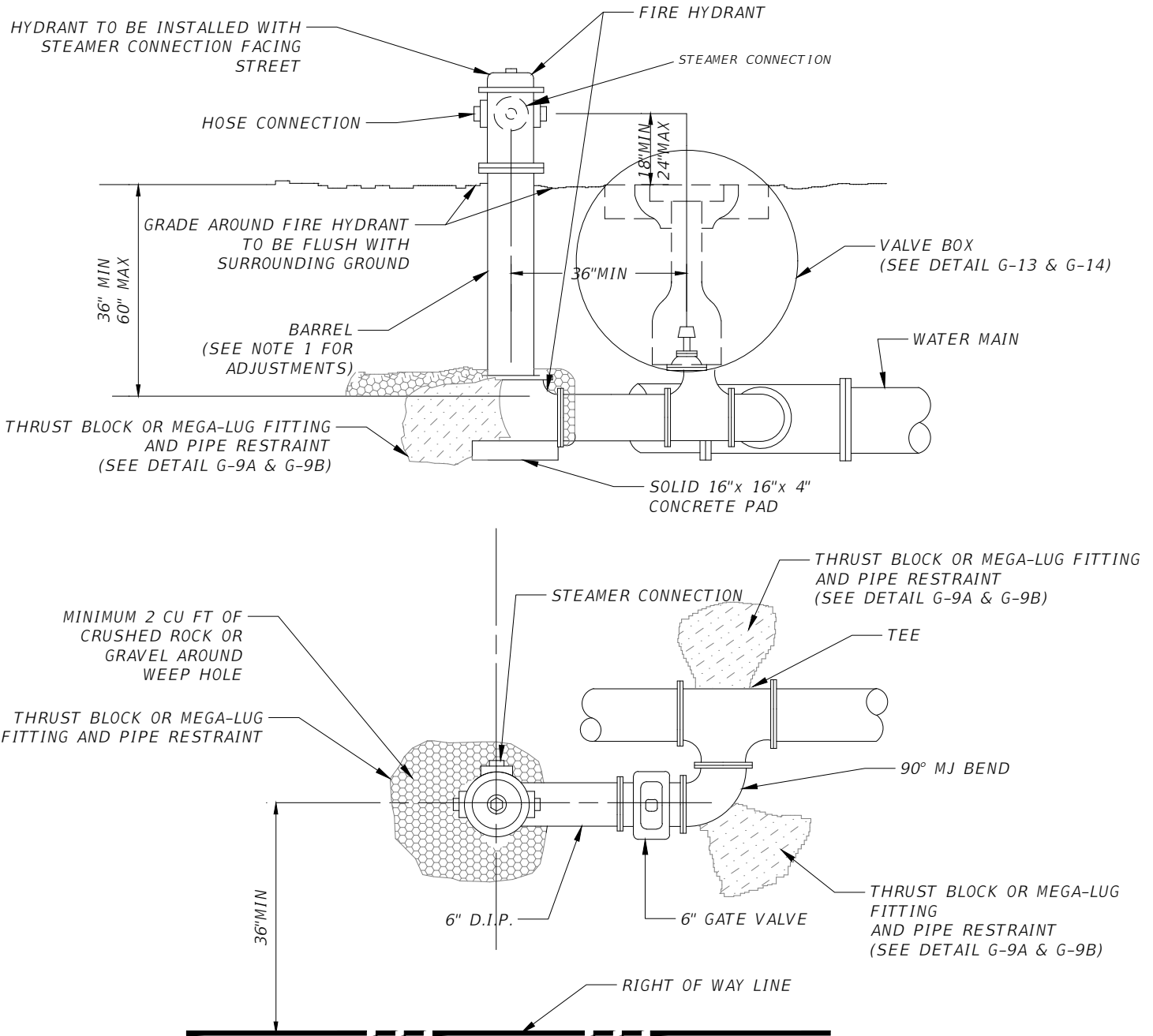
## FIRE HYDRANT ASSEMBLY

PERPENDICULAR TO MAIN

SECTION:  
WATER

W-3

REVISION DATE:  
DEC. 2020



### NOTES

1. NO MORE THAN ONE BARREL SECTION SHALL BE ALLOWED WHEN ADJUSTING HYDRANT TO FINISHED GRADE. HYDRANT EXTENSION TO BE SAME MANUFACTURER AS HYDRANT. MAXIMUM LENGTH OF EXTENSION LIMITED TO 24".
2. NEW HYDRANTS TO BE INSTALLED WITH "OUT OF SERVICE " MARKER. INSTALL ON HYDRANT UNTIL HYDRANT IS CLEARED AND ACCEPTED BY FIRE DEPARTMENT.
3. NEW FIRE HYDRANTS TO BE FACTORY PAINTED RED. EXISTING HYDRANTS THAT REQUIRE REPAINTING TO BE PRESSURE WASHED (3000 PSI) TO REMOVE ALL LOOSE DEBRIS, PAINT OR OTHER FOREIGN MATERIALS. REPAINT HYDRANT IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. FINISH PAINT TO BE POLYURETHANE, "SAFETY RED".
4. PROVIDE ONE BLUE REFLECTIVE PAVEMENT MARKER (RPM) IN THE CENTER OF THE CLOSEST VEHICLE TRAVEL LANE AND DIRECTLY IN FRONT OF HYDRANT LOCATION.
5. ALL HYDRANT ASSEMBLIES INCLUDE A HYDRANT TO GRADE.



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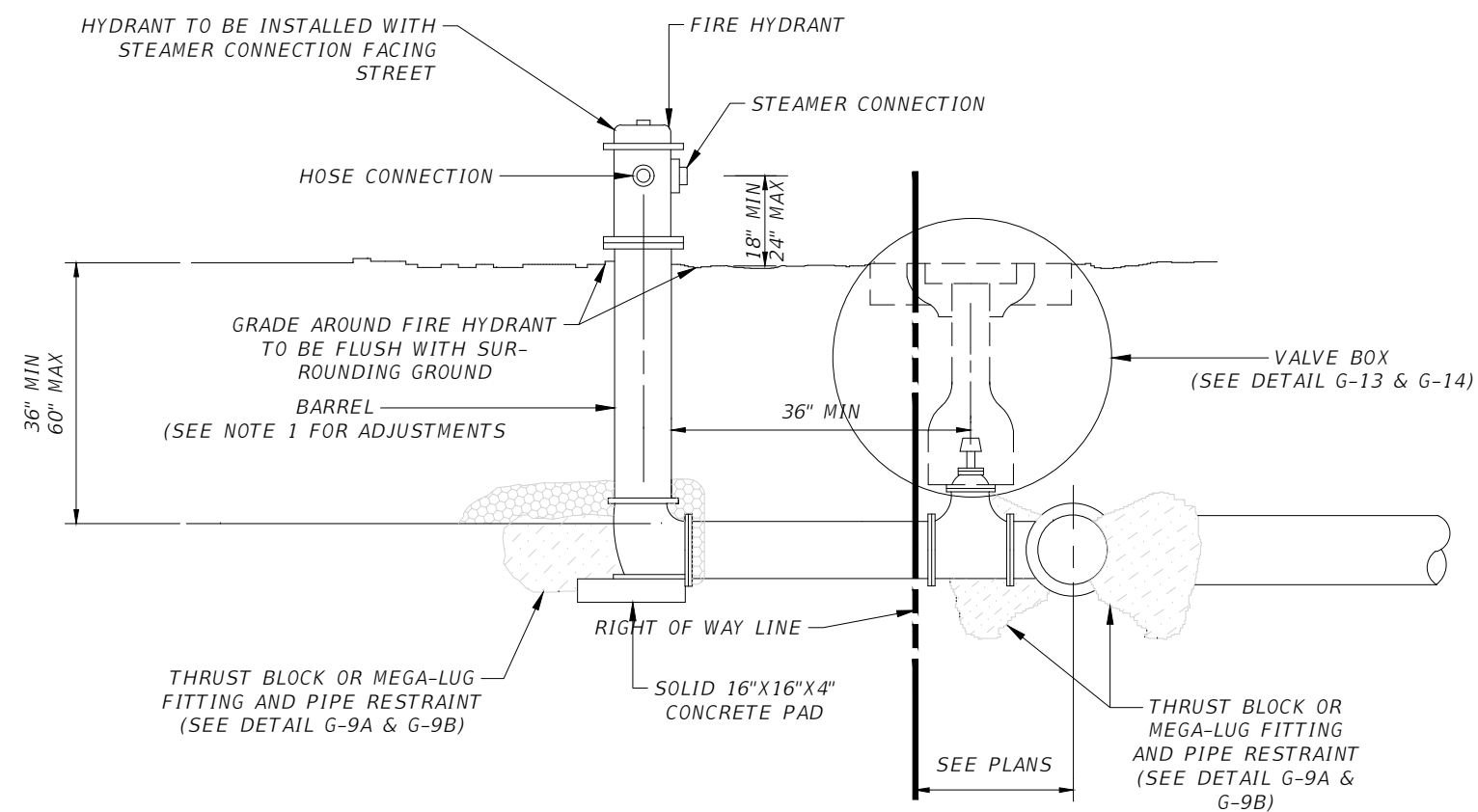
## FIRE HYDRANT ASSEMBLY

PARALLEL TO MAIN

SECTION:  
WATER

W-4

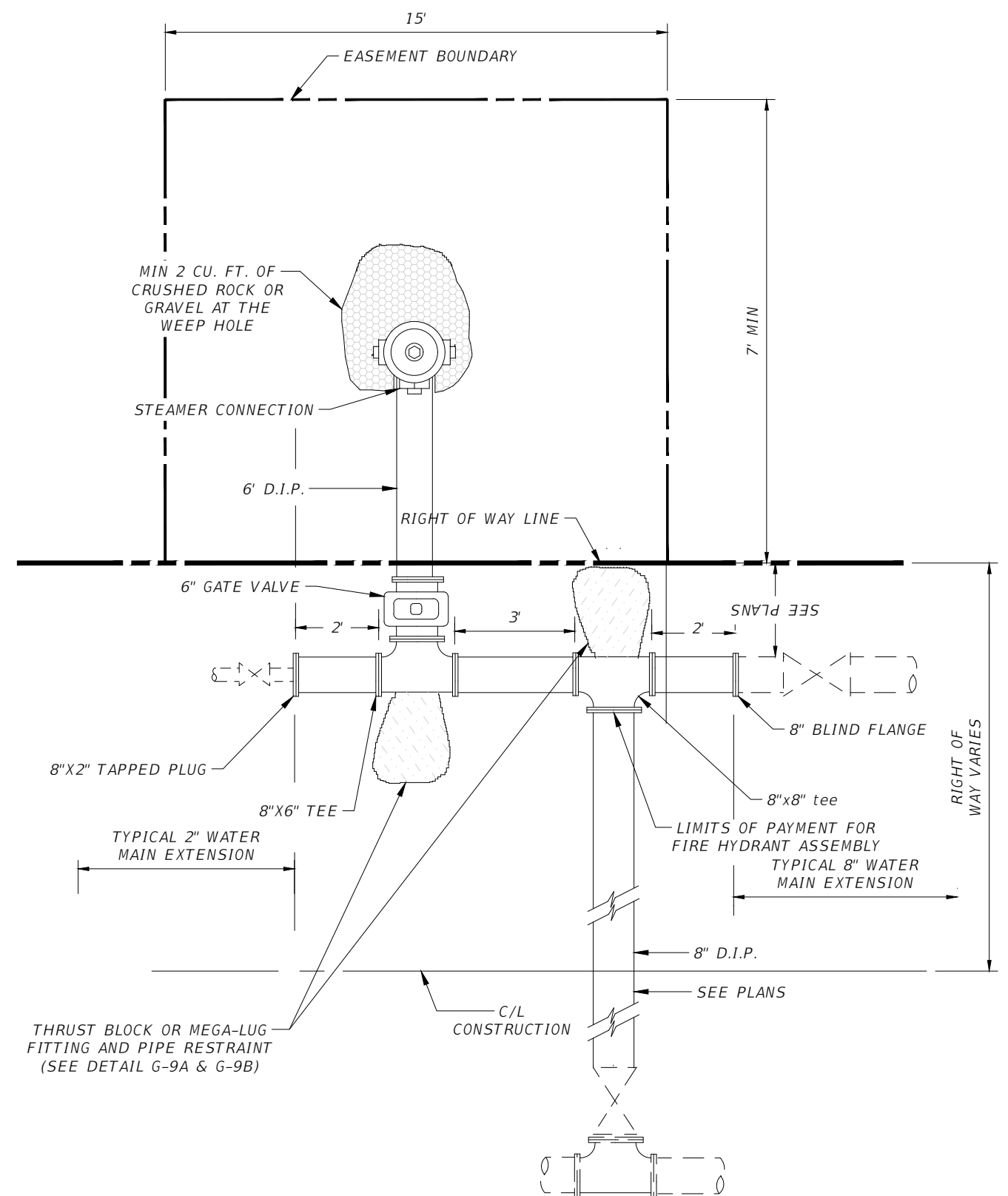
REVISION DATE:  
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**SECTION VIEW**

**NOTES**

1. NO MORE THAN ONE BARREL SECTION SHALL BE ALLOWED WHEN ADJUSTING HYDRANT TO FINISHED GRADE. HYDRANT EXTENSIONS TO BE SAME MANUFACTURER AS HYDRANT. MAXIMUM LENGTH OF EXTENSION IS LIMITED TO 24".
2. REFER TO CONSTRUCTION PLANS FOR ACTUAL LOCATION OF EASEMENT.
3. NEW HYDRANTS TO BE INSTALLED WITH "OUT OF SERVICE" MARKER. INSTALL ON HYDRANT UNTIL HYDRANT IS CLEARED AND ACCEPTED BY FIRE DEPARTMENT.
4. NEW FIRE HYDRANTS TO BE FACTORY PAINTED RED. EXISTING HYDRANTS THAT REQUIRE REPAINTING TO BE PRESSURE WASHED (3000 PSI) TO REMOVE ALL LOOSE DEBRIS, PAINT OR OTHER FOREIGN MATERIALS. REPAINT HYDRANT IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. FINISH PAINT TO BE POLYURETHANE, "SAFETY RED".
5. PROVIDE ONE BLUE REFLECTIVE PAVEMENT MARKER (RPM) IN THE CENTER OF THE CLOSEST VEHICLE TRAVEL LANE AND DIRECTLY IN FRONT OF HYDRANT LOCATION.
6. ALL HYDRANT ASSEMBLIES INCLUDE A HYDRANT TO GRADE.



**PLAN VIEW**



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**CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION**

**FIRE HYDRANT  
ASSEMBLY**

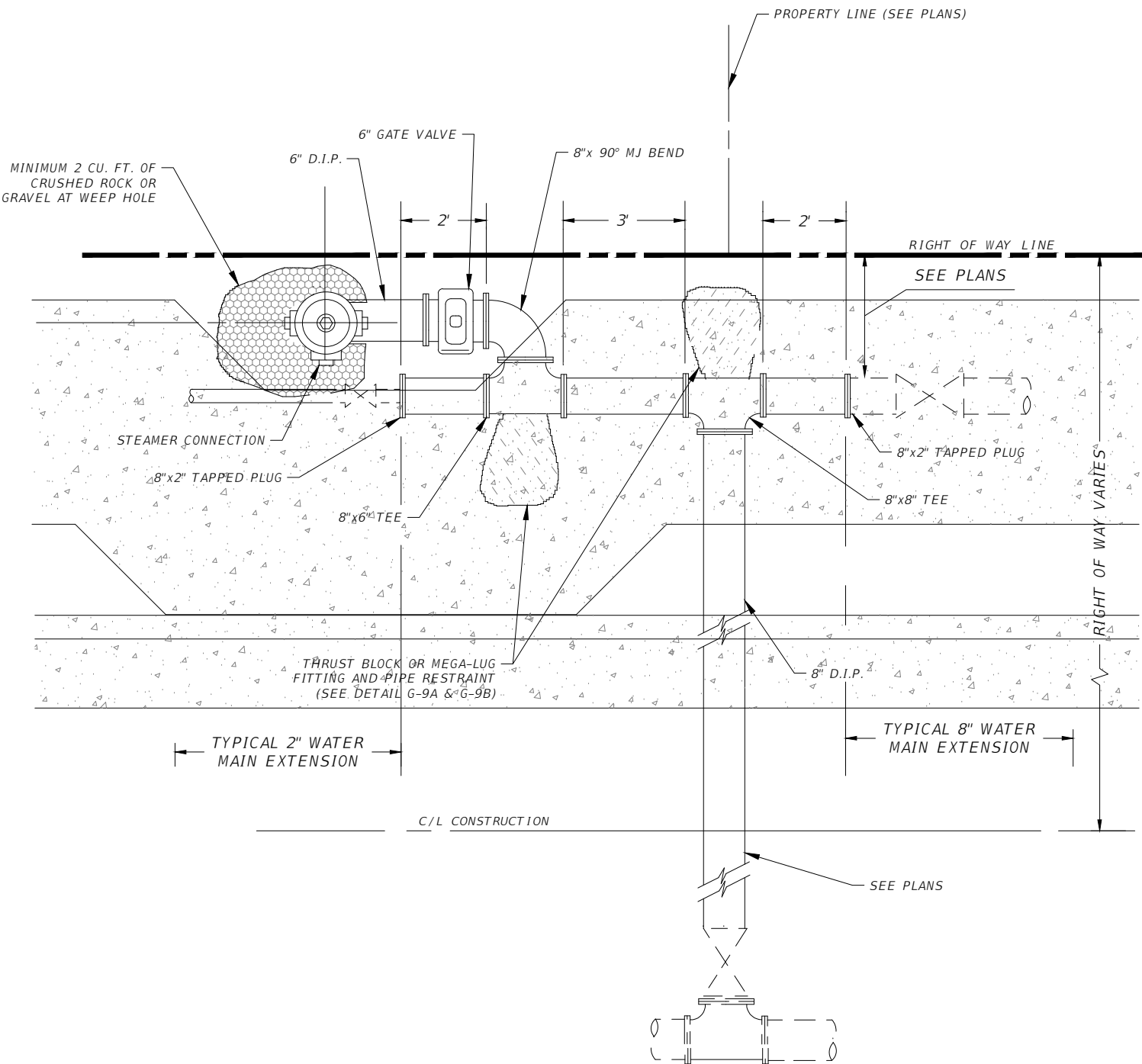
**FOUR LANE ROADWAY INSTALLATION**

SECTION:  
WATER

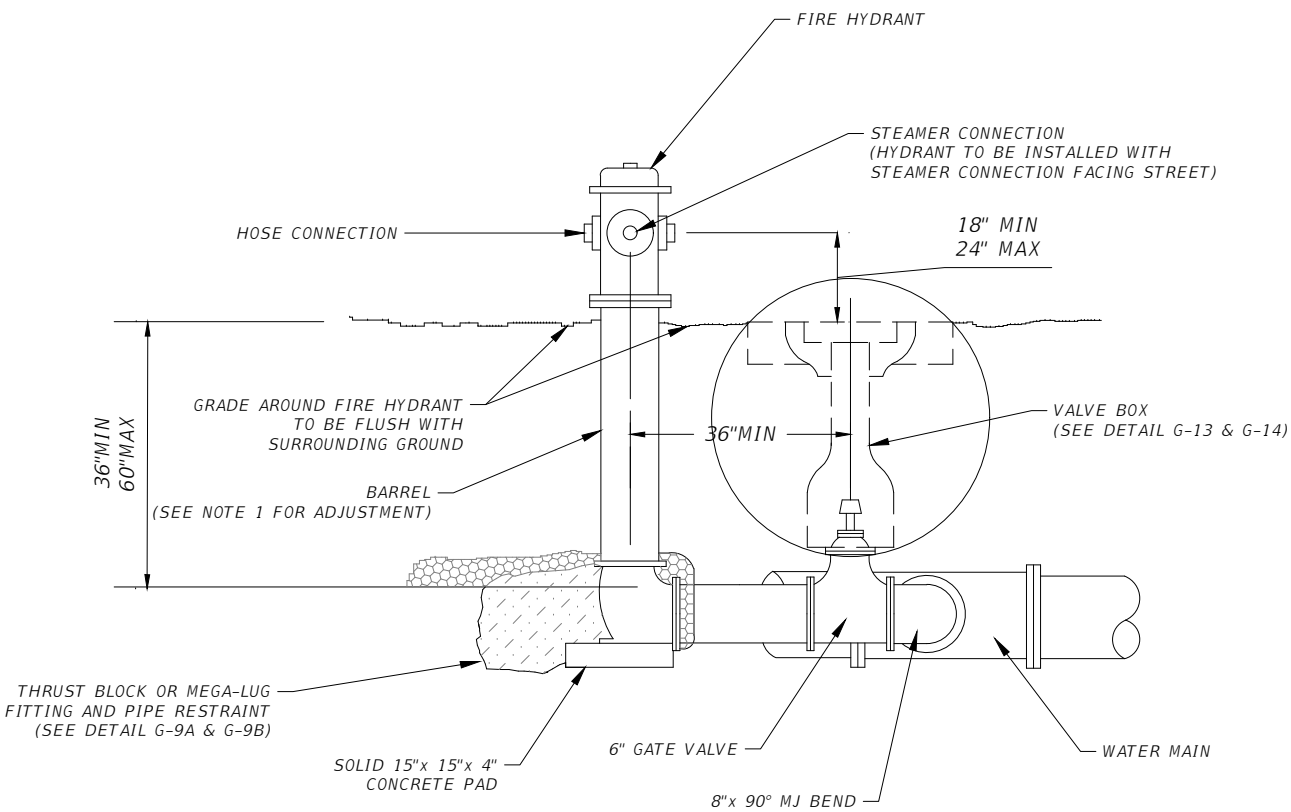
**W-5A**

REVISION DATE:  
DEC. 2020

PLAN VIEW



SECTION VIEW



NOTES

1. NO MORE THAN ONE BARREL SECTION SHALL BE ALLOWED WHEN ADJUSTING HYDRANT TO FINISHED GRADE. HYDRANT EXTENSIONS TO BE SAME MANUFACTURER AS HYDRANT. MAXIMUM LENGTH OF EXTENSION IS LIMITED TO 24".
2. NEW HYDRANTS TO BE INSTALLED WITH "NOT IN SERVICE" BAG. INSTALL ON HYDRANT UNTIL HYDRANT IS CLEARED AND ACCEPTED BY FIRE DEPARTMENT.
3. NEW FIRE HYDRANTS TO BE FACTORY PAINTED RED. EXISTING HYDRANTS THAT REQUIRE REPAINTING TO BE PRESSURE WASHED (3000 PSI) TO REMOVE ALL LOOSE DEBRIS, PAINT OR OTHER FOREIGN MATERIALS. REPAINT HYDRANT IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. FINISH PAINT TO BE RUST-OLEUM 639K7764402, "SAFETY RED" OR EQUIVALENT.
4. PROVIDE ONE BLUE REFLECTIVE PAVEMENT MARKER (RPM) IN THE CENTER OF THE CLOSEST VEHICLE TRAVEL LANE AND DIRECTLY IN FRONT OF HYDRANT LOCATION.
5. ALL HYDRANT ASSEMBLIES INCLUDE A HYDRANT TO GRADE.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

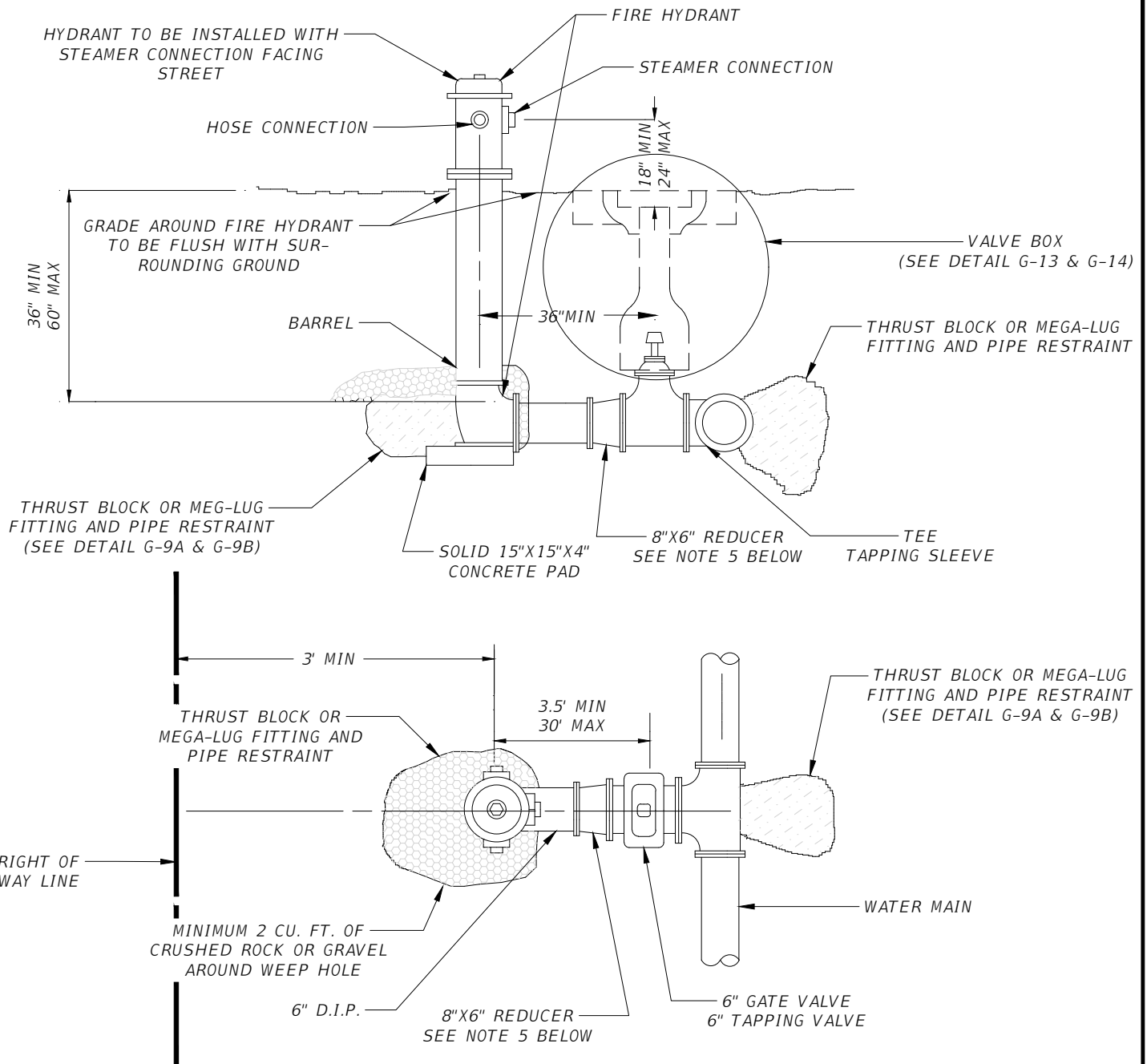
FIRE HYDRANT  
ASSEMBLY

FOUR LANE ROADWAY INSTALLATION

SECTION:  
WATER

W-5B

REVISION DATE:  
DEC. 2020



### NOTES

1. NO MORE THAN ONE BARREL SECTION SHALL BE ALLOWED WHEN ADJUSTING HYDRANT TO FINISHED GRADE. HYDRANT EXTENSIONS ARE TO BE SAME MANUFACTURER AS HYDRANT. MAXIMUM LENGTH OF EXTENSION SHALL BE 24".
2. NEW HYDRANTS TO BE INSTALLED WITH "NOT IN SERVICE" BAG. INSTALL ON HYDRANT UNTIL HYDRANT IS CLEARED AND ACCEPTED BY FIRE DEPARTMENT.
3. NEW FIRE HYDRANTS TO BE FACTORY PAINTED RED. EXISTING HYDRANTS THAT REQUIRE REPAINTING TO BE PRESSURE WASHED (3000 PSI) TO REMOVE ALL LOOSE DEBRIS, PAINT OR OTHER FOREIGN MATERIALS. REPAINT HYDRANT IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS. FINISH PAINT TO BE RUST-OLEUM 639K7764402, "SAFETY RED" OR EQUIVALENT.
4. PROVIDE ONE BLUE REFLECTIVE PAVEMENT MARKER (RPM) IN THE CENTER OF THE CLOSEST VEHICLE TRAVEL LANE AND DIRECTLY OPPOSITE THE HYDRANT LOCATION.
5. FOR NEW HYDRANT INSTALLATION WHERE THE HYDRANT WILL BE INSTALLED ON THE OPPOSITE SIDE OF THE ROAD FROM THE WATER MAIN, SEE "TYPE C" FIRE HYDRANT INSTALLATION.
6. ALL HYDRANT ASSEMBLIES INCLUDE A HYDRANT TO GRADE



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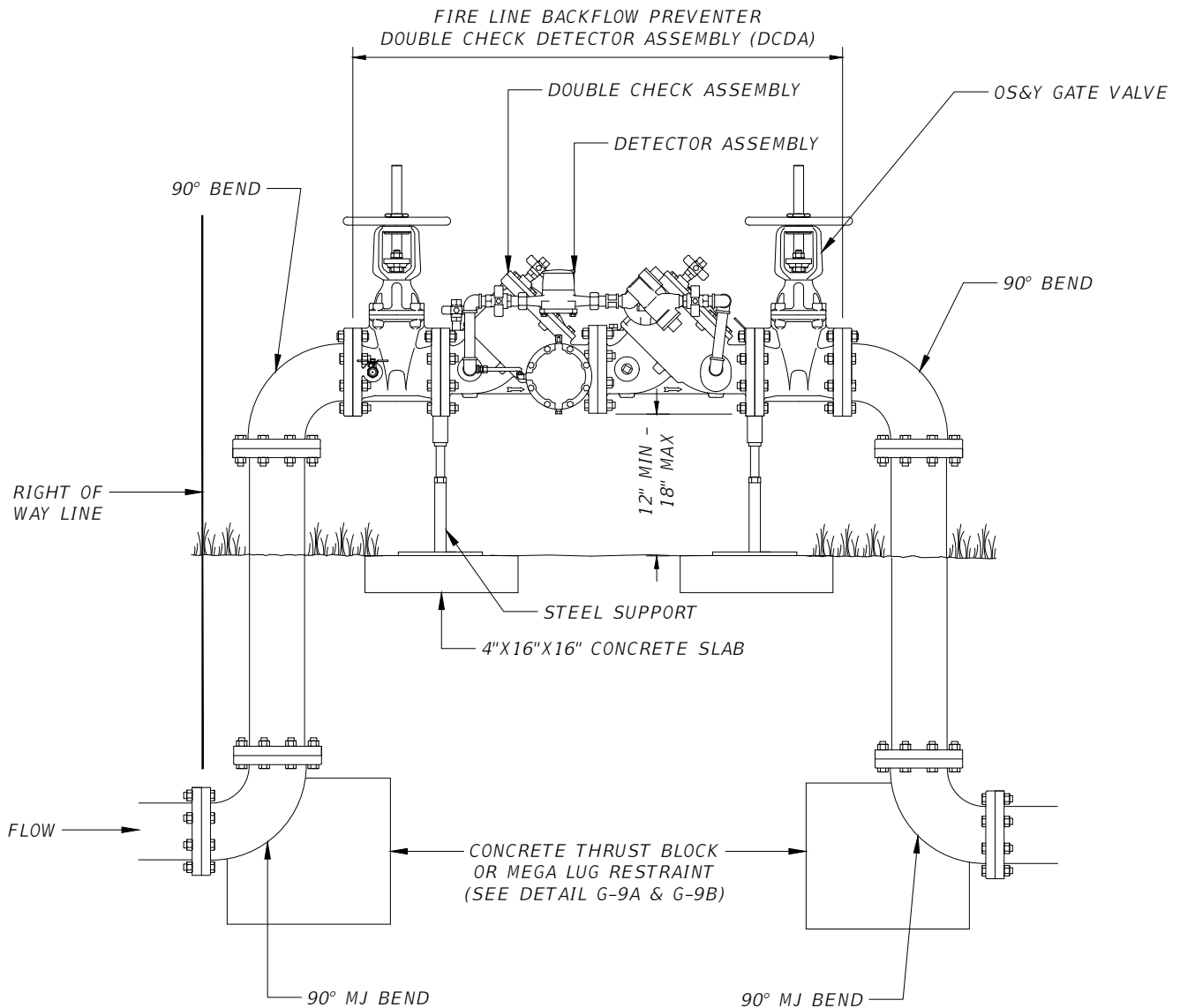
## FIRE HYDRANT ASSEMBLY

8" SERVICE LINE

SECTION:  
WATER

W-6

REVISION DATE:  
DEC. 2020



### NOTES

1. ALL ABOVE-GROUND PARTS OF THE BACKFLOW PREVENTOR ASSEMBLY, INCLUDING PIPING, SHALL BE PAINTED RED. PAINT SHALL BE POLYURETHANE, "SAFETY RED" OR EQUIVALENT.
2. ISOLATION VALVES SHALL BE CHAINED LOCKED IN THE OPEN POSITION.
3. BACKFLOW PREVENTOR ASSEMBLY SHALL BE PROTECTED WITH TAMPER SWITCHES AND TIES INTO THE FIRE ALARM SYSTEM.
4. NO LANDSCAPING OR OBSTRUCTIONS ARE PERMITTED WITHIN THE CLEAR ZONE. CLEAR ZONE TO BE 24" EACH SIDE OF CENTERLINE AND 12" EACH END. ANY LANDSCAPING INSTALLED AROUND THE DCDA SHALL BE INSTALLED SO AS TO PROVIDE MINIMUM CLEARANCES AT MATURITY OF THE PLANTINGS.
5. UNLESS OTHERWISE NOTED, ALL EXPOSED FITTINGS SHALL BE FLANGED AND ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT.



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STANDARD DETAILS  
FOR CONSTRUCTION

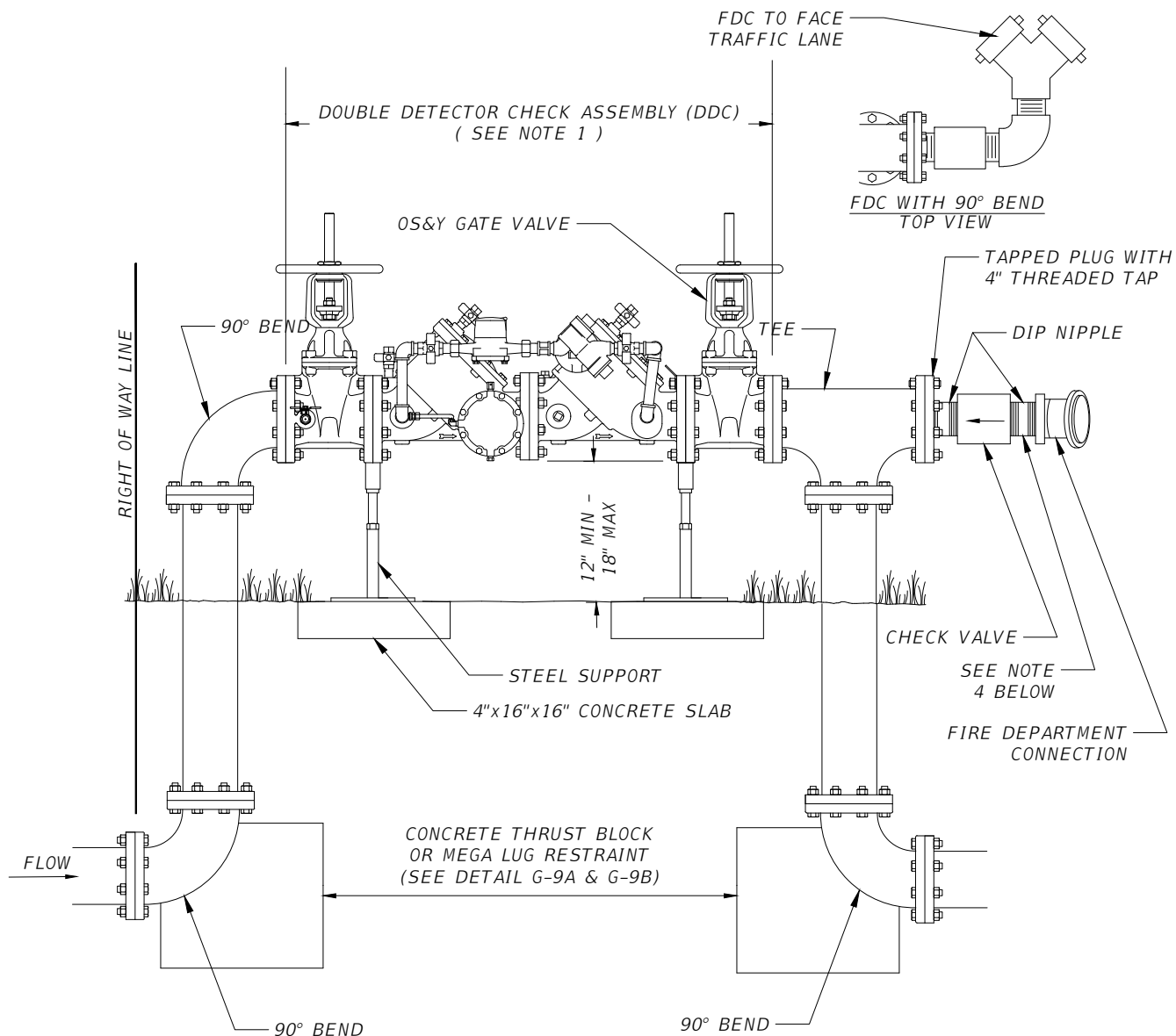
**FIRE LINE DOUBLE  
DETECTOR CHECK  
ASSEMBLY**

4" OR GREATER

SECTION:  
WATER

W-7

REVISION DATE:  
DEC. 2020



#### NOTES

1. CONTACT CITY FIRE MARSHAL FOR REQUIREMENTS FOR TAMPER SWITCHES, CHAINS, ETC.
2. FDC SHALL BE LOCATED NEAR OR ORIENTED FACING VEHICULAR TRAFFIC LANES, FULLY VISIBLE, RECOGNIZABLE AND ACCESSIBLE FROM THE TRAVEL LANE OR NEAREST POINT OF FIRE DEPT. APPARATUS.
3. PROVIDE A CLEAR ZONE OF 4' TO REAR AND 7-1/2' TO THE FRONT AND SIDES OF THE FDC.
4. IF REQUIRED PROVIDE 90° BEND BETWEEN CHECK VALVE AND FDC TO ORIENT FDC TOWARDS TRAVEL LANE.
5. ALL ABOVE GROUND PARTS OF THE ASSEMBLY, INCLUDING PIPING, SHALL BE PAINTED RED. PAINT SHALL BE POLYURETHANE, "SAFETY RED" OR EQUIVALENT.
6. UNLESS OTHERWISE NOTED, ALL EXPOSED FITTINGS SHALL BE FLANGED AND ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

**FIRE LINE DOUBLE  
DETECTOR CHECK  
ASSEMBLY WITH F.D.C**

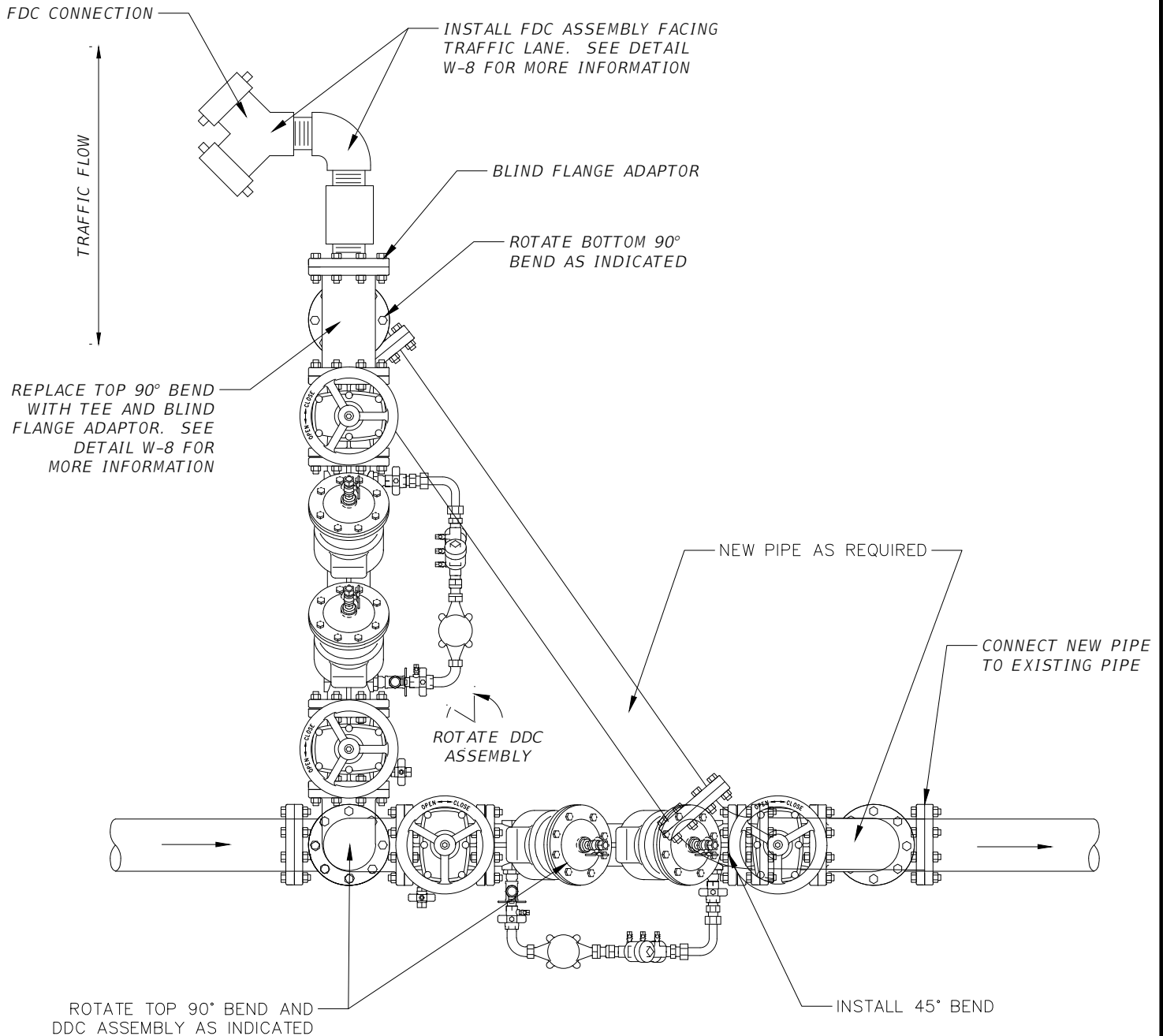
4" OR GREATER

SECTION:  
WATER

W-8

REVISION DATE:  
DEC. 2020





### NOTES

1. FOR EXISTING DDC ASSEMBLIES CONTACT CITY FIRE MARSHAL BEFORE RELOCATING DDC ASSEMBLY.
2. REFER TO DETAIL W-8 FOR INFORMATION REGARDING ADDITION OF FDC CONNECTION.



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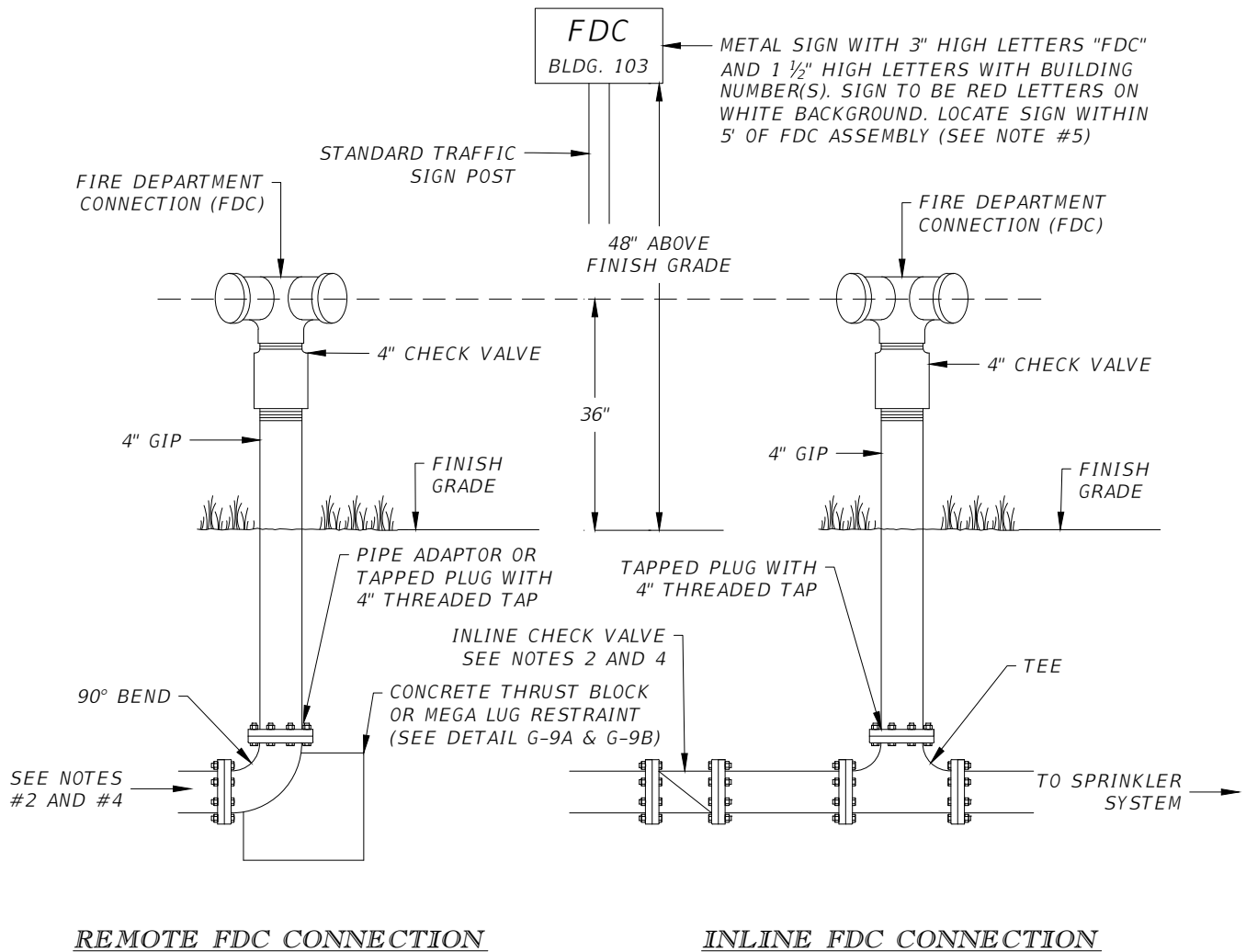
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

ALTERNATE DOUBLE  
DETECTOR CHECK  
ASSEMBLY WITH NEW  
F.D.C CONNECTION

SECTION:  
WATER

W-9

REVISION DATE:  
DEC. 2020



### NOTES

1. ALL ABOVE-GROUND PARTS OF THE FDC ASSEMBLY, INCLUDING PIPING, SHALL BE PAINTED RED. PAINT SHALL BE POLYURETHANE, "SAFETY RED" OR EQUIVALENT.
2. PROVIDE AN INLINE CHECK VALVE ONLY WHERE FDC CONNECTIONS ARE INSTALLED AND FIRE HYDRANTS ARE CONNECTED UPSTREAM.
3. FDC MAY BE MOUNTED ON DOUBLE CHECK DETECTOR ASSEMBLIES (DCDA). SEE DETAIL W-8.
4. WHERE CHECK VALVES ARE INSTALLED BELOW GRADE PROVIDE A PRECAST UTILITY BOX SIZED TO ADEQUATELY MAINTAIN THE CHECK VALVE ASSEMBLY.
5. PROVIDE A SIGN INDICATING WHAT BUILDING(S) OR UNIT(S) THE FDC CONNECTION SUPPLIES WATER TO.
6. PROVIDE UNOBSTRUCTED CLEAR ZONE AROUND FDC CONNECTION OF 4' TO THE REAR AND 7-1/2' TO SIDES AND FRONT. NO BUILDINGS, FENCES, TREES OR LARGE SHRUBBERY SHALL BE LOCATED IN CLEAR ZONE.



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FOR CONSTRUCTION

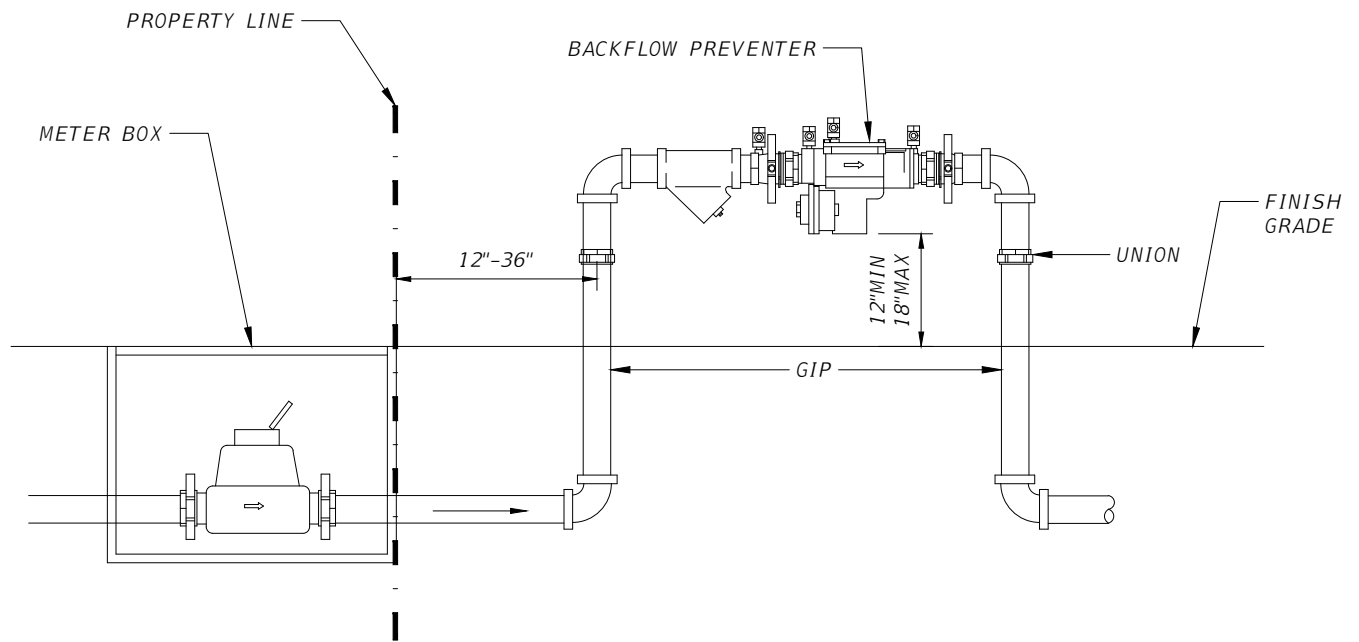
**FIRE DEPARTMENT  
CONNECTION**

F.D.C 4" OR GREATER

SECTION:  
WATER

**W-10**

REVISION DATE:  
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SINGLE METER INSTALLATION

NOTES

1. INSULATE ALL ABOVE GROUND PIPING FOR FREEZE PROTECTION.
2. INSTALL BOLLARDS FOR PROTECTION IN TRAFFIC AREAS.



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STANDARD DETAILS  
FOR CONSTRUCTION

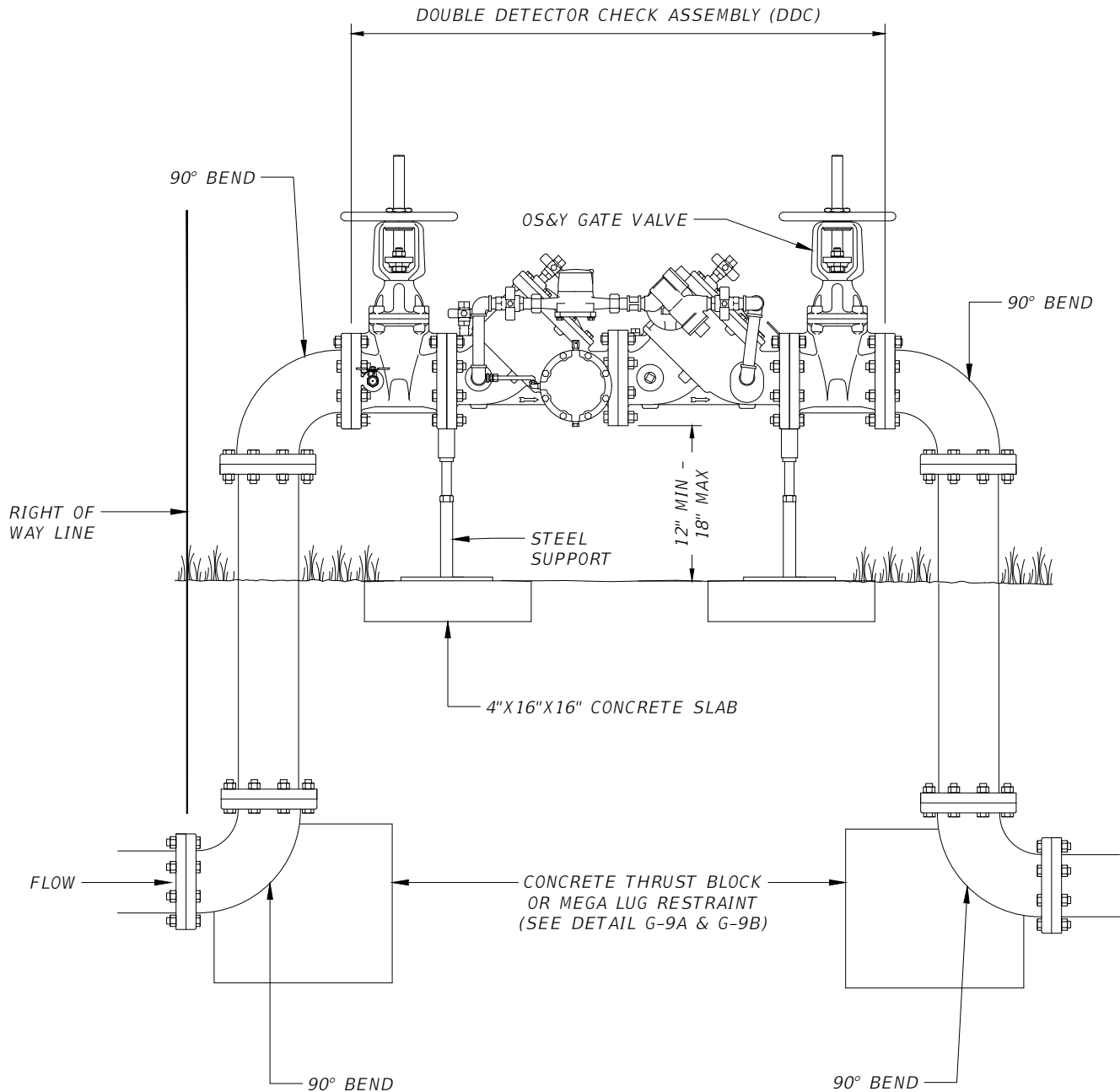
**SINGLE & MULTIFAMILY  
BACK FLOW PREVENTER  
INSTALLATION**

LESS THAN 3"

SECTION:  
WATER

**W-11**

REVISION DATE:  
DEC. 2020



### NOTES

1. FOR FIRE LINES CONTACT CITY FIRE DEPARTMENT FOR ADDITIONAL REQUIREMENTS.
2. ALL ABOVE GROUND PARTS OF THE ASSEMBLY, INCLUDING PIPING, SHALL BE PAINTED RED. PAINT SHALL BE POLYURETHANE "SAFETY RED" OR EQUIVALENT.
3. UNLESS OTHERWISE NOTED, ALL EXPOSED FITTINGS SHALL BE FLANGED AND ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT.
4. ALL MECHANICAL JOINT PIPING TO BE PROPERLY RESTRAINED PER DETAIL G-11.



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STANDARD DETAILS  
FOR CONSTRUCTION

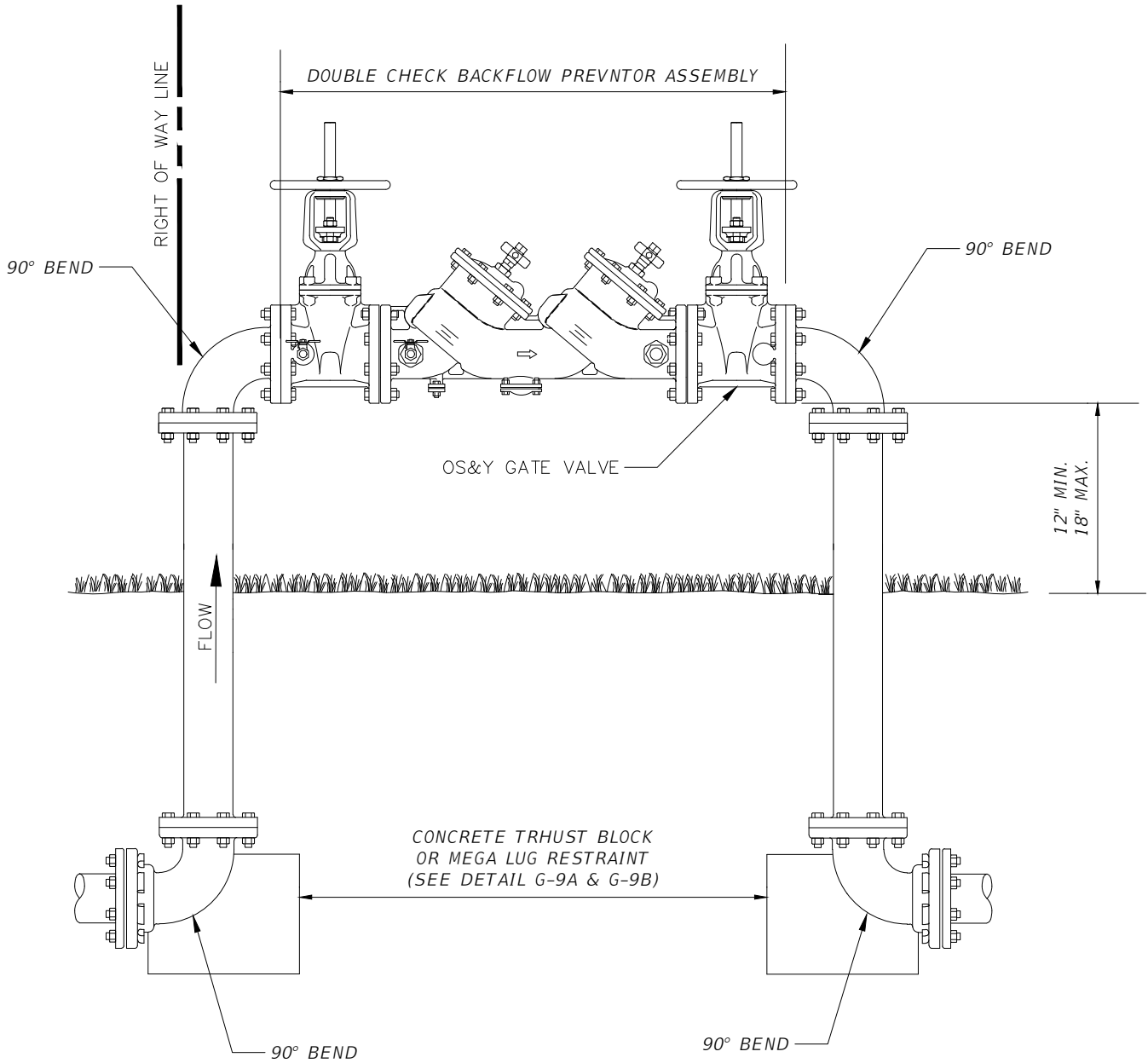
**FIRE LINE BACK FLOW  
PREVENTER**

4" OR GREATER

SECTION:  
WATER

**W-12**

REVISION DATE:  
DEC. 2020



### NOTES

1. UNLESS OTHERWISE NOTED, ALL EXPOSED FITTINGS SHALL BE FLANGED AND ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT.
2. ALL MECHANICAL JOINT PIPING TO BE PROPERLY RESTRAINED PER DETAIL G-11.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

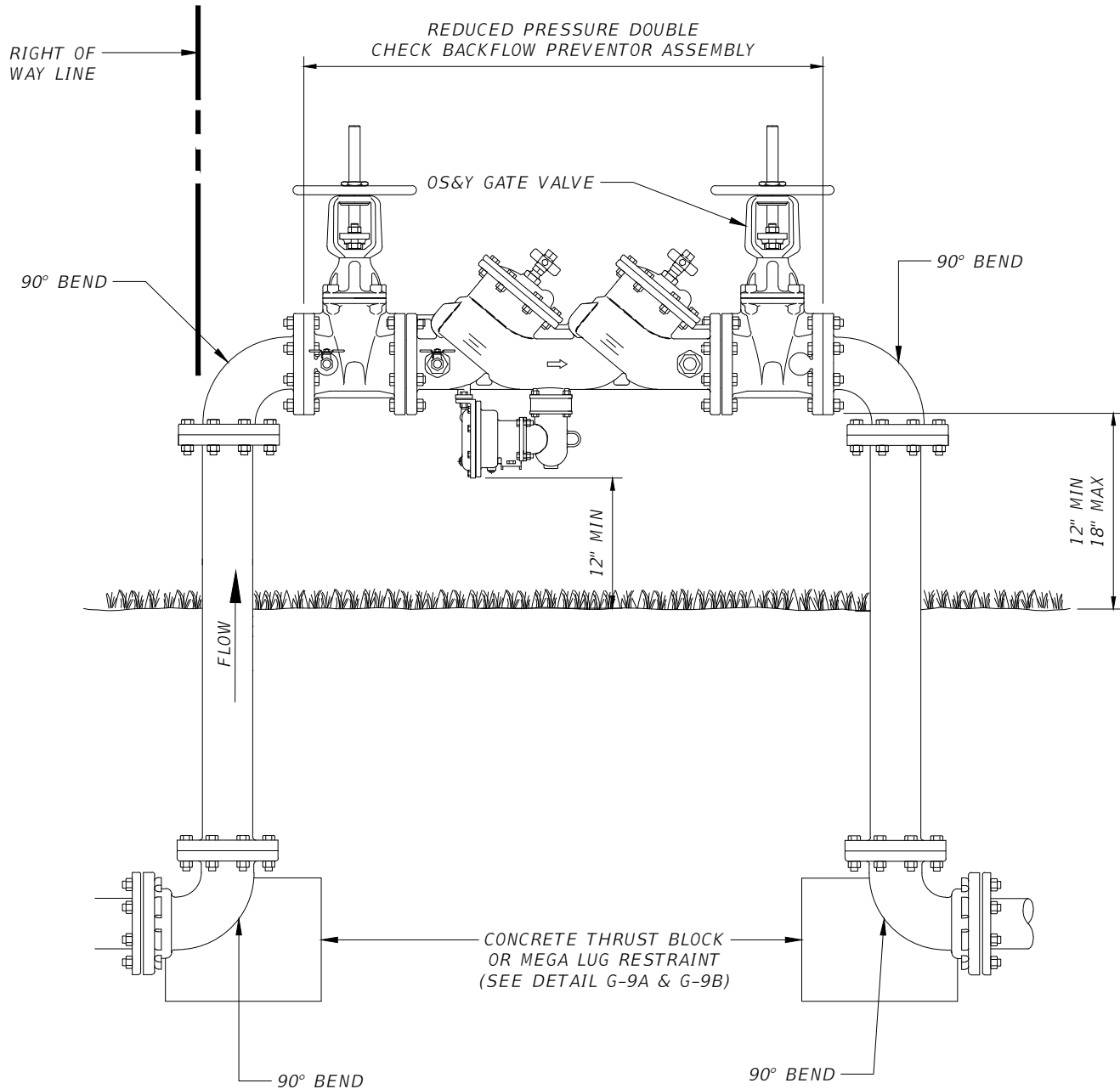
BACK FLOW PREVENTER

4" OR GREATER

SECTION:  
WATER

W-13

REVISION DATE:  
DEC. 2020



### NOTES

1. UNLESS OTHERWISE NOTED, ALL EXPOSED FITTINGS SHALL BE FLANGED AND ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT.
2. ALL MECHANICAL JOINT PIPING TO BE PROPERLY RESTRAINED PER DETAIL G-11.



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STANDARD DETAILS  
FOR CONSTRUCTION

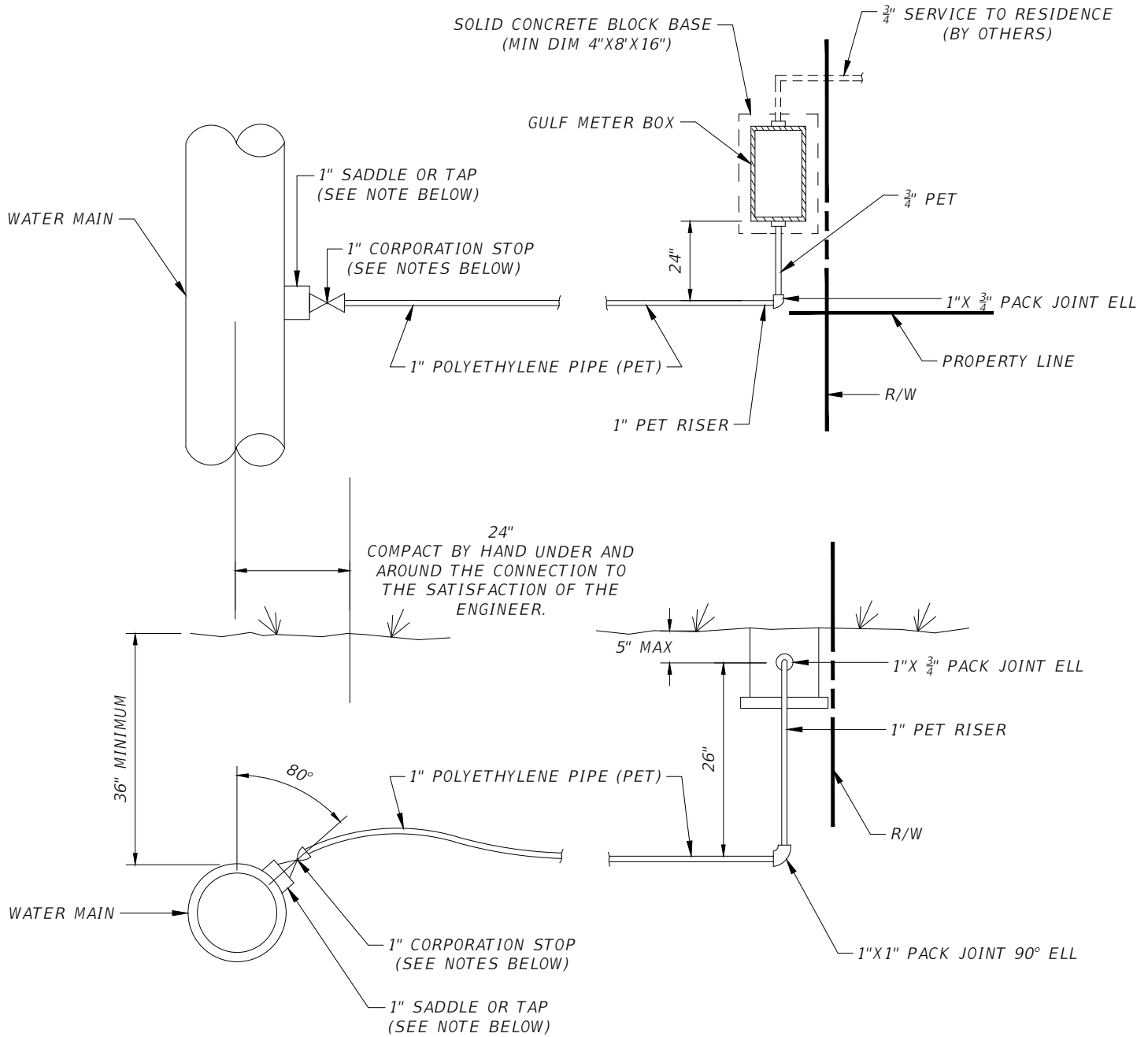
REDUCED PRESSURE  
BACK FLOW PREVENTER

4" OR GREATER

SECTION:  
WATER

W-14

REVISION DATE:  
DEC. 2020



### NOTES

1. METER BOXES SET IN PAVEMENT SHALL BE POLYMERE CONCRETE WITH COVER AND METER READERS LID.
2. WATER SERVICE TO BE INSTALLED WITH SOLID COPPER LOCATING WIRE. SEE STANDARD DETAIL G-15 (A-H) FOR LOCATING WIRE INSTALLATION.
3. ON NEW 2" PVC WATER MAINS, A 2" x 1" TAPPING SADDLE AND 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS.
4. ON NEW OR EXISTING WATER MAINS WITH A DIAMETER OF 6" OR LARGER, A 1" TAP SHALL BE MADE INTO THE MAIN AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS. (SADDLE FOR PVC)
5. THE BRASS EXPANSION CONNECTION SUPPLIED WITH THE METER BOX SHALL BE DELIVERED TO THE INSPECTOR AT THE TIME OF FINAL INSPECTION.
6. LONG SERVICES UNDER PAVEMENT REQUIRE 2" CASING OF PVC, HDPE OR STEEL.



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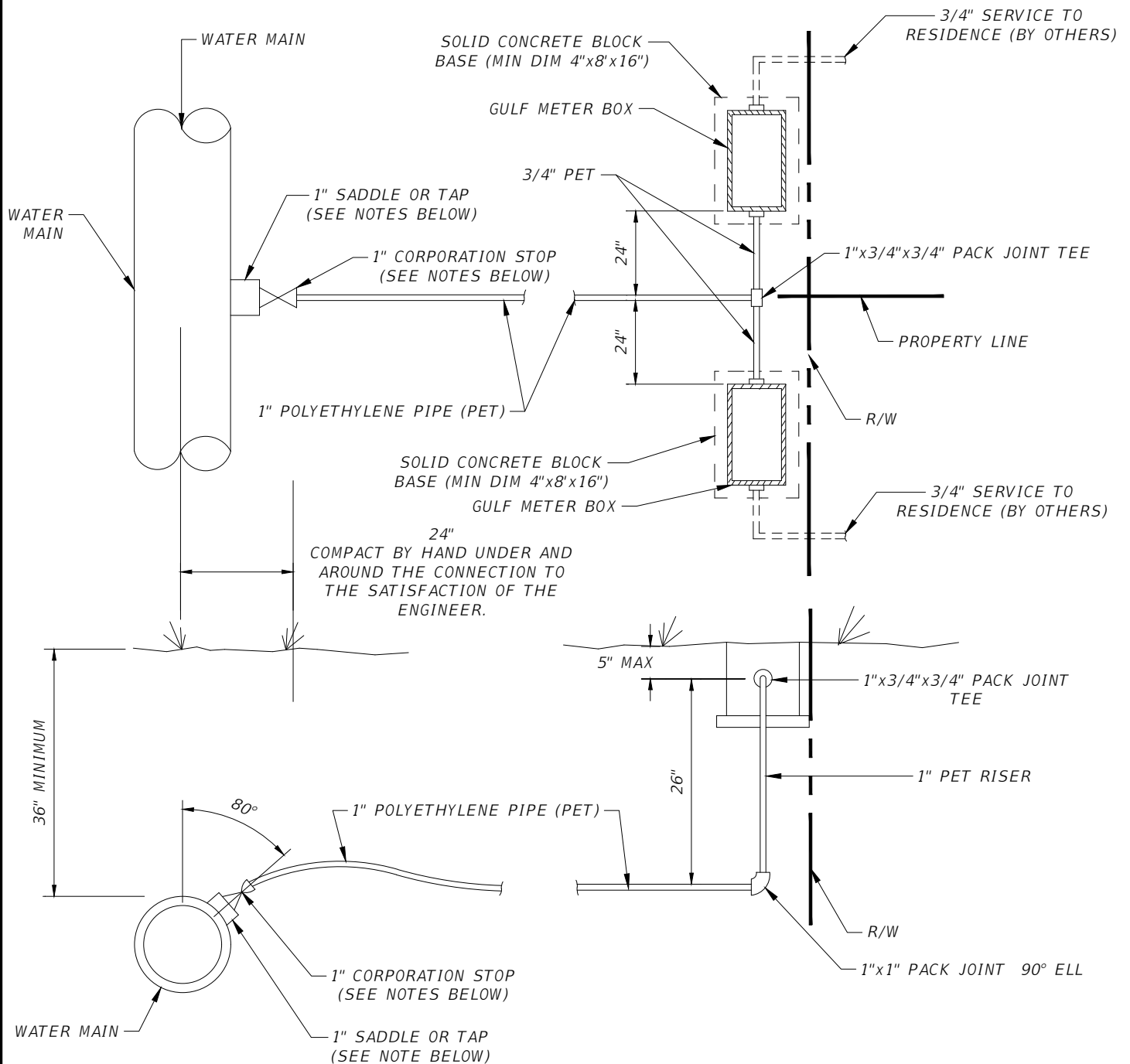
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

SINGLE 1"x $\frac{3}{4}$ "  
RESIDENTIAL WATER  
SERVICE

SECTION:  
WATER

W-15

REVISION DATE:  
DEC. 2020



#### NOTES

1. METER BOXES SET IN PAVEMENT SHALL BE POLYMERE CONCRETE WITH COVER AND METER READERS LID.
2. WATER SERVICE TO BE INSTALLED WITH SOLID COPPER LOCATING WIRE. SEE STANDARD DETAIL #G-15 (A-H) FOR LOCATING WIRE INSTALLATION.
3. ON NEW 2" PVC WATER MAINS, A 2" X 1" TAPPING SADDLE AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS.
4. ON NEW OR EXISTING WATER MAINS WITH A DIAMETER LARGER THAN 2", A 1" TAP SHALL BE MADE INTO THE MAIN AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS. (SADDLE FOR PVC)
5. THE BRASS EXPANSION CONNECTION SUPPLIED WITH THE METER BOX SHALL BE DELIVERED TO THE INSPECTOR AT THE TIME OF FINAL INSPECTION.
6. LONG SERVICES UNDER PAVEMENT REQUIRE 2" CASING OF PVC, HDPE OR STEEL.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

DOUBLE 1"x $\frac{3}{4}$ "  
RESIDENTIAL WATER  
SERVICE

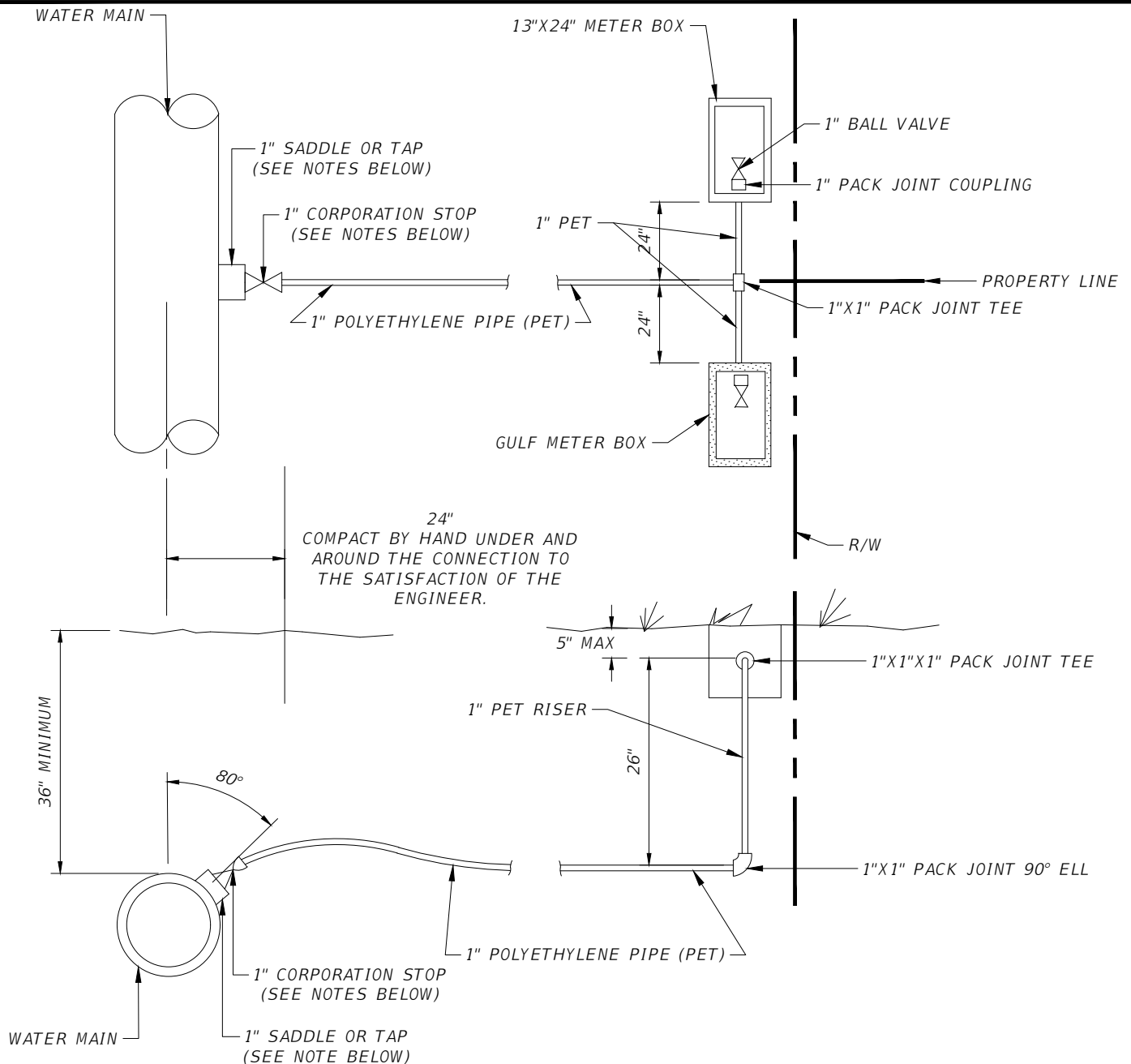
SECTION:  
WATER

W-16

REVISION DATE:  
DEC. 2020







### NOTES

1. METER BOXES SET IN PAVEMENT SHALL BE POLYMER CONCRETE WITH COVER AND METER READERS LID.
2. WATER SERVICE TO BE INSTALLED WITH SOLID COPPER LOCATING WIRE. SEE STANDARD DETAIL #G-15 (A-H) FOR LOCATING WIRE INSTALLATION.
3. ON NEW 2" PVC WATER MAINS, A 2" X 1" TAPPING SADDLE AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS.
4. ON NEW OR EXISTING WATER MAINS WITH A DIAMETER LARGER THAN 2", A 1" TAP SHALL BE MADE INTO THE MAIN AND A 1" CORPORATION STOP SHALL BE USED WHEN INSTALLING SERVICE CONNECTIONS.
5. LONG SERVICES UNDER PAVEMENT REQUIRE 2" CASING OF PVC, HDPE OR STEEL.



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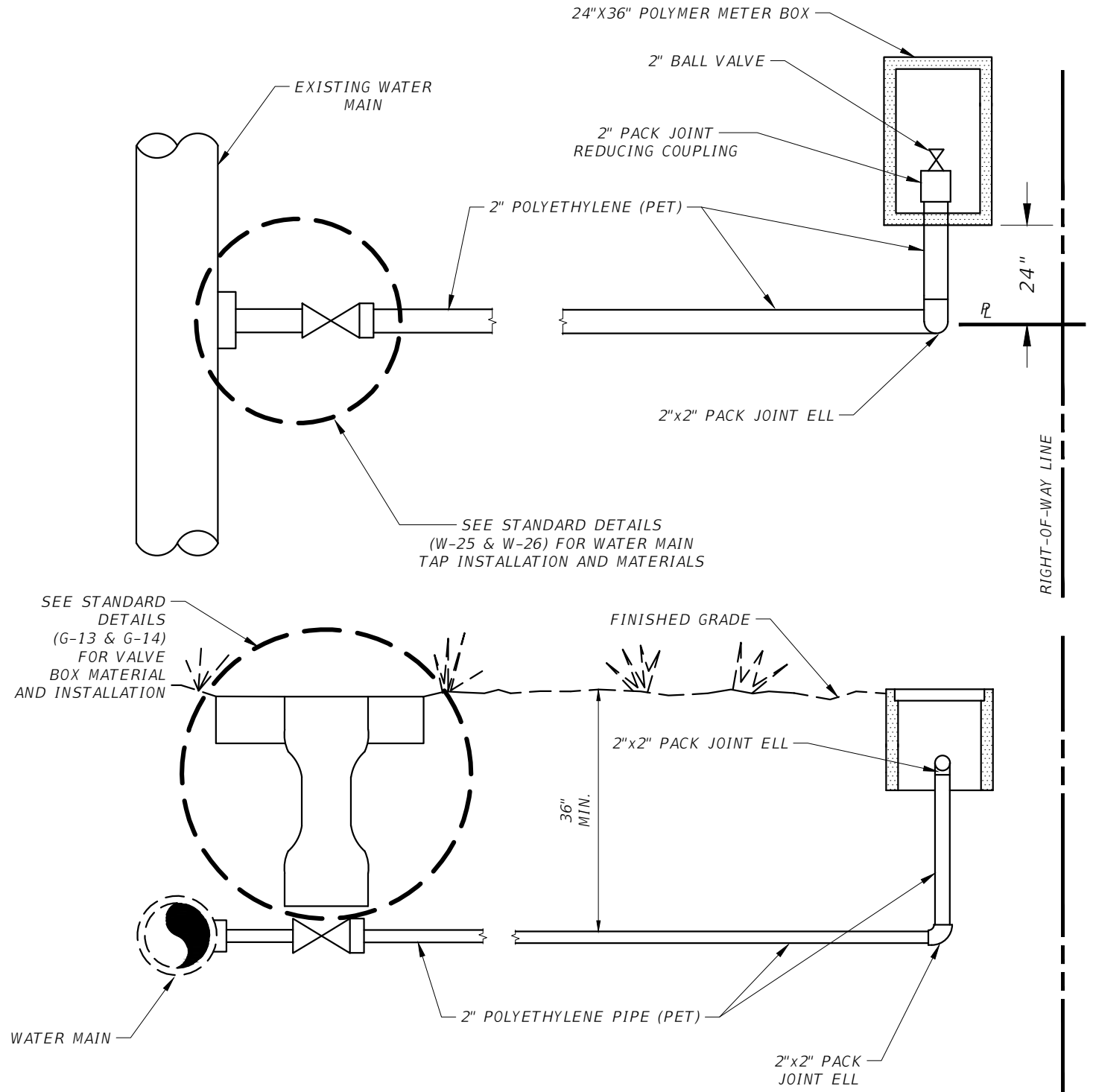
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

DOUBLE 1" RESIDENTIAL  
WATER SERVICE

SECTION:  
WATER

W-18

REVISION DATE:  
DEC. 2020



### NOTES

1. WATER SERVICE TO BE INSTALLED WITH A SOLID COPPER LOCATING WIRE. SEE STANDARD DETAIL #G-15 (A-H) FOR LOCATING WIRE INSTALLATION.
2. LONG SERVICES UNDER PAVEMENT SHALL INCLUDE 4" CASING OF PVC, HDPE, OR STEEL.
3. CONTRACTOR SHALL INSTALL ALL ELEMENTS OF THIS DETAIL. THE CITY SHALL INSTALL THE METER ONLY.



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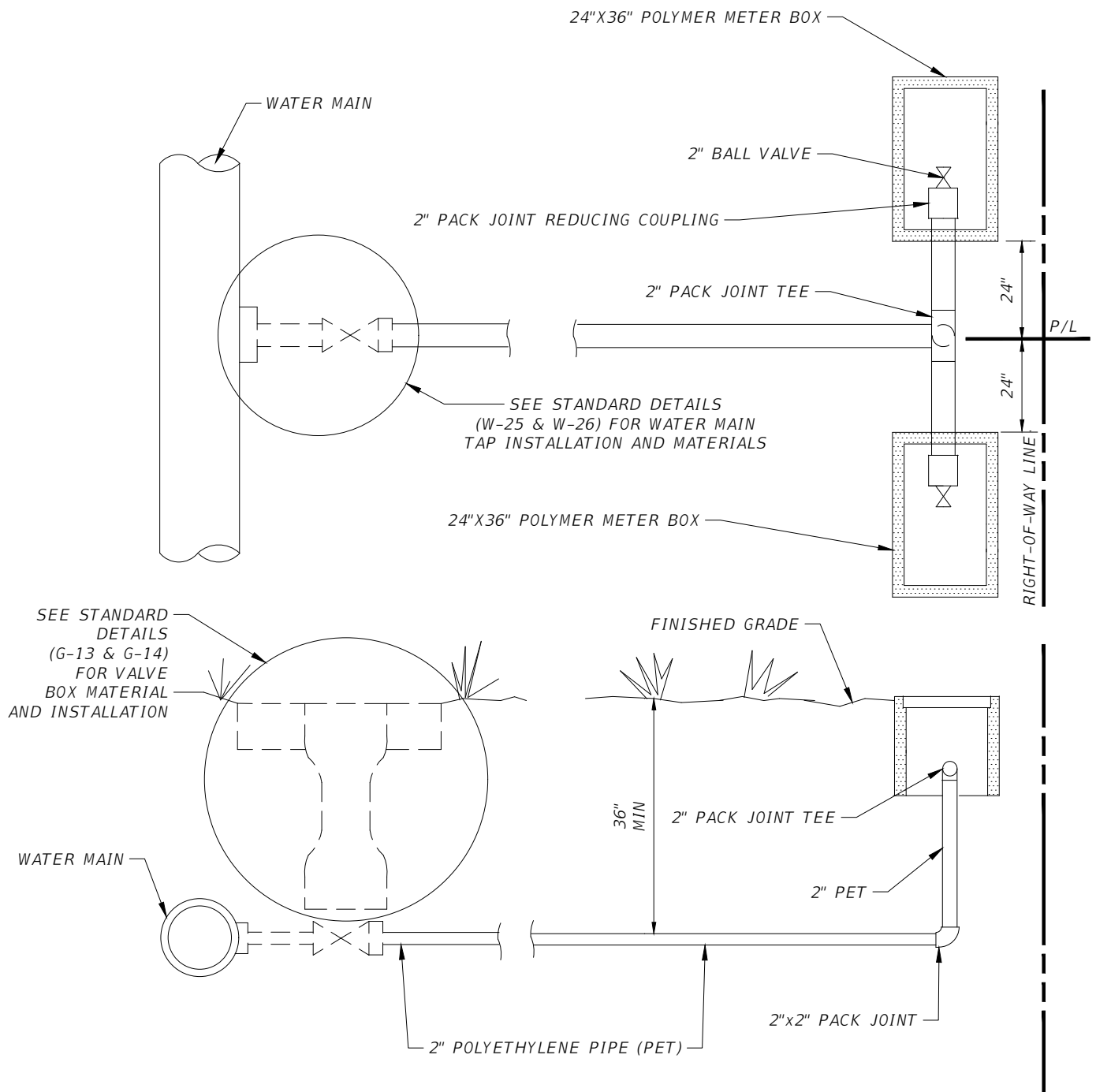
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

SINGLE COMMERCIAL  
WATER SERVICE

SECTION:  
WATER

W-19

REVISION DATE:  
DEC. 2020



### NOTES

1. WATER SERVICE TO BE INSTALLED WITH A SOLID COPPER LOCATING WIRE SEE STANDARD DETAIL G-15 (A-H) FOR LOCATING WIRE INSTALLATION.
2. LONG SERVICES UNDER PAVEMENT REQUIRE 4" CASING OF PVC, HDPE OR STEEL.



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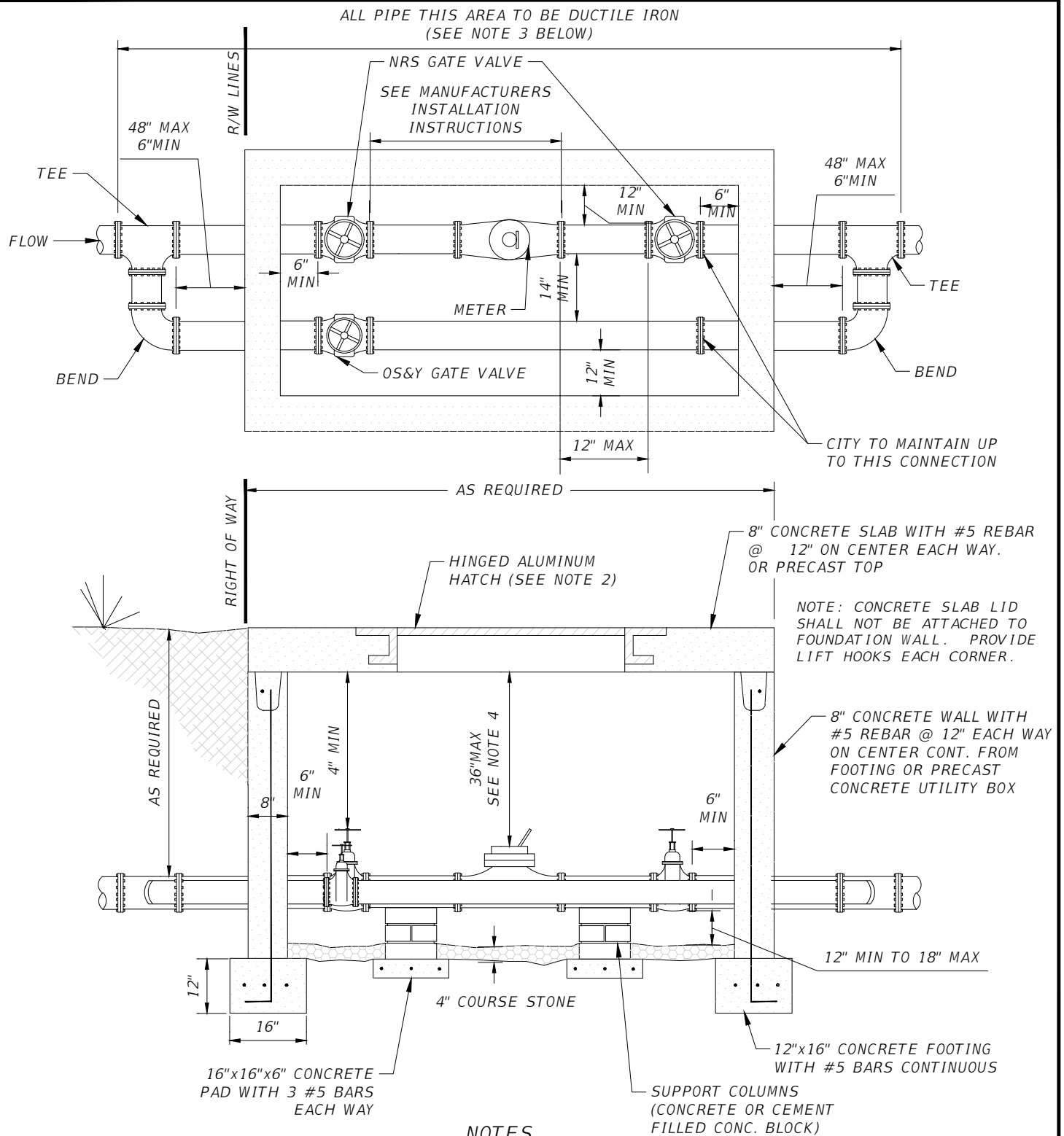
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

DOUBLE COMMERCIAL  
WATER SERVICE

SECTION:  
WATER

W-20

REVISION DATE:  
DEC. 2020



#### NOTES

1. METERS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS.
2. ALUMINUM HATCH SHALL BE 30" X 30" FOR METERS 3" AND 4". HATCH FOR METERS 6" AND ABOVE SHALL BE 42" X 42".
3. UNLESS OTHERWISE NOTED, ALL EXPOSED FITTINGS SHALL BE FLANGED AND ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT.
4. MINIMUM PIPE DIAMETER IS 4".
5. VAULT DIMENSIONS TO BE 6' X 5'.
6. USE HYMAX COUPLINGS.



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STANDARD DETAILS  
FOR CONSTRUCTION

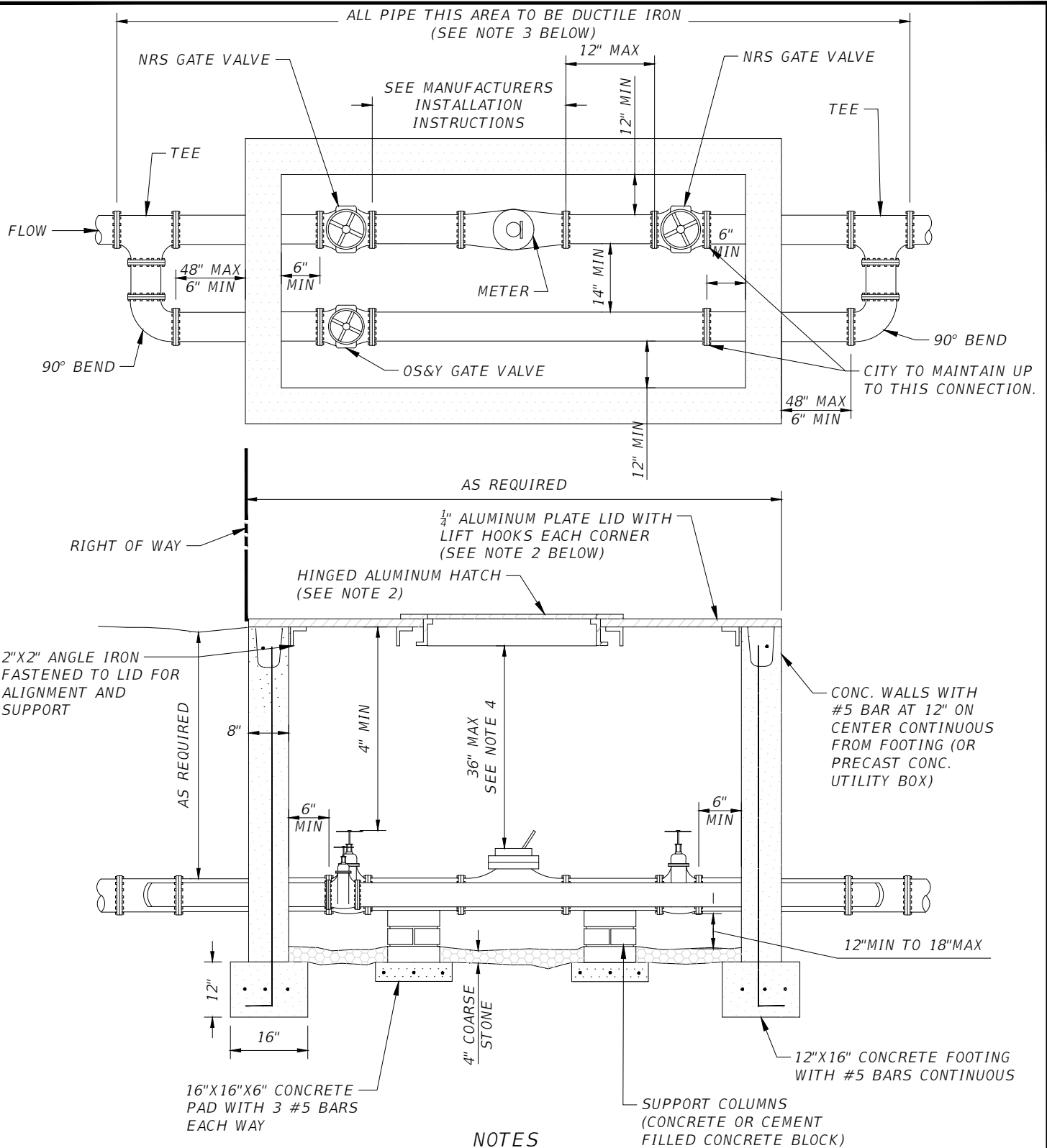
COMMERCIAL  
WATER SERVICE

4" PIPE AND ABOVE WITH TRAFFIC LID

SECTION:  
WATER

W-21

REVISION DATE:  
DEC. 2020



#### NOTES

1. METERS SHALL INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS INSTRUCTIONS.
2. ALUMINUM HATCH SHALL BE 30" X 30" FOR METERS 3" AND 4". HATCH FOR METERS 6" AND ABOVE SHALL BE 42" X 42".
3. UNLESS OTHERWISE NOTED, ALL EXPOSED FITTINGS SHALL BE FLANGED AND ALL BURIED FITTINGS SHALL BE MECHANICAL JOINT.
4. VAULT DIMENSIONS TO BE 6'X5'.
5. USE HYMAX COUPLINGS.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

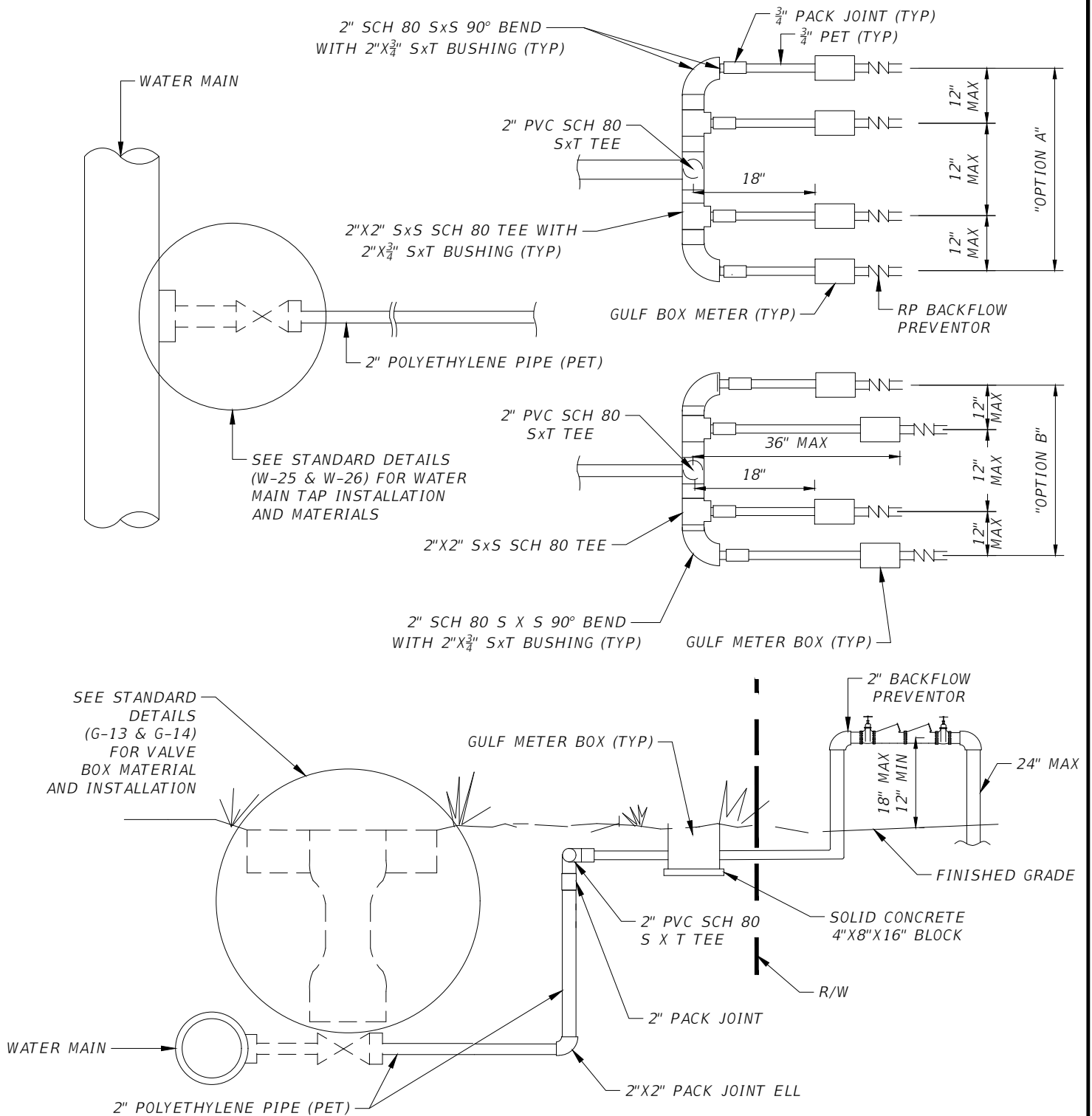
COMMERCIAL  
WATER SERVICE

4" PIPE AND ABOVE WITH NON-TRAFFIC LID

SECTION:  
WATER

W-22

REVISION DATE:  
DEC. 2020



### NOTES

1. WATER SERVICE TO BE INSTALLED WITH A SOLID COPPER LOCATING WIRE SEE STANDARD DETAIL (G-15) FOR LOCATING WIRE INSTALLATION.
2. MAXIMUM NUMBER OF METERS ON ONE TWO INCH (2") SERVICE TO BE FOUR (4).
3. LONG SERVICES UNDER PAVEMENT REQUIRE 4" CASING OF PVC, HDPE OR STEEL.
4. ABOVE GROUND PIPING MUST BE INSULATED FOR FREEZE PROTECTION.



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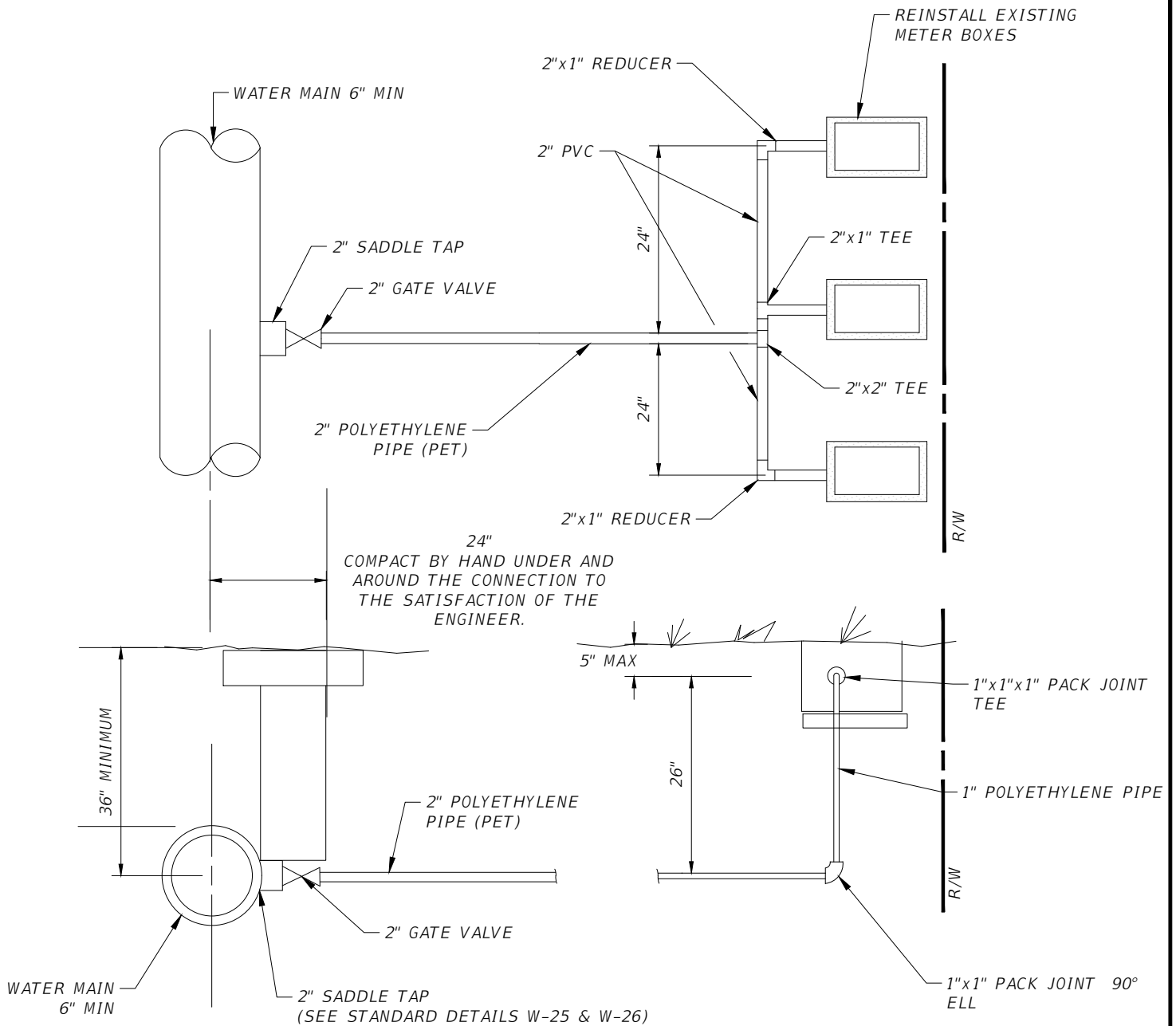
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

MULTI-FAMILY  
WATER SERVICE

SECTION:  
WATER

W-23

REVISION DATE:  
DEC. 2020



### NOTES

1. WATER SERVICE TO BE INSTALLED WITH SOLID COPPER LOCATING WIRE. SEE STANDARD DETAIL G-15 FOR LOCATING WIRE INSTALLATION.
2. LONG SERVICES UNDER PAVEMENT REQUIRE 4" CASING OF PVC, HDPE OR STEEL.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

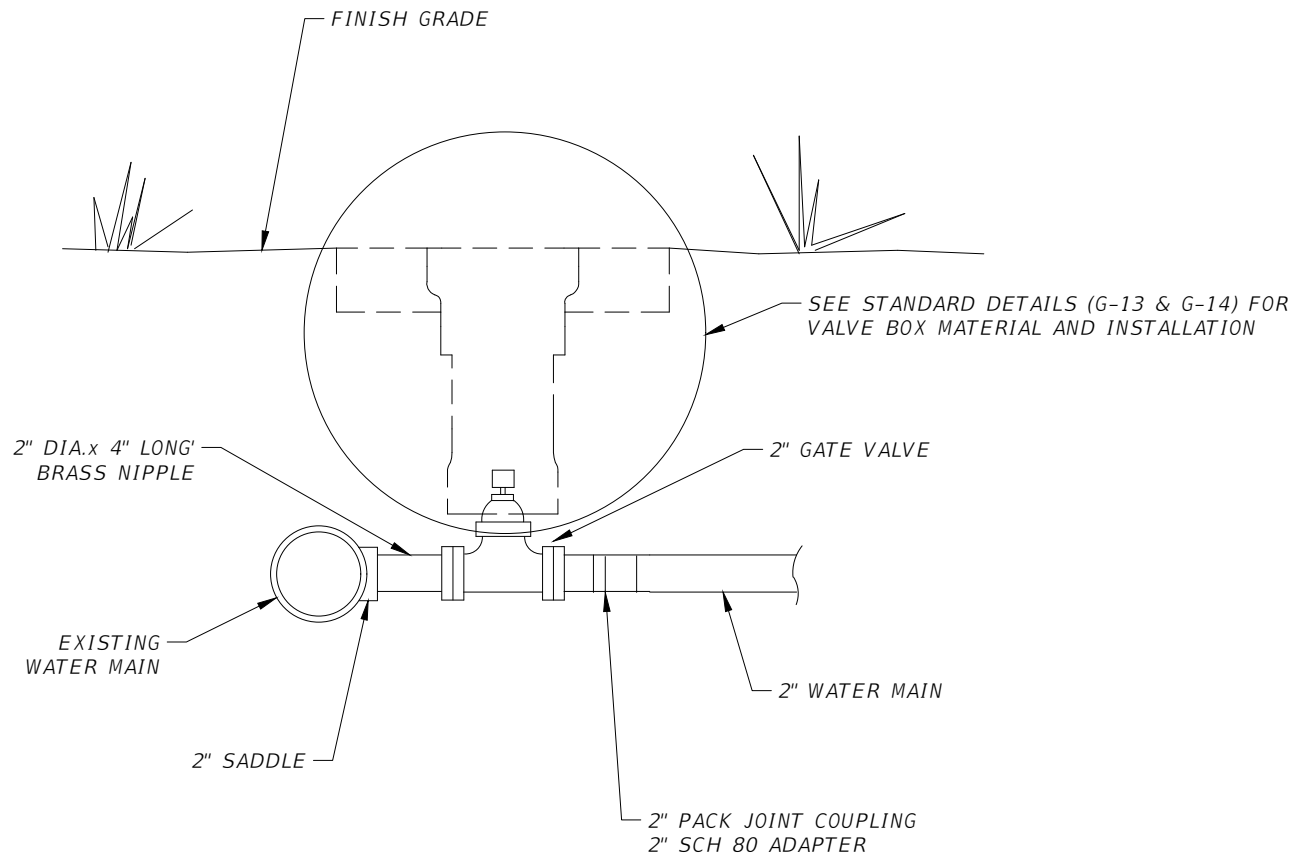
TRIPLE 1"  
WATER SERVICE

SECTION:  
WATER

W-24

REVISION DATE:  
DEC. 2020





### NOTES

1. PRESSURE TEST ALL SADDLES AND VALVES PRIOR TO TAPPING.
2. PRESSURE TEST AS SPECIFIED



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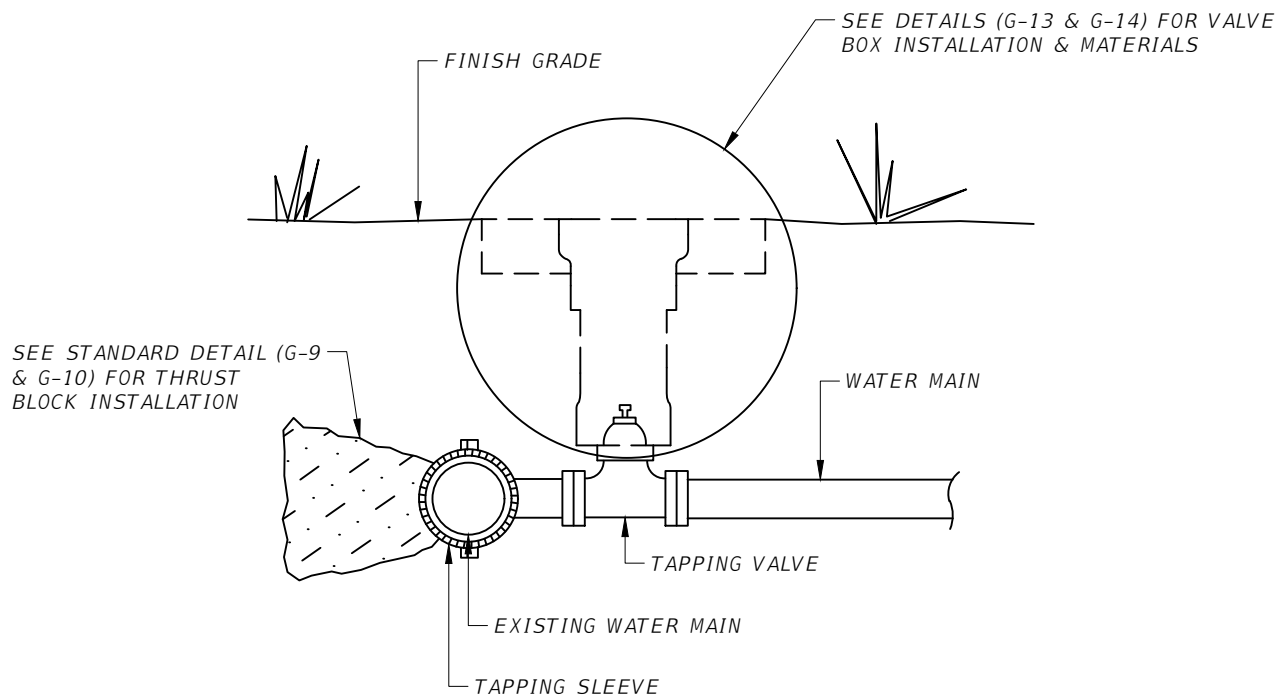
WATER MAIN TAP

2" PVC/PET TO EXISTING MAIN

SECTION:  
WATER

W-25

REVISION DATE:  
DEC. 2020



### NOTES

1. PRESSURE TEST ALL SADDLES AND VALVES PRIOR TO WET TAP.
2. PRESSURE TEST AS SPECIFIED.
3. ALL WATER MAIN TAPS TO INCLUDE, TAPPING SLEEVE AND VALVE. THRUST BLOCK ONLY FOR SIZE ON SIZE PIPES (EXAMPLE: 6" ON 6").



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FOR CONSTRUCTION

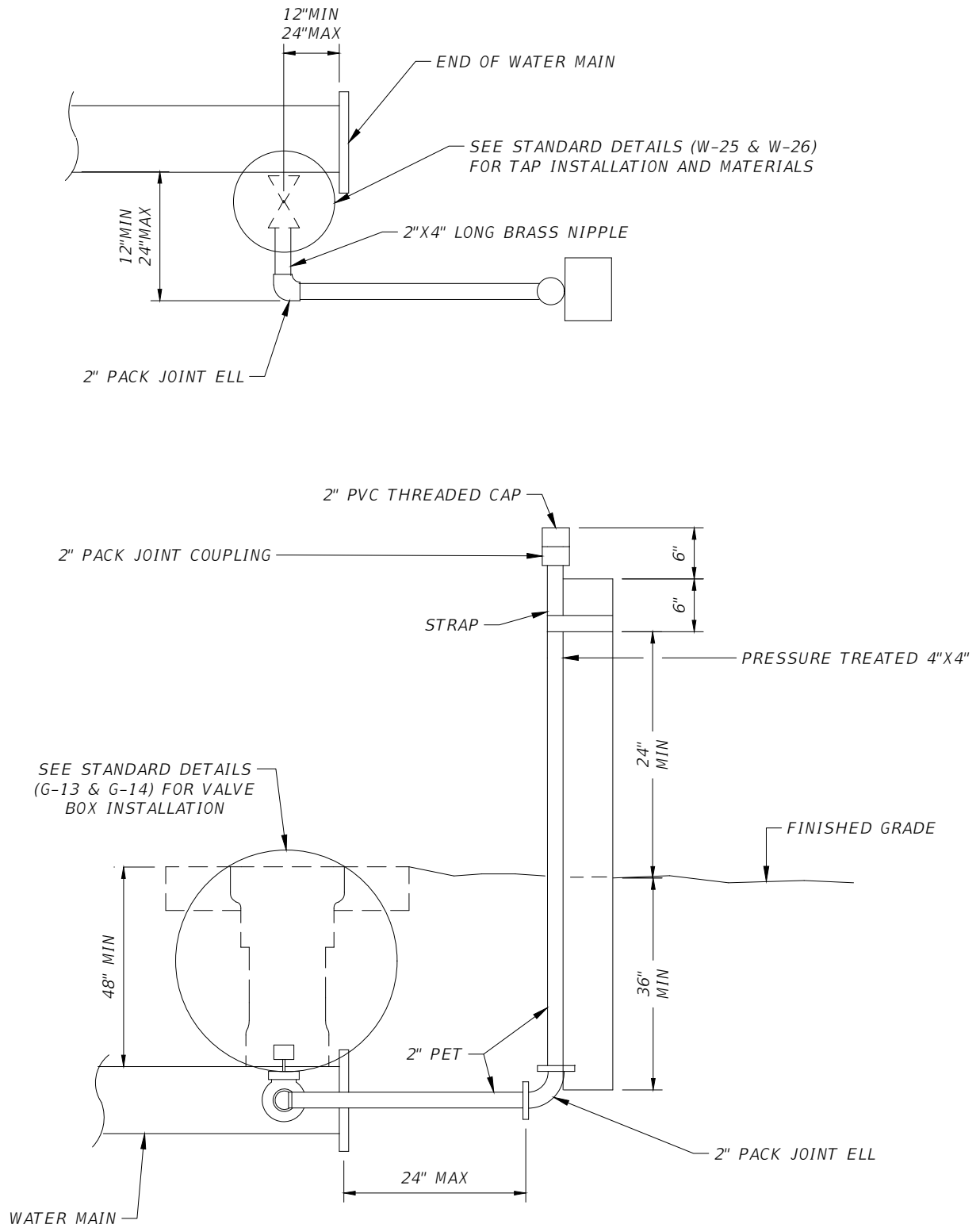
WATER MAIN TAP

4" AND ABOVE

SECTION:  
WATER

W-26

REVISION DATE:  
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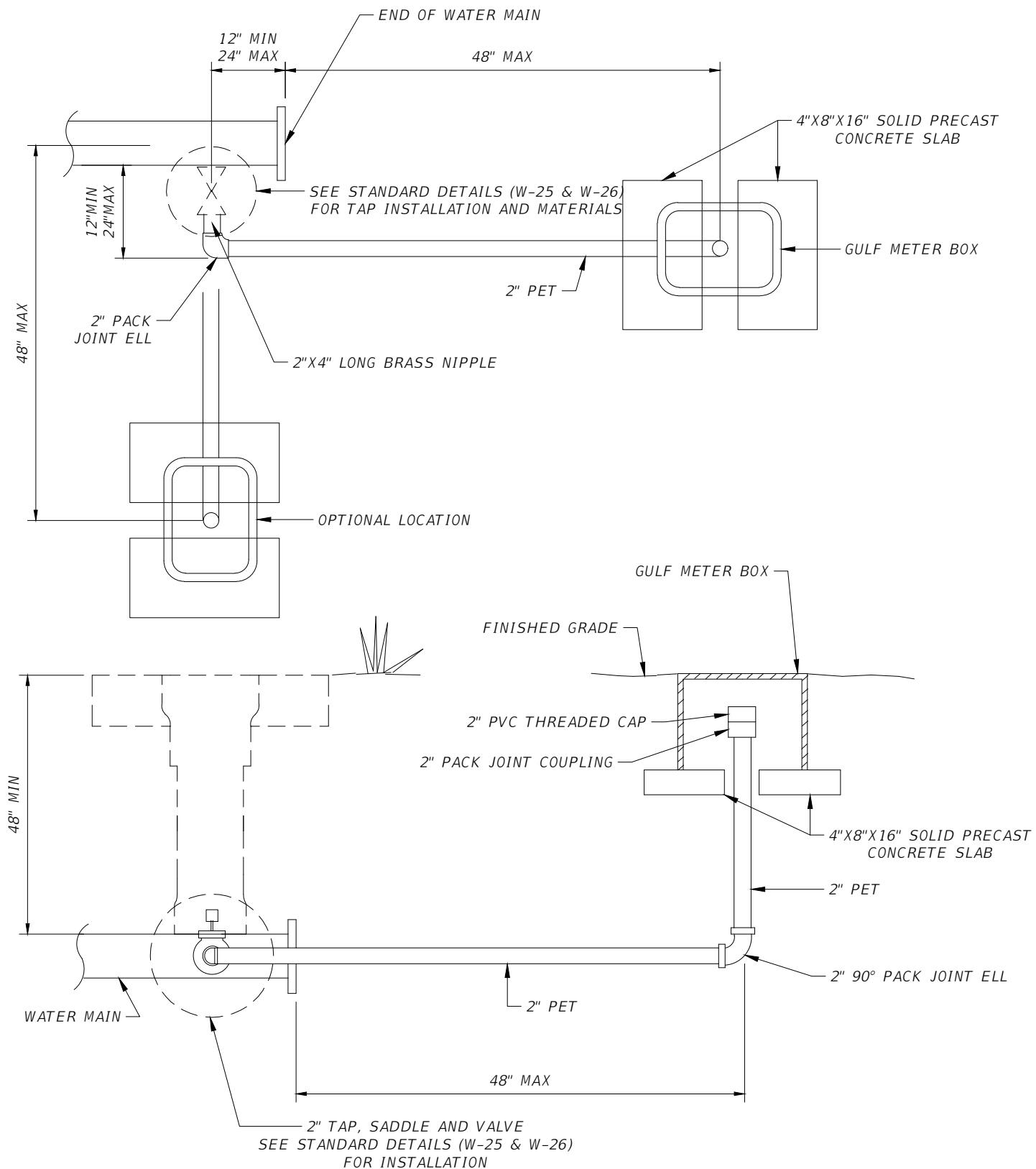
CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## TEMPORARY BLOWOFF ASSEMBLY

SECTION:  
WATER

W-27

REVISION DATE:  
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1805 NE 30TH AVE, BLDG #600  
OCALA, FLORIDA 34470

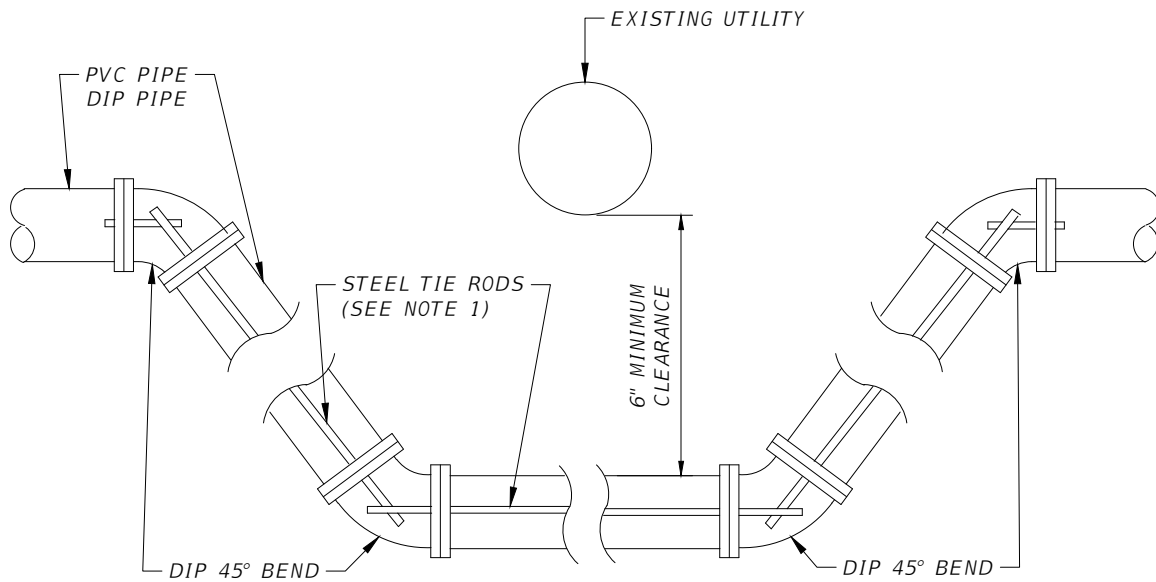
**CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION**

**2" BLOWOFF ASSEMBLY**

SECTION:  
WATER

**W-28**

REVISION DATE:  
DEC. 2020



### NOTES

1. FOR PIPE DIAMETERS UP TO 12" USE TWO (2) STEEL RODS. PIPE DIAMETERS OVER 12" USE THREE (3) 3/4" STEEL RODS. RESTRAINED JOINTS MAY BE USED IN LIEU OF RODS.
2. UNLESS OTHERWISE AUTHORIZED BY THE ENGINEER, WATER MAIN BYPASS SHALL BE CONSTRUCTED BELOW THE CONFLICTING UTILITY.
3. MEGALUGS, RATED FOR THE PARTICULAR PIPE MATERIAL BEING INSTALLED, MAY BE USED IN LIEU OF THE TIE RODS. REFER TO WSCM (G-11) FOR ADDITIONAL FITTING RESTRAINT REQUIREMENTS.



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## CITY OF OCALA STANDARD DETAILS FOR CONSTRUCTION

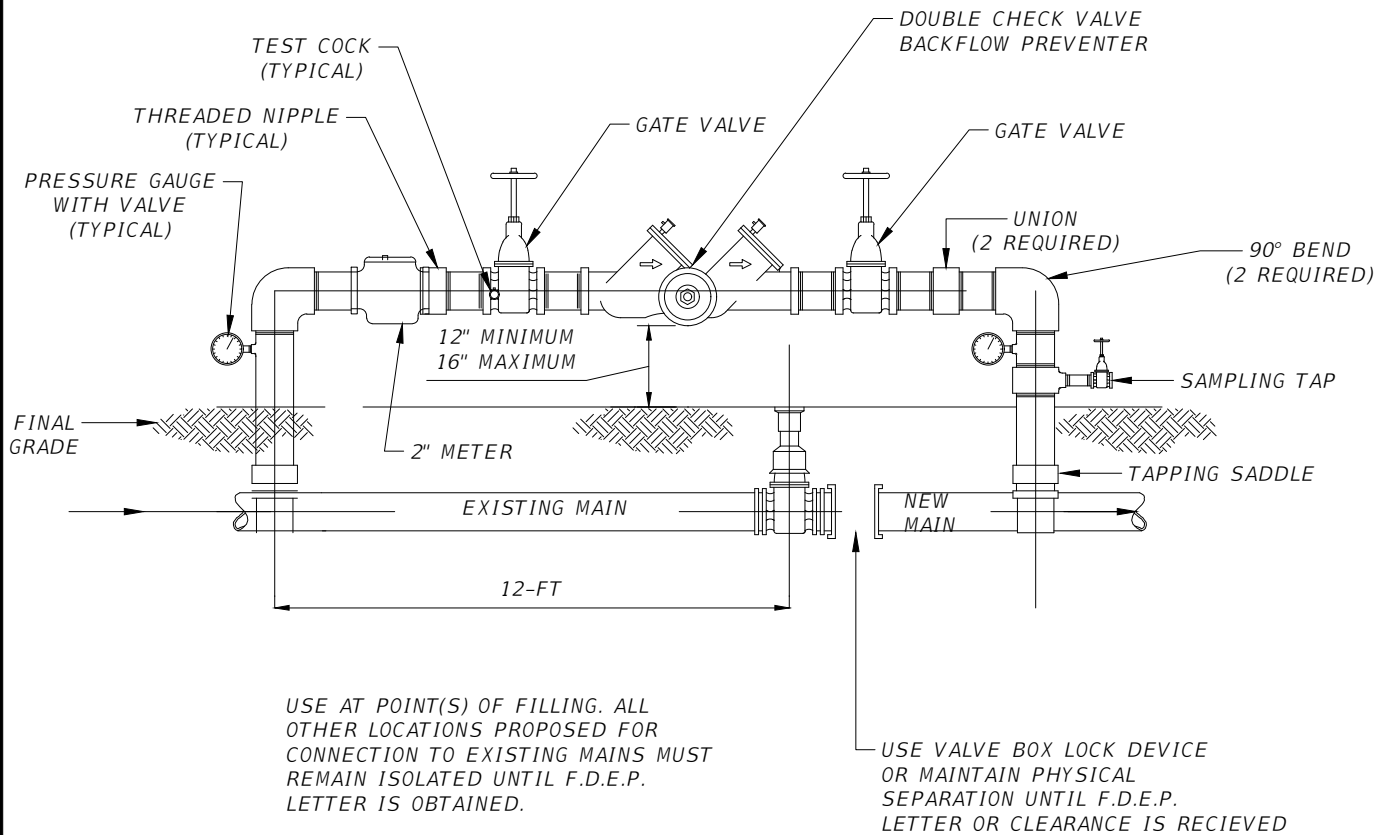
## WATER MAIN BY-PASS

SECTION:  
WATER

W-29

REVISION DATE:  
DEC. 2020

NOTE: ALL PIPING AND APPURTENANCES TO BE 2" FOR 8" AND BELOW WATER MAINS; 4" FOR 12" WATER MAINS; 8" FOR 16" WATER MAINS; 12" FOR 24" WATER MAINS.



1. A TEMPORARY JUMPER CONNECTION IS REQUIRED AT ALL CONNECTIONS BETWEEN EXISTING ACTIVE WATER MAINS AND PROPOSED NEW WATER MAIN IMPROVEMENTS. TEMPORARY JUMPER WATER METERS WILL BE SUPPLIED BY THE CITY OF OCALA ORDINANCE SECTION 70-413.
2. THIS DETAIL IS TO BE USED FOR FILLING ANY NEW WATER MAIN OF ANY SIZE FOR EXISTING ACTIVE WATER MAINS AND FOR FLUSHING OF NEW MAINS, AND FOR PULLING BACTERIOLOGICAL SAMPLES FROM ANY NEW WATER MAIN OF ANY SIZE. THE JUMPER CONNECTION SHALL BE MAINTAINED UNTIL AFTER FILLING, FLUSHING, TESTING, AND DISINFECTION OF THE NEW MAIN HAS BEEN SUCCESSFULLY COMPLETED AND CLEARANCE FOR USE FROM THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP) HAS BEEN RECEIVED. THIS JUMPER CONNECTION SHALL ALSO BE USED TO MAINTAIN A MINIMUM PRESSURE OF 20 PSI IN THE NEW MAINS ALL THE TIME AFTER DISINFECTION AND UNTIL THE FDEP CLEARANCE LETTER IS OBTAINED. ADEQUATE THRUST BLOCKING AND/OR RESTRAINTS SHALL BE PROVIDED TEMPORARILY, AS REQUIRED. PIPE AND FITTINGS USED FOR CONNECTING THE NEW PIPE TO THE EXISTING PIPE SHALL BE DISINFECTED PRIOR TO INSTALLATION IN ACCORDANCE WITH AWWA C651, LATEST EDITION. THE TAPPING SLEEVE AND THE EXTERIOR OF THE MAIN TO BE TAPPED SHALL BE DISINFECTED BY SPRAYING OR SWABBING PER SECTION II OF AWWA C651-LATEST.
3. UPON RECEIPT OF CLEARANCE FOR USE FROM FDEP AND THE CITY OF OCALA, THE CONTRACTOR SHALL REMOVE THE TEMPORARY JUMPER CONNECTION. THE MAINS CAN NOW BE CONNECTED BY SLEEVE OR FLANGED CONNECTIONS.
4. ALL INSTALLATION AND MAINTENANCE OF THE TEMPORARY JUMPER CONNECTION AND ASSOCIATED BACK FLOW PREVENTION DEVICE, FITTINGS, VALVE, ETC., SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
5. WATER FOR TESTING AND DISINFECTION OF THE NEW WATER MAIN AND WATER FOR MAINTENANCE OR OTHER USES SHALL BE AT THE CONTRACTOR'S EXPENSE.



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

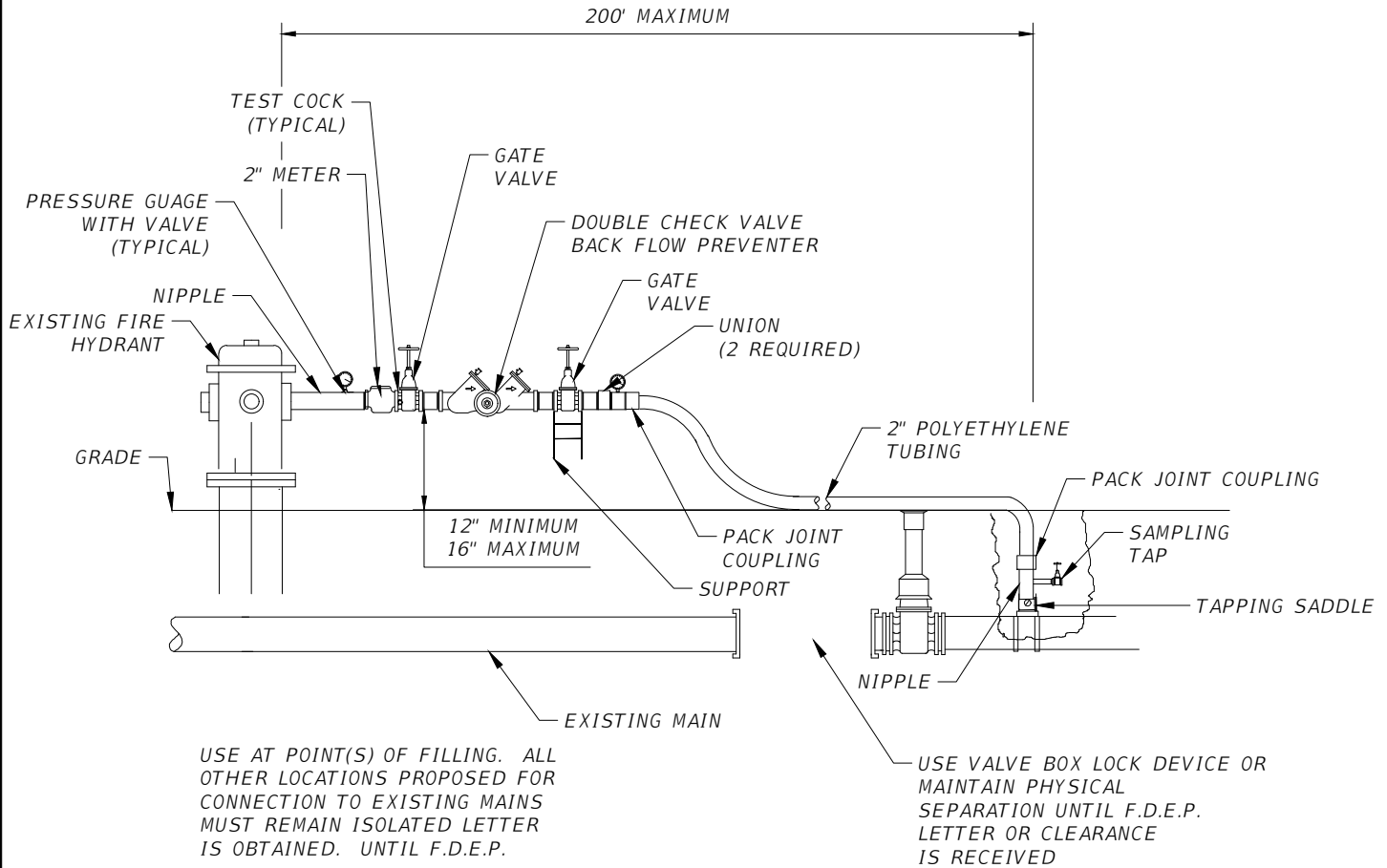
## TEMPORARY JUMPER CONNECTION

SECTION:  
WATER

W-30

REVISION DATE:  
DEC. 2020

NOTE: ALL PIPING AND APPURTENANCES TO BE 2" FOR 8" AND BELOW WATER MAINS; 4" FOR 12" WATER MAINS; 8" FOR 16" WATER MAINS; 12" FOR 24" WATER MAINS



#### NOTES

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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

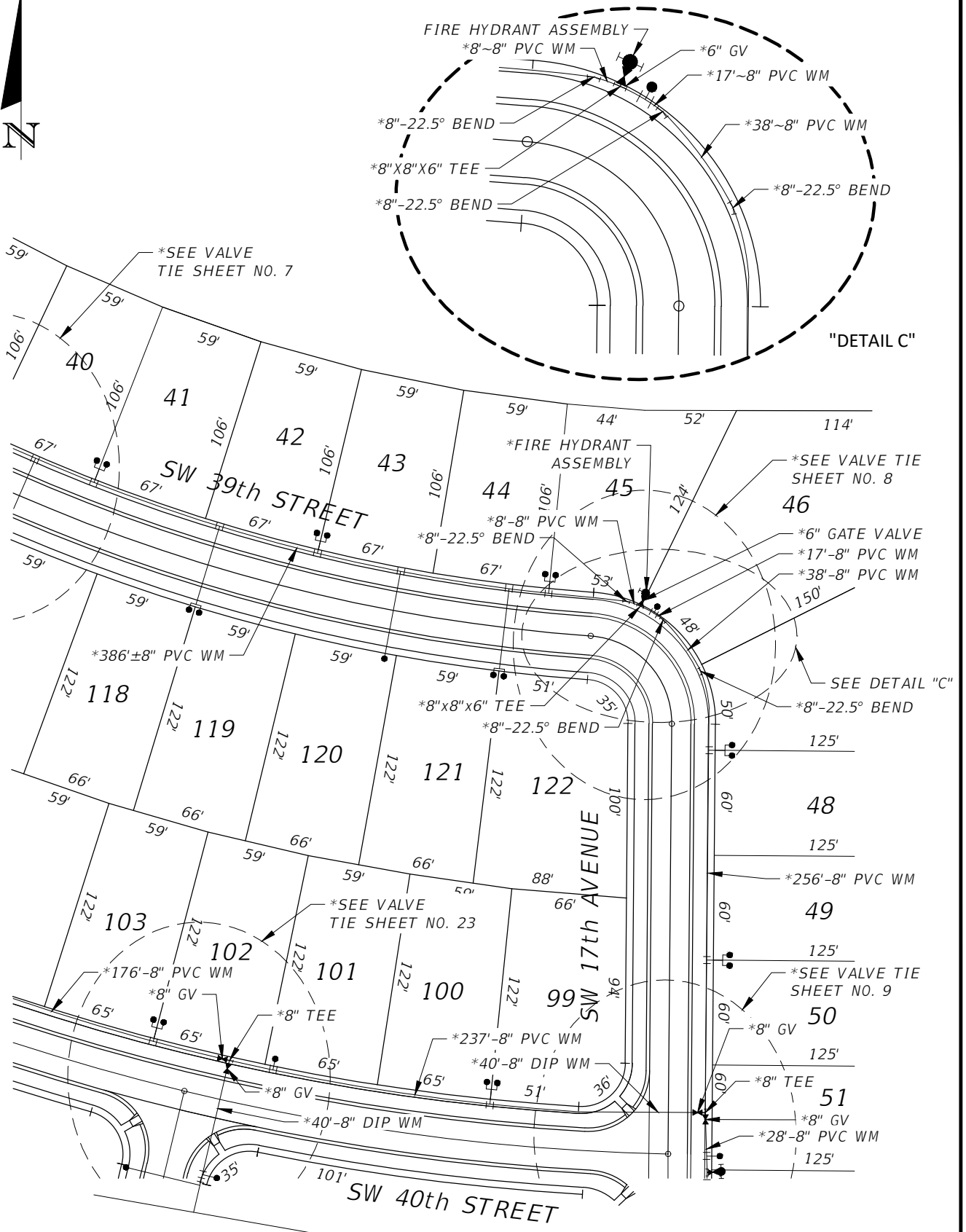
TEMPORARY JUMPER  
CONNECTION

WITH FIRE HYDRANT

SECTION:  
WATER

W-31

REVISION DATE:  
DEC. 2020



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CITY OF OCALA  
STANDARD DETAILS  
FOR CONSTRUCTION

## TYPICAL WATER ASBUILT DRAWING

SECTION:  
WATER

W-32

REVISION DATE:  
DEC. 2020