Standards and Specifications
Design Manual and Details

City of St. Augustine
Public Works Department

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STEPHEN LEE SLAUGHTER
LICENSE
No. 78389
STATE OF FLORIDA
PROFESSIONAL ENGINEER

TABLE OF CONTENTS

PAGE No.

PAGE No.

PAGE No.

PAGE No.

PAGE No.

PAGE No.

Note: ***Any and all use or reproduction of the Standard Details shall be in their entirety to include border, title block and CITY emblem.***

APPENDICES:

INTRODUCTION

APPLICATION

The standards and specifications set forth in this MANUAL shall apply to all new water and wastewater systems, both private and public, and to all alterations, modifications, retrofits, additions, or extensions to any new or existing water or wastewater system.

The standards and specifications set forth in this MANUAL constitute minimum requirements for the protection of the health and safety of the general public.

Nothing in this MANUAL shall be construed as repealing or superseding provisions of CITY ordinances and building codes when such provisions are not inferior to those set forth in this MANUAL.

The requirements established by this MANUAL are not intended to be discriminatory against materials, products, or construction techniques of demonstrated capabilities.

When field conditions dictate, or where good engineering practices indicate, appropriate variations of these standards which produce an equal or better end-product may be submitted to the CITY for review on a case by case basis. Any request for such a variation must be brought to the attention of the CITY and must be accompanied by supporting documentation and calculations.

This MANUAL shall not apply to utility systems owned and/or operated by the COUNTY.

PURPOSE

These standards and specifications are adopted to establish minimum acceptable standards for the design and construction of water distribution/transmission facilities and wastewater collection/transmission facilities that are to be dedicated to the CITY, or facilities that interconnect to utilities owned by the CITY. Such facilities include water mains, gravity sewer mains, wastewater force mains, wastewater pump stations, reuse mains and miscellaneous related appurtenances associated with such systems.

SECTION 10 - DEFINITIONS

10. 1 DEFINITIONS

Except where specific definitions are used within a specific section, the following terms, phrases, words, and their derivation shall have the meaning given herein when consistent with the context. Words used in the present tense include the future tense, words in the plural number include the singular number and words in the singular number include the plural number. The word "shall" is mandatory with the word "may" being permissive.

AASHTO - means American Association of State Highway and Transportation Officials. Any reference to AASHTO standards shall be taken to mean the most recently published revision unless otherwise specified.

ANSI - means American National Standards Institute. Any reference to ANSI standards shall be taken to mean the most recently published revision unless otherwise specified.

ASTM - means American Society for Testing Materials. Any reference to ASTM standards shall be taken to mean the most recently published revision unless otherwise specified.

AWWA - means American Water Works Association. Any reference to AWWA Standards shall be taken to mean the most recently published revision unless otherwise specified.

BUILDING CONTRACTOR - means the person, firm, corporation or group with whom the contract for work pertaining to the permitting and construction of building(s) has been made by the OWNER, the DEVELOPER, or the CITY, whichever is applicable.

CITY - means the City of St. Augustine, Florida, as governed by the St. Augustine City Commission, and/or its designated representative(s).

CITY UTILITY EASEMENT - means an easement which has been dedicated to the exclusive use of the CITY for the installation and maintenance of water, wastewater, reclaimed water facilities, and other CITY services and uses.

CODE - means the City of St. Augustine's Code of Ordinances, most recently adopted revision unless otherwise specified.

COMPREHENSIVE PLAN - means the City of St. Augustine Comprehensive Plan adopted by the St. Augustine City Commissioners. Any reference to the COMPREHENSIVE PLAN shall mean the most recently adopted version.

CONTRACTOR - means the person, firm, or corporation with whom the contract for work has been made by the OWNER, the DEVELOPER, or the CITY, whichever is applicable.

CONTRACTOR'S SURVEYOR - means a Professional Land Surveyor registered in Florida, pursuant to the provisions of Florida Statutes and Florida Administrative Code, who is competent in the field of land surveying, retained by the CONTRACTOR to provide professional surveying services for a project.

COUNTY - means St. Johns County, Florida, as governed by the St. Johns County Commission, and/or its designated representative(s).

DEVELOPER - means the person, firm, or corporation engaged in developing or improving real estate for use or occupancy.

DEVELOPER'S ENGINEER - means an engineer or engineering firm registered with the Florida Department of Business and Professional Regulation, retained by the DEVELOPER to provide professional engineering services for a project.

DEVELOPER'S SURVEYOR - means a Professional Land Surveyor registered in Florida, pursuant to the provisions of Florida Statutes and Florida Administrative Code, who is competent in the field of land surveying, retained by the DEVELOPER to provide professional surveying services for a project.

DIPRA - means Ductile Iron Pipe Research Association.

DIRECTOR - means the Director of Public Works for the City of St. Augustine, Florida, acting directly or through an assistant or other authorized representative.

DRAWINGS - means engineering drawings prepared by an ENGINEER to show the proposed construction.

ENGINEER - means a Professional Engineer registered in Florida, or other person exempted pursuant to the provisions of chapter 471, Florida Statutes, who is competent in the field of engineering.

FDEP - means the Florida Department of Environmental Protection.

FDOT - means the Florida Department of Transportation.

FORCE MAIN - means a conduit (pipe) that transports wastewater under pressure.

GEOTECHNICAL/SOILS ENGINEER - means a Registered Florida Engineer who provides services related to terrain evaluation and site selection, subsurface exploration and sampling, determination of soil and rock properties, foundation engineering, settlement and seepage analysis, design of earth and earth retaining structures, the design of subsurface drainage systems and the improvement of soil properties and foundation conditions, and testing and evaluation of construction materials.

LIFT STATION - means a facility (with pumps and all associated appurtenances) that collects and pumps wastewater from a collection system to a treatment facility.

MANUAL - means this City of St. Augustine's Standards and Specifications Design Manual and Details, latest edition.

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES - means the United States Department of Transportation's Manual on Traffic Control Devices, latest edition.

NEMA - means National Electrical Manufacturers Association. Any reference to NEMA Standards shall be taken to mean the most recently published revision unless otherwise specified.

NSF - means National Sanitation Test Laboratory Foundation. Any reference to NSF Standards shall be taken to mean the most recently published revision unless otherwise specified.

OFFSITE - means the rights-of-way, easements, and secondary real estate on which connective improvements for a development are placed.

ONSITE - means the primary real estate on which a development and its related improvements are placed.

OSHA - means the Federal Occupational Safety and Health Administration.

OWNER - means the person, firm, corporation, or governmental unit holding right of possession of the real estate upon which construction is to take place.

PLANS - means DRAWINGS as defined herein above.

POTABLE WATER - means water that has been treated, disinfected, and is suitable for drinking, culinary, and domestic purposes.

PRETREATMENT - means the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater to a treatable level, prior to or in lieu of discharging or otherwise introducing such pollutants into a wastewater system.

PUMP STATION - means LIFT STATION as defined herein above.

RAW WATER - means untreated water that has been obtained from a natural source.

RECLAIMED WATER - means water that has received at least secondary treatment, basic disinfection, and is reused after flowing out of a domestic wastewater treatment facility.

RIGHT-OF-WAY UTILIZATION REGULATIONS - means the City of St. Augustine's right-of-way utilization regulations.

SURVEYOR - means a Professional Land Surveyor registered in Florida, pursuant to the provisions of Florida Statutes and Florida Administrative Code, who is competent in the field of land surveying.

SJRWMD - means the St. Johns River Water Management District.

SPECIFICATIONS - means the specifications contained in this MANUAL.

STANDARD DETAILS - means the detailed drawings in Division 8 of this MANUAL.

STANDARD FDOT SPECIFICATIONS - means the Florida Department of Transportation's Standard Specifications for Road and Bridge Construction, latest edition.

TRAFFIC CONTROL AND SAFE PRACTICES MANUAL - means the Florida Department of Transportation's Manual on Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operation, latest edition.

UTILITIES DEPARTMENT - means the Utilities Department of the City of St. Augustine, Florida.

UTILITY ACCOMMODATION GUIDE - means the Florida Department of Transportation's Utility Accommodation Guide, latest edition.

WASTEWATER MAINS - means wastewater gravity sewers, force mains, pump stations, fittings, valves, service laterals, and miscellaneous related appurtenances.

WATER MAINS - means transmission mains, distribution mains, pipes, fittings, valves, hydrants, services, meters, and miscellaneous related appurtenances for potable, reclaimed, and raw water, as applicable.

WORK - means the labor, materials, equipment, supplies, services, and other items necessary for the execution, completion and fulfillment of the contract.

SECTION 11 – PLAN REVIEW, APPROVAL, PERMITTING AND ACCEPTANCE OF CONSTRUCTED IMPROVEMENTS

11. 1 GENERAL

Plan review, approval, permitting and acceptance of constructed improvements shall be in accordance with the written policies set forth by the CITY and all other applicable codes, rules and regulations that may apply. Contact the CITY Public Works Department for a copy of policies and/or refer to the CITY's website (www.citystaug.com) for more information.

In general, utility mains, manholes, extensions and connections shall be designed to be constructed in logical order. The DEVELOPER'S ENGINEER shall consider proper sequencing of construction and shall design utility mains, manholes, extensions or connections in such a manner that utility operations or normal and common construction practices would not depend on a future project phase, segmentation or portion thereof. All project phases must either be designed to operate wholly independent of other phases, or, be designed so that phases are constructed successively in logical and alphanumeric order with utility service delivered through previously installed and operational phases. Designs that require or direct utilities to be built out of order or outside of a respective project phase shall be rejected by the CITY. Should the project phasing or construction sequencing change at any time during the project, a design modification will be required by the CITY to meet the objectives of this section. Any resultant delays or costs will not be the responsibility of the CITY. The CITY will not accept utilities that do not meet CITY standards and specifications.

SECTION 20 – WATER SYSTEM DESIGN CRITERIA

20. 1 GENERAL

20. 1. 1 APPROVAL

The CITY will approve PLANS for water supply mains and extensions only when such mains are designed and constructed in accordance with the criteria set forth in this MANUAL.

The CITY maintains the right to select the size, type, routing, location and design of all mains, valves, taps, meters, backflow preventers, and any other water appurtenances being added to the CITY utility systems. New utilities or utility upgrades that are to be owned and maintained by the CITY must be constructed in open and improved public rights-of-way or easements. Physical conditions and criteria either proposed or existing of the rights-of-way or easements must meet the DIRECTOR's approval for the CITY's ability to effectively and efficiently maintain the dedicated utilities.

20. 1. 2 DESIGN PERIOD

Water mains should be designed for the estimated ultimate tributary population, as delineated in the approved City of St. Augustine Comprehensive Plan (latest edition). Water systems shall be designed to satisfy the domestic water demand and fire protection requirements for the area.

20. 1. 3 LOCATION

Water mains shall be located within dedicated rights-of-way, alleys or tracts with sufficient width and positioned within such areas to allow ample working room as determined by the CITY. If such areas are not public, then a CITY UTILITY EASEMENT shall be provided over said areas. In rare cases where design inside such areas is not possible, a minimum of a twenty (20) foot wide CITY UTILITY EASEMENT shall be provided and only as approved in advance by the CITY. Additional easement widths shall be provided if the pipe size or depth of cover so dictates. In general, the additional width of the easement shall be calculated by adding fifteen (15) feet to the facility's greatest depth and rounding up to the nearest even whole foot. All rights-of-way, alleys, tracts and utility easements shall be improved and maintained to provide continuous access. No utility mains shall be constructed in any unimproved area. At a minimum, improvements may include but are not limited to complete clearing, fencing and signage, grading and stabilization, seed or sod as directed by the CITY.

No water mains shall be placed under buildings, retention ponds, recreation courts, swimming pools, or other structures. Ample clear space between mains and such

improvements shall be provided as determined by the CITY. This criteria shall also apply to placement of mains close to retention pond embankment or berms. Mains shall not be located within side or rear lot lines. In general, air release valves and other valves shall not be placed on lot lines.

20. 1. 4 DESIGN PLAN REQUIREMENTS

All submitted plans shall be standard sheet size 24" x 36" with project ENGINEER's title block. Alternately, sheet size 11" x 17" may be approved in advance by the CITY on a case by case basis. Graphic bar scale(s) shall be provided on each plan sheet and all lettering shall be 1/8" height or larger. The plans shall be drawn at readable scale(s) so as to clearly depict existing and proposed features, notes and labels. Plans that are not legible will not be accepted. All plan sheets and the title page of submitted specifications must be signed, sealed and dated by the project ENGINEER.

All plans submitted shall be a complete "set" including Cover page, Note page(s) and Detail sheet(s), in addition to the sheets depicting project construction. The plan set shall be numbered sequentially using a logical scheme and sheets shall be arranged in logical order. The complete sheet list with page numbers and titles shall be shown on the Cover page. The CITY will review complete plan sets, regardless of governing authority, so as to ensure compliance with utility standards on other design features. Sheets may not be left out or removed from CITY submittals unless specifically approved or requested otherwise in advance by the CITY. Design shall be separated as needed on different plan sheets so as to clearly depict design and construction, existing and proposed features, labels and notes, and prevent overcrowding of plans. Plans that are not legible will not be accepted. The surveyed elevation datum on which the design is based shall be clearly displayed on all plan sheets depicting elevation numbers.

A Master Utility Plan will be required when the project site is broken up onto multiple sheets. The entire water, wastewater, stormwater, and/or reuse systems shall be shown on a single Master Utility Plan. The Master Utility Plan shall indicate the general locations of all water, sewer, storm and reuse mains, manholes, hydrants and lift stations with respect to the proposed development improvements and any existing utility systems being connected to. Main sizes shall be indicated on the Master Utility Plan. The Master Utility Plan shall be prepared at a legible scale. The scale shall be selected such that all items on the plan are clearly legible. Master Utility Plans that are not legible will not be accepted.

Plan and profiles shall be required on all underground utility designs. All gravity sewers, wastewater force mains, stormwater sewers, water mains, and reclaimed water mains shall be drawn in plan at a scale not to exceed 1"=40' and profile at 1"=4' on the same sheet. On-site water mains may be shown in plan view only. Where on-site water, reuse mains or force mains cross other utilities, the main shall be shown in the profile for 20 feet either side of the crossing. Off-site water main designs require plan and profiles. A graphical representation or "key map" of the plan sheet for location identification on the

overall project site is preferred. At minimum, the plan and profiles shall include the following information:

- General information such as north arrow, graphic scale(s) and legend.
- Profile with elevations at 100-foot intervals, or more frequently if warranted by good design practices.
- Project layout with horizontal and vertical controls.
- All conflicts with other utility systems.
- Clearance distances from outside of pipe to outside of pipe at all utility crossings.
- All manhole locations and rim elevations.
- Pipe data including size, lengths, material and slopes.
- Size, type, and locations of all fittings, valves, hydrants, and other related appurtenances.
- Limits of special coatings, materials or bedding requirements.
- Pipe restraint requirements.
- Details of connections to existing systems.
- Location(s) and general layout of wastewater pumping stations.
- Construction notes regarding cover, horizontal and vertical control, special construction requirements, and references to standard and special details.
- Existing and proposed street names, lot numbers, and other location features.

For all horizontal directional drilling (HDD), plan and profiles (horizontal and vertical alignment) of the proposed bore path at a scale not larger than 1:20 horizontal and 1:2 vertical shall be provided in the design plan set. The proposed bore path shall be shown along established surface survey baseline stationing that is tied to existing, fixed and visible sight features. The survey baseline shall be on Vertical Datum NAVD88 and Horizontal Datum NAD 83 State Plane Florida East Coordinate System (US Feet) and coordinates shall be shown on the plans. In addition to other Plan and Profile requirements listed above in this Section, the HDD plan and profiles shall, at a minimum, provide the following:

- Comprehensive, realistic design based on actual conditions for the particular HDD project.
- Document thoughtful planning required to successfully complete the HDD project.
- Identify real and potential obstructions along bore path design line and grade.
- Minimum and maximum bore path elevations.
- Entry and exit pits, at realistic size and to scale.
- Tie-in/connection(s) to existing systems.

20. 2 DESIGN BASIS

20. 2. 1 AVERAGE DAILY FLOW AND PEAK FLOWS

Average daily water flow shall be calculated by CITY approved methods. Maximum daily and peak hourly water flow rates shall be calculated by CITY approved peaking factors. Average daily demand shall be calculated by referencing the flow factors

outlined in the CITY CODE. AWWA Standards and FDEP rules shall be followed where applicable.

20. 2. 2 FIRE FLOW REQUIREMENTS

DEVELOPER's ENGINEER shall submit signed, sealed and dated fire flow design calculations with the PLANS. Fire flow requirements shall be a minimum of 1,000 gallons per minute for single family and duplex residential areas and 1,500 gallons per minute for nonresidential and multiple family residential area. Where fire flow requirements exceed the anticipated available fire flow from the central water system, on-site fire protection system, or other Fire Department approved mitigation measures shall be utilized.

20. 2. 3 WATER SYSTEM DESIGN CALCULATIONS

DEVELOPER's ENGINEER shall submit signed, sealed and dated water system design calculations with the PLANS. Calculation shall show the water mains will have sufficient hydraulic capacity to transport peak hourly flows and the combination of maximum daily flows and fire flows while meeting the requirements of Section 20.3.1 of this MANUAL. Head losses through meters and backflow devices shall also be included in calculations.

20. 3 DESIGN AND CONSTRUCTION

20. 3. 1 PRESSURE

All water mains shall be designed in accordance with Section 20.2.3 above. A minimum pressure of 20 psi at all points shall be maintained in the distribution system under all conditions of flow. Higher pressures may be required at commercial, industrial, and high density residential areas. The normal working pressure in the distribution system should be approximately 60 psi, but in no case less than 35 psi on the downstream side of a meter. For pressures greater than 90 psi, special provisions may be required. Design Friction Losses for water mains shall be as specified in Section 22.3.2 of this MANUAL.

20. 3. 2 DIAMETER

Four (4) inch water mains shall be permitted only in cul-de-sacs with a maximum length of 500 feet of pipe, and only where fire protection is not needed. In cul-de-sacs, the water main shall be looped to prevent dead ends.

As a minimum, six (6) inch looped systems shall be required in single family and duplex residential areas. Where the looping of mains back to existing CITY facilities is not practical, a minimum of an eight (8) inch main shall be required, unless detailed calculations are submitted to substantiate the sufficiency of the smaller main, and as approved by the DIRECTOR.

In nonresidential and multi-family residential areas, a minimum of an eight (8) inch looped main shall be required. Where the looping of mains back to existing CITY facilities is not practical, a minimum of a ten (10) inch main shall be required, unless detailed calculations are submitted to substantiate the sufficiency of the smaller main, and as approved by the DIRECTOR.

Larger size mains shall be required if necessary to allow the withdrawal of the required flow while maintaining the minimum residual pressure specified in Section 20.3.1 of this MANUAL.

20. 3. 3 FIRE HYDRANT LOCATION AND SPACING

For hydrants located within CITY limits, the maximum actual travel distance between hydrants in single family and duplex residential areas shall be five hundred (500) feet. The maximum actual travel distance between hydrants in non-residential and multi-family residential areas shall be five hundred (500) feet. Hydrants specifications shall be as shown in the STANDARD DETAILS.

For hydrants located within COUNTY limits, applicable standards and specifications of the COUNTY Utility Department shall apply.

20. 3. 4 DEAD ENDS

In order to provide increased reliability of service and reduce head loss, dead ends shall be minimized by making appropriate tie-ins whenever practical, as determined by the CITY. Mains in cul-de-sacs shall be looped in accordance with Section 20.3.2.

Where dead-end mains are permitted, they shall be provided with a fire hydrant or with an approved flushing hydrant or blow-off for flushing purposes, as determined by the CITY. Flushing devices shall be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. No flushing device shall be directly connected to any sanitary or storm sewer.

Dead-end mains for future expansion will require a plan to verify and support sizing of the water main.

20. 3. 5 VALVES

Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves shall be located at not more than 500 foot intervals in non-residential and multi-family residential areas and not more than 800 foot intervals in all other areas. Appropriate valving shall also be provided at all areas where water mains intersect to ensure effective isolation of water lines for repair, maintenance or future extension. As a minimum, valves shall be placed on at least two of the three legs of a tee or three of the four legs of a cross.

20. 3. 6 SEPARATION OF WATER MAINS AND SEWERS

Refer to Section 41.3 of this MANUAL for applicable requirements. No water pipe shall pass through or come in contact with any part of a sanitary or storm sewer manhole.

Extreme caution should be exercised when locating water mains at or near certain sites such as sewage treatment plants or industrial complexes. Individual septic tanks must be located and avoided.

Separation standards (latest edition) as set forth by the Florida Department of Environmental Protection Chapter 62-555 (Permitting, Construction, Operation and Maintenance of Public Water Systems) shall be complied with.

20. 3. 7 SURFACE WATER CROSSINGS

The CITY shall be consulted before PLANS are prepared. Requirements outlined in Sections 22.3.6 and 22.3.7 shall apply. All above ground pipe shall be painted as specified in Section 40.4.4 for water mains.

20. 3. 8 AIR RELIEF VALVES

At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of hydrants or automatic air relief valves, as determined by the CITY. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur. See specifications in STANDARD DETAILS.

20. 3. 9 CHAMBER DRAINAGE

Chambers, boxes, pits, or manholes containing air relief valves, blow-offs, meters, or other appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer. Blow-offs or air relief valves shall not be connected directly to any sewer.

20. 3. 10 EXISTING WATER MAIN CONNECTIONS TO BE REUSED

Existing water main connections intended to be reused shall be investigated by the utility contractor. The utility contractor is responsible for repairs and/or replacement as directed by the City Inspector. The repair or replacement of water meter yoke, water meter box/lid, back flow preventer, service tap or any other appurtenances required for service repair shall be installed by the contractor at no additional cost to the City. All lead fittings encountered during utility construction or repair shall be replaced with no exception.

20. 3. 11 EXISTING WATER MAIN CONNECTIONS TO BE ABANDONED

Existing water main connections that will no longer be utilized must be abandoned as part of the new utility construction. The utility contractor is required to visually verify the location of all known existing utility connections. The utility contractor will identify any unknown utility connections found during construction and notify the City Inspector and Engineer of Record within 24 hours.

Abandonment of existing utilities no longer in use shall be at the direction of the City Inspector or City Engineer. All service saddles and direct taps shall be removed and repair shall be with approved stainless steel full circle wraparound clamp. At no time shall saddles or direct taps be plugged. All service connection tees shall be plugged with blank mechanical plug.

20. 4 WATER SERVICES AND CONNECTIONS

Water services and connections shall conform to this Section, the applicable provisions of Sections 40 and 41 and the STANDARD DETAILS. Services shall be minimum of one (1) inch in diameter. Water services and connections shall be made to an existing CITY water main by the CONTRACTOR after approval by the CITY and after payment of all applicable fees and charges. All taps and connections shall be inspected by the CITY. The CONTRACTOR shall be responsible for all costs related to the installation and the restoration of all disturbed public and private improvements to CITY standards.

20. 5 WATER METERING

20. 5. 1 GENERAL

All water service connections shall be metered. All new and retrofit meters shall be furnished by the CITY, no exceptions. In general, the method of metering will follow the guidelines listed below. However, the DEVELOPER'S ENGINEER must obtain approval from the CITY before finalizing the design of the metering system. All meters subject to vehicular traffic shall be installed in a traffic rated meter box. Unless approved by the DIRECTOR, meter boxes shall not be installed in sidewalks or driveways.

20. 5. 2 SINGLE FAMILY, DUPLEX, AND MULTI-FAMILY SUBDIVISIONS WITH PUBLIC RIGHTS OF WAY

For single family and duplex subdivisions, each unit shall be individually metered. Meters shall be installed 1 foot maximum from the property line within the right-of-way in individual single meter boxes as indicated by the STANDARD DETAILS.

For multi-family subdivisions, each unit shall be individually metered. A meter bank for each building containing the meters for the individual units in the building shall be installed 1 foot maximum from the property line within the right-of-way. For meter

banks with connection located two feet or greater in elevation below finished grade, high-density polyethylene (HDPE) tubing in accordance with Section 40.5 shall be used to connect the meters to the service pipe (preferred). For meter banks with connection located less than two feet in elevation below finished grade, Polyvinyl chloride (PVC) and brass fittings in accordance with Section 40.5 may be approved by the DIRECTOR on a case by case basis only.

20. 5. 3 SINGLE FAMILY AND DUPLEX SUBDIVISIONS WITH PRIVATE STREETS

Individual meters may be permitted in accordance with Section 20.5.2 if the private streets are designed to CITY standards and easements are dedicated over the entire private street common areas. In addition, sufficient area must be available outside of paved areas to locate water mains, services, and meters.

20. 5. 4 COMMERCIAL, INDUSTRIAL, AND INSTITUTIONAL PROJECTS WITHOUT PRIVATE FIRE LINES

Buildings shall be individually metered when adjacent to a public right-of-way. Meter(s) shall be located in the public rights-of-way 1 foot maximum from the property line.

20. 5. 5 COMMERCIAL, INDUSTRIAL, INSTITUTIONAL, MULTI-FAMILY WITH PRIVATE STREETS, APARTMENTS, AND CONDOMINIUM PROJECTS WITH PRIVATE FIRE LINES

In general, all such projects shall require installation of a fire line master meter. A combination meter with a fire flow bypass and double check valve assembly, as a minimum, shall be required as determined by the CITY. Where on-site fire systems contain less than 250 feet of main, a dual system (separate domestic and fire lines) may be considered. Dual systems shall require a double check backflow prevention device, with a leak detector, on the fire line. Meters shall be located in the public rights-of-way 1 foot from the property line.

In some cases where the utility mains cannot be designed to CITY standards, and the CITY is not able to own the utility mains, individual meters may be permitted with only ingress and egress easements over the entire private street common area and a 5’x5’ to 10’x10’ (depending on the meter size) restoration easement around the individual meter. Utility mains within private property in such instances will remain private.

20. 5. 6 SHOPPING CENTERS

In general, shopping centers and associated outparcels shall require installation of a fire line master meter to service the entire development. In extreme cases, individual meters to each unit may be considered on a case-by-case basis subject to the DEVELOPER providing a CITY UTILITY EASEMENT over and across meters, and including access.

20. 5. 7 METER INSTALLATION

All meters shall be installed by the CITY and in accordance with the STANDARD DETAILS. In general, meters three inches or larger shall be located in a CITY UTILITY EASEMENT located adjacent to but outside of the public right-of-way.

The DEVELOPER'S ENGINEER shall coordinate the location of each water service line and meter so as to avoid conflicts or potentially dangerous situations with electrical transformers or street light installations. Electrical transformers shall not be located over water service lines.

20. 5. 8 METER SIZING

The size of all meters shall be recommended by the DEVELOPER'S ENGINEER and approved by the DIRECTOR. The DEVELOPER'S ENGINEER shall provide sufficient information, when requested by the DIRECTOR, on estimated peak flows and low flows. The meter size can be verified using to the chart below. The DEVELOPER'S ENGINEER shall include head losses through the metering device when designing the water system.

CUSTOMER WATER METER SIZE REQUIRMENTS	
Water Meter Size Inches	Max Operating Capacity GPM
3/4	up to 25
1	26 to 50
2	51 to 160
3	161 to 435
4	436 to 750
6	751 to 1,600
8	1,601 to 2,800
10	2,801 to 4,200
12	4,201 to 5,300
* AWWA C7001-07	

20. 6 MATERIAL, INSTALLATION, AND TESTING

Applicable provisions of Divisions 3, 4, and 5 shall apply. Sampling points shall be shown on the PLANS.

20. 7 LOCATION AND IDENTIFICATION

All lettering shall be legible and colors correct for the intended use. Refer to Section 41.9 of this MANUAL.

SECTION 21 – GRAVITY SEWER DESIGN CRITERIA

21. 1 GENERAL

21. 1. 1 TYPE OF SEWERS

The CITY will approve PLANS for new sewer systems and extensions only when designed as separate systems in which precipitation, runoff, and groundwater are prevented from entering the system.

The CITY maintains the right to select the size, type, routing, location and design of all manholes, gravity sewers, force mains pump stations and any other components being added to the CITY utility systems. New utilities or utility upgrades that are to be owned and maintained by the CITY must be constructed in open and improved public rights-of-way or easements. Physical conditions and criteria either proposed or existing of the rights-of-way or easements must meet the DIRECTOR's approval for the CITY's ability to effectively and efficiently maintain the dedicated utilities.

21. 1. 2 DESIGN PERIOD

Sewer systems should be designed for the estimated ultimate tributary population, as delineated in the approved City of St. Augustine Comprehensive Plan (latest edition).

21. 1. 3 LOCATION

Gravity sewer mains shall be located within dedicated rights-of-way, alleys or tracts with sufficient width and positioned within such areas to allow ample working room as determined by the CITY. If such areas are not public, then a CITY UTILITY EASEMENT shall be provided over said areas. In rare cases where design inside such areas is not possible, a minimum of a twenty (20) foot wide CITY UTILITY EASEMENT shall be provided and only as approved in advance by the CITY. Additional easement widths shall be provided if the pipe size or depth of cover so dictates. In general, the additional width of the easement shall be calculated by adding fifteen (15) feet to the facility's greatest depth and rounding up to the nearest even whole foot. All rights-of-way, alleys, tracts and utility easements shall be improved and maintained to provide continuous access. No utility mains shall be constructed in any unimproved area. At a minimum, improvements may include but are not limited to complete clearing, fencing and signage, grading and stabilization, seed or sod as directed by the CITY.

No sewer mains shall be placed under buildings, retention ponds, recreation courts, swimming pools, or other structures. Ample clear space between mains and such improvements shall be provided as determined by the CITY. Mains shall not be located within side or rear lot lines. In general, manholes shall not be placed on lot lines.

21. 2 DESIGN BASIS

21. 2. 1 AVERAGE DAILY FLOW

The gravity sewer design shall be based on full ultimate development as known or projected. Average daily flow shall be calculated by CITY approved methods. Maximum daily and peak hourly flow rates shall be calculated by CITY approved peaking factors. The DEVELOPER'S ENGINEER shall check with the CITY Engineering Manager for current, approved Daily Flows.

21. 2. 2 PEAK DESIGN FLOW

Gravity sewers shall be designed on the basis of ultimate development maximum rates of flow, which shall be the product of selected peak factors times the accumulative average daily flow as calculated above. In general, the following minimum peak factors shall be applicable for the range of average daily flow rates.

FLOW RANGE	MINIMUM PEAK FACTOR
Flows to 100,000 GPD	4.0
100,000 GPD to 250,000 GPD	3.5
250,000 GPD to 1,000,000 GPD	3.0
Flows greater than 1,000,000 GPD	2.5

For design average daily flows above 2,000,000 GPD, peaking factors less than 2.5 may be considered if substantiated by extensive data. Under no circumstances shall peaking factors less than 2.0 be allowed.

21. 2. 3 SEWER SYSTEM DESIGN CALCULATIONS

DEVELOPER'S ENGINEER shall submit signed, sealed, and dated design calculations with the PLANS for all sewer projects. Calculations shall show that sewers will have sufficient hydraulic capacity to transport all design flows.

21. 3 DESIGN AND CONSTRUCTION

21. 3. 1 MINIMUM SIZE

Gravity sewer mains conveying wastewater shall not be less than 8 inches in diameter.

21. 3. 2 MINIMUM COVER

The minimum cover over gravity sewers shall be no less than three and a half (3.5) feet measured from the top of pipe to finished grade with the minimum invert depth being

4.17 feet below finish grade for a eight (8) inch in diameter main, unless otherwise approved by the DIRECTOR.

The maximum manhole depth shall be fourteen (14) feet below finished grade, unless otherwise approved by the DIRECTOR on a case by case basis.

21. 3. 3 SLOPE

All sewers shall be designed and constructed to give minimum velocities, when flowing full, of not less than two feet per second, and a maximum of eight feet per second. Velocity calculations shall be based on Manning's formula using an "n" value of 0.012 for PVC and 0.013 for other pipe materials. Minimum slopes shall be as specified in the table below:

MINIMUM SLOPE FOR GRAVITY SEWER	
SEWER SIZE (Inches)	**MINIMUM SLOPE (Feet per 100 feet of pipe)**
8	0.400
10	0.280
12	0.220
15	0.150
18	0.120
21	0.110
24	0.080
27	0.067
30	0.058
36	0.046

Gravity sewer mains shall be installed with uniform slopes between manholes. A 0.1 feet drop will also be required in a manhole between the incoming and outgoing sewer.

21. 3. 4 SIZE AND ALIGNMENTS

Size conversion between manholes shall not be allowed. All sewers shall be laid with straight alignments between manholes.

21. 3. 5 EXISTING GRAVITY SEWER CONNECTIONS TO BE REUSED

Existing gravity sewer connections intended to be reused shall be investigated by the utility contractor. Excavation and/or closed-circuit tv inspection of gravity sewer main may be required as directed by City Inspector. The utility contractor is responsible for repairs and/or replacement as directed by the City Inspector. The repair shall include

washing, repairing or replacing any damaged sewer service lateral, point of connection cleanout replacement or any other appurtenances required for gravity sewer service. Service laterals shall meet all current city standard for gravity sewer laterals. Repair shall be installed by the contractor at no additional cost to the City.

21. 3. 6 EXISTING GRAVITY SEWER CONNECTIONS TO BE ABANDONED

Existing gravity sewer connections that will no longer be utilized must be abandoned as part of the new utility construction. The utility contractor is required to visually verify the location of all known existing sewer service connections. The utility contractor will identify any unknown utility connections found during construction and notify the City Inspector and Engineer of Record within 24 hours.

Abandonment of existing gravity sewer service connections no longer in use shall be abandoned at the direction of the City Inspector or City Engineer. All gravity sewer service laterals to be abandoned shall be removed and/or plugged before the sewer service lateral reaches the gravity sewer main. The abandoned service lateral shall be grout filled with a minimum three foot section of grout in pipe or as directed by City Inspector of City Engineer.

21. 3. 7 ADDITIONAL REQUIREMENTS

Main drain and back wash systems for pools and spas, air conditioning condensate discharge, and storm drain systems shall not connect to the gravity sewer system, unless a discharge permit is obtained from the CITY.

In general, all sewer extensions for future connections shall terminate at a manhole. The CITY may allow such extensions without a terminal manhole on a case by case basis subject to all of the following conditions:

1. Total sewer extension length shall be limited to 50 feet.
2. Sewer extension location at the initiating manhole shall be plugged to the satisfaction of the CITY.
3. Such sewer extensions shall not be a part of the accepted sewer facilities. This shall be clearly delineated on the PLANS.
4. All such sewer extensions shall be inspected and accepted as part of the future construction phase.

21. 4 MANHOLES

21. 4. 1 LOCATION

Manholes shall be installed at the end of each gravity sewer pipe run, all changes in grade, size, or alignment, and all sewer intersections. Mains with diameters between 8 and 15 inches shall have a manhole spacing not exceeding three hundred (300) feet. Diameters of 18 to 24 inches shall have manholes spaced not more than four hundred

(400) feet apart. For mains larger than 24 inches in diameter, the manhole spacing shall be approved by the DIRECTOR.

Private sewer systems must be separated from the CITY sewer system by a manhole located at the right-of-way line.

21. 4. 2 DROP MANHOLE

An outside drop pipe shall be provided for a sewer entering a manhole where its invert elevation is 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer invert and the manhole invert is less than 24 inches, the manhole invert shall be filleted or benched to prevent solids deposition.

21. 4. 3 DIAMETER

For mains 21 inches in diameter and smaller, the minimum inside diameter of manholes shall be 48 inches. For mains between 24 inches and 36 inches, the minimum inside diameter shall be 60 inches. For mains larger than 36 inches in diameter, a 72 inch inside diameter manhole shall be provided.

A minimum access opening diameter of 30 inches shall be provided. Minimum access cover diameter shall be 36 inches. See STANDARD DETAILS.

The minimum and maximum vertical distance between the top of the manhole cover and the inside top of the manhole structure shall be according to the STANDARD DETAILS.

21. 4. 4 FLOW CHANNEL

The flow channel through manholes shall be made to conform in shape and slope to that of the sewers. Flow direction changes in excess of 90 degrees shall not be included in sewer alignments without special consideration. When directional changes exceeding 45 degrees occur, an additional flow line elevation drop of 0.1 foot across manholes shall be provided. Benching shall be provided which shall have a minimum slope of 2 inches per foot.

21. 4. 5 MATERIALS

Manholes shall be constructed of precast units as specified in Section 52. Manhole coatings shall be according to Section 52.2.2. Brick manholes shall not be permitted. Cast-in-place manholes may be accepted on a case by case basis for conflict resolution.

21. 4. 6 CASTINGS

Cast iron frames and covers shall be as specified in Section 52.3. Bolt down and/or gasketed covers shall be provided where manholes are located in areas subject to ponding

or flooding.

21. 4. 7 ACCESS

A ten (10) foot wide access road shall be provided for all manholes which are located outside of the CITY's roadways. The top 8 inches of the access road shall be stabilized to a Florida Bearing value of 50 psi and compacted to 95 percent of AASHTO T-180. Special consideration may be given when conflicts with required landscaping occurs.

21. 5 SERVICE AND LATERAL CONNECTIONS

21. 5. 1 GENERAL

Service connection shall be through a gravity sewer lateral, and miscellaneous appurtenances, as shown on the STANDARD DETAILS. Laterals not requiring the open cutting of a roadway or driveway shall be made to an existing CITY sanitary sewer system by the CITY only after approval by the CITY and after payment of all applicable fees and charges, unless the CITY instructs the CONTRACTOR to do so. All taps and connections shall be inspected by the CITY. Laterals to new and existing sanitary sewer systems for structures within new subdivisions, non-residential uses, multi-family residential improvements, and those installations which require the open cutting of a roadway or driveway shall be made by the CONTRACTOR and inspected by the CITY. The CONTRACTOR shall be responsible for all costs related to the lateral installation and the restoration of all disturbed public and private improvements to CITY standards.

21. 5. 2 SIZE AND LENGTH

Laterals and fittings shall be a minimum of six (6) inches in diameter. Services and fittings shall be a minimum of six (6) inches in diameter for single family residential installations and six (6) inches in diameter for all other installations. Single laterals only shall be allowed.

All laterals shall extend from the sewer main to one (1) foot outside the right-of-way terminating with a two-way cleanout to be installed one (1) foot outside the right-of-way by the CONTRACTOR. Payment to the CITY for the right-of-way cleanout shall be made by the OWNER as part of the sewer service connection fee. The right-of-way cleanout shall be maintained by the OWNER. See STANDARD DETAILS.

In addition to the right-of-way cleanout, a cleanout at each building shall be installed by the BUILDING CONTRACTOR. See STANDARD DETAILS.

21. 5. 3 SLOPE

Laterals shall have a minimum slope of one (1) percent.

21. 5. 4 CONNECTION

Laterals shall not be allowed to discharge into sanitary manholes.

21. 6 GREASE TRAPS, INTERCEPTORS, SEPARATORS

This section pertains to facilities as defined in Chapter 26 of the CITY CODE and the CITY's Fats, Oils and Grease (FOG) Program discharging to the CITY wastewater system. All food preparation and service establishments shall be required to install an approved grease trap or grease interceptor. All wastewater flow from the food preparation areas of these establishments must flow through the approved grease trap or grease interceptor prior to entering the CITY system. Any automobile related facility shall be required to install an approved oil/water separator. All grease traps, grease interceptors and oil/water separators shall be designed, constructed, maintained and monitored according to the provisions as set forth in the CITY CODE Chapter 26, Article IV and the CITY's Fats, Oils and Grease (FOG) Program.

21. 7 MATERIALS, INSTALLATION, AND TESTING

Applicable provisions of Divisions 3, 4, and 5 shall apply.

21. 8 LOCATION AND IDENTIFICATION

All lettering shall be legible and colors correct for the intended use. Refer to Section 53.7 of this MANUAL.

SECTION 22 – FORCE MAIN DESIGN CRITERIA

22. 1 GENERAL

22. 1 .1 DESIGN PERIOD

Force main systems shall be designed for the estimated ultimate tributary population, as delineated in the approved City of St. Augustine Comprehensive Plan (latest edition).

The CITY maintains the right to select the size, type, routing, location and design of force mains and pump station components being added to the CITY utility systems. New utilities or utility upgrades that are to be owned and maintained by the CITY must be constructed in open and improved public rights-of-way or easements. Physical conditions and criteria either proposed or existing of the rights-of-way or easements must meet the DIRECTOR's approval for the CITY's ability to effectively and efficiently maintain the dedicated utilities.

22. 1. 2 LOCATION

Force mains shall be located within dedicated rights-of-way, alleys or tracts with sufficient width and positioned within such areas to allow ample working room as determined by the CITY. If such areas are not public, then a CITY UTILITY EASEMENT shall be provided over said areas. In rare cases where design inside such areas is not possible, a minimum of a twenty (20) foot wide CITY UTILITY EASEMENT shall be provided and only as approved in advance by the CITY. Additional easement widths shall be provided if the pipe size or depth of cover so dictates. In general, the additional width of the easement shall be calculated by adding fifteen (15) feet to the facility's greatest depth and rounding up to the nearest even whole foot. All rights-of-way, alleys, tracts and utility easements shall be improved and maintained to provide continuous access. No utility mains shall be constructed in any unimproved area. At a minimum, improvements may include but are not limited to complete clearing, fencing and signage, grading and stabilization, seed or sod as directed by the CITY.

No force mains shall be placed under buildings, retention ponds, recreation courts, swimming pools, or other structures. Ample clear space between mains and such improvements shall be provided as determined by the CITY. Mains shall not be located within side or rear lot lines. This criteria shall also apply to placement of mains close to retention pond embankment or berms. In general, air release valves and other valves shall not be placed on lot lines.

22. 1. 3 DESIGN PLAN REQUIREMENTS

All submitted plans shall be standard sheet size 24" x 36" with project ENGINEER's title

block. Alternately, sheet size 11" x 17" may be approved in advance by the CITY on a case by case basis. Graphic bar scale(s) shall be provided on each plan sheet and all lettering shall be 1/8" height or larger. The plans shall be drawn at readable scale(s) so as to clearly depict existing and proposed features, notes and labels. Plans that are not legible will not be accepted. All plan sheets and the title page of submitted specifications must be signed, sealed and dated by the project ENGINEER.

All plans submitted shall be a complete "set" including Cover page, Note page(s) and Detail sheet(s), in addition to the sheets depicting project construction. The plan set shall be numbered sequentially using a logical scheme and sheets shall be arranged in logical order. The complete sheet list with page numbers and titles shall be shown on the Cover page. The CITY will review complete plan sets, regardless of governing authority, so as to ensure compliance with utility standards on other design features. Sheets may not be left out or removed from CITY submittals unless specifically approved or requested otherwise in advance by the CITY. Design shall be separated as needed on different plan sheets so as to clearly depict design and construction, existing and proposed features, labels and notes, and prevent overcrowding of plans. Plans that are not legible will not be accepted. The surveyed elevation datum on which the design is based shall be clearly displayed on all plan sheets depicting elevation numbers.

A Master Utility Plan will be required when the project site is broken up onto multiple sheets. The entire water, wastewater, stormwater, and/or reuse systems shall be shown on a single Master Utility Plan. The Master Utility Plan shall indicate the general locations of all water, sewer, storm and reuse mains, manholes, hydrants and lift stations with respect to the proposed development improvements and any existing utility systems being connected to. Main sizes shall be indicated on the Master Utility Plan. The Master Utility Plan shall be prepared at a legible scale. The scale shall be selected such that all items on the plan are clearly legible. Master Utility Plans that are not legible will not be accepted.

Plan and profiles shall be required on all underground utility designs. All gravity sewers, wastewater force mains, stormwater sewers, water mains, and reclaimed water mains shall be drawn in plan at a scale not to exceed 1"=40' and profile at 1"=4' on the same sheet. On-site water mains may be shown in plan view only. Where on-site water, reuse mains or force mains cross other utilities, the main shall be shown in the profile for 20 feet either side of the crossing. Off-site water main designs require plan and profiles. A graphical representation or "key map" of the plan sheet for location identification on the overall project site is preferred. At minimum, the plan and profiles shall include the following information:

- General information such as north arrow, graphic scale(s) and legend.
- Profile with elevations at 100-foot intervals, or more frequently if warranted by good design practices.
- Project layout with horizontal and vertical controls.
- All conflicts with other utility systems.
- Clearance distances from outside of pipe to outside of pipe at all utility crossings.

- All manhole locations and rim elevations.
- Pipe data including size, lengths, material and slopes.
- Size, type, and locations of all fittings, valves, hydrants, and other related appurtenances.
- Limits of special coatings, materials or bedding requirements.
- Pipe restraint requirements.
- Details of connections to existing systems.
- Location(s) and general layout of wastewater pumping stations.
- Construction notes regarding cover, horizontal and vertical control, special construction requirements, and references to standard and special details.
- Existing and proposed street names, lot numbers, and other location features.

For all horizontal directional drilling (HDD), plan and profiles (horizontal and vertical alignment) of the proposed bore path at a scale not larger than 1:20 horizontal and 1:2 vertical shall be provided in the design plan set. The proposed bore path shall be shown along established surface survey baseline stationing that is tied to existing, fixed and visible sight features. The survey baseline shall be on Vertical Datum NAVD88 and Horizontal Datum NAD 83 State Plane Florida East Coordinate System (US Feet) and coordinates shall be shown on the plans. In addition to other Plan and Profile requirements listed above in this Section, the HDD plan and profiles shall, at a minimum, provide the following:

- Comprehensive, realistic design based on actual conditions for the particular HDD project.
- Document thoughtful planning required to successfully complete the HDD project.
- Identify real and potential obstructions along bore path design line and grade.
- Minimum and maximum bore path elevations.
- Entry and exit pits, at realistic size and to scale.
- Tie-in/connection(s) to existing systems.

22. 2 DESIGN BASIS

22. 2. 1 AVERAGE DAILY FLOW

Provisions of Section 21.2.1 shall apply.

22. 2. 2 PEAK DESIGN FLOW

Provisions of Section 23.2.1 shall apply.

22. 2. 3 DESIGN CALCULATIONS

DEVELOPER'S ENGINEER shall submit signed, sealed, and dated design calculations with the PLANS for all force main projects. Calculations shall show that force mains will have sufficient hydraulic capacity to transport all design flows.

22. 3 DESIGN AND CONSTRUCTION

22. 3. 1 VELOCITY AND DIAMETER

At design pumping rates, a cleansing velocity of at least 2 feet per second shall be maintained. Maximum velocity at design pumping rates should not exceed 8 feet per second for ductile iron pipe or 5 feet per second for PVC pipe. The minimum force main diameter shall be two (2) inches, if a grinder pumping station is provided.

22. 3. 2 DESIGN FRICTION LOSSES

Friction losses through force mains shall be based on the Hazen and Williams formula. In the use of Hazen and Williams formula, the value for "C" shall be 120 for ductile iron pipe and 130 for PVC pipe. "C" values greater than 130 shall not be allowed.

When initially installed, force mains may have a significantly higher "C" factor. The higher "C" Factor should be considered only in calculating maximum power requirements and duty cycle time of the motor.

22. 3. 3 DESIGN PRESSURE AND RESTRAINT

The force main and fittings, including all restrained joint fittings, shall be designed to withstand pump operating pressures and pressure surges, but not less than 150 psi.

Where restrained joints are used, the restrained joint table in the STANDARD DETAILS shall be utilized.

22. 3. 4 TERMINATION

Force mains shall not terminate directly into a gravity sewer line. Force mains shall enter the gravity sewer system at the flow line of the receiving manhole.

22. 3. 5 AIR RELEASE AND VACUUM RELIEF VALVES

Air release valves, or air/vacuum relief valves, shall be provided, as necessary, to prevent air locking and vacuum formation. All such valves shall be clearly delineated on the force main profile in the DRAWINGS. See additional requirements in Section 55.6.

22. 3. 6 AERIAL CROSSINGS

The CITY shall be consulted before PLANS are prepared.

STRUCTURAL SUPPORT
Support shall be provided for all joints in pipes utilized for aerial crossings. The supports shall be designed to prevent overturning, settlement, and corrosion. Exposed steel parts

shall be hot dip galvanized or painted as specifies in Section 55.

EXPANSION PROTECTION
Expansion joints shall be provided between the aerial and buried sections of the pipe.

FLOOD CLEARANCE
For aerial stream crossings, the impact of flood waters and debris shall be considered. The bottom of the pipe shall be placed no lower than 1 foot above the 100 year flood elevation.

PIPE MATERIAL AND JOINTS
Flanged joints shall be used. Pipe and Flange material shall be ductile iron, minimum class 53. All above ground pipe shall be painted as specified in Section 55.4.4 for above ground wastewater force mains. Use of epoxy coated steel pipe may be allowed on a case by case basis.

VALVES
Underground valves shall be provided at both ends of the crossing so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding. An air release/vacuum relief valve shall be installed at the high point of the crossing.

GUARDS
Appropriate fan type guards, as approved by the DIRECTOR, shall be installed at both ends of the crossing to prevent pipe access to the public.

PERMITS AND REQUIREMENTS OF OTHER AGENCIES
It shall be the responsibility of the DEVELOPER to obtain all applicable regulatory permits. When the Aerial Crossing is accomplished by attachment to a bridge or drainage structure, the DEVELOPER shall meet all requirements of the agencies who own or have jurisdiction over such structures.

22. 3. 7 EXISTING SEWER FORCE MAIN CONNECTIONS TO BE REUSED

Existing sewer force main connections intended to be reused shall be investigated by the utility contractor. Excavation and inspection of gravity sewer main may be required as directed by City Inspector. The utility contractor is responsible for repairs and/or replacement as directed by the City Inspector. The repair shall include repairing or replacing any damaged sewer force main sections, point of service connection check valve replacement or any other appurtenances required for sewer service. Sewer force main service connections shall meet all current city standards for sewer force mains. Repair shall be installed by the contractor at no additional cost to the City.

22. 3. 8 EXISTING SEWER FORCE MAIN CONNECTIONS TO BE ABANDONED

Existing sewer force main connections that will no longer be utilized must be abandoned

as part of the new utility construction. The utility contractor is required to visually verify the location of all known existing sewer service connections. All service saddle taps and direct taps shall be removed and repair shall be with approved stainless steel full circle wraparound clamp. At no time shall saddle taps or direct taps be plugged. The utility contractor will identify any unknown utility connections found during construction and notify the City Inspector and Engineer of Record within 24 hours.

22. 3. 9 UNDERWATER CROSSINGS

The CITY shall be consulted before PLANS are prepared.

PIPE MATERIAL AND COVER
The pipe shall be encased according to Section 55.4.5 of this MANUAL. A minimum cover of three (3) feet plus a four (4) inch concrete slab shall be provided over the pipe. The pipe material shall meet appropriate AWWA Standards for use in submerged conditions.

DIRECTIONAL DRILLING
For the purposes of this section, the term directional drilling means trenchless methods of crossing a water body using pressurized mud systems. This method is preferable to open-cut and isolated crossings as the pipe is drilled underneath the water body with minimal disturbance to bed, banks, wildlife and fish habitats. A minimum cover of three (3) feet shall be maintained from the top of the pipe to the bottom elevation of the water body. Pipe crossings shall use HDPE (DR11) pipe. In cases where the crossing exceeds 1,000 feet, a steel casing shall be provided. For water bodies exceeding fifteen (15) feet in width, the pipe crossing shall be designed with flexible watertight joints. Refer to Section 33.5 of this MANUAL.

VALVES
Valves shall be provided at both ends of the water crossings so that the section can be isolated for testing or repair. The valves shall be easily accessible, and not subject to flooding. Both valves shall be provided in a manhole or a valve vault.

PERMIT
It shall be the responsibility of the DEVELOPER to obtain all applicable regulatory permits, including dredge and fill permits.

INDENTIFICATION
Underwater crossings shall be clearly marked by permanent warning signs placed on the banks of the water body clearly identifying the nature and location (including depths below design or natural bottom) of the crossings. Special care shall be taken to provide warning signs where crossings occur near any area where anchoring may be expected. Warning signs shall be compatible with the surrounding land use, while serving the intended purpose.

22. 3. 9 VALVES

Sufficient valves shall be provided on force main systems to facilitate effective isolation of the pipe system for repairs and maintenance. On straight runs of force mains, valve spacing shall not exceed 800 feet. Additional valves shall be provided where force mains intersect and extensions are anticipated so that isolation of pipe segments can be facilitated.

22. 4 MATERIAL, INSTALLATION, AND TESTING

Applicable provisions of Divisions 3, 4, and 5 shall apply.

22. 5 LOCATION AND IDENTIFICATION

All lettering shall be legible and colors correct for the intended use.

22. 6 FUTURE SIZING REQUIREMENTS

While designing force main systems, consideration shall be given to possible future connecting pumping stations. If applicable, this requirement shall be reviewed with the DIRECTOR prior to finalization of the design.

22. 7 PRIVATE FORCE MAIN TIE-INS

Force mains from private pump stations shall be designed to CITY standards and shall connect to the CITY's force main system through an approved swing check valve. A plug valve shall be installed next to the check valve. See STANDARD DETAILS and Appendix A.

SECTION 23 – WASTEWATER PUMP STATION DESIGN CRITERIA

23. 1 GENERAL

The design standards outlined in this Section apply to public or private wastewater pump stations discharging 3,000 gallons per minute or less. Pump stations discharging over 3,000 gallons per minute require special review and approval by the CITY.

Private pump stations shall be designed in accordance with the pump manufacturer's criteria, the regulations of the Florida Department of Environmental Regulations, and the applicable Sections of this MANUAL, such as Section 23.5, and the applicable components of the STANDARD DETAILS.

If dedication to the CITY is desired, pump stations shall be municipally rated and of the submersible or self priming centrifugal above ground type, and shall conform to the STANDARD DETAILS.

For the design of pump stations discharging more than 3,000 gallons per minute, the type of pump station and the basis of design shall be reviewed with the DIRECTOR with approval obtained before proceeding with the design.

Should the DEVELOPER desire to use a pumping system, which is to be dedicated to the CITY, other than those specified in Appendix "C", the DEVELOPER'S ENGINEER shall submit a signed and sealed document to the DIRECTOR specifically addressing all the differences between the proposed system and the pump specifications contained in this MANUAL.

23. 2 DESIGN

23. 2. 1. DESIGN FLOWS

Design flow shall be based upon the total ultimate development flow from all contributory areas to the pump station. The design average daily flow shall be computed as outlined in Section 21.2.1. The design pumping capability of the station shall be based upon the Peak Design Flow which shall be calculated by multiplying the design average flow with the applicable minimum peaking factors as outlined below:

DESIGN AVERAGE DAILY FLOW	MINIMUM PEAKING FACTOR FOR PEAK DESIGN FLOW
Flows to 100,000 GPD	4.0
100,000 GPD to 250,000 GPD	3.5
250,000 GPD to 1,000,000 GPD	3.0
Flows greater than 1,000,000 GPD	2.5

For design average daily flows above 2,000,000 GPD, peaking factors less than 2.5 may be considered if substantiated by extensive data. Under no circumstances shall peaking factors less than 2.0 be allowed.

23. 2. 2. NUMBER OF PUMPS

For pump stations with a peak design flow of 1,500 G.P.M. or less, a minimum of two pump units shall be provided. Where the peak design flow exceeds 1,500 GPM, three or more units shall be provided. See Section 23.4 for standby requirements.

23. 2. 3 PUMP AND MOTOR SELECTION

The pump station shall be capable of pumping the peak design flow with the largest pumping unit out of service. Pumps shall be capable of meeting all system hydraulic conditions without overloading the motors. In addition, a minimum 5 HP motor shall be required. Head capacity curves shall be prepared and submitted to the CITY along with the pump station plans. Such curves shall be based upon the friction losses outlined in Section 22.3.2 of these specifications. Head capacity curves shall verify that the pumps are operating at peak efficiency and are suitable for the design flow application. Pump and motor selection and head capacity curves shall reflect hydraulic conditions in cases where receiving force main systems are interconnected to additional pumping stations.

23. 2. 4 DESIGN CALCULATIONS

DEVELOPER'S ENGINEER shall submit signed, sealed, and dated design calculations for all wastewater pump stations. Calculations shall include head capacity curves with copies of the manufacturer's pump curves, hydraulic analysis of force main system, operating cycle calculations with wet well sizing, buoyancy calculations, and electrical calculations.

23. 3 DESIGN AND CONSTRUCTION

23. 3. 1 FLOODING

Wastewater pumping station structures and electrical and mechanical equipment shall be protected from physical damage by 100 year flood events. The finished top elevation of the submersible station's wet well, valve vault and the bottom of the above ground control panel and emergency generator or if an above ground lift station, the finished floor elevation, shall be a minimum of one (1) foot above said event's designated elevation or eighteen (18) inches above the crown of the adjacent roadway, whichever is higher. Wastewater pumping stations shall remain fully operational and accessible during a 100 year flood event.

Regulations of Local, State, and Federal agencies regarding flood plain obstructions shall be complied with.

23. 3. 2 ACCESSIBILITY

The pump station shall conform to the STANDARD DETAILS. The pumping station shall be readily accessible by maintenance vehicles during all weather conditions. The access road to the pumping station shall be paved using concrete or asphaltic concrete. Consideration shall be given to providing sufficient maneuvering space for CITY vehicles servicing the pumping station. An aesthetically pleasing location shall be chosen with consideration including but not limited to the following factors:

- Proximity to existing / future gravity line and force main (consider hydraulic capacity)
- Land ownership and easements, and existing land tracts
- Site location and size
- Vehicular access
- Site and surrounding conditions such as flood potential and drainage issues
- Landscaping and setback requirements
- Existing / future utilities availability
- Zoning and permitting
- Operation and maintenance considerations
- Geotechnical and environmental considerations
- Noise and odor control
- Security fencing and lighting

The facility shall not be located in public or private rights-of-way. In a phased development, the pumping station shall be situated within the boundaries of the initial phase.

23. 3. 3 BUOYANCY

Buoyancy of pump station structures shall be considered and adequate provisions shall be made for protection. Calculations must be submitted for review for both public and private wastewater pump stations.

23. 3. 4 PUMP REQUIREMENTS

Wastewater pump stations shall comply with the requirements as stated in Section 57. Only approved pumps shown in the STANDARD DETAILS shall be allowed for pumps subject to dedication to the CITY. Pumps and motors shall be designed specifically for raw sewage use, including totally submerged operation during a portion of each pumping cycle for submersible pump stations. Submersible pumps shall be readily removable and replaceable without Dewatering the wet well or disconnecting any piping in the wet well.

Pumps shall be capable of handling raw sewage and passing spheres of at least 3 inches in diameter. Pump suction and discharge openings shall be at least 4 inches in diameter.

23. 3. 5 WET WELL

Wet well shall be minimum 6-foot diameter and shall have a minimum 5.0 foot depth below the lowest invert. Additional depth shall be provided based on station design and cycle time. Maximum wet well depth shall be 20.0 feet below finished grade.

Pumping levels shall be set to provide a minimum capacity between operational water levels sufficient to allow a minimum of five (5) minutes between successive starts of the pumps under normal flow conditions.

Pump-off water levels shall provide adequate submergence to preclude pump inlet vortexing, or air binding. Operational maximum water levels shall not exceed the invert elevation of the influent pipe.

The wet well floor shall have a minimum slope of 1 to 1 to the hopper bottom. The horizontal area of the hopper bottom shall be no greater than necessary for proper installation and function of the pump inlet.

The interior surfaces of wet wells, including the tops, shall have a full height integrally attached fiberglass interior light colored liner.

Interior ladders shall not be permitted in the wet well.

Only one inlet connection shall be permitted to a wet well unless otherwise approved by the DIRECTOR.

23. 3. 6 WASHDOWN WATER SUPPLY

All wastewater pump stations shall be provided with a water system with adequate capacity and pressure for station wash down and other requirements. The station water system shall be completely separated from the potable water supply by means of a reduced pressure type backflow preventer or other CITY approved device.

23. 3. 7 ELECTRICAL EQUIPMENT AND POWER SUPPLY

Requirements in Sections 57 and 58 shall apply.

23. 3. 8 CONTROLS

Requirements in Section 58 shall apply.

23. 3. 9 SITE SIZING AND EASEMENT REQUIREMENTS

Pump station sites shall be minimum 40 feet by 40 feet fenced area in a tract dedicated to the CITY. On rare occasions only when approved in advance by the CITY, when it is

clearly not feasible to meet the 40 feet by 40 feet fenced area and when it is deemed beneficial by the CITY, an alternate size pump station site may be allowed. The DEVELOPER shall dedicate the pump station site by special warranty deed or plat to the CITY. Dedicated easements may also be required around the site. In general, the property for the paved access drive shall also be dedicated to the CITY by special warranty deed or plat. An exception to this requirement may be allowed, on a case by case basis by the DIRECTOR, in the form of an ingress/egress easement for access.

23. 3.10 SITE FENCING

Perimeter fencing at the pump station site, shall comply with the technical criteria established in Section 56.8. In general, all pump station sites shall be fenced.

23. 3.12 ABOVE GROUND PUMPING STATION

The sewage pumps, motors, and standby power generator system for above ground pumping stations shall be housed in an appropriately sized decorative concrete block structure as approved by the DIRECTOR. The building shall conform to all CITY building code requirements. Sufficient ventilation and interior and exterior illumination shall be provided. All areas shall be sodded and landscaped. A metered potable water line terminating in a hose bib at the building shall be provided along with the appropriate backflow prevention device. The appropriately sized power standby generator set shall be fully equipped and have an automatic electric starting capability.

23. 4 EMERGENCY OPERATION

All pump stations shall be provided with emergency power receptacles as specified in Section 58.9. In addition, for pump stations to be dedicated to the CITY, a stand-by emergency generator set shall be provided to the CITY at no cost for each wastewater pumping station in accordance with Section 56.6. All such generators shall be rated and designed to operate as specified in Section 56.6. Determination of the pump station's critical points shall be at the discretion of the DIRECTOR.

23. 5 PRIVATE PUMP STATIONS

23. 5. 2 SIGNAGE

Privately owned and maintained pump stations shall be signed so as to identify the current owner and provide a 24 hour per day 7 days a week emergency response telephone number. The aluminum sign shall be clearly visible from the adjacent roadway, using two (2) inch high black letters on a white background made of engineering grade reflective materials, and shall measure a minimum of twenty four (24) inches high by thirty six (36) inches long. The sign shall be mounted on the pump station's control panel support structure or the optional perimeter security fencing with the bottom of the sign three (3) feet above finish grade. See STANDARD DETAILS.

SECTION 24 – CROSS CONNECTION CONTROL

24. 1 GENERAL

Cross connection control for the CITY is regulated by the CITY's Cross Connection Control Policy Manual which is separate and distinct from this MANUAL. Contact the CITY Public Works Department for a copy of the Cross Connection Control Policy Manual and/or refer to the CITY's website (www.citystaug.com) for more information.

SECTION 25 – ROADWAY DESIGN CRITERIA

(This section reserved.)

SECTION 30 – GENERAL CONSTRUCTION

30. 1 GRADES, SURVEY LINES, AND PROTECTION OF MONUMENTS

30. 1. 1 GRADE

All WORK shall be constructed in accordance with the lines and grades shown on the PLANS. Full responsibility for keeping alignment and grade shall rest upon the CONTRACTOR.

Elevation bench marks and horizontal control points shall be established prior to beginning work. The CITY shall not be responsible for providing horizontal or vertical survey controls. Reference marks for lines and grades as the work progresses will be located to cause as little inconvenience to the prosecution of the work as possible. The CONTRACTOR shall so place excavation and other materials as to cause no inconvenience in the use of the reference marks provided. The CONTRACTOR shall remove any obstructions placed contrary to this provision.

CITY funded improvements shall be designed and constructed based on Vertical Datum NAVD88 and Horizontal Datum NAD 83 State Plane Florida East Coordinate System (US Feet). All private improvements that are designed or constructed based on vertical or horizontal datum other than listed above shall provide conversion factors on all survey, plans and as-built drawings. Datum used shall be clearly labeled on all plan sheets.

30. 1. 2 SURVEY LINES

The CONTRACTOR shall furnish and maintain, at CONTRACTOR’s own expense, stakes and other such materials and give such assistance, including qualified helpers, for setting reference marks to the satisfaction of the CITY and the ENGINEER. The CONTRACTOR shall check such reference marks by such means as he may deem necessary and, before using this information, shall call the CITY's attention to any potential inaccuracies. The CONTRACTOR shall, at CONTRACTOR’s own expense, establish all working or construction lines and grades as required from the reference marks and shall be solely responsible for the accuracy thereof. The CONTRACTOR shall, however, be subject to checks and reviews by the CITY.

30. 1. 3 MONUMENT PRESERVATION

Property corners and survey monuments shall be preserved using care not to disturb or destroy them. If a property corner or survey monument is disturbed or destroyed during construction, whether by accident, careless work, or is required to be disturbed or destroyed by the construction work, said property corner or survey monument shall be restored by a professional land surveyor registered in the State of Florida. All costs for this work shall be paid for by the CONTRACTOR.

30. 2 UTILITY COORDINATION

30. 2. 1 LOCATION OF UTILITIES

Prior to proceeding with trench excavation, the CONTRACTOR shall contact the CALL SUNSHINE One Call system at 811 or 1-800-432-4770 and all non-member utility companies in the area to aid in locating their underground services. It shall be the CONTRACTOR's responsibility to contact utility companies at least forty eight (48) hours before starting construction. The CONTRACTOR shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground utilities may be determined.

The CONTRACTOR shall take all reasonable precautions against damage to existing utilities. However, in the event of a break in an existing water main, gas main, sewer, or underground cable, the CONTRACTOR shall immediately notify the responsible official of the organization operating the interrupted utility. The CONTRACTOR shall lend all possible assistance in restoring services. The responsibility for all costs, charges, or claims connected with the interruption and repair of such services shall be determined in accordance with Florida Statutes.

30. 2. 2. DEVIATIONS OCCASIONED BY STRUCTURES OR UTILITIES

Wherever obstructions are encountered during the progress of the WORK and interfere to such an extent that an alteration in the PLANS is required, the CITY shall have the authority to order a deviation from the line and grade or arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstructions. Where gas, water, telephone, electrical, steam, or other existing utilities are an impediment to the vertical or horizontal alignment of the proposed improvements, the CITY shall order a change in grade or alignment or shall direct the CONTRACTOR to arrange with the owners of the utilities for their removal. If a change in line or grade of a gravity sewer is necessary, the CITY will require the addition of any manholes needed to maintain the integrity of the sewer system. All such WORK shall be completed at no expense to the CITY.

30. 2. 3 TEST PITS

Test pits for the purpose of locating underground pipeline, utilities, or structures in advance of the construction shall be excavated and backfilled by the CONTRACTOR. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the CITY. The costs for such test pits shall be borne by the CONTRACTOR.

30. 3 MAINTENANCE OF TRAFFIC AND CLOSING OF STREETS

Where required by the CITY, the PLANS, or any additional responsible authorities including FDOT and the COUNTY, the CONTRACTOR shall provide a Maintenance of Traffic Plan to the CITY for approval prior to the start of any construction activities. The CONTRACTOR shall carry on the WORK in a manner which will cause a minimum of interruption to traffic.

Where traffic must cross open trenches, the CONTRACTOR shall provide suitable bridges at street intersections and driveways. The CONTRACTOR shall post suitable signs indicating that a street or sidewalk is closed and necessary detour signs for the proper maintenance of traffic. Prior to closing of any streets or sidewalk, the CONTRACTOR shall notify and obtain the approval of the CITY and all additional responsible authorities including FDOT and the COUNTY.

Unless permission to close a street or sidewalk is received in writing from the proper authority (the CITY, COUNTY, FDOT, etc.), all construction operations shall be conducted so that vehicular and pedestrian traffic may be maintained at all times. If the CONTRACTOR's operations cause traffic hazards, the CONTRACTOR shall repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the CITY and all additional responsible authorities including FDOT and the COUNTY.

Detours around construction will be subject to the approval of the authority having jurisdiction and the CITY. Where detours are permitted, the CONTRACTOR shall provide all necessary barricades and signs as required to divert the flow of traffic. While traffic is detoured, the CONTRACTOR shall expedite construction operations. Periods when traffic is being detoured will be strictly controlled by the CITY.

It shall be the sole responsibility of the CONTRACTOR to take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. The CONTRACTOR shall be fully responsible for damage or injuries whether or not police protection has been provided.

All applicable FDOT and OSHA requirements shall be met by the CONTRACTOR.

30. 4 PROTECTION OF PUBLIC AND PROPERTY

30. 4. 1 BARRICADES, GUARDS, AND SAFETY PROVISIONS

The CONTRACTOR shall be solely responsible for adhering to the rules and regulations of OSHA and appropriate authorities regarding safety provisions. To protect persons from injury and to avoid property damage, adequate barricades, construction signs, lights,

and guards as required shall be placed and maintained by the CONTRACTOR at CONTRACTOR's expense during the progress of the WORK and until it is safe for traffic to use the roads and streets. All material piles, equipment, and pipe, which may serve as obstructions to traffic, shall be enclosed by fences or barricades and shall be protected by proper lights when visibility is poor.

All signage and barricades shall be in accordance with the MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, the TRAFFIC CONTROL AND SAFE PRACTICES MANUAL, and the Florida Department of Transportation's Roadway and Traffic Design Standards.

All applicable FDOT and OSHA requirements shall be met by the CONTRACTOR.

30. 4. 2 PROTECTION OF UTILITY STRUCTURES

Temporary support, adequate protection, and maintenance of all underground and surface utility structures, including drains, sewers, manholes, hydrants, valves, valve covers, power poles, and miscellaneous other utility structures encountered in the progress of the WORK shall be furnished by the CONTRACTOR at CONTRACTOR's expense. Any such structures which may have been disturbed shall be restored upon completion of the WORK. The CITY may require site specific protection measures on a case by case basis.

30. 4. 3 OPEN EXCAVATION

The CONTRACTOR shall comply with the Florida Trench Safety Act. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights, and other means to prevent accidents to persons and damage to property. The CONTRACTOR shall, at CONTRACTOR's own expense, provide suitable and safe bridges with hand railings and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required. The length of open trench will be controlled by the particular surrounding conditions, but shall be limited to 300 feet unless otherwise approved by the CITY.

If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the CITY may require special construction procedures, such as limiting the length of open trench, fencing, prohibiting excavated material in the street, and requiring that the trench shall not remain open overnight. The CONTRACTOR shall take precautions to prevent injury to the public due to open trenches. All trenches, excavated material, equipment, or other obstacles which could be dangerous to the public shall be well lighted at night.

All requirements of the CITY's Archaeological Preservation CODE shall be adhered to.

30. 4. 4 PROTECTION OF TREES AND SHRUBS

All trees and shrubs not shown to be removed on the PLANS shall be protected by the CONTRACTOR at CONTRACTOR's expense. No excavated materials shall be placed so as to injure such trees or shrubs. Trees or shrubs destroyed by negligence of the CONTRACTOR or CONTRACTOR's employees shall be replaced by the CONTRACTOR with new stock of similar or equivalent size and age at the sole expense of the CONTRACTOR. The caliper of all trees shall be measured at four and one half (4 1/2) feet from the ground.

30. 4. 5 PROTECTION OF LAWN AREAS

Lawn areas shall be left in as good or better condition as before starting of the WORK. Where sod is to be removed, it shall be carefully restored with new sod of the same type.

30. 4. 6 RESTORATION OF PRIVATE PROPERTY IMPROVEMENTS

Fences and other private property improvements, or any part thereof, that are damaged or removed during the course of the WORK shall be replaced or repaired by the CONTRACTOR and shall be left in as good or better condition as before the starting of the WORK. The manner in which the improvement is repaired or replaced and the materials used shall be subject to the approval of the CITY and the respective property owner.

30. 4. 7 PROTECTION AGAINST SILTATION AND BANK EROSION

The CONTRACTOR shall abide by the Storm Water Pollution Prevention Plan in the approved PLANS and the STANDARD DETAILS. The CONTRACTOR shall arrange his operations to minimize siltation and bank erosion on construction sites and on existing or proposed water courses and drainage ditches. Silt barriers and protective measures shall be used when the CONTRACTOR is working adjacent to wetlands and other environmentally sensitive areas. All catch basins, inlets and storm water structures shall be protected according to the Storm Water Pollution Prevention Plan in the approved PLANS and the STANDARD DETAILS. The CONTRACTOR, at CONTRACTOR's own expense, shall remove any siltation deposits and restore to original grade. All protective measures shown on the PLANS and all applicable requirements of the SJRWMD shall be followed by the CONTRACTOR.

30. 5 ACCESS TO THE PUBLIC SERVICES

Neither the materials excavated nor the materials or equipment used in the construction of the WORK shall be so placed as to prevent free access to public services. All excavated material shall be piled in a manner that will not endanger the WORK and that will avoid obstructing streets, sidewalks, and driveways. Excavated material suitable for

backfilling shall be stockpiled separately on the site. No material shall be placed closer than 2 feet from the edge of an excavation. Fire hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, or other utility controls shall be left unobstructed and accessible until the WORK is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage. Natural water courses shall not be obstructed or polluted. Surplus material and excavated material unsuitable for backfilling shall be transported and disposed of off the site in disposal areas obtained by the CONTRACTOR.

30. 6 PUBLIC NUISANCE

The CONTRACTOR shall not create a public nuisance including but not limited to encroachment on adjacent lands, flooding of adjacent lands, or excessive noise or dust. The CONTRACTOR shall control noise to the greatest extent practicable at all times.

30. 7 CONSTRUCTION HOURS

Work hours shall conform to the requirements set forth in the CODE. No WORK that requires CITY inspection shall be done between the weekday hours of 4:00 p.m. and 8:30 a.m., Fridays, Saturdays, Sundays, or CITY recognized holidays unless the proper and efficient prosecution of the WORK requires operations during these hours. In the event that such work hours are necessary, the CONTRACTOR shall reimburse the CITY for all costs associated with inspection staff overtime. Written notification for doing the WORK shall be provided to the CITY a minimum of 48 hours before starting WORK within the above restricted hours and shall be subject to the availability of the inspection staff.

No WORK that does not require CITY inspection shall be done between the hours of 7:00 p.m. and 7:00 a.m., or on Saturdays and Sundays, unless the proper and efficient prosecution of the WORK requires operations during these times. Written notification for doing WORK during these times shall be provided to the CITY a minimum of 48 hours before starting the WORK. The CITY shall have 24 hours to review and approve the notification before the WORK may be started.

30. 8 CONSTRUCTION IN EASEMENTS AND RIGHTS-OF-WAY

30. 8. 1 CONSTRUCTION IN EASEMENTS

In easements across private property, the CONTRACTOR shall confine all operations within the easement area and shall be responsible and liable for all damage outside of the easement area. Trees, fences, shrubbery, or other type of surface improvements located in easements shall be protected during construction. Precautions shall be taken by adequate sheeting or other approved method to prevent any cave-in or subsidence beyond the easement limits or damage to improvements within the easement. In general, the easement area is intended to provide reasonable access and working area for efficient operation by the CONTRACTOR. Where easement space for efficient operation is not provided, the CONTRACTOR shall be responsible for organizing CONTRACTOR's

operations to perform within the restrictions shown on the PLANS. The CONTRACTOR shall be responsible for fully restoring all disturbed property to its pre-construction condition up to and including re-sodding with similar type grass, replacing fences, etc.

30. 8. 2 CONSTRUCTION IN FDOT AND COUNTY RIGHTS-OF-WAY

The CONTRACTOR shall strictly adhere to the requirements of the FDOT and the COUNTY where construction work is in a right-of-way under either jurisdiction and shall take care to avoid any unreasonable traffic conflicts due to the WORK in said right-of-way. The CONTRACTOR is responsible for obtaining applicable permits for WORK in all rights-of-way.

30. 8. 3 CONSTRUCTION IN CITY RIGHTS-OF-WAY

WORK done within the CITY's rights-of-way shall be governed by the CITY's right-of-way utilization policies and this MANUAL.

30. 9 SUSPENSION OF WORK DUE TO WEATHER

During inclement weather, all WORK which might be damaged or rendered inferior by such weather conditions shall be suspended. During suspension of the WORK from any cause, the WORK shall be suitably covered and protected so as to preserve it from injury by the weather or otherwise. Partially installed pipe shall be plugged and restrained to prevent flotation.

30.10 USE OF CHEMICALS

All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of either the United States Environmental Protection Agency or United States Department of Agriculture and be applied by a State of Florida licensed individual. Use of all such chemicals and disposal of residues shall be in strict conformance with label instructions.

30.11 COOPERATION WITH OTHER CONTRACTORS AND FORCES

During construction progress, it may be necessary for other contractors and persons employed by the CITY to work in or about the site. The CITY reserves the right to put such other contractors to work and to afford such access to the construction site and at such times as the CITY deems proper. The CONTRACTOR shall not impede or interfere with the work of such other contractors and shall cooperate with the other contractor(s) for proper prosecution of the work.

30.12 SUBSURFACE EXPLORATION

The CONTRACTOR shall make such subsurface explorations as he or she believes necessary to perform the WORK.

30.13 CLEANING

30.13. 1 DURING CONSTRUCTION

During construction, the CONTRACTOR shall, at all times, keep the construction site and adjacent premises as free from material, debris, and rubbish to the extent practicable and shall remove the same from any portion of the site if, in the opinion of the CITY, such material, debris, or rubbish constitutes a nuisance or is objectionable.

30.13. 2 FINAL CLEANING

At the conclusion of the WORK, all tools, temporary structures, and materials belonging to the CONTRACTOR shall be promptly taken away. The CONTRACTOR shall remove and promptly dispose of all water, dirt, rubbish, or any other foreign substances.

30.14 SALVAGE AND ARCHAEOLOGICAL REVIEW

Any existing CITY-owned equipment or material, including but not limited to valves, pipes, fittings, couplings, bricks, curbing, structures, etc., which are removed or replaced as a result of construction may be designated as salvage by the CITY and, if so, shall be carefully excavated if necessary and delivered to the CITY at a location specified by the CITY. All requirements and provisions of CITY CODE Chapter 6 Archaeological Preservation shall be adhered to. An Archaeological Review may be required at any time during the WORK, regardless of any prior Archaeological Review which may have been required or conducted during design and/or construction portions of the WORK.

30.15 UTILITY CONSTRUCTION AND DEDICATION REQUIREMENTS

30.15. 1 GENERAL

Utility construction, dedication and acceptance of all utilities to be dedicated to the CITY shall, at a minimum, follow procedures and requirements in this Section and as outlined in the CITY's "Utility Construction and Dedication Requirements" policy, latest edition, available on the CITY website (www.citystaug.com) and as distributed to pre-construction meeting attendees and other entities as relevant for each project.

This Section is not intended to be all inclusive with respect to all possible requirements that may be specific to each project. All utility construction must, at a minimum, follow specifications and details in this MANUAL, and all pertinent sections of the CODE. All

utility construction must be in strict accordance with the CITY approved project plans and all project permits. All utility construction materials must be in strict accordance with the completed and CITY approved Appendix A, and the CITY approved shop drawings, as specific to the project. Failure to construct utilities accordingly may result in delays in obtaining service, CITY refusal to accept the utilities, and possible unanticipated costs and construction time while corrections are made. Such delays and costs will not be the responsibility of the CITY.

The CITY must accept all utilities to be dedicated to the CITY prior to installing or unlocking any water meters, and prior to signing off on any use permit or certificate of occupancy. Dedication includes satisfactory completion of the items listed in this Section and as appropriate to the project. Providing these items accurately, diligently and in a timely manner shall be the responsibility of the DEVELOPER, the CONTRACTOR, and/or the DEVELOPER'S ENGINEER, not CITY staff.

All documents related to the project must be submitted to the Public Works Department – Lobby B – 4th Floor – City Hall – 75 King Street or be mailed to the Public Works Department – PO Box 210 – St. Augustine, Florida 32085-0210. These submittals should be transmitted with a cover letter clearly identifying the contents and purpose of the submittal and name of the project. Electronic submittals will not be accepted.

30.15. 2 APPENDIX A MATERIALS LIST AND SHOP DRAWINGS

For utilities that are to remain *private*, the CONTRACTOR shall submit one (1) copy of all shop drawings, reviewed and signed by the DEVELOPER'S ENGINEER, prior to scheduling the Pre-Construction Meeting.

For all utilities that are to be dedicated to the CITY, the CONTRACTOR shall submit a minimum of four (4) sets (PLUS the number of sets needed by the CONTRACTOR) of the completed Appendix A - List of Approved Materials and Manufacturers. Instructions are provided on the cover page of Appendix A. The Appendix A list must be reviewed and approved by the CITY prior to scheduling the Pre-Construction Meeting.

Shop drawings for items that are listed on Appendix A are not required. For all items that are *not* listed on Appendix A, such as manholes, wet wells, and other castings, shop drawings are required. CONTRACTOR shall submit a minimum of four (4) sets (PLUS the number of sets needed by the CONTRACTOR) of the shop drawings. The data shown on the shop drawings shall be complete with respect to dimensions, design criteria, materials of construction, and the like, to enable review of the information as required. It will be the responsibility of the DEVELOPER's ENGINEER to check and verify that the shop drawings match the approved PLANS and SPECIFICATIONS. The CITY will review the shop drawings on a courtesy basis in an attempt to confirm requirements of this MANUAL. The CITY will not be responsible or liable for items that have been missed as part of the review. Shop drawings must be reviewed and approved by the CITY prior to scheduling the Pre-Construction Meeting.

Ordering materials and products without the specific written approval from the CITY of Appendix A and any necessary shop drawings is not recommended. Any material or product not on Appendix A shall be approved in advance by the CITY. The CONTRACTOR shall, furnish certificates, affidavits of compliance, test reports, or samples for check analysis for any of the materials not specified in this MANUAL and Appendix A.

30.15. 3 PRE-CONSTRUCTION MEETING

The Pre-Construction Meeting shall be scheduled following CITY approval of the project plans, and prior to the start of construction. The following Pre-Construction Checklist and all required documentation must be submitted to the CITY prior to scheduling the Meeting. A minimum of five (5) business days notice shall be provided to the CITY to set a Pre-Construction Meeting. The Pre-Construction Meeting, at a minimum, must be attended by the CONTRACTOR's project superintendent, by the Utility Contractor's project superintendent (if different from the CONTRACTOR), by the DEVELOPER'S ENGINEER and by the OWNER or OWNER's authorized representative. CITY staff members, as appropriate to the project, must be present. Meetings will be held in the City Public Works Conference Room, unless otherwise requested by the CITY, and are subject to CITY staff member availability and schedules.

Pre-Construction Checklist (items required prior to scheduling meeting):

- ☐ City-approved – Appendix A.
- ☐ City-approved – Shop Drawings for any items *not* listed on Appendix A.
- ☐ Payment of all utility connection fees.
- ☐ Copies of all permits required from CITY departments and government agencies.
- ☐ List of all contractors and subcontractors (with contact information) who are to perform work on the project.
- ☐ Proposed list of Pre-Construction Meeting attendees with company and contact information (mailing address, phone number and email address.)
- ☐ Copies of State and local licenses for all contractors and subcontractors who are to perform work on the project.
- ☐ Contractor's current Certificate of Liability Insurance coverage. (If performing work for the City, specific insurance requirements apply, as administered by the City Purchasing Department.)
- ☐ Contractor Performance Bond and/or Labor & Materials Bond, and Maintenance Bond.
- ☐ Fully-Executed Developer's Agreement with City, if required for the project.
- ☐ If applicable to project, required submittals for Directional Drills per Section 33 of this MANUAL.
- ☐ Anticipated Weekly Construction Schedule.

30.15. 4 FLUSHING, INSPECTIONS, TESTING AND CONNECTIONS

For main flushing, contact the CITY Inspector a minimum of twenty-four (24) hours prior to conducting any main flushing.

For inspections and testing, contact the CITY Inspector a minimum of three (3) working days prior to schedule water and sewer inspections, pressure tests, chlorinating and Bac-T sampling, CCTV inspections, walk-throughs, pump station start-up inspections, etc.

For connections, contact the CITY Inspector a minimum of three (3) working days prior to any and all connections to the CITY utility system.

Locate wire installation and testing shall be in strict accordance with CITY details. Entire locate system shall be inspected by the CITY prior to backfilling. After backfilling but prior to paving, the entire locate system shall be tested by a certified utility locator or licensed electrical contractor. Submittal of a successful continuity test report to the CITY is required prior to CITY acceptance of utilities.

30.15. 5 FDEP WATER CLEARANCE

If a FDEP Water Permit was issued for the project, then FDEP Clearance must be obtained prior to connection to the CITY system and prior to connecting any water services. Submit three (3) paper copies of the "Certification of Construction Completion and Request for Clearance to Place Permitted PWS Components into Operation" form to the CITY for signature, along with the following items:

- ☐ Two (2) paper copies of the Preliminary As-built Survey.
- ☐ Three (3) paper copies of the successful Bac-T test results.
- ☐ Successful Pressure Test results.

It shall be the DEVELOPER or DEVELOPERS ENGINEER'S responsibility to transmit the package to FDEP, obtain clearance, and provide a copy of the clearance letter to the CITY.

30.15. 6 FDEP WASTEWATER CLEARANCE

If a FDEP Wastewater Permit was issued for the project, then FDEP Clearance must be obtained prior to placing the new or modified wastewater facilities in service. Submit three (3) paper copies of the "Request for Approval to Place a Domestic Wastewater Collection/Transmission System into Operation" form to the CITY for review and signature, along with the following items:

- ☐ Two (2) paper copies of the Preliminary As-built Survey.
- ☐ Successful Pump Station and/or Force Main Test results, if applicable.

It shall be the DEVELOPER or DEVELOPERS ENGINEER'S responsibility to transmit the package to FDEP, obtain clearance, and provide a copy of the clearance letter to the CITY.

30.15. 7 WALK-THROUGH INSPECTIONS

The preliminary walk-through inspection(s) must be requested by the CONTRACTOR, and can be scheduled *after* receipt by the CITY of the Preliminary As-Built Survey. Following this walk-through, if necessary, a letter will be written by the City Inspector stating the remaining punch list items to be completed by the CONTRACTOR prior to the scheduling a final walk-through. Additional walk-through inspections and punch lists may be generated as required.

The final walk-through inspection must be requested by the CONTRACTOR. Following the successful final walk-through, a letter will be written from the CITY stating that a final walk-through inspection has been made of all utilities to be dedicated, and that all utility construction has been completed to CITY standards and specifications with no punch list items remaining.

30.15. 8 EASEMENTS, BILL OF SALE, SCHEDULE OF VALUES, WARRANTY, OPERATION & MAINTENANCE AND CERTIFICATIONS OF WORK

Utilities to be dedicated to the CITY which are *not* installed in dedicated public rights-of-way must be located in a CITY UTILITY EASEMENT to allow the CITY access for maintenance, repairs and meter reading. A copy of the acceptable CITY easement form is available upon request. The completed, signed, witnessed and notarized form must be submitted to the CITY. When approved by the City Attorney, the easement document will be returned to the DEVELOPER for recording at the COUNTY recording office. A copy of the recorded easement document must be submitted to the CITY.

A Bill of Sale is required to transfer ownership of the utilities to be dedicated to the CITY. A copy of the Bill of Sale form is available upon request.

A Schedule of Values is required to accompany the Bill of Sale. The Schedule of Values should be provided by the CONTRACTOR, and shall include all utilities and appurtenances with associated dollar values that are to be dedicated to the CITY.

A Letter of Warranty is required to the CITY signed by an authorized agent for the CONTRACTOR on the Contractor's letterhead, guaranteeing workmanship, materials and equipment for a period of one year from the date of the letter on all infrastructure and utilities constructed to be dedicated to the CITY with the project. Letter must be dated within five (5) days following the successful final walk-through inspection by the CITY.

Six (6) sets of Operation and Maintenance Manuals for all equipment shall be submitted to the CITY.

Certifications of Work from other agencies as appropriate to the project (COE, FDEP, FDOT, SJC, etc.) stating that the work has been done in accordance with their requirements shall be submitted to the CITY.

30.15. 9 CLOSEOUT DOCUMENTS SPECIFIC TO CITY CONTRACT PROJECTS

Notification of Completion by the CONTRACTOR to the CITY stating that all claims have been paid, discharged or waived.

Warranty of Title, Lien Release, whereby the CONTRACTOR warrants and guarantees that title to all work, materials and equipment covered by the Application for Payment shall have passed to the CITY free and clear of all liens, claims, security interests, and encumbrances.

Letter of consent from Surety as to final payment. This in no way relieves obligation to provide performance and payment bonds during the guarantee period.

Post-construction photographs (if required by contract documents.)

30.15.10 PRELIMINARY AS-BUILT DRAWINGS

All as-built information shall be recorded and kept current during the progress of the construction Work. On a monthly basis, the CONTRACTOR or DEVELOPER's authorized agent shall furnish to the CITY a photocopy "redline" set of drawings identifying those field changes made to the Work to date, along with a photocopy set of the associated field notes and photographs. Revisions and recording of information on the photocopy set of drawings shall be done to scale in red ink clearly and accurately. The CITY may review and comment on the drawings which shall be incorporated into the next month "redline" as-built submittal. Failure to incorporate changes the following month may result in the rejection of any application for payment submittal to the CITY, denial of certification of completion or denial of acceptance by the CITY.

Upon completion of the Work and prior to dedication of utilities to the CITY the CONTRACTOR shall furnish electronic files in AutoCAD DWG and Acrobat PDF formats that are in the State Plane Coordinate System using the Florida East Zone (US Feet) with reference to the North American Datum (NAD) 1983 for horizontal data and the North American Vertical Datum (NAVD) 1988 Datum for elevation data and two (2) 24"x36" paper copies for the purposes of FDEP Clearance Requests, CITY review and CITY walk-thru inspections. Preliminary as-built drawings shall be based on the engineering design drawings as released for construction and shall include all detail sheets and depict any deviations. The engineering design drawings electronic file shall be furnished to the CONTRACTOR by the project ENGINEER. The preliminary as-built drawings electronic file shall remain intact per the engineering design drawings electronic file and be re-drawn/revised to indicate final as-built data (true to scale) and

separated from the engineering design drawing features by individual layers as indicated on the CITY's electronic drawing file standards and submittal form (see Appendix C) in accordance with all addenda and change orders. The engineering design drawing layers shall be lightened and/or grayed as to not distract from the as-built layers. Simply changing the coordinates note or just adding notes is not acceptable. Separate preliminary as-built drawings are required for water, sewer and stormwater. No preliminary as-built drawings will be accepted which contain a combination of the above construction types, unless prior approval by the CITY is granted.

The CONTRACTOR shall provide access to buried utilities in order to allow for accurate horizontal and vertical measurements to be acquired by the SURVEYOR or ENGINEER as needed. At no time shall the SURVEYOR or ENGINEER accept the CONTRACTOR's word or sketch to replace onsite survey methods to record as-built data. Should discrepancies exist, at the discretion of the CITY and at no cost to the CITY the CONTRACTOR shall verify buried utilities.

Each sheet of the as-built drawings shall be labeled AS-BUILT in 1" high or larger printed letters and bear the name of the signed as-built certification of the CONTRACTOR and the signed and sealed as-built certification of the registered professional SURVEYOR and MAPPER (PSM) and/or registered professional ENGINEER (PE) who provided the horizontal and vertical dimensions and elevations on the as-built drawings. The signatures shall certify that the as-built drawings do, in fact, reflect true as-built conditions as located under the direct supervision of the registered PSM and/or PE. The drawings shall be certified using the forms provided by the CITY (see Appendix C).

At a minimum, as-built drawings shall clearly indicate horizontal and vertical locations of all pipes, valves, appurtenances, taps, manholes, structures, etc... Clearly show Bac-T sample points numbered and matching the Bac-T test reports. Datum and benchmark information shall be boldly displayed in large print on each drawing sheet. A minimum of two (2) benchmarks on or adjacent to the site shall be shown along with four (4) GPS acquired location points of property corners or existing permanent site features on or adjacent to the site are required.

Failure to comply with the CITY's preliminary as-built drawings standards herein or failure to field verify as-built drawings as required shall result in the CONTRACTOR being ineligible to bid on future CITY projects or install underground utilities within the CITY service area.

30.15.11 FINAL AS-BUILT DRAWINGS

After the preliminary as-built drawings have been reviewed and approved by the CITY, after all punch list items have been successfully completed and after the final walk-thru inspection of the project has been conducted the CONTRACTOR may submit the final as-built drawings. Submittal to the CITY shall consist of the following items:

- □ One (1) electronic set (CD) per 30.15.10.
- □ Three (3) signed and sealed paper sets per 30.15.10.
- □ One (1) 24" x 36" signed and sealed reproducible Mylar set.

Failure to comply with the CITY final as-built drawings standards herein or failure to submit final as-built drawings in a timely matter shall result in the CONTRACTOR being ineligible to bid on future CITY projects or install underground utilities within the CITY service area.

30.16 DEWATERING

30.16. 1 DISCHARGE TO WATER BODY

If the CONTRACTOR encounters groundwater, the CONTRACTOR shall be responsible for utilizing a dewatering system(s) to remove water from the excavations. Prior to beginning any dewatering, the CONTRACTOR shall comply with all sampling requirements listed in Florida Department of Environmental Protection (FDEP) Dewatering Regulations (62-621.300(2) F.A.C.). The CONTRACTOR shall be responsible for obtaining a *Generic Permit for Discharge of Produced Ground Water from any Non-Contaminated Site Activity* from the FDEP.

Once the sampling analysis is complete, the sample(s) results shall be submitted to the FDEP for approval and a copy provided to the CITY. If the sample analysis fails to meet FDEP water quality standards, no dewatering can proceed without further instruction from the FDEP and CITY. Additionally, prior to any dewatering, the CONTRACTOR shall apply for a St. Johns River Water Management District (SJRWMD) Generic Permit for Short Term Dewatering, and comply with all SJRWMD requirements.

If the above requirements are not followed, the CONTRACTOR shall be held liable for any fines and/or violations incurred by the CITY.

30.16. 2 DISCHARGE TO SANITARY SEWER SYSTEM

CONTRACTOR shall obtain an Industrial Pretreatment Permit from the CITY for allowing discharges of groundwater from dewatering efforts into the CITY's sanitary sewer system. CONTRACTOR shall abide by the permit conditions. CONTRACTOR shall coordinate notice and proposed discharge of groundwater directly with the CITY prior to proceeding with such operation. At a minimum, the CONTRACTOR shall provide the following information at the preconstruction meeting for use of obtaining the permit:

- Processes employed to minimize/eliminate discharge of solids/sediment and sand into sanitary sewer
- Process to monitor and document the discharge rate and volume on a daily basis (maximum of 100 GPM with an average flow rate of 50 GPM)

- Process to monitor for groundwater pollutants i.e. chemical odors, oily sheen, etc. Moreover, a procedure for stopping discharge in the event such is encountered.

30.16. 3 NPDES PERMIT CONFORMANCE - STORMWATER POLLUTION PREVENTION

The CONTRACTOR shall obtain as necessary a Generic Permit for Stormwater Discharge from Large and Small Construction Activities (CGP), and shall develop a Stormwater Pollution Prevention Plan (SWPPP) compliant with local, state, and federal rules, laws, and ordinances. CONTRACTOR shall be responsible for implementing the SWPPP, installing and maintaining in a functional manner structural and nonstructural best management practices as described therein, evaluating the effectiveness of the best management practices, and employing additional performance based best management practices as may be deemed necessary by the CITY. The CONTRACTOR, at its own expense, shall revise, or include as addendum to the SWPPP measures as may be required by a local, state, or federal authority to remain compliant with local, state, and federal rules, laws, and ordinances. No additional payments shall be made to CONTRACTOR for revisions or addendums to the SWPPP, or for the actual implementation of those revisions on the WORK site, including those made so as to achieve functional performance based best management practices.

The CONTRACTOR shall obtain all other applicable local, state, and federal permits subsequent to notification of the CITY of the need for such authorization(s). It is unlawful to have any discharges that are not composed entirely of stormwater (except discharges pursuant to a NPDES permit) to the Municipal Separate Stormwater System (MS4). Only non-contaminated water/non-turbid water shall be transported through the MS4. Groundwater discharge (approved by the FDEP pursuant to 62-621.300(2)) from dewatering activities may be routed into the stormwater system, drainage ditch, creek, river or wetland providing that erosion, and transportation of suspended solids to the system is prevented. If contaminated soil or contaminated groundwater is encountered, the dewatering activity shall cease immediately, and the CONTRACTOR shall contact the CITY.

Upon approval to proceed to do so by the CITY, the CONTRACTOR shall complete a Notice of Termination (NOT) (DEP Doc. No. 62-621.300(6), F.A.C.), to terminate the CGP coverage within one (1) week of final site stabilization.

If the above requirements are not followed, the CONTRACTOR shall be held liable for any fines and/or violations incurred by the CITY.

SECTION 31 – SITE PREPARATION, SURFACE REMOVAL, AND RESTORATION

31. 1 GENERAL

This Section covers clearing, grubbing, and stripping of the construction sites. The CONTRACTOR shall clear and grub all of the area within the limits of construction as shown on the PLANS and approved by the CITY prior to the beginning of any WORK. All site work shall conform to the applicable site clearing, landscaping, and arbor regulations of the CITY.

31. 2 CLEARING AND GRUBBING

31. 2. 1 CLEARING

The surface of the ground for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish, and all other objectionable obstructions resting on or protruding through the surface of the ground. The CONTRACTOR shall avoid any and all encroachment into wetlands, natural upland buffers, preservation areas, conservation areas, and other environmentally sensitive areas. However, trees and shrubs shall be preserved as specified in Section 30.4.4. Clearing operations shall be conducted in a manner that prevents damage to existing and proposed structures and installations and provides for the safety of employees and others.

31. 2. 2 GRUBBING

Grubbing shall consist of the complete removal of all stumps, roots larger than 1-1/2 inches in diameter, matted roots, brush, timber, logs, and any other organic or metallic debris not suitable for foundation purposes, resting on, under, or protruding through the surface of the ground to a depth of 18 inches below the subgrade. All depressions excavated below the original ground surface for or by the removal of such objects shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

31. 2. 3 STRIPPING

In areas so designated, top soil shall be stripped and stockpiled. Topsoil so stockpiled shall be protected until it is placed as specified. Any topsoil remaining after all WORK is in place shall be disposed of by the CONTRACTOR.

31. 2. 4 DISPOSAL OF CLEARED AND GRUBBED MATERIAL

The CONTRACTOR shall at CONTRACTOR's expense dispose of all material and debris from the clearing and grubbing operation in accordance with all applicable ordinances.

31. 3 DUST CONTROL

CONTRACTOR shall control dust resulting from clearing and grubbing operations to prevent nuisance to adjacent property owners and the general public. CONTRACTOR shall use dust control methods and materials approved by the CITY or the ENGINEER.

31. 4 SURFACE REMOVAL

Along the proposed pipe lines as indicated on the PLANS, the CONTRACTOR shall remove the surface materials only to such widths as will permit a trench to be excavated which will afford sufficient room for proper efficiency and proper construction. All applicable CITY, COUNTY and FDOT regulations shall be followed. Where sidewalks, driveways, pavements, and curb and gutter are encountered, care shall be taken to protect against fracture or disturbance beyond reasonable working limits. All fractured, broken, or disturbed surfaces shall be restored to their original condition prior to completion of the WORK.

31. 5 RESTORATION

Prior to beginning any of the WORK, the CONTRACTOR shall furnish the CITY with unedited video tape(s) with superimposed timer and vocal commentary of the existing conditions before any construction begins, along the entire construction route. Tape(s) should include both sides of the right-of-way and record close attention to paved and unpaved driveways and walkways; conditions of lawns, shrubs, flowers, flower beds, and trees; conditions of pavement, fences, signs, planters, and any other item within or adjacent to the right-of-way. The tape(s) shall become a part of the DEVELOPER'S ENGINEER's permanent job records. Tape(s) should be indexed using the timer for locations by stationing and by street intersections.

Restoration of all surfaces including road subbase, soil cement, limerock base, asphalt concrete surface, portland cement concrete pavement and driveways, sidewalks, handicap ramps, and concrete curbs shall be in strict accordance with the road construction specifications shown on the PLANS, and as specified by FDOT and COUNTY requirements, and as approved by the CITY. All grassing and mulching shall be done as specified on the PLANS, FDOT and COUNTY requirements, and as approved by the CITY. Solid sodding shall be placed on all slopes greater than 4:1, within 10 feet of all proposed structures, where existing sod is removed or disturbed by the WORK, and where needed to control erosion. In addition, CONTRACTOR shall restore all storm drains, culverts, inlets, and storm manholes to equal or better condition in accordance with specifications shown on the PLANS, and as specified by FDOT and COUNTY requirements, and as approved by the CITY.

On a case by case basis as directed by the CITY, the CONTRACTOR shall be required to replace existing sections of sidewalks that intersect at roadways and driveways which do not contain handicap ramping with an ADA compliant 12 to 1 maximum sloped facility

per CITY specifications when it is necessary to remove or damage those sections during construction, or when such sections are inadvertently damaged during construction.

SECTION 32 – EXCAVATION, BACKFILL, COMPACTION, AND GRADING

32. 1 GENERAL

This Section covers excavation, backfill, fill, and grading associated with utility trench and structural construction. All such WORK shall be performed by the CONTRACTOR concurrently with the WORK specified in Divisions IV and V of these specifications. The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary to perform all excavation, backfill, fill, compaction, grading, and slope protection required to complete the WORK shown on the DRAWINGS and specified herein. The WORK shall include, but not necessarily be limited to: pump stations, manholes, vaults, conduit, pipe, roadways and paving, all backfilling, fill and required borrow, grading, disposal of surplus and unsuitable materials, and all related WORK such as sheeting, bracing, and water handling.

32. 2 SOIL BORINGS AND SUBSURFACE INVESTIGATIONS

The DEVELOPER'S ENGINEER shall examine the site and undertake subsurface investigations, including soil borings. Written reports, including any recommendations by the GEOTECHNICAL/SOILS ENGINEER, concerning said investigations shall be provided to the CITY during the plan review process. The CITY will not be responsible for presumed or existing soil conditions in the WORK area.

32. 3 EXISTING UTILITIES

CONTRACTOR shall locate existing utilities in the areas of WORK in accordance with Section 30.2.1. If utilities are to remain in place, the CONTRACTOR shall provide adequate means of protection during earthwork operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, the CONTRACTOR shall consult the owner of such piping or utility and the ENGINEER immediately for directions. Payment for damage and repair to piping or utilities shall be made in accordance with Florida Statutes. Refer to Section 30.2 for utility coordination requirements.

32. 4 MATERIALS

32. 4. 1 GENERAL

Materials for use as bedding and backfill, whether in situ or borrow, shall be as described under this Section. The CONTRACTOR shall, upon request by the CITY, make an appropriate sample of this material available for testing by the CITY or its designated representative.

32. 4. 2 STRUCTURAL FILL

Materials for structural fill shall be bedding rock or select common fill as specified herein or other suitable material as approved by the CITY.

32. 4. 3 COMMON FILL

Common fill shall consist of mineral soil, substantially free of clay, organic material, loam, wood, trash, and other objectionable material which may be compressible or which cannot be compacted properly. Common fill shall not contain stones larger than 6 inches in any dimension, asphalt, broken concrete, masonry, rubble, or other similar materials. The fill shall have physical properties such that it can be readily spread and compacted during filling. Additionally, common fill shall be no more than 12 percent by weight finer than the No. 200 mesh sieve unless finer material is approved for use in a specific location by the CITY.

Material falling within the above specifications, encountered during the excavation, may be stored in segregated stockpiles for reuse. All materials which, in the opinion of the CITY, are not suitable for reuse, shall be spoiled as specified herein for disposal of unsuitable materials.

32. 4. 4 SELECT COMMON FILL

Select common fill shall be as specified above from common fill, except that the material shall contain no stones larger than 1-1/2 inches in largest dimension, and shall be no more than 5 percent by weight finer than the No. 200 mesh sieve.

32. 4. 5 BEDDING ROCK

Bedding rock shall be 3/16 inch to 3/4 inch washed and graded stone (FDOT #67). This stone shall be graded so that 90 to 100 percent will pass a 3/4 inch screen and 95 to 100 percent will be retained on a No. 8 screen. No stones larger than 1 inch in any dimension shall be accepted. See STANDARD DETAILS.

32. 5 SHEETING AND BRACING IN EXCAVATIONS

32. 5. 1 GENERAL

If required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction and to protect adjacent structures, existing piping and/or foundation material from disturbance, undermining, or other damage, the CONTRACTOR shall construct, brace, and maintain cofferdams consisting of sheeting and bracing. Care shall be taken to

prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed. The CONTRACTOR shall comply with the Florida Trench Safety Act.

32. 5. 2 MISCELLANEOUS REQUIREMENTS

For trench sheeting for pipes, no sheeting is to be withdrawn if driven below mid-diameter of any pipe and no wood sheeting shall be cut off at a level lower than one foot above the top of any pipe unless otherwise directed by the CITY. If, during the progress of the WORK, the CITY decides that additional wood sheeting should be left in place, it may direct the CONTRACTOR to do so. If steel sheeting is used for trench sheeting, removal shall be as specified above, unless written approval is given by the CITY for an alternate method of removal. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger the construction of other structures, utilities, existing piping, or property. Unless otherwise approved or indicated on the PLANS or in the SPECIFICATIONS, all sheeting and bracing shall be removed after completion of the substructure. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools specially adapted to that purpose, by watering, or otherwise as may be directed.

The right of the CITY to order sheeting and bracing left in place shall not be construed as creating any obligation on its part to issue such orders, and its failure to exercise its right to do so shall not relieve the CONTRACTOR from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the CONTRACTOR to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

The CONTRACTOR shall construct the cofferdams and sheeting outside the neat lines of the foundation unless indicated otherwise to the extent he deems it desirable for his method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting, bracing, and cofferdams shall be adequate to withstand all pressures to which the structure will be subjected. Pumping, bracing, and other work within the cofferdam shall be done in a manner to avoid disturbing any construction already performed. Any movement or bulging which may occur shall be corrected by the CONTRACTOR at CONTRACTOR's own expense so as to provide the necessary clearances and dimensions.

32. 6 DEWATERING, DRAINAGE, AND FLOTATION

32. 6. 1 GENERAL

The CONTRACTOR shall excavate, construct, and place all pipelines, concrete work, fill, and bedding rock "in-the-dry". In addition, the CONTRACTOR shall not make the final 24 inches of excavation until the water level is a minimum of one foot below proposed bottom of excavation. For purposes of these specifications "in-the-dry" is

defined to be within 2 percent of the optimum moisture content of the soil. The CITY reserves the right to ask the CONTRACTOR to demonstrate that the water level is a minimum of one foot below proposed bottom of excavation before allowing the construction to proceed.

In addition to the CITY requirements in this section, all applicable requirements of SJRWMD, FDOT and the COUNTY pertaining to dewatering shall be met. The CONTRACTOR is responsible for obtaining all applicable permits from SJRWMD, FDOT and the COUNTY.

Discharge water shall be clear with no visible soil particles. Discharge from dewatering shall be disposed of in such a manner that it will not interfere with the normal drainage of the area in which the WORK is being performed, create a public nuisance, or form ponding. The operations shall not cause injury to any portion of the WORK completed, or in progress, or to the surface of streets, or to private property. The dewatering operation shall comply with the requirements of the appropriate regulatory agencies. Additionally, where private property will be involved, advance permission from the owner of record shall be obtained by the CONTRACTOR.

32. 6. 2 ADDITIONAL REQUIREMENTS

The CONTRACTOR shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.

Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

Where well-points are required for pre-drainage of the soils prior to final excavation for some of the deeper in-ground structures or piping and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline, or fill will not be floated or otherwise damaged, well-points shall be surrounded by suitable filter sand and negligible fines shall be removed by pumping.

The CONTRACTOR shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems for handling groundwater and surface water encountered during construction of structures, pipelines, and compacted fills.

During backfilling and construction, water levels shall be measured in observation wells located as directed by the ENGINEER. Continuous pumping will be required as long as water levels are required to be below natural levels.

32. 7. EXCAVATION

32. 7. 1 GENERAL

Excavation consists of removal, storage, and disposal of material encountered when establishing required grade elevations and in accordance with the notes shown on the PLANS.

Authorized earth excavation includes removal and disposal of pavements and other obstructions visible on ground surface, underground structures, and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation. Unauthorized excavation consists of removal of material beyond the limits needed to establish required grade and subgrade elevations without specific direction of the CITY. Unauthorized excavation, as well as remedial work directed by the CITY shall be at the CONTRACTOR's expense. Such remedial work shall be performed as directed by the CITY.

If requested by the CITY, when excavation has reached required subgrade elevations, a GEOTECHNICAL/SOILS ENGINEER shall make an inspection of conditions. If the subgrade is unsuitable, CONTRACTOR shall carry excavation deeper and replace excavated material with select common fill or bedding rock, as directed by the CITY, at CONTRACTOR’s expense.

If the CONTRACTOR excavates below grade through error, for his own convenience, through failure to properly dewater the excavation, or disturbs the subgrade before dewatering is sufficiently complete, CONTRACTOR may be directed by the CITY to excavate below grade and refill the excavation using select common fill or bedding rock at CONTRACTOR’s expense.

Side slopes of excavations shall comply with CITY SPECIFICATIONS and with OSHA requirements. CONTRACTOR shall shore and brace where sloping is not possible due to space restrictions or stability of the material excavated. Sides and slopes shall be maintained in a safe condition until completion of backfilling.

CONTRACTOR shall stockpile satisfactory excavated materials at a location approved by the CITY until required for backfill and fill. When needed in the WORK, material shall be located and graded at the direction of a GEOTECHNICAL/SOILS ENGINEER.

Stockpiles shall be placed and graded for proper drainage. All soil materials shall be located away from the edge of excavations. All surplus and/or unsuitable excavated material shall be legally disposed of by the CONTRACTOR. Any permits required for the hauling and disposing of this material shall be obtained by the CONTRACTOR prior to commencing hauling operations.

32. 7. 2 EXCAVATION FOR STRUCTURES

All such excavations shall conform to the elevations and dimensions shown on the PLANS within a tolerance of plus or minus 0.10 feet and extending a sufficient distance from footings and foundations to permit placing and removing formwork, installation of services and other construction, inspection or as shown on the DRAWINGS. In excavating for footings and foundations, care shall be exercised not to disturb the bottom of the excavation. Bottoms shall be trimmed to required lines and grades to leave a solid base to receive concrete.

32. 7. 3 TRENCH EXCAVATION

Excavation for all trenches required for the installation of utility pipes shall be made to the depths indicated on the DRAWINGS and in such manner and widths as will give suitable room for laying the pipe within the trenches, for bracing and supporting, and for pumping and drainage facilities.

The bottom of the excavations shall be firm and dry and in all respects acceptable to the CITY and the ENGINEER. All backfilling materials and measures shall be inspected and approved by the CITY prior to commencing of backfilling.

Excavation shall not exceed normal trench width as specified in the STANDARD DETAILS. Any excavation which exceeds the normal trench width shall require special backfill requirements as determined by the CITY and the ENGINEER.

Where pipes are to be laid in bedding rock, select common fill, or encased in concrete, the trench may be excavated by machinery to or just below the designated subgrade provided that the material remaining in the bottom of the trench is only slightly disturbed.

Where the pipes are to be laid directly on the trench bottom, the lower part of the trenches shall not be excavated to grade by machinery. The last of the material being excavated shall be done manually in such a manner that will give a shaped bottom, true to grade, so that pipe can be evenly supported on undisturbed material, as specified in the STANDARD DETAILS. Bell holes shall be hand excavated as required. No pipe shall bear upon the bell.

CONTRACTOR is responsible for compliance with the State of Florida Trench Safety Act.

32. 8 BEDDING AND BACKFILL

32. 8. 1 GENERAL

Material placed in fill areas under and around structures and pipelines shall be deposited within the lines and to the grades shown on the DRAWINGS or as directed by the CITY,

making due allowance for settlement of the material. Fill shall be placed only on properly prepared surfaces which have been inspected and approved by the CITY. If sufficient select common or common fill material is not available from excavation on site, the CONTRACTOR shall provide fill as may be required.

Fill shall be brought up in substantially level lifts starting in the deepest portion of the excavation. The entire surface of the WORK shall be maintained free from ruts and in such condition that construction equipment can readily travel over any section.

Fill shall be placed and spread in layers by a backhoe or other approved method, unless otherwise specified. Prior to the process of placing and spreading, all materials not meeting those specified under Section 32.4 shall be removed from the fill areas. The CONTRACTOR shall assign a sufficient number of workers to this WORK to ensure satisfactory compliance with these requirements.

If the compacted surface of any layer of material is determined to be too smooth to bond properly with the succeeding layer, it shall be loosened by harrowing or by another approved method before the succeeding layer is placed.

All fill materials shall be placed and compacted "in-the-dry". The CONTRACTOR shall dewater excavated areas as required to perform the work and in such a manner as to preserve the undisturbed state of the natural inorganic soils.

Prior to filling, the ground surface shall be prepared by removing vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials. CONTRACTOR shall plow, strip, or break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with the existing surface. When existing ground surface has a density less than that specified under Section 32.9 for the particular area classification, CONTRACTOR shall break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

Before compaction, material shall be moistened or aerated as necessary to provide the optimum moisture content. Material which is too wet shall be spread on the fill area and permitted to dry, assisted by harrowing if necessary, until the moisture content is reduced to allowable limits. If added moisture is required, water shall be applied by sprinkler tanks or other sprinkler systems, which will insure uniform distribution of the water over the area to be treated and give complete and accurate control of the amount of water to be used. If too much water is added, the area shall be permitted to dry before compaction is continued. The CONTRACTOR shall supply all hose, piping, valves, sprinklers, pumps, sprinkler tanks, hauling equipment, and all other materials and equipment necessary to place water in the fill in the manner specified. CONTRACTOR shall compact each layer to required percentage of maximum dry density or relative dry density in accordance with Section 32.9. Backfill or fill material shall not be placed on surfaces that are muddy, frozen, or contain frost or ice.

32. 8. 2 BEDDING AND BACKFILL FOR STRUCTURES

Bedding rock shall be used for bedding under all structures as indicated on the STANDARD DETAILS. The CONTRACTOR shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion, or loosening of this bed. Structural fill shall be used as backfill against the exterior walls of the structures. Fill shall be compacted sufficiently in accordance with Section 32.9.2 of these SPECIFICATIONS. If compaction is by rolling or ramming, material shall be wet down as required.

Backfilling shall be carried up evenly on all walls of an individual structure. No backfill shall be allowed against walls until the walls and their supporting slabs, if applicable, have attained sufficient strength.

In locations where pipes pass through building walls, the CONTRACTOR shall take precautions to consolidate the fill up to an elevation of at least one (1) foot above the bottom of the pipes. Structural fill in such areas shall be placed for a distance of not less than three (3) feet either side of the center line of the pipe in level layers not exceeding eight (8) inches in depth.

The surface of filled areas shall be graded to smooth true lines that strictly conform to grades indicated on the DRAWINGS. No soft spots or non-compacted areas will be allowed in the WORK.

Temporary bracing shall be provided as required during construction of all structures to protect partially completed structures against all construction loads, hydraulic pressure, and earth pressure. The bracing shall be capable of resisting all loads applied to the walls as a result of backfilling.

32. 8. 3 BEDDING AND BACKFILL FOR PIPES

Bedding for pipe shall be as shown on the PLANS and specified on the STANDARD DETAILS. The CONTRACTOR shall take all precautions necessary to maintain the bedding in a compacted state and to prevent washing, erosion, or loosening of this bed.

Backfilling over and around pipes shall begin as soon as practicable after the pipe has been laid, jointed, and inspected. All backfilling shall be prosecuted expeditiously and as specified on the STANDARD DETAILS.

Any space remaining between the pipe and sides of the trench shall be carefully backfilled, spread by hand or approved mechanical device, and thoroughly compacted with a tamper as fast as placed, up to a level of one (1) foot above the top of the pipe. The filling shall be carried up evenly on both sides. Compaction shall be in accordance with the STANDARD DETAILS and Section 32.9.

The remainder of the trench above the compacted backfill as just described above, shall be filled and thoroughly compacted in uniform layers not exceeding twelve (12) inches in depth. Compaction of soil backfill shall be in accordance with the STANDARD DETAILS and Section 32.9.

32. 9. COMPACTION

32. 9. 1. General

The CONTRACTOR shall control soil compaction during construction to provide the percentage of maximum density specified. The CONTRACTOR shall provide the CITY copies of all soils testing reports, prepared by a GEOTECHNICAL/SOILS ENGINEER, demonstrating compliance with these SPECIFICATIONS.

When the existing trench bottom has a density less than that specified under Section 32.9.2, the CONTRACTOR shall break up the trench bottom surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

32. 9. 2 PERCENTAGE OF MAXIMUM DENSITY REQUIREMENTS

Fill or undisturbed soil from the bottom of the pipe trench to 1 foot above the pipe shall be compacted to a minimum density of 95 percent of the maximum dry density as determined by AASHTO T-180.

Backfill from 1 foot above utility pipes to grade shall be compacted to a minimum density of 95 percent of the maximum dry density as determined by AASHTO T-180.

Fill under and around structures, to the extent of the excavation, shall be compacted to a minimum density of 95 percent of the maximum dry density as determined by AASHTO T-180.

32. 9. 3 COMPACTION TESTS

One compaction test location shall be required for each 300 linear feet of pipe and each structure. The CITY may determine that more compaction tests are required to certify the installation depending on field conditions. The locations of compaction tests within the trench shall be in conformance with the following schedule:

a. One test at the spring line of the pipe.

b. At least one test for each 12 inch layer of backfill within the pipe bedding zone for pipes 24 inches and larger.

c. One test at an elevation of one foot above the top of the pipe.

d. One test for each two feet of backfill placed from one foot above the top of the pipe to finished grade elevation.

If, based on GEOTECHNICAL/SOILS ENGINEER testing reports and inspection, fill which has been placed is below specified density, CONTRACTOR shall provide additional compaction and testing prior to commencing further construction.

32.10 FLOWABLE FILL

32.10. 1 GENERAL

Furnish and place flowable fill as an alternative to compacted soil as approved by the ENGINEER and/or as required by the CITY or other agencies. Applications for flowable fill include beddings, encasements, closures for tanks, pipes, and general backfill for trenches.

32.10. 2 MATERIALS

Materials must meet the following requirements of STANDARD FDOT SPECIFICATIONS:

Fine Aggregate ---------- Section 902 (Any clean fine aggregate with 100% passing a 3/8 inch mesh sieve and not more than 15% passing a No. 200 sieve may be used.)

Portland Cement (Types I ,II or III) ---------- Section 921

Water---------- Section 923

Air Entraining Admixtures---------- Section 924 (High air generators or foraming agents may be used in lieu of conventional air entraining admixtures and may be added at jobsite and mixed in accordance with manufacturer's recommendation.)

Fly Ash, Slag and other Pozzolanic Materials ---- Section 929

32.10. 3 MIX DESIGN

Flowable fill is a mixture of Portland cement, fly ash, fine aggregate, air entraining admixture and water. Flowable fill contains a low cementitious content for reduced strength development.

Submit mix designs to the ENGINEER for approval. The following are suggested mix guides for excavatable and non- excavatable flowable fill:

	Excavatable	Non-Excavatable
Cement Type I	75 – 100 lb / yd ^{3}	75 – 100 lb / yd ^{3}
Fly Ash	None	150 – 600 lb / yd ^{3}
Water	* (Note 1)	* (Note 1)
Air ** (Note 2)	5 – 35 %	5 – 15 %
28 Day Compressive Strength ** (Note 2)	Maximum 100 psi	Minimum 125 psi
Unit Weight (Wet) ** (Note 2)	90 – 110 lb / yd ^{3}	100 – 125 lb / yd ^{3}
* Note 1: Mix designs shall produce a consistency that will result in a flowable self-leveling product at time of placement.		
** Note 2: The requirements for percent air, compressive strength and unit weight are for laboratory designs only and are not intended for jobsite acceptance requirements.		
Fine Aggregate shall be proportioned to yield 1 yd ^{3}.		

32.10. 4 PRODUCTION AND PLACING

Use flowable fill manufactured at a production facility that meets the requirements of STANDARD FDOT SPECIFICATIONS Section 347-3.

Deliver flowable fill using concrete construction equipment. Revolution counter are waived. Place flowable fill by chute, pumping or other methods approved by the ENGINEER. Tremie flowable fill through water.

32.10. 5 CONSTRUCTION REQUIREMENTS

Use straps, soil anchors or other approved means of restraint to ensure correct alignment when flowable fill is used as backfill for pipe or where flotation or misalignment may occur.

Protect flowable fill from freezing for a period of 36 hours after placement.

Place flowable fill to the designated fill line without vibration or other means of compaction. Do not place flowable fill during inclement weather, e.g. rain or ambient temperatures below 40ºF. Take all necessary precautions to prevent any damages caused by the hydraulic pressure of the fill during placement prior to hardening. Provide the means to confine the material within the designated space.

32.10. 6 ACCEPTANCE

Acceptance of flowable fill will be based on the following documentation and a minimum temperature of flowable fill at the point of delivery of 50ºF.

Furnish a delivery ticket to the ENGINEER for each load of flowable fill delivered to the worksite. Ensure that each ticket contains 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 aggregates,
7) Quantity of water withheld.

Leave the fill undisturbed until the material obtains sufficient strength. Sufficient strength is 35 psi penetration resistance as measured using a hand held penetrometer in accordance with ASTM C-403. Provide a hand held penetrometer to measure the penetration resistance of the hardened flowable fill.

32.10. 7 BASIS OF PAYMENT

When the item of flowable fill is included in the contract, payment will be made at the contract unit price per cubic yard. Such price and payment will include all cost of the mixture, in place and accepted, determined as specified above. No measurement and payment will be made for material placed outside the neat line limits or outside the adjusted limits, or for unused or wasted material.

32.11 GRADING

All areas within the limits of construction, including transition areas, shall be uniformly graded to produce a smooth uniform surface. Areas adjacent to structures or paved surfaces shall be graded to drain away from structures and pavement. Ponding shall be prevented. After grading, the area shall be compacted to the specified depth and percentage of maximum density.

No grading shall be done in areas where there are existing pipelines that may be uncovered or damaged until such lines have been relocated.

32.12 MAINTENANCE

CONTRACTOR shall protect newly graded areas from traffic and erosion and keep them free of trash and debris. CONTRACTOR shall repair and reestablish grades in settled, eroded, and rutted areas.

Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, CONTRACTOR shall scarify surface, reshape, and compact to

required density prior to further construction.

32.13 INSPECTION AND QUALITY ASSURANCE

32.12. 1 INSPECTION

CONTRACTOR shall examine the areas and conditions under which excavating, filling, and grading are to be performed and not proceed with the WORK until unsatisfactory conditions have been corrected.

CONTRACTOR shall examine existing grade prior to commencement of WORK and report to the CITY if elevations of existing grade vary from elevations shown on the DRAWINGS.

32.12. 2 QUALITY ASSURANCE

All work shall be performed in compliance with applicable requirements of governing authorities having jurisdiction.

The CONTRACTOR, at CONTRACTOR's expense, shall engage a GEOTECHNICAL/SOILS ENGINEER for quality assurance testing during earthwork operations. The GEOTECHNICAL/SOILS ENGINEER shall be subject to the approval of the CITY.

Quality assurance testing shall be performed during construction to ensure compliance with these SPECIFICATIONS. CONTRACTOR shall allow the GEOTECHNICAL/SOILS ENGINEER to inspect and approve fill materials and fill layers before further construction is performed. The CONTRACTOR shall give copies of all test results in a report form to the DIRECTOR to demonstrate compliance with compaction requirements stipulated in this MANUAL.

SECTION 33 – BORING AND JACKING, AND DIRECTIONAL DRILLING

33. 1 BORING AND JACKING – GENERAL

The installation of a casing pipe by the method of boring and jacking shall be governed by these SPECIFICATIONS. The overall work scope shall include, but not be limited to, boring and jacking pits and equipment, sheeting, steel casing pipe, skid, steel straps, coatings, location signs as required, miscellaneous appurtenances to complete the entire WORK as shown on the STANDARD DETAILS, and restoration. Applicable provisions of Divisions 3, 4, and 5 shall apply concurrently with these SPECIFICATIONS. Boring and jacking operations shall be performed within the right-of-way and/or easements shown on the DRAWINGS.

The CITY maintains the right to select the size, type, routing, location and design of all water mains, sewer force mains, and any other components being installed by jack and bore or directional drill methods for the CITY utility systems. New utilities or utility upgrades that are to be owned and maintained by the CITY must be constructed in open and improved public rights-of-way or equivalent. Physical conditions and criteria either proposed or existing of the rights-of-way must meet the DIRECTOR's approval for the CITY's ability to effectively and efficiently maintain the dedicated utilities.

33. 2 BORING AND JACKING – PIPE MATERIAL

33. 2. 1 STEEL CASING

Steel casings shall conform to the requirements of ASTM Designation A139 (straight seam pipe only) Grade "B" with a minimum yield strength of 35,000 psi. The casing pipes shall have the minimum nominal diameter and wall thickness (in inches) as shown on the following table:

STEEL CASINGS		
CARRIER NOMINAL DIAMETER	**CASING OUTSIDE DIAMETER**	**CASING WALL THICKNESS**
4	14	0.250
6	16	0.375
8	20	0.375
10	20	0.375
12	24	0.375
16	30	0.500
18	30	0.500
20	36	0.625

24	42	0.625
30	48	0.625
36	54	0.625
42	60	0.625

Field and shop welds of the casing pipes shall conform with the American Welding Society (AWS) standard specifications. Field welds shall be complete penetration, single-bevel groove type joints. Welds shall be airtight and continuous over the entire circumference of the pipe and shall not increase the outside pipe diameter by more than 3/4-inch.

33. 2. 2 CARRIER PIPE

The carrier pipe shall comply with the specifications outlined in Division 4 and 5.

33. 2. 3 INSPECTION

All casing pipe to be installed may be inspected at the site of manufacture for compliance with these SPECIFICATIONS by an independent laboratory selected and paid for by the CITY. The MANUFACTURER's cooperation shall be required in these inspections.

All casing pipe shall be subjected to a careful inspection prior to being installed. If the pipe fails to meet the SPECIFICATIONS it shall be removed and replaced with a satisfactory replacement at no additional expense to the CITY.

33. 3 BORING AND JACKING – PIPE HANDLING

Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe shall not be dropped. All pipe shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe or coatings shall be repaired to the satisfaction of the CITY.

33. 4 BORING AND JACKING – CONSTRUCTION

33. 4. 1 WORK COORDINATION

It shall be the CONTRACTOR'S responsibility to perform the boring and jacking work in strict conformance with the requirements of the agency in whose right-of-way or easement the work is being performed. Any special requirements of the agency such as insurance, flag persons, etc., shall be strictly adhered to during the performance of WORK. The special requirements shall be performed by the CONTRACTOR at no additional cost to the CITY.

33. 4. 3 DEWATERING

Dewatering through the casing during construction shall not be permitted. All dewatering

methods shall be approved by the CITY before construction work begins. CONTRACTOR shall install silt fence between all operations and any drainage, wetland, waterway or other area designated for such protection by the CITY or other state, federal and local regulations. CONTRACTOR shall follow all requirements of the CITY's Storm Water Pollution Prevention Plan (See STANDARD DETAILS) and the Dewatering Section of this MANUAL. CONTRACTOR shall adhere to all applicable environmental regulations stated in local, state and federal permits, laws, rules and regulations. A National Pollutant Discharge Elimination System (NPDES) permit shall be obtained by the CONTRACTOR. The CONTRACTOR shall verify that the NPDES permit is current, valid and in place before commencing any work on the project. The CONTRACTOR shall be responsible for obtaining a "Generic Permit for Discharge of Produced Ground Water from any Non-Contaminated Site Activity" from the Florida Department of Environmental Protection (FDEP) in accordance with the Dewatering Section of this MANUAL. The CONTRACTOR shall verify that the NPDES permit is current, valid and in place before commencing any work on the project.

33. 4. 4 CARRIER PIPE SUPPORT

The carrier pipes shall be supported within the casing pipes so that the pipe bells do not rest directly on the casing. The load of the carrier pipes shall be distributed along the casing by casing spacers as shown on the STANDARD DETAILS. Casing spacers shall be bolt on style split shells made of either T-304 stainless steel or fusion coated steel (a minimum 0.010 inches thick coating of PVC shall be provided over the entire band). The shell shall be lined with a PVC liner 0.090 inches thick with 85-90 Durometer. All nuts and bolts shall be high strength low alloy in accordance to AWWA C111. Runners shall be made of a high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction.

A conditional alternative pipe support method, composed of four - 4 foot long 4 inch by 4 inch pressure treated wood skids that are notched for and use one inch wide stainless steel bands, have a beveled leading edge, and that are placed 90 degrees to each other around the carrier pipe, may be used on a case by case basis as approved specifically by the DIRECTOR in writing. Should the wood skids experience slippage around the carrier pipe, the use of a cascade type casing spacer shall be required.

33. 4. 5 JACKING PITS

Excavation adjacent to the roads shall be performed in a manner to adequately support the roads. Bracing, shoring, sheeting, or other supports shall be installed as needed. The jacking pit and the end of the casing shall be located 5 feet preferred but a minimum of 2 feet, unless otherwise approved by the DIRECTOR, outside the edge of the road. CONTRACTOR shall install suitable reaction blocks for the jacks as required. Jacking operations shall be continuous and precautions shall be taken to avoid interruptions which might cause the casing to "freeze" in place. Upon completion of jacking operations, the reaction blocks, braces, and all other associated construction materials shall be completely removed from the site. All excavation activities shall comply with the Florida Trench

Safety Act.

33. 4. 6 MISCELLANEOUS REQUIREMENTS

Correct line and grade shall be carefully maintained. Earth within the casing shall not be removed too close to the cutting edge in order to prevent the formation of voids outside the casing. If voids are formed, they shall be satisfactorily filled with grout by pumping.

The sections of steel casing shall be field welded in accordance with the applicable portions of AWWA C206 and AWS D7.0 for field welded pipe joints. CONTRACTOR shall wire brush the welded joints and paint with Inertol Quick-Drying Primer 626 by Koppers Company or approved equal. After completion of jacking, CONTRACTOR shall clean the interior of the casing of all excess material.

The annular space between the carrier pipe and casing shall be filled with clean sand, if required in the Bore and Jack permit. Masonry plugs are to be installed at each open end of the casing. Plugs shall be suitable for restraining the earth load while allowing drainage of the casing.

33. 5 DIRECTIONAL DRILLING – GENERAL

33. 5. 1 SCOPE OF WORK

The work described in this section consists of furnishing and installing underground utilities using open-cut method or the Horizontal Directional Drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring, and shall be governed by these SPECIFICATIONS. This work shall include all services, equipment, materials, and labor for complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration. For the supply of domestic water during construction, the CONTRACTOR shall utilize a CITY meter assembly (meter & backflow device) and pay for all water consumed except in the case where a new water main is connected directly into the active water system for line filling and flushing operation. Un-accountable domestic water quantities shall be minimized, where possible. Applicable provisions of Divisions 3, 4, and 5 shall apply concurrently with these SPECIFICATIONS. Directional drilling operations shall be performed within the right-of-way and/or easements shown on the DRAWINGS.

33. 5. 2 REQUIREMENTS

CONTRACTOR shall provide a structurally sound, leak-proof, HDPE pipe for all piping identified for installation by HDD. Individual pipe lengths shall be assembled by butt-fusion unless otherwise specified. Connecting fittings shall be fused or mechanically joined to the piping as specified. CONTRACTOR shall also be responsible for all installation processes including drilling, back-reaming, management and disposal of all drilling fluid, dewatering, and leak testing the pipe and fittings in accordance with this MANUAL. CONTRACTOR shall be solely responsible for being familiar with the

conditions which may be encountered during the HDD, and for competently handling those conditions as they arise. A Bid Item is not included for geotechnical investigations, therefore the cost of any geotechnical investigations the CONTRACTOR deems necessary must be included in the unit price for the HDD. There may be other data necessary to ensure a successful project. The CONTRACTOR shall include the costs for any other investigation in the unit price for HDD.

33. 5. 3 QUALITY ASSURANCE

The requirements set forth in this section specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this section or within any associated permit (i.e.: FDEP, FDOT, etc.). Adherence to the specifications contained herein, or the CITY representative's approval on any aspect of any directional bore operation covered by this specification, shall in no way relieve the CONTRACTOR of their ultimate responsibility for the satisfactory completion of the work. The CONTRACTOR shall be responsible for the repair of all damage to private and/or public property (at no expense to the CITY). Repair work shall meet all local and state rules and requirements.

33. 5. 4 PROJECT SCHEDULE AND COOPERATION

The project schedule shall be established on the basis of working a normal work schedule including five days per week, single shift, and eight hours per day or four days per week, single shift, ten hours per day. Unless approved otherwise by the CITY, normal or general items of work, such as bacteriological testing, leakage and pressure testing, density testing and final inspections, shall be scheduled during the normal work schedule as specified in Section 30 of this MANUAL. Due to operational and manpower limitations on CITY systems, the CITY may require the CONTRACTOR to perform work outside of the normal work schedule. These operational and manpower limitations, including but not limited to, line filling and flushing operation, tie-in work, (cut-in work or other work) and other phases of the work which may impact the continued (non-interruptible) service to existing CITY customers. The CONTRACTOR shall plan and anticipate the cost impact of these systems limitations and provide such work or services at no additional cost to the CITY. If the CONTRACTOR requests to work outside of the normal CITY works hours, then the CITY Inspector, and any other CITY Staff necessary to perform the work, at the sole expense of the CONTRACTOR, shall be present at the project site for the duration of the work performed.

33. 5. 5 WARRANTY

The CONTRACTOR shall supply to the CITY a two (2) year unconditional warranty. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the SPECIFICATIONS.

33. 5. 6 REFERENCED STANDARDS

The work shall conform to applicable provisions of this MANUAL, latest edition, and the following standards, latest editions:

American Water Works Association (AWWA) Standards:

AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution

American Society for Testing and Materials (ASTM) Standards:

ASTM D618	Standard Methods of Conditioning Plastics and Electrical Insulating Materials for Testing.
ASTM D638	Standard Test Method for Tensile Properties of Plastics.
ASTM D1238	Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
ASTM D1248	Standard Specifications for Polyethylene Plastics Molding and Extrusion Materials.
ASTM D1505	Standard Test Method for Density of Plastics by the Density-Gradient Technique.
ASTM D1598	Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
ASTM D1599	Standard Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings.
ASTM D1603	Standard Test Method for Carbon Black in Olefin Plastics.
ASTM D2122	Standard Method of Determining Dimensions of Thermoplastics Pipe and Fittings.
ASTM D2290	Standard Test Method for Apparent Tensile Strength or Tubular Plastics and Reinforced Plastics by Split Disk Method.
ASTM D2683	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
ASTM D2839	Standard Practice for Use of a Melt-Index Strand for Determining Density of Polyethylene.
ASTM D3035	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
ASTM E3261	Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
ASTM D3350	Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
ASTM D4218	Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
ASTM F412	Standard Terminology Relating to Plastic Piping Systems.
ASTM F477	Elastic Seals (Gaskets) for Joining Plastic Pipe.

33. 5. 7 PERMITS

Permits for all work within FDOT, COUNTY, CITY, and Submerged Land of the State of Florida rights-of-way shall be obtained by the owner. The CONTRACTOR shall verify the existence of all permits before commencing any work on the project.

33. 5. 8 SUBMITTALS REQUIRED (SPECIFICALLY FOR HDD PROJECTS)

BORE PLAN
CONTRACTOR shall submit the following required information for all individual HDD segments. Acceptable responses to the evaluation criteria listed below shall be required prior to beginning any HDD work.

1. CONTRACTOR shall provide a BORE PLAN of each HDD segment for the project that is compatible with the pipe characteristics, site conditions, and HDD equipment.
2. CONTRACTOR shall provide calculations (in accordance with ASTM F 1962 or equal) for pull back force required and the resulting rig size proposed for the project.
3. CONTRACTOR shall provide calculations (in accordance with industry standards) predicting the expected annular pressure and identify areas subject to hydrofracture.
4. CONTRACTOR shall provide calculations demonstrating that the pipe will not be overstressed.
5. CONTRACTOR shall verify that the information and calculations presented in the BORE PLAN will be fully incorporated into the WORK PLAN.
6. CONTRACTOR shall identify which, if any, items of the basis of design that the CONTRACTOR proposes to change (entry/exit angles, depth, radius, etc.). These changes shall be reflected in the calculations and information required in these evaluation criteria.

WORK PLAN
Prior to beginning work, the CONTRACTOR must submit to the CITY a WORK PLAN detailing the procedure and schedule to be used to execute the project. The WORK PLAN should include a description of all equipment to be used, down-hole tools, a list of personnel and their qualifications and experience (including back-up personnel in the event that an individual is unavailable), list of any sub-CONTRACTORs, a schedule of work activity, a safety plan (including MSDS of any potentially hazardous substances to be used), traffic control plan (if applicable), an environmental protection plan and contingency plans for possible problems including a Frac-Out and Surface Spill Contingency Plan (for CITY approval). The WORK PLAN should be comprehensive, realistic and based on actual working conditions for the particular project. The WORK PLAN should document the thoughtful planning required to successfully complete the project. The CONTRACTOR shall submit and obtain the CITY's approval of a pre-construction bore-log depicting a plan and profile (horizontal and vertical alignment) of the proposed bore path. The bore-log shall show all utility crossings and existing structures. All proposed deviations from the drawings included in the contract documents shall be clearly identified.

The WORK PLAN shall specifically address the following potential problems:

1. A Frac-Out and Surface Spill Contingency Plan as completed by the CITY as part of the permit.
2. Loss of returns.
3. Obstructions along bore path during reaming or pullback.
4. Drill pipe or product pipe cannot be advanced.
5. Deviations from design line and grade exceed allowable tolerances.
6. Drill pipe or product pipe broken off in borehole.
7. Collapse of product pipe or excessive deformation.
8. Damage to a utility.
9. Excessive subsidence or heave.
10. Impacts to underground utility mains.

The WORK PLAN shall address the following procedures:

1. Methods:
   The CONTRACTOR shall provide complete descriptions of proposed plans, procedures, and personnel, as well as supporting calculations, for the following:
   a. Drilling operations, addressing: Procedures for pilot hole drilling and reaming. Procedures for tracking and controlling the drilling head location. Procedures for documenting and preparing as-builts.
   b. Drilling fluid management plan.
   c. Spoils handling and disposal plan.
   d. Pipe storage and handling, addressing: The means and methods for protecting pipe and ensuring temperature control in accordance with the CONTRACTOR's installation calculations.
   e. Pipeline assembly and installation, addressing: Procedures for pipe joining, pipeline pullback, and pullback monitoring.
   f. Prevention of inadvertent fluid losses and spills, and contingencies for rapid containment and cleanup, addressing: Measures to mitigate risk of inadvertent fluid returns to surface. Procedures for monitoring and controlling drilling fluid flows and pressures. Equipment, resources, and procedures for identifying, containing, and cleaning up fluid losses and spills.
   g. Quality control and testing procedures.
   h. Safety plan.
   i. Tie-in/connection(s) to existing system.

2. Equipment:
   The CONTRACTOR shall provide the make, model, and technical specifications for each of the following:
   a. Horizontal directional drill rig.
   b. Drilling system components.
   c. Downhole drilling assembly and reaming equipment.
   d. Downhole pressure sub.
   e. Guidance and control system.

f. Pulling head.
g. Swivel.
h. Rollers.
i. Solids separation and drill fluid recirculation systems.
j. Pipe fusion equipment.
k. Pipe fusion data logger.
l. Pipe handling equipment.
m. Pigs and pigging equipment.

The CONTRACTOR shall provide the following specific equipment information:
a. Calibration certification for the pilot bore guidance and control system.
b. Calibration certification for the heat fusion data logger.

CALCULATIONS

The following calculations shall be sign and sealed by a Professional Engineer licensed in the State of Florida and submitted prior to beginning any HDD work:

1. Pullback load calculation.
2. Pipe stress calculation.
3. Rate of penetration.
4. Maximum allowable drilling fluid pressure calculation.
5. CONTRACTOR shall confirm that the design parameters do not result in installation stresses that exceed allowable pipe stresses.

PRIOR TO DRILLING

A minimum of 24 hours prior to directional drilling.

1. CONTRACTOR shall walk each proposed bore path with the City Inspector. All utility crossings shall be identified and vertically verified by the CONTRACTOR.
2. CONTACTOR shall confirm in writing that the proposed bore path and all crossings meet the requirements of the permitted plan. Any deviations shall be reported to the Engineer of Record and the City Inspector.

DAILY REPORTS

The CONTRACTOR shall maintain daily activity reports throughout all horizontal directional drilling operations, including pipe installation. A sample daily report shall be submitted to the CITY for approval prior to the commencement of drilling operations.

Daily Reports shall be submitted within 24 hours of completion, and shall include, for each drill rod added or withdrawn, or every 25 feet during drilling, pre-reaming, and pullback:

1. Downhole tools and equipment in use.
2. Description of ground conditions encountered.
3. Description of drilling fluid.
4. Drilling fluid pumping rate.
5. Maximum and minimum downhole fluid pressures.
6. Drilling head location - at least every 10 feet along the bore path.
7. Drill stem torque.

8. Details and perceived reasons for delays greater than one hour other than normal breaks and shift changes.
9. Details of any unusual conditions or events.

SHOP DRAWING SUBMITTALS

Actual catalog data, brochures and descriptive literature will not be required for items of standard usage which meet the requirements of this MANUAL. Any specialty item not listed as a part of this MANUAL will require a complete shop drawing submittal for any material which may, in the ENGINEER's or the CITY's opinion, not be in compliance with this MANUAL.

The following data shall be provided for items which are not included in this MANUAL:

1. The CONTRACTOR shall provide detailed submittals of the proposed pipe and fitting products within 30 days of receiving notice to proceed. The CONTRACTOR shall provide documentation for products delivered to the site within three (3) days of delivery to the site. Horizontal directional drilling shall not commence until the CONTRACTOR has received written approval of all proposed product submittals from the CITY.

2. The following information shall be submitted for all proposed pipes, fittings, flanges, and specials:
   a. Catalog sheets and/or specifications, verifying compliance with the requirements of this SECTION.
   b. Shop drawings.
   c. Manufacturing quality control and quality assurance procedures.
   d. MANUFACTURER's recommendations for transportation, handling, and storage.
   e. MANUFACTURER's recommendations for field joining and joint quality control.
   f. MANUFACTURER's recommendations for field testing.
   g. Pipe and fittings material quality control and assurance test results.
   h. Pipe MANUFACTURER's retests and rejections tests.
   i. Product and material certifications for compliance with the referenced standards, for all products delivered to the site.

RECORD DRAWINGS

Submit for the CITY's approval the as-built records within five (5) working days after completing the pull back. RECORD DRAWINGS and BORE LOG shall be provided in Vertical Datum NAVD88 and Horizontal Datum NAD 83 State Plane Florida East Coordinate System (US Feet), and contain a minimum of four (4) coordinate points of property corners within or adjacent to the project site area. RECORD DRAWINGS shall be signed and sealed by a Professional Land Surveyor licensed in the State of Florida and/or the Engineer of Record. The CONTRACTOR shall certify the accuracy of all as-built record drawings. Following the CITY's approval of the preliminary as-built submittal, the final as-built records shall be submitted within five (5) working days.

The preliminary as-built submittal shall consist of:

1. Two (2) copies of the Bore Log.
2. Two (2) 24" x 36" paper copies at a scale not larger than 1:20 horizontal and 1:2 vertical that provide a Plan and Profile (data every 25 LF of main, at a minimum), and all information recorded during the progress of the work, including all identified subsurface anomalies.

The final as-built submittal shall consist of:

1. One (1) electronic set (CD) in AutoCAD format "DWG" on NAD 83 State Plane Florida East Coordinate System (US Feet).
2. Three (3) copies of the Bore Log.
3. Three (3) 24" x 36" signed and sealed paper sets.
4. One (1) 24" x 36" signed and sealed reproducible Mylar set.

33. 5. 9 NOTIFICATION

The CITY must be notified 48 hours (minimum) in advance of starting the HDD work. The HDD shall not begin until all necessary SUBMITTALS for the operation have been completed and approved by the CITY.

33. 5. 10 SITE PREPARATION

Prior to any alterations to the work-site, the CONTRACTOR shall provide a digital video recording of the entire work area. One (1) copy of which shall be given to the CITY and one (1) copy to remain with CONTRACTOR for a period of two (2) years following the completion of the project.

CONTRACTOR shall ensure the protection of all existing utilities by following the Common Ground Alliance Best Practices Version 1.0 or latest version, unless exceptions are specifically agreed to by the CITY. Also, the CONTRACTOR shall coordinate utilities locates with Sunshine State One-Call of Florida, Inc. (#800/432-4770 or website www.callsunshine.com). Once the locate service has field marked all utilities, the CONTRACTOR shall verify each utility (including any service laterals, i.e. water, sewer, cable, gas, electric, phone, etc.) and those within each paved area. Verification may be performed utilizing hand dig, or vacuum excavation. Prior to initiating drilling, the CONTRACTOR shall record on the drawings both the horizontal and vertical location of the utilities off of a predetermined baseline. The CONTRACTOR shall manage and control drilling practices to prevent damage to existing utilities. The CONTRACTOR shall be responsible for all losses and repairs as a result of damage to underground utilities resulting from drilling operations. The CONTRACTOR shall make a reasonable effort to locate evidence of any other potential subsurface obstructions such as piles or piers.

The work site shall be graded and filled to provide a level working area. No alterations beyond what is required for operations are to be made. CONTRACTOR shall confine all activities to designated work areas.

Following drilling operations, CONTRACTOR will de-mobilize equipment and restore the work site to original condition. All excavations will be backfilled and compacted to 95% of original density (at a minimum), or as otherwise specified.

33. 5. 11 ENVIRONMENTAL PROTECTION

CONTRACTOR shall install silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by the CITY or other state, federal and local regulations. CONTRACTOR shall follow all requirements of the CITY's Storm Water Pollution Prevention Plan (See STANDARD DETAILS) and the Dewatering Section of this MANUAL. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. CONTRACTOR shall adhere to all applicable environmental regulations stated in local, state and federal permits, laws, rules and regulations. Fuel may not be stored in bulk containers (greater than 25 gallons) within 200 feet of any water body, wetland or environmentally sensitive area. A National Pollutant Discharge Elimination System (NPDES) permit shall be obtained by the CONTRACTOR. The CONTRACTOR shall verify that the NPDES permit is current, valid and in place before commencing any work on the project. The CONTRACTOR shall be responsible for obtaining a "Generic Permit for Discharge of Produced Ground Water from any Non-Contaminated Site Activity" from the Florida Department of Environmental Protection (FDEP) in accordance with the Dewatering Section of this MANUAL. The CONTRACTOR shall verify that the FDEP permit is current, valid and in place before commencing any work on the project.

33. 5. 12 SAFETY

CONTRACTOR shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.

33. 5. 13 PERSONNEL QUALIFICATIONS CERTIFICATION

DIRECTIONAL BORING
All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. Each person must have been fully trained for over 1,000 hours on all facets of directional drilling, including, but not limited to machine operations, mud mixing, locating, and material fusion. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed, must be in direct charge and control of the operation at all times. In all cases the supervisor must be continually present at the job site during the actual Directional Bore operation. The CONTRACTOR shall have a sufficient number of competent workers on the job at all times to ensure the Directional Bore is made in a timely and satisfactory manner.

PIPE ASSEMBLY
Joints between plain end pipes and pipe fittings shall be made by butt fusion when possible. The on-site welder making the joints shall have received specific training from the MANUFACTURER of the fittings and/or pipe being welded and shall have written proof

of proper training/certification from the associated MANUFACTURERs. Only certified welders who have written training certifications from the fitting and/or pipe MANUFACTURER will be allowed to perform this work. That is, to weld a fitting in place, the on-site welder (employee) must be trained and certified by the fitting MANUFACTURER. To butt weld pipe, the on-site welder (employee) must be trained and certified by the pipe MANUFACTURER. The fusion work shall be accomplished (welding and cool-down/closing times) in accordance with the fitting and pipe MANUFACTURERs' recommendations, at a minimum. External and internal beads shall not be removed unless approved by the CITY. Upon request by the CITY or CONTRACTOR, the pipe MANUFACTURER shall provide training and training materials in the MANUFACTURER's recommended butt fusion, saddle fusion and electro fusion procedures to the CONTRACTOR's installation personnel, and to Inspectors representing the CITY, at no additional cost to the CITY. Only certified (MANUFACTURER certification) employees will be allowed to complete this fusion work.

33. 6 DIRECTIONAL DRILLING – MATERIALS

33. 6. 1 HIGH DENSITY POLYETHYLENE (HDPE, PE) PIPE AND FITTINGS

MATERIALS
Materials used for the MANUFACTURER of polyethylene pipe and fittings shall be PE3408 high density polyethylene meeting cell classification 345464C per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting MANUFACTURER in PPI TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73ºF per ASTM D-2837. The MANUFACTURER shall certify that the materials used to manufacture pipe and fittings meet these requirements.

2" POLYETHYLENE TUBING LINES (LOW PRESSURE SEWER LINES ONLY)
Tubing shall be manufactured of PE 3408, High Density Polyethylene (HDPE), in accordance with AWWA C901, ASTM D1248, ASTM D2239, ASTM D2737 and ASTM D3350. The tubing shall have a minimum working pressure of 200 psi. Polyethylene tubing shall be copper tube size or IPS SDR-9 and shall be colored black or green. HDPE pipe shall have ultraviolet (UV) inhibitors for protection against direct sunlight for one (1) year. Inserts for polyethylene tubing may be utilized, at CONTRACTOR's option, and if used, shall be 316 stainless steel. The CITY prefers stainless steel fittings be utilized when at all possible. The use of brass fittings (including couplings) is not acceptable, unless a suitable stainless steel fitting cannot be found. In such cases, the CITY may approve brass fittings in advance on a case-by-case basis. Tubing shall be approved for use with potable water by the National Sanitation Foundation (NSF-14) and shall be continuously marked at intervals of not more than four feet with the following:

1. Nominal size
2. Pressure rating
3. NSF seal

4. MANUFACTURER's name or trademark
5. Standard dimension ratio
6. ASTM specification

POLYETHYLENE PIPE (4 INCH AND LARGER)

HDPE Pipe shall conform to AWWA C906, DR-II, Ductile Iron Pipe (DIP) size and NSF 61 Standard. For pipe sizes 24-inch and larger, the HDPE may be IPS size, DR 11. Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, dimensions and either quick burst or ring tensile strength (equipment permitting).

Note that nominal pipe sizes only may be indicated on the drawings and/or bid form. Outside diameter of pipe is generally 1 to 2-inches greater than the nominal pipe diameter.

SERVICE IDENTIFICATION

Permanent identification of piping service shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. The striping material shall be the same material as the pipe material except for color. The following colors shall be used to identify piping service (pressure service):

Blue - potable water
Green - wastewater or force main
Purple - reclaimed water
Black - raw water

POLYETHYLENE FITTINGS AND CUSTOM FABRICATION

Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe MANUFACTURER or trained personnel. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Fabricated fittings must have the same working pressure as the mating pipe.

MOLDED FITTINGS

Molded fittings shall be manufactured in accordance with ASTM D3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing, and shall be so marked. Each production lot of molded fittings shall be subjected to the test required under ASTM D3261.

FABRICATED FITTINGS

Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service equivalent to the full service pressure rating of the mating pipe. Directional fittings 16" and larger such as elbows, tees, crosses, etc., shall have a plain end inlet for butt fusion and flanged directional outlets.

ELECTRO FUSION BRANCH SADDLES

Shall meet AWWA C-906, outlet shall comply with ASTM-D3261, and shall be specifically manufactured for HDPE pipe. This saddle may be utilized for wet-tap applications. These electro fusion fittings shall be designed and manufactured in accordance with ASTM Specifications F-1055 for use with HDPE (DIPS) pipe.

POLYETHYLENE FLANGE ADAPTERS

Flange adapter shall be made with sufficient throughbore length to be clamped in a butt fusion joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooved to provide gasketless sealing, or to restrain the gasket against blow-out. Below ground flange adapter may be utilized for 30" and larger, DIP and valves. Adapters for 24 inch and smaller utilize an MJ adapter (see below).

BACK-UP RINGS AND FLANGE BOLTS

Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. Convoluted style backup rings preferred over the flat stock rings. The lap joint flange bore shall be chamfered to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

MANUFACTURER'S QUALITY CONTROL

The pipe and fitting MANUFACTURER shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rated, and contamination. The cell classification properties of the material shall be certified by the supplier, and verified by MANUFACTURER's quality control.

POLYETHYLENE MECHANICAL JOINT (MJ) ADAPTERS

Mechanical connections of HDPE pipe (4" through 24" diameter) to Ductile Iron or PVC piping, mechanical joint fittings, or valves shall be through a self-restraining, fusible mechanical joint adapter with or without an integral, internal stainless steel insert. Mechanical joint adapter shall be of the same SDR rating as the pipe. A separate, loose stainless steel type insert will only be allowed for pipe sizes 4 inch through 8 inches. Provide the mechanical joint adapter, including but not limited to longer tee bolts or all thread rods with nuts at the mechanical joint bell. Note that PE flanged adapters may be utilized for pipe sizes 30 inches and larger.

CAST TRANSITION COUPLINGS

HDPE to MJ cast transition coupling may only be utilized for 8 inch and smaller pipe size. A stainless steel stiffener is required sized at proper ID of HDPE pipe. The transition coupling must be epoxy lined (3 mils minimum for water use and 12 mils minimum for sewer use). Acceptable is a Power Seal model 3520 or approved equal.

ELECTRO FUSION COUPLINGS

Polyethylene pipe and fittings may be joined using approved electro fusion couplings. Fittings shall be PE3408 HDPE, Cell Class 345464C as determined by ASTM D3350-99.

Electro fusion fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe. All electro fusion fittings shall be suitable for use as pressure conduit per AWWA C906, and have nominal burst value of 3.5 times the working pressure of the fitting. To minimize "toe-in" problems when installing an electro fusion coupling larger than 12 inch size, the CONTRACTOR shall remove 12 inches (minimum) from all associated "factory ends" and use a re-rounding clamp on the associated pipe. The CONTRACTOR shall mark pipe insertion depth prior to assembly and construct in accordance with MANUFACTURER's instructions.

33. 6. 2 FUSIBLE PVC PIPE (4"-12" SIZE)

May be used on potable water or reclaimed water systems (not acceptable on sewer applications). Fusible PVC may be utilized for directional drilling and direct bury applications. Pipe shall meet C-900 pressure class, DR-18 wall thickness and color coded. The pipe shall be marked with the name and location of the MANUFACTURER, pressure rating and size. Unless approved otherwise by the CITY, the bending radius shall not exceed 50% of the MANUFACTURER's recommendation and the pulling force shall not exceed 80% of the MANUFACTURER's recommendation.

33. 6. 3 SERVICE CONNECTIONS

Polyethylene service line tubing shall conform to specifications in this MANUAL, except as specified herein. Services 2 inches and smaller shall include an integral shut-off valve and be Philmac Fuse-A-Corp fusible valve; or Central Plastics electro fusion saddle tapping tee (use shell cutter to cut the HDPE or CITY approved equal). The CONTRACTOR shall supply all adapters, electrofused couplings, and special connections necessary to transition from the service connection to the CITY standard polyethylene service tubing at both ends. Services are to be in accordance with all CITY standards.

33. 6. 4 DRILLING FLUIDS

Drilling fluids shall be a bentonite slurry.

33. 6. 5 DELIVERY, STORAGE AND HANDLING OF MATERIALS

CONTRACTOR shall inspect materials delivered to the site for damage. All materials found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay.

CONTRACTOR shall unload and store opposite or near the place where the work will proceed with minimum handling. Store material under cover out of direct sun light. Do not store directly on the ground. Keep all materials free of dirt and debris.

CONTRACTOR is responsible for obtaining, transporting and sorting any fluids, including water, to the work site.

Disposal of fluids is the responsibility of the CONTRACTOR. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations. The bentonite drilling slurry may be recycled for reuse in the hole opening operation, or shall be hauled by the CONTRACTOR to an approved location or landfill for proper disposal. CONTRACTOR shall thoroughly clean entire area of any fluid residue upon completion of installation, and replace any and all plants and sod damaged, discolored or stained by drilling fluids.

33. 7 DIRECTIONAL DRILLING – EQUIPMENT REQUIREMENTS

33. 7. 1 GENERAL

The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the drill, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused, a guidance system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safety operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

33. 7. 2 DRILLING SYSTEM

DRILLING RIG
The directional drilling machine shall consist of a power system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The power system shall be self contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drilling string and an audible alarm which automatically sounds when an electrical current is detected.

DRILL HEAD
The drillhead shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

MUD MOTORS (IF REQUIRED)
Mud motors shall be of adequate power to turn the required drilling tools.

DRILL PIPE
Shall be constructed of high quality 4130 seamless tubing, grade D or better.

33. 7. 3 GUIDANCE SYSTEM

GENERAL

A Magnetic Guidance System (MGS) or proven gyroscopic system shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at all depths up to eighty (80) feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate to +/-2% of the vertical depth of the borehole at sensing position at depths up to one eighty (80) feet and accurate within two (2) feet horizontally. The Guidance System shall be of a proven type and shall be operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

BORE TRACKING AND MONITORING

At all times during the pilot bore the CONTRACTOR shall provide and maintain a bore tracking system that is capable of accurately locating the position of the drill head in the x, y, and z axes. The CONTRACTOR shall record these data at least once per drill pipe length or every twenty-five (25) feet, whichever is most frequent, and the data logged shall be tied to the surface grid tracking system.

DOWNHOLE AND SURFACE GRID TRACKING SYSTEM

CONTRACTOR shall monitor and record x, y, and z coordinates relative to an established surface survey bench mark and baseline stationing that is tied to existing, fixed and visible sight features. The survey baseline shall be referenced to the NAD 83 State Plane Florida East Coordinate System (US Feet). The data shall be continuously monitored and recorded at least once per drill pipe-length or at twenty-five (25) feet, whichever is more frequent.

DEVIATIONS

Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed +/-2% of the vertical depth of the borehole at sensing position and/or two (2) feet horizontally from the design path, such occurrences shall be reported immediately to the CITY. The CONTRACTOR shall undertake all necessary measures to correct deviations and return to design line and grade.

DRILLING FLUID PRESSURES AND FLOW RATES

Drilling fluid pressures and flow rates shall be continuously monitored and recorded by the CONTRACTOR. The pressures shall be monitored at the pump. These measurements shall be made during pilot bore drilling, reaming, and pullback operations.

33. 7. 4 DRILLING FLUID (MUD) SYSTEM

MIXING SYSTEM

A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. Mixing system shall continually agitate the drilling fluid during operations.

DRILLING FLUIDS

Drilling fluid shall be composed of clean water, appropriate additives and clay. Water shall be from an authorized source with a minimum pH of 6.0. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No potentially hazardous material may be used in drilling fluid.

DELIVERY SYSTEM

The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid cycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage and recycling facilities.

DRILLING FLUID RECYCLING SYSTEM

The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

CONTROL OF DRILLING FLUIDS

The CONTRACTOR shall follow all requirements of the Frac-Out and Surface Spill Contingency Plan as submitted and approved and shall control operational pressures, drilling mud weights, drilling speeds, and any other operational factors required to avoid hydro-fracture fluid losses to formations, and control drilling fluid spillage. This includes any spillages or returns at entry and exit locations or at any intermediate point. All inadvertent returns or spills shall be promptly contained and cleaned up. The CONTRACTOR shall maintain onsite mobile spoil removal equipment during all drilling, pre-reaming, reaming and pullback operations and shall be capable of quickly removing spoils. The CONTRACTOR shall immediately notify the CITY of any inadvertent returns or spills and immediately contain and clean up the return or spill.

33. 7. 5 OTHER EQUIPMENT

PIPE ROLLERS
Pipe rollers, if utilized, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

PIPE RAMMERS
Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of the CITY representative.

RESTRICTIONS
Other devices or utility placement systems for providing horizontal thrust other than those defined above in the preceding sections shall not be used unless approved by the CITY prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the projects.

33. 8 DIRECTIONAL DRILLING – DRILLING PROCEDURES

33. 8. 1 DRILL PATH

Prior to drilling CONTRACTOR shall utilize all verified locate information to determine drill pathway. Marked up drawings shall be onsite at all times, and referred to during the drill operation.

33. 8. 2 GUIDANCE SYSTEM

CONTRACTOR shall provide and maintain instrumentation necessary to accurately locate the pilot hole (both horizontal and vertical displacements), measure pilot string torsional and axial and measure drilling fluid discharge rate and pressure. The CITY representative shall have access to instrumentation and readings at all times during operation.

33. 8. 3 PILOT HOLE

GENERAL
The pilot hole shall be drilled along the path shown on the plans and profile drawings or as directed by the CITY representative in the field. Unless approved otherwise by the CITY, the pilot-hole tolerances shall be as follows:

VERTICAL ALIGNMENT
Shall be +/-2% of the vertical depth of the borehole at sensing position as shown on the plans.

HORIZONTAL ALIGNMENT
Shall be ± 2 feet and within 3 feet of right-of-way or easement boundary.

CURVE RADIUS
The pilot hole radius shall be no less than 80% of the maximum bending radius as recommended by the pipe MANUFACTURER of the pipe being installed. In no case shall the bending radius be less than 30 pipe diameters, unless approved otherwise by the CITY.

ENTRY POINT LOCATION
The exact pilot hole entry point shall be within ± 2 feet of the location shown on the drawing or as directed by the CITY representative in the field.

EXIT POINT LOCATION
The exit point location shall be within ± 2 feet of the location shown on the drawing or as directed by the CITY representative in the field.

LIMITATIONS ON DEPTH
If not noted on the plans, 6" HDPE pipe and smaller shall be installed with a depth of 3 to 5 feet and 8" HDPE pipe thru 12" pipe shall be installed with a depth of 3 to 6 feet unless it is required to install the pipe deeper due to utility conflicts. HDPE pipe larger than 12" shall be specifically designed by the ENGINEER and approved by the CITY. Where utilities cross under FDOT, COUNTY, CITY, and/or Submerged Land of the State of Florida rights-of-way, the depth of cover shall comply with applicable permits.

WATER MAIN AND NON-WATER MAIN SEPARATION REQUIREMENTS
The minimum separation requirements between HDPE water main and a non-water main shall be as outlined in Section 41 of this MANUAL.

33. 8. 4 PULL BACK

After successfully reaming the bore hole to the required diameter, CONTRACTOR will pull the pipe through the bore hole. In front of the pipe will be a swivel and reamer to compact bore hole walls. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations CONTRACTOR will not apply more than the maximum safe pipe pull pressure at any time. Maximum allowable tensile force imposed on the pull section shall be equal to 80% of the pipe MANUFACTURER's safety pull (or tensile) strength.

Torsional stress shall be minimized by using a swivel to connect a pull section to the reaming assembly.

The pullback section of the pipeline shall be supported during pullback operations so that it moves freely and the pipe is not damaged.

External pressure shall be minimized during installation of the pullback section in the reamed hole. Damaged pipe resulting from external pressure shall be replaced at no cost to the CITY.

Buoyancy modification shall be at the discretion of the CONTRACTOR and shall be approved by the CITY representative. The CONTRACTOR shall be responsible for any damage to the pull section resulting from such modifications.

In the event that the pipe becomes stuck, CONTRACTOR will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, CONTRACTOR will notify the CITY representative. The CITY representative and CONTRACTOR will discuss options and then work will proceed accordingly.

33. 9 DIRECTIONAL DRILLING – PIPE ASSEMBLY

33. 9. 1 GENERAL

Pipe shall be welded/fused together in one length, if space permits. Pipe may be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. For pipes 16 inch and larger, a re-rounding clamp tool shall be utilized during the electro-fusion process to ensure pipe roundness. For pipe sizes larger than 12 inch, mechanical scrappers (per the fitting MANUFACTURER's recommendation) shall be utilized during the electro-fusion work. It is critical that all original oxidized pipe surfaces be removed in order for fusion to take place. The scraping process requires that approximately 0.10" of the outer "skin" be removed in order to penetrate the oxidation and contamination barrier.

33. 9. 2 ACCEPTABILITY OF DAMAGED PIPE

Cuts or gouges that reduce the wall thickness by more than 10% is not acceptable and must be cut out and discarded.

33. 9. 3 BUTT FUSION TESTING

When requested by a CITY inspector, butt fusion testing will be performed. The test fusion shall be allowed to cool completely, and then fusion test straps shall be cut out. The test strap shall be 12" (min) or 30 times the wall thickness in length with the fusion in the center and 1" (min) or 1.5 times the wall thickness in width. Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new test fusion shall be made, cooled completely and tested.

33. 9. 4 MECHANICAL JOINING

Polyethylene pipe and fittings may be joined together or to the materials by means of flanged connections (flange adapters, electrofused couplings, and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material. Mechanical couplings shall be fully pressure rated and fully thrust

restrained such that when installed in accordance with MANUFACTURER's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.

33. 9. 5 MECHANICAL JOINT AND FLANGE INSTALLATION

Mechanical joints and flange connections shall be installed in accordance with the MANUFACTURER's recommended procedure. Flange faces shall be centered and aligned to each other before assembling and tightening bolts. In no case shall the flange bolts be used to draw the flanges into alignment. Bolt threads shall be lubricated, and flat washers shall be fitted under the flange nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the MANUFACTURER. At least one (1) hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the MANUFACTURER. The final tightening torque shall be 100 ft-lbs or less as recommended by the MANUFACTURER.

33. 9. 6 SPECIAL CONSTRUCTION REQUIREMENTS FOR 24 INCH AND LARGER PIPE

For HDPE pipe 24 inch and larger, unless approved otherwise by the CITY, a foundation bed of granular material (#57 stone) shall be placed under and around all ductile iron fittings and valves for additional support of heavy system components. A foundation bed of granular material shall be provided for all valves 20 size and larger. For granular materials, the minimum vertical limit is 12 inches under the fitting or valve, up to 1/3 the overall height of the fitting or valve. The minimum horizontal limits of the granular material shall be 12 inches in all directions beyond the outer edges of the fitting or valve. The compaction of soils below the granular material shall be at 98% of the maximum density. All spool pieces between 24 inch and larger ductile fittings and valves shall be at least 5 feet long. No joint deflection shall be allowed at the fittings or valves.

33. 9. 7 GENERAL REQUIREMENTS FOR OPEN-CUT CONSTRUCTION

Mains shall be constructed of the materials specified and as shown on the drawings, and in conformance with this MANUAL. Pipe and fittings shall be carefully handled to avoid damage, and if feasible, while they are suspended over the trench before lowering, they shall be inspected for defects and to detect cracks. Defective, damaged for unsound pipe or fittings shall be rejected. Each section of the pipe shall rest upon the pipe bed for the full length of its barrel. Any pipe which has its grade or joint disturbed after laying shall be taken up and re-laid. Only suitable soils (no heavy clay) shall be utilized in the backfill operation up to 12 inches above the pipe. All precautions shall be taken to prevent sand or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any time the pipe installation is not in progress, the open ends of pipe shall be closed by a

watertight plug or other method approved by the Engineer. Plugs shall remain in pipe ends until all water is removed from the trench. Any sand or foreign material that enters the pipe shall be removed from the pipe immediately. No pipe shall be installed when trench conditions (standing water, excess mud, etc.) or the weather (rain, etc.) is unsuitable for such work, except by permission of the ENGINEER and the CITY. Any section of pipe already laid which is found to be defective or damaged shall be replaced with new pipe. The CONTRACTOR shall coordinate utility locates with Sunshine State One-Call of Florida, Inc. (# 800-CAREFUL), at a minimum. The cover over all piping less than 24-inch size shall be a minimum of 30 inches in unpaved areas and 36 inches in paved areas with a maximum of 60 inches, unless approved otherwise by the CITY. The cover over all piping 24-inch size or greater shall be 36 inches (paved or unpaved areas), with a maximum of 84 inches, unless approved otherwise by the CITY. Cover for pipe under pavement shall be measured from the finished grade. Any reduction in pipe cover will require approval from the CITY and the ENGINEER. Greater depths will be permitted where required to miss obstructions only. Lines shall be located as shown on the drawings. The CONTRACTOR shall investigate well in advance of pipe laying any conflicts which may require readjustments in planned locations and advise the ENGINEER and the CITY of the results of these investigations so that the ENGINEER may give instructions as to the modifications required.

33. 10 TESTING

33. 10. 1 DISINFECTION TESTS

All water pipe and fittings shall be thoroughly disinfected prior to being placed in service. Disinfection shall follow the applicable provisions of the procedure established for the disinfection of water mains as set forth in AWWA - Standard C651 entitled "AWWA Standard for Disinfecting Water Mains" and shall be in accordance with Chapter III. 1.-Section 350. Bacteriological testing on the water main shall be scheduled with the CITY representative. CONTRACTOR will collect the water samples and be responsible for completing the water analysis (lab testing).

Temporary blow-offs shall be installed for the purpose of cleaning the water main. Blow-offs installed on water mains up to and including 12 inches shall be the same diameter as the water main. Blow-offs installed on 16 inch water mains and larger shall be the next smaller size, in diameter, than the water main being tested. Temporary blow-offs shall be removed and plugged after the main is cleared. The CITY representative shall be present prior to and during the operation of blow-offs. The main shall be flushed prior to disinfection.

The new water main shall be connected to the existing water main at one point only for flushing purposes (no looping). The new main must have a blow-off on the end as required previously. After the new main is thoroughly flushed, the open end shall be sealed and restrained and the main shall be thoroughly disinfected. Anytime the new line is reopened (to repair defective joints or pipe, defective fittings or valves) the complete disinfection

process shall be repeated. Once bacteriological clearance has been received from the regulatory authority, the new main may be pressure tested.

33. 10. 2 PRE-INSTALLATION PNEUMATIC PRESSURE TEST

After each HDPE pipe section has been assembled and prior to pullback, the CONTRACTOR shall perform an air pretest. The test pressure shall be 2 psi and this pressure shall be held for two (2) hours. CONTRACTOR is responsible for providing all equipment for this test. Pressure and temperature shall be monitored and recorded with calibrated instruments throughout the test. End caps, fittings or valve connected to the Product Pipe section shall have a pressure rating equal to or greater than the test pressure. The CONTRACTOR shall confirm with the Product Pipe's MANUFACTURER that the specified test procedures are suitable for the supplied pipe. Any recommended modifications to the procedures outlined in this specification shall be submitted to the CITY for approval. If leakage is indicated, the pipe shall be visually inspected and the leaking joint(s) shall be cut out and replaced and the section re-tested in accordance with the Specification requirements. All costs of repair and retesting shall be borne by the CONTRACTOR.

33. 10. 3 PRESSURE AND LEAKAGE TESTS

CONTRACTOR shall test pipelines installed in accordance with these specifications prior to acceptance of the pipeline by the CITY. All field tests shall be made in the presence of the CITY representative. Except as otherwise directed, all pipelines shall be tested. Unless approved otherwise by the CITY, all fusible or butt weld joints shall be tested, including MJ adapter fittings associated with the new construction. All piping to operate under liquid pressure shall be tested in sections of approved length. The pressure testing of an HDPE line section shall be tested separately from the PVC and DIP line sections. Where impractical, the HDPE test section shall include only a minimum amount of PVC and ductile iron pipe within the test section. If at all possible, the PVC and DIP test sections shall be left exposed during the pressure test for visual leakage observation. For these tests, the CONTRACTOR shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment, and all labor required. If the CONTRACTOR chooses to pressure test against an existing CITY water main/valve, the new water main must be disinfected prior to connection to the CITY line. The CITY will not be responsible for failure of the pressure test due to the existing valve leaking. The CITY may elect to furnish suitable pressure gauges for these tests. If not, the CONTRACTOR will furnish suitable pressure gauges, calibrated by an approved testing laboratory, which increments no greater than 2 psi. Gauges used shall be of such size that pressures tested will not register less than 10% or more than 90% of the gauge capacity. All valved sections shall be hydrostatic tested to ensure sealing (leak allowance) of all line valves. All HDD over 100 LF shall be air pressure tested (above ground) ± 5 PSI for a period of 15 minutes, prior to insertion. There shall be no pressure loss allowed.

Unless it has already been done, the section of pipe to be tested shall be filled with potable water and air shall be expelled from the pipe. Reclaimed water may be utilized for filling

new reclaimed water or sewer force main installations. If blow-offs or other outlets are not available at high points for releasing air, the CONTRACTOR shall provide 1 inch (minimum taps and blow-off valves (at the 12:00 position), as necessary. The cost of constructing blow-off valves and plugging them, after a successful pressure test, shall be included in the unit price bid amount for the HDPE pipe.

For mains larger than 20-inch size, it is highly recommended that the CONTRACTOR profile (line and grade) the main after installation and prior to pressure and leakage test to accurately locate all high points. Field survey instrument (Level equipment) shall be utilized for this task. Blow-off valves shall be installed (at a minimum) at all high points which offset vertically more than two pipe diameters in length (at a minimum). The CONTRACTOR shall consult the ENGINEER on any technical questions or concerns.
Hydrostatic testing shall consist of a 150 psig test pressures, based on the elevation of the highest point of the line or section under tests. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the CITY representative. The pump, pipe connection and all necessary apparatus shall be furnished by the CONTRACTOR and shall be subject to the approval of the CITY representative.

Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, and then allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.

INITIAL PHASE OF PRESSURE TESTING
First, all air must be removed from the test section. The pressure test shall be completed after the line is backfilled. If possible, all flanged or mechanical joint valves and fittings shall be left exposed for visual leak inspection. If possible all PVC and DIP test sections shall be left exposed for visual leak inspection. Initially, the pressure within the test section should be raised to approximately 160 psi and then allowed to be idle (no additional make-up water/pressure to be injected), for approximately 3 hours. During this 3 hour period, the test section shall be allowed to stabilize and come to an equilibrium stage. No additional make-up water/pressure shall be applied to the test section during this 3 hour stabilization period unless the line pressure drops below 140 psi. In this case, make-up water/pressure shall only be applied to the test section to maintain a minimum of 140 psi (during the 3 hour stabilization period).

FINAL PHASE OF PRESSURE TESTING
The final phase of the pressure test shall involve applying make-up water/pressure to achieve an "initial test pressure" of 150 psi (minimum)/155 psi (maximum). The test section is then allowed to be idle (no make-up water/pressure is added) for a period of 2 hours. After this 2 hour period, make-up water/pressure is applied and measured to re-establish the "initial test pressure". The quantity of water utilized to re-pump the line shall be measured and compared to the allowable quantities as determined by the table below. If the actual make-up water quantity is equal or less than the allowable amount, the pressure test passes. If the actual make-up water quantities are greater than the allowable amount, the pressure test fails.

Table 1: Allowable Make Up Amount	
Nominal Pipe Size (inches)	**Make-up Water Allowance (Gallons/Linear feet of Pipe) 2-hour test**
6	0.0030
8	0.0050
10	0.0065
12	0.0115
14	0.0140
16	0.0165
18	0.0215
20	0.0275
22	0.0350
24	0.0440
26	0.0500
28	0.0555
30	0.0635
32	0.0715
34	0.0810
36	0.0900
42	0.1155
48	0.1350
54	0.1570

In the event a section fails to pass the tests, the CONTRACTOR shall do everything necessary to locate, uncover (even to the extent of uncovering the entire section), and replace the defective pipe, valve, fitting or joint. Visible leaks shall be corrected regardless of total leakage. Lines which fail to meet these tests shall be retested as necessary until test requirements are complied with. All testing shall be performed at the CONTRACTOR's expense.

If, in the judgment of the CITY, it is impracticable to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made with approval; but, in any event, the CONTRACTOR shall be responsible for the ultimate tightness of the piping within the above requirement. Re-disinfection shall be required if the line is de-pressurized for repairs prior to tying.

33. 10. 4 LOCATE WIRE

Locate wire shall be provided on all installations. For HDD projects, locate wire shall be a minimum 12AWG copper-clad carbon steel with 30 mils (min) insulation. For open-cut projects, the locate wire construction and testing shall meet CITY locate wire requirements.

The external color shall be either white or yellow. Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations" and all "exit point locations", regardless of whether such boxes are identified on the plans. For HDD projects, there is no maximum length or interval between locate wire stations. The locate wire testing and reporting requirements shall be as per CITY STANDARDS. If the locate wire breaks or is not continuous (from end to end), the CONTRACTOR shall, at the CONTRACTOR's sole expense, provide soft-digs for the portions of the main with 12-feet or less cover (every 50 LF along main) to confirm as-built data. This soft-dig data shall be recorded on the as-built record drawings.

SECTION 34 – PRESSURE PIPE RESTRAINTS

34. 1 GENERAL

Pressure pipe fittings and other items requiring restraint shall use restraining assemblies as specified in this Section. Mechanically restrained joints shall be used for all installations. The use of concrete thrust blocks and tie rodding is prohibited.

Pipelines shall be restrained at all valves, bends, tees, crosses and dead ends for a specified distance. The DEVELOPER's ENGINEER shall design the pipe restraint distance in accordance with the specific conditions or circumstances on each pipeline design project. Determination of distances shall occur during design and be specified on the PLANS according to the Restrained Joint Details in the STANDARD DETAILS.

SECTION 35 – PRESSURE PIPE CONNECTIONS

35. 1 GENERAL

Installations of pressure connections shall be made in accordance with this Section.

35. 2 TAPPING SLEEVES

35. 2. 1 GENERAL

Tapping sleeves shall be fabricated stainless steel sleeves as specified below and in Appendix A.

35. 2. 2 STAINLESS STEEL TAPPING SLEEVES

Tapping sleeves shall meet or exceed AWWA C223. Sleeves shall be fabricated of 18-8 Type 304 stainless steel. Flange shall be Type 304 stainless steel in accordance with ANSI/AWWA C-207 Class D 150 ANSI B 16.5 CI 150. Branch shall be Type 304 stainless steel 14 gauge rolled to an I.D. of 0.5 inches larger than the nominal flange size. The branch shall be TIG (GTAW) welded to the flange and upper shell on the inside and MIG (GMAW) welded to the flange and upper shell on the outside. Bolts shall be 18-8 Type 304 stainless steel 5/8 inch – 11 track head NC rolled thread. Each sleeve shall be provided with seven (7) 1/2 inch long bolts with a minimum of 5 inch threads. Nuts shall be Type 304 stainless steel 5/8 inch heavy rolled hex with NC rolled threads tapped oversized 0.005-inch. Nuts shall be coated with an anti-seizing material such as xylan. Gasket shall be vulcanized natural or synthetic rubber compounded for use in water and wastewater systems.

35. 2. 3 TAPPING VALVES

Tapping valves shall meet the requirements of Section 42.2 except that units shall be flange by mechanical joint ends. Valves shall be compatible with tapping sleeves as specified above and specifically designed for pressure connection operations.

35. 3 NOTIFICATION AND CONNECTION TO EXISTING MAINS

All connections to existing mains shall be made by the CONTRACTOR only after the connection procedure and CONTRACTOR's work scheduling has been reviewed and approved by the CITY. The CONTRACTOR shall submit a written request to the CITY a minimum of forty-eight (48) hours prior to scheduling said connection, unless otherwise agreed upon at a CITY attended pre-construction conference. In the CONTRACTOR's request the following shall be outlined:

1. Points of Connection, fittings to be used, and method of flushing and disinfection if applicable.

2. Estimated construction time for said connections.

The CITY shall review the submittal within three (3) working days after receiving it and inform the CONTRACTOR regarding approval or denial of the request. If the request is rejected by the CITY, the CONTRACTOR shall resubmit the request modifying it in a manner acceptable to the CITY.

All connections shall only be made on the agreed upon date and time. If the CONTRACTOR does not initiate and complete the connection work in the agreed upon manner, the CONTRACTOR shall be required to reschedule the said connection by following the procedure outlined above.

The CONTRACTOR shall not operate any valves in the system.

35. 4 INSTALLATION

35. 4. 1 EXCAVATION, BACKFILL, COMPACTION, AND GRADING

The applicable provisions of Section 32 shall apply.

35. 4. 2 CONSTRUCTION SPECIFICATIONS

Sufficient length of main shall be exposed to allow for installation of the tapping sleeve and valve and the operation of the tapping machinery. The main shall be supported on concrete pedestals or bedding rock at sufficient intervals to properly carry its own weight, plus the weight of the tapping sleeve valve and machinery. Any damage to the main due to improper or insufficient supports shall be repaired at the CONTRACTOR'S expense.

The inside of the tapping sleeve and valve, the outside of the main, and the tapping machine shall be cleaned and swabbed or sprayed with 10 percent liquid chlorine prior to beginning installation for water system pressure connections.

After the tapping sleeve has been mounted on the main, the tapping valve shall be bolted to the outlet flange making a pressure tight connection. Prior to beginning the tapping operation, the sleeve and valve shall be pressure tested at 150 psi for a minimum of 30 minutes to ensure that no leakage will occur.

For pressure connections through diameters 12 inches or less, the minimum diameter cut shall be 1/2 inch less than the nominal diameter of the pipe to be attached. For 14 inch through 20 inch installations, the minimum diameter shall be 1-1/2 inch or less; for larger taps the allowable minimum diameter shall be 2 inches to 3 inches less than the nominal

diameter of the pipe being attached. After the tapping procedure is complete the CONTRACTOR shall submit the coupon to the CITY.

For pressure connections to wastewater force mains, the tapping valve shall be placed horizontally. After the tapping procedure is complete a plug valve shall be attached to the tapping valve. The tapping valve shall be left in the open position prior to backfilling.

Restrained joint fittings shall be provided to prevent movement of the installation when test pressure is applied. The excavation shall be maintained free of water at all times. Provisions of Section 34 shall apply.

35. 4. 3 TEMPORARY JUMPER CONNECTION

A temporary jumper connection shall be provided by the CONTRACTOR as required by the Florida Department of Environmental Protection when connecting new main to an existing potable water main.

SECTION 40 – WATER SYSTEM MATERIALS

40. 1 GENERAL

These specifications cover the pipe, fittings, and accessory items used for potable water transmission facilities.

Pipe used in water distribution systems shall be either polyvinyl chloride (PVC), or ductile iron pipe (DIP).

The CONTRACTOR shall be responsible for all materials furnished and storage of same, until the date of substantial completion. CONTRACTOR shall replace at CONTRACTOR's expense all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by the CITY, furnish certificates, affidavits of compliance, test reports, and/or samples for check analysis for any of the materials specified herein. All pipe delivered to the project site for installation is subject to random testing for compliance with the designated specifications.

40. 2 PIPE INSPECTION AND TESTING

Requirements specified in Section 50.5 shall apply.

40. 3 POLYVINYL CHLORIDE PIPE AND FITTINGS

40. 3. 1 PVC PIPE

All PVC pipe of nominal diameter four (4) inches through twelve (12) inches shall be manufactured in accordance with AWWA standard C900, latest edition. The PVC pipe shall have a minimum working pressure rating of 150 psi and shall have a dimension ratio (DR) of 18. Pipe shall be the same outside diameter as ductile iron pipe.

40. 3. 2 JOINTS

PVC pipe shall have integral bell push on type joints conforming to ASTM D3139.

40. 3. 3 FITTINGS

Fittings used with PVC pipe shall conform to Section 40.4.

40. 4 DUCTILE IRON PIPE AND FITTINGS

40. 4. 1 DUCTILE IRON PIPE

All ductile iron pipe shall be manufactured in accordance with ANSI/AWWA

A21.51/C151 and have a minimum 350 pressure class rating. Ductile iron pipe shall be used in special cases as approved by the DIRECTOR.

40. 4. 2 FITTINGS

Fittings shall be ductile iron compact fittings manufactured in accordance with ANSI/AWWA A21.53/C153 and have a minimum 350 pressure class rating.

40. 4. 3 JOINTS

Joints for ductile iron pipe and fitting joints shall be push-on, or mechanical for pipe diameters of 12 inch and above, joints conforming to ANSE/AWWA A21.11/C111. Where called for in the plans, restrained or flanged joints shall be provided. Flanged joints shall conform to ANSI Standard B 16.1-125 LB. Restrained joints shall conform to Sections 34.3 and 34.4.

40. 4. 4 COATINGS AND LININGS

Ductile iron pipe, fittings, and valves shall be thoroughly cleaned immediately prior to coating. CONTRACTOR shall prepare pipe, fittings and valves for coating using power tool cleaning or brush-off blast cleaning.

CONTRACTOR shall apply primer coat of Polyamide Epoxy, minimum 3.0 mils DFT. If shop coat is damaged, CONTRACTOR shall re-prime bare areas in field. If shop coat is bituminous coating, prime with 2 coats of stain barrier, 1 mil of dry film. CONTRACTOR shall apply two (2) finish coats, applied by spray, of Polyamide Epoxy, BLP Mobile Paints, minimum 4.0 mils DFT. Primer and field coats shall be compatible and shall be applied in accordance with the manufacturer's recommendations.

All ductile iron pipe and fittings for potable water applications shall have an interior protective lining of cement-mortar with a seal coat of asphaltic material in accordance with ANSI/AWWA A21.4/C104.

40. 4. 5 POLYETHYLENE ENCASEMENT

The pipe shall be polyethylene encased (8 mil) where shown on the DRAWINGS or required by the CITY in accordance with ANSI/AWWA A21.51/C105.

40. 5 SERVICE PIPE, STOPS, FITTINGS, AND SERVICE SADDLES

40. 5. 1 SERVICE MATERIAL

a) High-density polyethylene (HDPE) 1-inch tubing meeting the applicable standards of ASTM D3350, ASTM D2239 and NSF-14. See Appendix A.

b) High-density polyethylene (HDPE) 2-inch tubing meeting the applicable standards of ASTM D3350, ASTM D2239 and NSF-14. See Appendix A.

c) Polyvinyl chloride (PVC) 4-inch to 12-inch DR-18, PVC 1120 pipe meeting the applicable standards of ASTM D1784 and AWWA C900 having a pressure rating of 150psi. See Appendix A.

d) Polyvinyl chloride (PVC) 14-inch and up DR-18, PVC 1120 pipe meeting the applicable standards of ASTM D1784 and AWWA C905 having a pressure rating of 235psi. See Appendix A.

40. 5. 2 STOPS

a) 1-inch brass with wide rectangular operating head, conforming to AWWA C800, ASTM B62 and ASTM B584. See Appendix A.

b) 2-inch brass, with wide rectangular operating head, iron pipe thread configuration, installed with padlock wing for locking valve in closed position, conforming to AWWA C800, ASTM B62 and ASTM B584. See Appendix A.

40. 5. 3 FITTINGS

Brass fittings shall be cast and machined in accordance with specifications in AWWA C800 and AWWA C901. See Appendix A.

40. 5. 4 SERVICE SADDLES

A service saddle shall be used for all service line taps up to two (2) inches. Service saddles shall be sized exactly to the water main pipe outside diameter. Service saddle body shall be brass conforming to ASTM B62, ASTM B584 and AWWA C800. Nuts and washers shall be 304 stainless steel. Straps and bolts shall be 304 stainless steel. Single bands must have a minimum 3-1/4-inch width. Single band service saddles must have a total of four (4) bolts. Hinged saddles shall be allowed on 2-inch water mains only. See Appendix A.

SECTION 41 – WATER SYSTEM INSTALLATION

41. 1 GENERAL

Pipe shall be installed in accordance with the manufacturer's specifications and instructions for the type of pipe used and applicable AWWA standards, such as C600 and C603, unless otherwise stated in these specifications.

41. 2 PIPE HANDLING

All types of pipe shall be handled in such manner as will prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of the CITY or be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on properly prepared ground, graded to eliminate all rock points and to provide uniform support along the full length. When being transported, the pipe shall be supported at all times in a manner which will not permit distortion or damage to the lining or coating. Any unit of pipe that is damaged beyond repair by the CONTRACTOR, in the judgment of the CITY, shall be removed from the work site and replaced with another unit.

Joint gaskets shall be stored in a clean, dark, and dry location until immediately before use.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations. Any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned, and re-laid. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by a water-tight plug or by other means approved by the CITY to ensure absolute cleanliness inside the pipe.

41. 3 SEPARATION OF WATER MAINS AND SEWERS

41. 3. 1 GENERAL

Potable water mains that are laid in the vicinity of pipe lines designated to carry raw wastewater, reclaimed water, or storm water shall meet the horizontal and vertical separations specified below, and at a minimum shall conform to FDEP rules and the Utility Separation Diagram shown in this Section.

41. 3. 2 HORIZONTAL SEPARATION

NORMAL CONDITIONS: Water mains shall be located preferred 10 feet horizontally from pipes carrying raw wastewater, storm water or reclaimed water. The distance shall be measured from outside edge of pipe to outside edge of pipe.

UNUSUAL CONDITIONS: When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a pipe carrying raw wastewater or storm water provided that the bottom of the water main is at least 12 inches above the top of the sewer or storm water pipe and the water main is laid in a separate trench or on an undisturbed earth shelf. Such installations shall be specifically approved by the CITY.

41. 3. 3 VERTICAL SEPARATION

NORMAL CONDITIONS: Water mains shall be laid to provide a separation of at least 12 inches between the bottom of the water main and the top of the sanitary sewer or storm water pipe.

UNUSUAL CONDITIONS: When construction conditions prevent a vertical separation of 12 inches as described hereinabove, the sewer pipe shall be constructed of ductile iron pipe with mechanical joints.

41. 3. 4 CROSSING OF WATER MAINS AND SEWERS

Water mains shall be above the sanitary sewer or storm water pipe whenever they cross.

A vertical separation of at least 12 inches shall be maintained between the top of the sanitary sewer or storm water pipe and the bottom of the water main.

Adequate structural support for both the water main and sanitary sewer or storm water pipe shall be provided to prevent excessive deflection of joints and settling.

Sanitary sewer mains shall be constructed of PVC or ductile iron pipe with mechanical joints and the length of PVC or ductile iron pipe shall be a minimum of 18 feet and centered at the point of crossing so that the joints will be equidistant and as far as possible from the water main.

Utility Separation Diagram

OTHER PIPE	HORIZONTAL SEPARATION	CROSSINGS (1)	JOINT SPACING @ CROSSINGS (FULL JOINT CENTERED)
STORM SEWER, STORMWATER FORCE MAIN RECLAIMED WATER (2)	WATER MAIN 3 FT. MINIMUM OTHER PIPE	WATER MAIN 12 IN. MIN., EXCEPT STORM SEWER, THEN 6 IN. MIN., 12 IN. PREFERRED OTHER PIPE	ALTERNATE 3 FT. MINIMUM WATER MAIN
VACUUM SANITARY SEWER	WATER MAIN 10 FT. PREFERRED 3 FT. MINIMUM OTHER PIPE	WATER MAIN 12 IN. PREFERRED 6 IN. MINIMUM OTHER PIPE	ALTERNATE 3 FT. MINIMUM WATER MAIN
GRAVITY OR PRESSURE SANITARY SEWER, SANITARY SEWER FORCE MAIN, RECLAIMED WATER (4)	WATER MAIN 10 FT. PREFERRED 6 FT. MINIMUM (3) OTHER PIPE	WATER MAIN 12 IN. MIN., EXCEPT GRAVITY SEWER, THEN 6 IN. MIN., 12 IN. PREFERRED OTHER PIPE	ALTERNATE 6 FT. MINIMUM WATER MAIN
ON-SITE SEWAGE TREATMENT & DISPOSAL SYSTEM	10 FT. MINIMUM	—	—

ALL DISTANCES ARE TO OUTER PIPE WALL.
(1) WATER MAIN SHOULD CROSS ABOVE OTHER PIPE WHEN AT ALL POSSIBLE. WHEN WATER MAIN MUST BE BELOW OTHER PIPE, THE MINIMUM SEPARATION IS 18 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.

DESIGN SEPARATION SHALL BE GREATER THAN MINIMUMS TO ALLOW FOR TOLERANCE IN FIELD.
CITY INSPECTOR MAY DIRECT ALTERNATE SEPARATION REQUIREMENTS BASED ON FIELD CONDITIONS.

DISCLAIMER – THIS DETAIL IS PROVIDED FOR CONVENIENCE ONLY. PLEASE REFER TO F.A.C. RULE 62-555.314 AND C.O.S.A. STANDARDS AND SPECIFICATIONS DESIGN MANUAL AND DETAILS FOR ADDITIONAL CONSTRUCTION REQUIREMENTS.

C.O.S.A.

UTILITY SEPARATION REQUIREMENTS

REVISION DATE: FEB 2017
NOT TO SCALE
SS-42&W-35

41. 4 TRENCH PREPARATION AND PIPE BEDDING

41. 4. 1 TRENCH PREPARATION AND PIPE BEDDING

Applicable provisions of Section 32 and the STANDARD DETAILS shall apply.

41. 4. 2 PIPE PREPARATION AND HANDLING

All pipe and fittings shall be inspected prior to lowering into the trench to ensure no cracked, broken, or otherwise defective materials are being used. CONTRACTOR shall clean ends of pipe thoroughly and remove foreign matter and dirt from inside of the pipe and keep clean during and after installation.

CONTRACTOR shall use proper implements, tools, and facilities for the safe and proper protection of the WORK. CONTRACTOR shall lower pipe into the trench in such a manner as to avoid any physical damage to the pipe and shall remove all damaged pipe from the jobsite. Care shall be taken to not drop or dump pipe into trenches under any circumstances.

41. 4. 3 TRENCH DEWATERING AND DRAINAGE CONTROL

Specifications from Section 32 shall apply. CONTRACTOR shall prevent water from entering the trench during excavation and pipe laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water.

41. 4. 4 SURVEY LINE AND GRADE

Pipe shall be laid to the lines and grades shown on the PLANS. The CONTRACTOR shall provide line and grade stakes at a 100 foot maximum spacing and at all line and/or grade change locations. CONTRACTOR shall provide temporary bench marks (TBM's) at maximum 1000 foot intervals. The minimum ground cover shall be three (3) feet from the finished grade surface or three (3) feet below the elevation of the edge of pavement of the road surface, whichever is greater.

41. 4. 5 PIPE LAYING IN TRENCH

CONTRACTOR shall prevent foreign material from entering the pipe while it is being placed in the trench. CONTRACTOR shall remove all foreign material from the pipe or joint ring before the next pipe is placed. If the pipe laying crew cannot put the pipe into the trench and in place without getting earth into the pipe, the CITY may require that snugly-fitted and tightly-woven canvas bags be placed over each end before lowering the pipe. The bags shall be left in place until the connection is to be made to the adjacent pipe. During laying operations, CONTRACTOR shall keep debris, tools, clothing, or other materials out of the pipe.

41. 4. 6 LAYING POLYVINYL CHLORIDE PIPE

All PVC pipe shall be installed in accordance with standards set forth in the UNI-BELL "Handbook of PVC Pipe Design and Construction" unless such standards conflict with this MANUAL in which case this MANUAL shall govern.

41. 4. 7 LAYING DUCTILE IRON PIPE

All ductile iron pipe shall be installed in accordance with AWWA C600 unless such standards conflicts with this MANUAL in which case this MANUAL shall govern. CONTRACTOR shall cut pipe only as necessary to comply with alignment shown on the PLANS. Torch cutting of pipe shall not be allowed.

CONTRACTOR shall provide special tools and devices, such as special jacks, chokers, and similar items required for proper installation. Lubricant for the pipe gaskets shall be furnished by the pipe manufacturer with no substitutes to be permitted under any circumstances.

The pipe shall be polyethylene encased (8 mil) where shown on the DRAWINGS in accordance with ANSI/AWWA A21.51/C105.

41. 4. 8 LAYING OF PIPES ON CURVES

Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints. Maximum deflections at pipe joints and laying radius for the various pipe lengths shall be as recommended by the pipe manufacturer.

41. 4. 9 PIPE RESTRAINING

Requirements specified in Section 34 shall apply.

41. 4. 10 BEDDING AND BACKFILL FOR PIPES

Requirements specified in Section 32 shall apply.

41. 5 HYDROSTATIC TESTS

41. 5. 1 GENERAL

Hydrostatic tests shall consist of pressure and leakage tests. Hydrostatic tests shall be conducted on all newly laid pressure pipes, joints, and valves including all service lines to the curb stops. Air testing of pressure pipes will not be permitted under any circumstance. Tests may be made on sections not exceeding 2,000 feet when acceptable to the CITY. CONTRACTOR shall furnish all necessary equipment and material, make all taps, and furnish all closure pieces in the pipe as required. Equipment to be furnished

by the CONTRACTOR shall include graduated containers, pressure gauges, hydraulic force pumps, and suitable hoses and piping. The CITY will monitor and approve a satisfactory test.

The CONTRACTOR may conduct hydrostatic tests after the trench has been partially backfilled with the joints left exposed, for informational purposes only. The hydrostatic tests for acceptance shall be conducted only after the trenches have been completely backfilled and compacted as specified.

41. 5. 2 TESTING CRITERIA

All pipe sections to be pressure tested shall be subjected to a hydrostatic pressure of 150 psi. The duration of each pressure test shall be for a period of 2 hours. If during the test, the integrity of the tested line is in question, the CITY may require a 6 hour pressure test. The basic provisions of AWWA C-600 shall be applicable.

41. 5. 3 PROCEDURE FOR PRESSURE TEST

Each section of pipe to be tested, as determined by the CITY, shall be slowly filled with water through the required jumper connection and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made and appropriate valves installed to ensure bleeding of all air from the main. If defective pipes, fittings, valves, or hydrants are discovered in consequence of this pressure test, all such items shall be removed and replaced by the CONTRACTOR with sound material and the test shall be repeated until satisfactory results are obtained. Provisions of AWWA C600, where applicable, shall apply.

41. 5. 4 PROCEDURE FOR LEAKAGE TEST

After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure. Applicable provisions of AWWA C600 shall apply.

Allowable leakage in gallons per hour for pipeline shall not be greater than that determined by the formula:

$$L = \frac{SD\,(P)^{1/2}}{133{,}200}$$

Note: L = Allowable leakage in gallons per hour.
S = Length of pipe tested, in feet.
D = Nominal diameter of the pipe in inches.
P = Average test pressure during leakage test in pounds per square inch gauge.

Leakage is defined as the quantity of water to be supplied in the newly laid pipe or any valve section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. Should any test of pipe laid disclose leakage greater than that allowed, CONTRACTOR shall locate, replace and/or repair the defective joints, pipe, or valve until the leakage from subsequent testing is within the specified allowance.

41. 6 DISINFECTION

41. 6. 1 GENERAL

Before being placed in service, all new water mains shall be chlorinated in accordance with the specifications below and the procedures outline in AWWA C-651 "Standard Procedure for Disinfecting Water Mains". All provisions of the Florida Department of Environmental Protection permit shall be complied with.

41. 6. 2 FLUSHING

Sections of pipe to be disinfected shall first be flushed (full diameter) to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a blow-off valve shall be provided large enough to develop a velocity of at least 2.5 feet per second in the main.

All taps required for chlorination, flushing, or for temporary or permanent release of air shall be provided for by the CONTRACTOR as a part of the construction of water mains. After the disinfection, all such taps shall be sealed to the satisfaction of the CITY.

41. 6. 3 DISINFECTION CRITERIA

Before being placed into service, all new mains and repaired portions of, or extensions to existing mains shall be chlorinated so that the initial chlorine residual is not less than 50 mg/1 and that a chlorine residual of not less than 25 mg/1 remains in the water after standing 24 hours in the pipe.

41. 6. 4 FORM OF APPLIED CHLORINE

Chlorine may be applied as a liquid chlorine (gas-water mixture), or a mixture of water and high-test calcium hypochlorite. CONTRACTOR shall assume responsibility for safe handling of chlorine and shall meet requirements of OSHA and other regulatory agencies for safe handling of chlorine.

41. 6. 5 POINT OF APPLICATION

The preferred point of application of the chlorinating agent is at the beginning of the pipe line extension or any valve section of it, and through a corporation stop inserted in the

pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of applications may be used when approved or directed by the CITY.

41. 6. 6 OPERATION OF CITY VALVES

Valves shall be manipulated by the CITY personnel so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water.

41. 6. 7 RETENTION PERIOD

Treated water shall be retained in the pipe at least 24 hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 25 mg/1.

41. 6. 8 CHLORINATING VALVES AND HYDRANTS

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.

41. 6. 9 FINAL FLUSHING AND TESTING

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its lengths shows upon test, a free chlorine residual not in excess of that normally carried in the system.

After flushing, water samples collected on 2 successive days from the treated piping system, as directed by the CITY, shall show acceptable bacteriological results. All bacteriological testing shall be the responsibility of the CONTRACTOR. Bacteriological analysis shall be performed by a laboratory certified by the State of Florida with copies of all results provided to the CITY.

Proper chain of custody procedures must be followed and samples shall only be collected by certified laboratory personnel in the presence of CITY personnel.

Copies of testing results and all related correspondence with the Florida Department of Environmental Protection (FDEP) shall be submitted to the CITY. The DEVELOPER'S ENGINEER shall submit request for system clearance to FDEP after approval by the CITY.

At a minimum, sampling points shall be as stipulated on the FDEP permit. The CITY may designate additional sampling points. Testing must be performed on all sample points. Sampling points shall be shown on as-built surveys.

41. 6. 10 REPETITION OF FLUSHING AND TESTING

Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the CONTRACTOR until satisfactory results are obtained without any additional cost to the CITY.

41. 7 NOTIFICATION AND CONNECTION TO EXISTING MAINS

Requirements specified in Section 35.3 shall apply.

41. 8 WATER SERVICE PIPING CONNECTION

Water service piping and connection shall be installed as indicated in the STANDARD DETAILS. The location of all service lines shall be as shown on the DRAWINGS and shall be single service.

41. 9 LOCATION AND IDENTIFICATION

All lettering shall be legible and colors correct for the intended use. For locations with curbing, etch the letter "W" minimum of 2 inches high and 1/4 inch deep in face of curb, and paint blue. For locations without curbing but with sidewalk, etch the letter "W" minimum of 2 inches high and 1/4 inch deep in front of sidewalk, and paint blue. As an alternative to etching in all locations and conditions, a stainless steel disc and nail may be used. Disc shall be 1-1/2" diameter, and engraved with the word "WATER" centered at the 12 o'clock position and the word "SERVICE" centered at the 6 o'clock position on the disc. Nail and disc shall be installed at the edge of pavement, curbing or sidewalk directly in line with the water service.

The CITY may require other means of identification, such as treated fence posts painted blue on top to mark services for future development.

SECTION 42 – VALVES, HYDRANTS, AND ACCESSORIES

42. 1 GENERAL

All valves, hydrants, and appurtenances shall be products of well established firms who are fully experienced and qualified in the manufacture of the particular item to be furnished. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these SPECIFICATIONS as applicable. All valves shall open by turning the operator nut counter clock wise.

42. 2 RESILIENT SEAT GATE VALVES

42. 2. 1 GENERAL

All gate valves twelve (12) inches and smaller shall be resilient seat gate valves. Such valves shall be manufactured to meet or exceed the requirements of ANSI/AWWA C509 and certified to ANSI/NSF 61. Valves shall be mechanical joint and comply with ANSI/AWWA C111. See Appendix A.

42. 2. 2 MATERIAL

The valve body, bonnet, and bonnet cover shall be cast iron in accordance with ASTM A126, Class B. All inside and outside surfaces shall have an epoxy coating that meets or exceeds all applicable requirements of ANSI/AWWA C550 and certified to ANSI/NSF 61. A two (2) inch square wrench nut shall be provided for operating the valve. All valves are to be tested in strict accordance with AWWA C515. See Appendix A.

42. 2. 3 MISCELLANEOUS REQUIREMENTS

The valves shall be non-rising stem (NRS) with the stem made of cast, forged, or rolled bronze as specified in AWWA C515. Triple O-ring seal stuffing box (2 upper and lower O-rings). See Appendix A.

The resilient sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.

42. 3 BUTTERFLY VALVES

42. 3. 1 GENERAL

All shut-off valves sixteen (16) inches and larger shall be butterfly valves. Butterfly valves shall meet or exceed all applicable requirements of ANSI/AWWA C504 Standard Class 150B and certified to NSF 61. See Appendix A.

42. 3. 2 MATERIAL

The valve body shall be constructed of close grain cast iron per ASTM A126 Class B. All above ground valves shall be coated with 3 mils phenolic alkyd primer on the valve outside diameter and 5 mils asphalt varnish on the inside diameter, meeting or exceeding AWWA C504. The disc edge shall be 316 stainless steel. See Appendix A.

Valve seats thirty (30) inches and larger shall be field adjustable and replaceable without dismounting operator disc or shaft and without removing the valve from the line. All retaining segments and adjusting devices shall be of corrosion resistant material. Valves twenty four (24) inches and smaller shall have bonded or mechanically restrained seats as outlined in AWWA C504. See Appendix A.

42. 3. 3 FACE TO FACE DIMENSION

The face-to-face dimensions of valves shall be in accordance with above mentioned AWWA specification for short-body valve.

42. 3. 4 VALVE SHAFT

The valve shaft shall be turned, ground, and polished constructed of 18-8 Type stainless steel and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. Shaft shall be of either a one piece unit extending full size through the valve disc and valve bearing or it may be of a stub shaft design. See Appendix A.

42. 3. 5 VALVE OPERATOR

In general, the butterfly valve operators shall conform to the requirements of AWWA Standard Specifications for Rubber Seated Butterfly Valves, Designation C504, as applicable.

42. 4 VALVE INSTALLATION

All valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. All valves and appurtenances shall be installed true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the CITY before they are installed.

Valves shall be installed in a vertical position and be provided with a standard valve box so arranged that loads will not be transmitted to the valve. The box shall be vertically centered over the operating nut, and the cast iron box cover shall be set flush with the finished pavement surface or final grade in unpaved areas.

After installation, all valves shall be subjected to the field test for piping as outlined in Section 41 of these specifications. Should any defects in materials or workmanship appear during these tests, the CONTRACTOR shall correct such defects to the satisfaction of the CITY.

The CONTRACTOR shall provide one (1) valve wrench of the appropriate length to the CITY for each development based on the depth of the deepest valve actuating nut.

Flanged joints shall be made with hot dipped galvanized bolts, nuts and washers. Mechanical joints shall be made with mild corrosion resistant alloy steel bolts and nuts. All exposed bolts shall be painted the same color as the pipe. All buried bolts and nuts shall be heavily coated with two (2) coats of bituminous paint.

42. 5 VALVE BOXES

All buried valves shall have cast-iron three piece adjustable valve boxes. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by the CITY. The barrel shall be two-piece, sliding type, having 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with a cast iron covers. Covers shall have "WATER" or "SEWER" cast into the top for all such mains, as appropriate. The actuating nuts for deeper valves shall be extended to come up to within four (4) feet of the finished grade.

Care shall be taken installing valve boxes to ensure that valve stems are vertical and the cast iron box has been placed over the stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. CONTRACTOR shall remove any sand or undesirable fill from valve box prior to final inspection.

42. 6 AIR-RELEASE - AIR/VACUUM COMBINATION VALVES

The combination air-release and air/vacuum valves for use in water mains shall be installed as shown on the STANDARD DETAILS. The valves shall be as specified in Appendix A. Valves shall be located as shown on the DRAWINGS. All valves are to be located outside roadway paving. If water main location is inside paved area, then offset air release valve shall be used. See STANDARD DETAILS.

42. 7 FIRE HYDRANTS

42. 7. 1 GENERAL

The following specifications shall apply to fire hydrants located within CITY limits. For hydrants located within COUNTY limits, applicable standards and specifications of the COUNTY Utility Department shall apply. Per Florida Statutes, the State Fire Marshal

shall have the right to inspect any fire control system during and after construction to determine that such system meets the standards set forth in the laws and rules of the state.

42. 7. 2 MATERIAL

Fire hydrants shall have a 5-1/4 inch valve opening and meet or exceed all applicable standards of ANSI/AWWA C502 Standard, for 200 psig maximum working pressure and 400 psig static pressure. The hydrant shall be of a post type dry barrel design with dry top design. The hydrant shall be "Traffic" type with stainless steel safety stem coupling. The main valve shall be compression type closed with pressure for positive seal made of reversible rubber. The hydrant shall be ordered with square operating nut. Hydrant shall open by turning to the left (counter clockwise). See Appendix A and STANDARD DETAILS.

42. 7. 3 PAINTING

All metal parts of the hydrant both inside and outside shall be painted by the CONTRACTOR, in accordance with AWWA C501. All inside surfaces and the outside surfaces below the ground line shall be coated with two (2) coats of asphalt varnish in compliance with NSF-61, the first coat having dried thoroughly before the second is applied. The outside of the hydrant above the finished grade line shall be thoroughly cleaned and painted by the CONTRACTOR with one (1) coat of primer paint of a durable composition, and one (1) additional coat of red and silver in accordance with the STANDARD DETAILS. Paint shall be RUS-KIL enamel.

42. 7. 4 INSTALLATION

Hydrants shall be plumb and shall have their nozzles parallel with or at right angles to the curb, with the pumper nozzle facing the curb. Hydrants shall be set so that the lowest hose connection is a minimum of 18 inches and a maximum of 24 inches above the surrounding finished grade. All hydrants shall be inspected in the field upon delivery to the job to ensure proper operation before installation. The resetting of existing hydrants and moving and reconnecting of existing hydrants shall be handled in a manner similar to a new installation. Hydrant "Gradelok" for offset adjustments may be utilized. A concrete pad using 4,000 psi concrete and matching the STANDARD DETAILS shall be installed. Hydrants shall be constructed in accordance with the STANDARD DETAILS.

The CONTRACTOR shall supply one (1) hydrant wrench to the CITY for every three (3) new hydrants installed. In the event there are less than three (3) hydrants, a minimum of one (1) hydrant wrench shall be supplied.

42. 7. 5 LOCATION

Fire hydrants shall be located in the general location as shown on the DRAWINGS. Final field location of all hydrants shall be as approved by the CITY. All hydrants shall be located no less than four (4) and no more than eighteen (18) feet from the edge of pavement of the adjacent roadway and no less than four (4) feet from any physical feature which may obstruct access or view of any hydrant unless otherwise approved by the CITY.

42. 7. 6 IDENTIFICATION

A traffic rated blue reflective pavement marker (R.P.M.) shall be properly installed by the CONTRACTOR on the center line of the adjacent roadway that the main port faces so that the hydrant can be found at night from either direction of travel.

SECTION 50 – WASTEWATER MATERIALS

50. 1 GENERAL

Pipe used in gravity sewer construction shall be polyvinyl chloride (PVC). Where reference is made to an ASTM, ANSI, or AASHTO designation, it shall be the latest revision.

The CONTRACTOR shall be responsible for all materials furnished and storage of same, until the date of substantial completion. CONTRACTOR shall replace at CONTRACTOR's expense all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by the CITY, furnish certificates, affidavits of compliance, test reports, or samples for check analysis for any of the materials specified herein. Sewer mains shall be cleaned, inspected, and tested in accordance with Section 54 of this MANUAL. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

50. 2 PIPE MATERIALS

50. 2. 1 POLYVINYL CHLORIDE GRAVITY SEWER PIPE

PVC Gravity Sewer Pipe (4 inch - 15 inch), ASTM D3034, SDR 35 for pipe installations with a depth of 10 feet or less, and ASTM D3034, SDR 26 for pipe installations deeper than 10 feet - Uniform minimum "pipe stiffness" at five (5) percent deflection shall be 46psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477. Applicable UNI-Bell Plastic Pipe Association standard is UNI-B-4.

PVC Gravity Sewer Pipe (18 inch - 27 inch), ASTM F679, SDR 35 for pipe installations with a depth of 10 feet or less, and ASTM D3034, SDR 26 for pipe installations deeper than 10 feet - Uniform Minimum "pipe stiffness" at five (5) percent deflection shall be 46psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477. Applicable UNI-Bell Plastic Pipe Association standard is UNI-B-7.

All PVC pipe shall bear the NSF-DW seal and be green in overall color. The minimum standard length of pipe shall be thirteen (13) feet.

50. 2. 2 PIPE MARKINGS

All pipe shall have a homing mark on the spigot provided by the manufacturer. On field cut pipe, CONTRACTOR shall provide homing mark on the spigot in accordance with manufacturer's recommendations.

50. 3 JOINT MATERIALS

50. 3. 1 POLYVINYL CHLORIDE PIPE

PVC sewer pipe joints shall be flexible elastomeric seals per ASTM D 3212. See Appendix A.

50. 3. 2 JOINTS FOR DISSIMILAR PIPE

Joints between pipes of different materials shall be made with a flexible mechanical compression coupling. See Appendix A.

50. 4 FITTINGS

Unless otherwise specified, wyes shall be provided in the gravity sewer main for single service lateral connections. Wyes shall be six (6) inches in diameter for residential services and six (6) inches in diameter for non-residential services, unless otherwise approved by the CITY. All fittings shall be of the same material as the pipe. Dual type services shall not be permitted. See Appendix A.

Plugs for stub outs shall be of the same material as the pipe, and the gasket shall be the same gasket material as the pipe joint, or be of material approved by the CITY. The plug shall be secured to withstand test pressures specified in Section 54 of these specifications.

50. 5 INSPECTION AND TESTING

50. 5. 1 GENERAL

Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. Pipe which is not marked clearly is subject to rejection. All rejected pipe shall be promptly removed from the project site by the CONTRACTOR.

50. 5. 2 MISCELLANEOUS INSPECTION AND TESTING REQUIREMENTS

All pipe and accessories to be installed shall be inspected and tested at the place of manufacture by the manufacturer as required by the Standard Specifications to which the material is manufactured.

Each length of pipe shall be subject to inspection and approval at the factory, point of delivery, and site of work. If requested by the CITY, a sample of pipe to be tested shall be selected at random by the CITY or the testing laboratory hired by the CITY.

When the specimens tested conform to applicable standards, all pipe represented by such

specimens shall be considered acceptable based on the test parameters measured. Copies of test reports shall be available before the pipe is installed in the project.

In the event that any of the test specimens fail to meet the applicable standards, all pipe represented by such tests shall be subjected to rejection. The CONTRACTOR may furnish two additional test specimens from the same shipment or delivery, for each specimen that failed and the pipe will be considered acceptable if all of these additional specimens meet the requirements of the applicable standards. All such retesting shall be at the CONTRACTOR'S expense.

Pipe which has been rejected by the CITY shall be removed from the site of the work by the CONTRACTOR and replaced with pipe which meets these specifications.

SECTION 51 – PIPE LAYING, JOINTING, AND MISCELLANEOUS CONSTRUCTION REQUIREMENTS

51. 1 SURVEY LINE AND GRADE

The CONTRACTOR shall set Temporary Bench Marks (TBM'S) at a maximum 500 foot interval. The CONTRACTOR shall constantly check line and grade of the pipe by laser beam method. In the event line and grade do not meet specified limits described hereinafter, the WORK shall be immediately stopped, the CITY notified, and the cause remedied before proceeding with the WORK.

51. 2 PIPE PREPARATION AND HANDLING

All pipe and fittings shall be inspected prior to lowering into trench to ensure no cracked, broken, or otherwise defective materials are being used. The CONTRACTOR shall clean ends of pipe thoroughly and remove foreign matter and dirt from inside of pipe and keep clean during and after pipe installation.

Proper implements, tools, and facilities shall be used for the safe and proper protection of the WORK. Pipe shall be lowered into the trench in such a manner as to avoid any physical damage to the pipe. Pipe shall not be dropped or dumped into trenches under any circumstances.

51. 3 SEWER PIPE LAYING

Laying of sewer pipe shall be accomplished to line and grade in the trench only after it has been dewatered and the trench has been prepared in accordance with specifications outlined in Division 3. Refer to Section 51.4 for additional bedding requirements. Mud, silt, gravel, and other foreign material shall be kept out of the pipe and off the jointing surface. All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the line and grade shown on the PLANS.

Variance from established line and grade, at any point along the length of the pipe, shall not be greater than one thirty-second (1/32) of an inch per inch of pipe diameter and not to exceed one-half (1/2) inch, provided that any such variation does not result in a level or reverse sloping invert.

The sewer pipe, unless otherwise approved by the CITY, shall be laid upgrade from point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell end forward or upgrade. When pipe fitting/installation is not in progress the open end of the pipe shall be kept tightly closed with an approved temporary plug.

All PVC pipe shall be installed in accordance with the pipe manufacturer's written recommendations as approved by the CITY.

51. 4 TRENCH PREPARATION AND PIPE BEDDING

51. 4. 1 TRENCH EXCAVATION, DEWATERING, BEDDING MATERIAL, BACKFILL, COMPACTION, FILL AND GRADING

Applicable provisions of Section 32 shall apply. Also refer to STANDARD DETAILS.

51. 4. 2 PLACEMENT OF PIPE BEDDING MATERIAL

CONTRACTOR shall hand-grade bedding to proper grade ahead of pipe laying operation. Bedding shall provide a firm, unyielding support along the entire pipe length.

If without direction from the CITY, the trench has been excavated below the required depth for pipe bedding material placement, CONTRACTOR shall fill the excess depth with pipe bedding material to the proper grade.

CONTRACTOR shall excavate bell holes at each joint to permit proper assembly and inspection of the entire joint. No pipe shall bear upon the bell.

51. 4. 3 DEPTH OF BEDDING MATERIAL

CONTRACTOR shall provide pipe bedding material in accordance with the STANDARD DETAILS.

51. 5 GRAVITY PIPE AND WATER MAIN SEPARATION

Gravity sewers that are laid in the vicinity of pipe lines designated to carry potable water shall meet the conditions set forth in Section 41.3.

51. 6 PLUGS AND CONNECTIONS

Plugs for pipe branches, stubs, or other open ends which are not to be immediately connected shall be made of an approved material and shall be secured in place with a joint comparable to the main line joint.

51. 7 PIPE JOINTING

All pipe shall be installed to the homing mark on the spigot. The CITY shall be given an opportunity to check all joints in this manner before backfilling.

Type of joint to be used will conform to the requirements of Sections 50.3. All pipe and jointing for gravity sewers shall be subject to the tests specified in Section 54.

51. 8 LOCATION AND IDENTIFICATION

All lettering shall appear legibly on the pipe and run the entire length of the pipe. Lettering read and color shall be as is acceptable for the intended use. Provide locate tape 1-foot above the top of pipe.

SECTION 52 – MANHOLES

52. 1 GENERAL

Manholes shall be leak-tight and constructed of pre-cast concrete units.

52. 2 PRE-CAST CONCRETE SECTIONS

52. 2. 1 GENERAL

Pre-cast manholes shall conform to specifications for Pre-cast Reinforced Concrete Manhole Sections, ASTM Designation C478, except as otherwise specified below.

52. 2. 2 MISCELLANEOUS REQUIREMENTS

The minimum wall thickness shall be 5 inches. Pre-cast manholes shall be constructed with a pre-cast monolithic base structure as shown on the STANDARD DETAILS. The minimum base thickness shall be 8 inches.

Concrete for manholes shall be Type II, 4,000 psi at 28 days. Barrel, top, and base sections shall have tongue and groove joints. All jointing material shall be cold adhesive preformed plastic gaskets, conforming with FDOT Article 942-2. See Appendix A. Exposed joints and brick leveling courses shall be sealed using a heat shrinking polymer material as required and approved by the DIRECTOR.

The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section.

Sections shall be cured by an approved method for at least 28 days prior to painting and shall not be shipped until at least 2 days after having been painted.

Pre-cast concrete top slabs shall be used where cover over the top of the pipe is less than 4 ft. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast manhole sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the manhole sections.

Concrete surfaces shall have form oil, curing compounds, dust, dirt, and other interfering materials removed by brush or sand blasting and shall be fully cured prior to the application of any coatings.

The exterior of the manhole and the adjustment rings shall be given two coats of waterproofing material, CS-55 by Concrete Sealants, Inc. or approved equal. Do not coat joint or pipe opening surfaces. The interior surface of the manhole shall be coated with Sewpercoat or Spectrashield protective coating system to prevent concrete deterioration

from hydrogen sulfide and other corrosive gases. Manholes immediately upstream of pumping stations require fiberglass lining. Manholes receiving force main flow less than or equal to 4 inch force main may be lined with Sewpercoat or Spectrashield. Manholes receiving force main flow greater than 4 inch force main require fiberglass lining. See STANDARD DETAILS and Appendix A.

52. 2. 3 INSPECTION

The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the CITY. Such inspection may be made at the place of manufacture, or at the site after delivery, or at both places, and the sections shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected and, if already installed, removed and replaced, entirely at the CONTRACTOR's expense.

At the time of inspection, the sections will be carefully examined for compliance with the specified ASTM designation and with the approved manufacturer's drawings. All sections shall be inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured. CONTRACTOR shall provide mil report to CITY for application thickness on all coatings.

52. 3 CASTINGS

Gray iron castings for manhole frames, covers, adjustment rings, and other items shall conform to the ASTM Designation A 48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects which would impair their strength or otherwise make them unfit for the service intended. The seating surfaces between frames and covers shall be machined to fit true. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting patterns shall conform to those shown or indicated on the STANDARD DETAILS. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings. Frames shall be suitable for the future addition of a cast iron ring for upward adjustment of top elevation. In certain locations, such as in flood prone areas, bolt down covers and gasketed covers shall be located as shown on the DRAWINGS or as required by the CITY.

52. 4 CONSTRUCTION

52. 4. 1 BEDDING

Base sections shall be placed on bedding rock conforming to the requirements in Section

32.8.2. The bedding rock shall be firmly tamped, made smooth, and level to assure uniform contact and support of the pre-cast element. Refer to Section 32.9.2 for density requirements. Refer to the STANDARD DETAILS for additional bedding specifications.

52. 4. 2 CAST IN PLACE BASES

Cast in place bases shall be utilized only when specifically approved by the CITY. Unless otherwise specified, cast-in-place bases shall be at least eight (8) inches thick and shall extend at least six (6) inches outside of the outside dimension of the manholes section. Reinforcement and connection to the riser sections shall be designed by the DEVELOPER'S ENGINEER and submitted to the CITY for approval.

52. 4. 3 PRE-CAST MANHOLES

A pre-cast base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment and to insure that all entering pipes can be inserted on proper grade.

Pre-cast manhole sections shall be handled by lift rings or non-penetrating lift holes. Such holes shall be filled with non-shrink grout after installation of the manhole.

The first pre-cast section shall be placed and carefully adjusted to true grade and alignment. All inlet pipes shall be properly installed so as to form an integral watertight unit. The sections shall be uniformly supported by the base structure and shall not bear directly on any of the pipes.

Pre-cast sections shall be placed and aligned to provide vertical alignment with a 1/4-inch maximum tolerance per 5 feet of depth. The completed manhole shall be rigid, true to dimensions, and watertight.

52. 4. 4 EXCAVATION AND BACKFILLING

Requirements of Section 32 shall apply.

52. 4. 5 PLACING CASTINGS

Casting shall be fully bedded in mortar with adjustment brick courses placed between the frame and manhole. Brick courses shall be a minimum of two (2) and a maximum of four (4). Mortar shall conform to ASTM C-270, type M. Bricks shall be made of clay and conform to ASTM C-216, grade SW, and sized 3 1/2 inches (w) x 8 inches (l) x 2 1/4 inches (h).

Top of manhole castings located in pavement, shouldered areas, and sidewalks shall be set flush with grade. Top of manhole castings located outside these areas shall be placed 2 inches above grade prior to sodding.

52. 4. 6 CHANNELS

Manhole flow channels shall be as shown in the STANDARD DETAILS, with smooth and carefully shaped bottoms, built up sides, and benching constructed using cement mortar and brick with no voids. Channels shall conform to the dimension of the adjacent pipe and provide changes in size, grade, and alignment evenly. Cement shall be Portland Cement Type II only.

52. 4. 7 PIPE CONNECTIONS

Special care shall be taken to assure that the openings through which pipes enter the structure are provided with watertight connections. Connections shall conform with ASTM C 923, "Standard Specifications for Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes."

No service laterals shall be connected to a manhole without the specific approval of the DIRECTOR.

52. 4. 8 DROP MANHOLE CONNECTIONS

Drop manhole connections shall conform in all respects to details shown on the STANDARD DETAILS or DRAWINGS. Internal drop manhole connections shall not be permitted, except in extreme cases and only with the specific written approval of the DIRECTOR.

52. 4. 9 DOGHOUSE MANHOLES

Doghouse type manholes shall be manufactured in accordance with Section 52.2. Voids between the existing pipe and the structure shall be completely sealed by non-shrink cement grout.

52. 5 CLEANING

All newly constructed manholes shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

52. 6 INSPECTION

No visible leakage in the manhole or at pipe connections will be permitted. All manholes shall be inspected by the CITY prior to acceptance. All manholes failing to meet the specification set forth in Section 52 above shall be reconstructed or replaced by the CONTRACTOR to comply with these specifications. Pressure grouting of manholes for repair shall not be accepted.

SECTION 53 – SANITARY SEWER LATERALS

53. 1 GENERAL

The sanitary sewer lateral is a branch gravity sewer constructed from the main gravity sewer to the right-of-way line or to a point established by the CITY. The building service runs from the right-of-way clean-out to the building.

The general requirements for construction of gravity sewers in Sections 50 and 51 of these Specifications shall apply to laterals unless they are inconsistent with the provisions of this Section. Laterals shall have maximum lengths of seventy five (75) feet and connect to the system along pipe sections, not at manholes, unless otherwise specifically approved by the DIRECTOR.

Laterals and fittings shall be a minimum of six (6) inches for all installations. Services and fittings shall be a minimum of four (4) inches in diameter for residential and six (6) inches in diameter for non-residential installations.

53. 2 MATERIALS

Pipe, fittings, and joints shall be PVC or DI pipe and shall conform to the requirement for gravity sewer construction in Section 50 of these specifications.

Laterals shall be connected to the wye, provided in the gravity sewer where such is available, utilizing approved fittings or adapters.

On existing mains where no wye is provided or available, connection shall be made by either a machine-made tap and saddle as specified in Appendix A, or a cast-in-place manhole as referenced in Section 21.4.5.

53. 3 CONSTRUCTION

53. 3. 1 GENERAL

Service and lateral connections shall conform to these specifications and STANDARD DETAILS. All necessary approvals for service and lateral construction shall be obtained prior to beginning the work.

53. 3. 2 EXCAVATION AND BACKFILL

Excavation and backfilling for services and laterals shall conform to the requirements of Section 32 and 51, except that no backfill in excess of that required to hold the pipe in true alignment shall be placed prior to inspection.

53. 3. 3 PIPE LAYING AND JOINTING

Pipe laying and jointing, except as hereinafter provided, shall in general conform to the requirements of Section 51. During the pipe laying and jointing, the services and laterals shall be kept free of any water, dirt, or objectionable matter.

53. 3. 4 LINE AND GRADE

Laterals shall be laid with a minimum grade of one foot per 100 feet. The CONTRACTOR shall establish such alignment and grade control as is necessary to properly install the lateral. Pipe shall be laid in a straight line at a uniform grade between fittings.

53. 4 TERMINATION OF SERVICE LATERALS

All laterals shall extend from the sewer main to one (1) foot outside the right-of-way terminating with a two-way cleanout to be installed one (1) foot outside the right-of-way by the CONTRACTOR. Payment to the CITY for the right-of-way cleanout shall be made by the OWNER as part of the sewer service connection fee. The right-of-way cleanout shall be maintained by the OWNER. See STANDARD DETAILS.

In addition to the right-of-way cleanout, a cleanout at each building shall be installed by the BUILDING CONTRACTOR. See STANDARD DETAILS.

53. 5 INSPECTION

Laterals shall meet the inspection requirements specified in Section 50.5.

53. 6 RESTORATION, FINISHING, AND CLEANUP

The CONTRACTOR shall restore all paved surfaces, curbing, sidewalks, or other surfaces to their original condition in such manner as to meet the requirements established in Division 3 of these specifications. All surplus material and temporary structures, as well as all excess excavation shall be removed. The entire site shall be left in a neat and clean condition.

53. 7 LOCATION AND IDENTIFICATION

The exact location of the termination point of each installed service shall be marked. All lettering shall be legible and colors correct for the intended use. For locations with curbing, etch the letter “S” minimum of 2 inches high and 1/4 inch deep in face of curb, and paint green. For locations without curbing but with sidewalk, etch the letter “S” minimum of 2 inches high and 1/4 inch deep in front of sidewalk, and paint green. As an alternative to etching in all locations and conditions, a stainless steel disc and nail may be used. Disc shall be 1-1/2” diameter, and engraved with the word “SEWER” centered at

the 12 o'clock position and the word "SERVICE" centered at the 6 o'clock position on the disc. Nail and disc shall be installed at the edge of pavement, curbing or sidewalk directly in line with the sewer service.

The CITY may require other means of identification, such as treated fence posts painted green on top to mark services for future development.

SECTION 54 – SANITARY SEWER TESTING AND INSPECTION

54. 1 GENERAL

Gravity sewer systems shall be tested for alignment, deflection, and integrity prior to acceptance by the CITY. All testing, procedures, and video inspections shall be performed by the CONTRACTOR in the presence of CITY inspection personnel and certified by the DEVELOPER'S ENGINEER. The CONTRACTOR shall be responsible for furnishing all necessary labor and equipment for all such testing and inspections.

54. 2 TESTING

54. 2. 1 TYPE OF TEST

Testing procedures may be performed by the CONTRACTOR prior to construction of road base. When the lamping procedure is performed, each test section of pipe with a full circle showing shall be considered acceptable.

a) Low-Pressure Air Leakage Test: Testing shall be conducted in accordance with the procedure for "Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe" as established by the Uni-Bell PVC Pipe Association. Passing this test shall be presumed to establish leakage test limits of 50 gallons per day per inch of diameter per mile of sewer.

b) Infiltration and Ex-filtration Leakage Test: Flows shall not exceed 150 gallons per day per inch of nominal pipe diameter per mile as measured between adjacent manholes over a two (2) hour testing period.

54. 2. 2 SELECTION OF TEST SECTIONS

Each test section shall not exceed 400 feet in length and be conducted between adjacent manholes.

54. 2. 3 PREPARATION AND COORDINATION FOR TESTING

The CONTRACTOR shall flush all sewers with water sufficient in volume to obtain free flow through each line. Flushing water and debris shall not enter any pump station wet well. Water will be pumped from the sewer system during flushing to an acceptable discharge location. A visual inspection shall be made and all obstructions removed.

The CONTRACTOR shall notify the DIRECTOR forty eight (48) hours prior to performing any leakage testing.

The results of all leakage tests shall be neat, legible, and certified by the DEVELOPER'S

ENGINEER when presented to the CITY. The results shall be formatted and adequately labeled so that they are easily understandable.

54. 3 VIDEO INSPECTION

An internal video inspection, with audio, for all gravity sewers shall be performed by the CONTRACTOR to check for alignment and deflection. Video inspection shall be used to check for cracked, broken, or otherwise defective pipe. The CONTRACTOR shall provide the CITY with a copy of the video inspection and field log report for staff review in a format acceptable to the CITY. The CITY shall respond back to the CONTRACTOR within five (5) working days after the receipt of acceptable tapes.

Prior to video inspection, the CONTRACTOR shall flush all sewers with water sufficient in volume to obtain free flow through each line. Flushing water and debris shall not enter any pump station wet well. Water will be pumped from the sewer system during flushing to an acceptable discharge location. A visual inspection shall be made and all obstructions removed.

The video inspection shall be conducted within 30 days after substantial completion of the gravity sewer system, provided the road base is in place and the manhole rings and covers are to grade. The requirement of the road base being in place shall be waived if the top of the sewer is 12 feet below the finished grade. In such cases, the video inspection shall be performed once the trench has been compacted up to the road base.

A final inspection of the gravity sewer system shall be conducted by the CITY prior to the end of the two (2) year warranty period.

If any inspection reveals cracked, broken, defective, or misaligned pipe resulting in vertical sags in excess of 1-1/2 inches and in the case of PVC pipe a ring deflection in excess of 5 percent, the CONTRACTOR shall be required to repair or replace the pipeline. The CITY reserves the right to pass a mandrel through the PVC pipe to confirm ring deflection.

Successful passage of the video inspection is required before the system can be accepted by the CITY.

Prior to repair or replacement of any failed sewer pipe, the method of repair or replacement shall be submitted to the CITY for approval. Pressure grouting of pipe or manholes shall not be considered as an acceptable method of repair.

SECTION 55 - FORCE MAIN CONSTRUCTION

55. 1 GENERAL

These specifications cover the pipe, fittings, and accessory items used for wastewater force main systems.

Pipe used in wastewater force main systems shall be either Polyvinyl Chloride (PVC), or Ductile Iron Pipe (DIP).

The CONTRACTOR shall be responsible for all materials furnished and storage of same, until the date of project completion. The CONTRACTOR shall replace at CONTRACTOR's expense all materials found to be defective or damaged in handling or storage. The CONTRACTOR shall, if requested by the CITY, furnish certificates, affidavits of compliance, test reports, or samples for check analysis for any of the materials specified herein. All pipe delivered to the project site for installation is subject to random testing for compliance with the designated specifications.

55. 2 INSPECTION AND TESTING

Requirements specified in Section 50.5 shall apply.

55. 3 POLYVINYL CHLORIDE PIPE AND FITTINGS

55. 3. 1 PVC PIPE

All PVC pipe of nominal diameter six (6) inches and larger shall be manufactured in accordance with AWWA standard C900. The PVC pipe shall have a minimum working pressure rating of 100 psi or higher and shall have a dimension ratio (DR) of 18, or 25 as based on the system's design requirements. Pipe shall be the same overall diameter as ductile iron pipe.

55. 3. 2 JOINTS

PVC pipe shall have integral bell push on type joints conforming to ASTM D3139.

55. 3. 3 FITTINGS

Fittings used with PVC pipe shall conform to Section 55.4.

55. 4 DUCTILE IRON PIPE AND FITTINGS

55. 4. 1 DUCTILE IRON PIPE

Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 and have a minimum 350 psi pressure class rating.

55. 4. 2 FITTINGS

Fittings shall be ductile iron compact fittings in accordance with ANSI/AWWA A21.53/C153 and have a minimum 350 psi pressure class rating.

55. 4. 3 JOINTS

Joints for ductile iron pipe and fittings shall be push-on or mechanical joints conforming to ANSI/AWWA A21.11/C111, unless otherwise called for on the DRAWINGS. Where called for on the DRAWINGS, restrained or flanged joints shall be provided. Flanged joints shall conform to ANSI Standard B16.1-125 LB. Restrained joints shall conform to Sections 34.3 or 34.4

55. 4. 4 COATINGS AND LININGS

Ductile iron pipe, fittings, and valves shall be thoroughly cleaned immediately prior to coating. CONTRACTOR shall prepare pipe, fittings and valves for coating using power tool cleaning or brush-off blast cleaning.

CONTRACTOR shall apply primer coat of Polyamide Epoxy, minimum 3.0 mils DFT. If shop coat is damaged, CONTRACTOR shall re-prime bare areas in field. If shop coat is bituminous coating, prime with 2 coats of stain barrier, 1 mil of dry film. CONTRACTOR shall apply two (2) finish coats, applied by spray, of Polyamide Epoxy, BLP Mobile Paints, minimum 4.0 mils DFT.

Primer and field coats shall be compatible and shall be applied in accordance with the manufacturer's recommendations. Final field coat color shall be forest green for raw wastewater and forest green for treated wastewater.

All ductile iron pipe and fittings shall have an interior protective lining of coal tar epoxy or polyethylene with a minimum dry thickness of 3.0 mils applied by the pipe manufacturer. Polyethylene lining material shall comply with ASTM D-1248 and shall be fused to the interior of the pipe by heat forming a tightly bonded lining.

55. 4. 5 POLYETHYLENE ENCASEMENT

The pipe shall be polyethylene encased (8 mil) where shown on the DRAWINGS or required by the CITY in accordance with ANSI/AWWA A21.51/C105.

55. 5 PIPE HANDLING

Requirements specified in Section 41.2 shall apply.

55. 6 AIR AND VACUUM RELEASE VALVES

55. 6. 1 GENERAL

Wastewater force mains shall be equipped with either air or air/vacuum release valves located as shown on the DRAWINGS. All valves are to be located outside roadway paving. If force main location is inside paved area, then offset air release valve shall be used. See STANDARD DETAILS. All valves shall be located in an enclosure as called for on the STANDARD DETAILS.

The valves shall be as described below. See Appendix A for approved manufacturers.

55. 6. 2 WASTEWATER COMBINATION VALVE

Valve shall be in accordance with Appendix A, List of Approved Materials and Manufacturers. Valve shall be combination air valve that combines air and vacuum large orifice and automatic small orifice in a single body.

55. 7 NOTIFICATION AND CONNECTION TO EXISTING MAINS

Pressure connection to existing wastewater force mains shall comply with the requirements of Section 35.3.

55. 8 PLUG VALVES

55.8. 1 GENERAL

All plug valves shall be installed so that the direction of flow through the valve is in accordance with the manufacturer's recommendations. See Appendix A.

55. 8. 2 VALVE CONSTRUCTION

Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the plans, unless otherwise approved by the DIRECTOR. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall meet AWWA C111, Class B.

Valve bodies shall be of ASTM A126, Class B Semi-steel, 31,000psi tensile strength minimum in compliance with AWWA C507 and C504. All exposed nuts, bolts, springs, washers, etc. shall be zinc or cadmium plated. Resilient plug facings shall be of Hycar or Neoprene.

Port areas for valves 4 inches through 20 inches shall be 80 percent nominal pipe diameter. Valves 24 inches and larger shall have a minimum port area of 70 percent of nominal pipe diameter. All exposed nuts, bolts, springs, washers, etc., shall be zinc or cadmium plated. Resilient plug facings shall be of Hycar or Neoprene.

Valves shall be furnished with permanently lubricated stainless steel or oil-impregnated bronze upper and lower plug stem bushings. These bearings shall comply with AWWA C507 and C504.

Seats in 4-inch and larger valves shall have a welded-in overlay of a high nickel content on all surfaces contacting the plug face which comply with AWWA C507 and C504.

Valve shaft seals shall be adjustable and comply with AWWA C507.

55. 8. 3 VALVE TESTING

Plug valves shall be tested in accordance with AWWA C504. Each valve shall meet the performance, leakage, and hydrostatic tests described in AWWA C504. The leakage test shall be applied to the face of the plug tending to unseat the valve. The manufacturer shall furnish certified copies of reports covering proof of design testing as described in AWWA C504.

55. 8. 4 ACTUATORS

Manual valves shall have lever or gear actuators, tee wrenches, extension stems, floor stands, etc. as indicated on the plans. All valves 6-inch and larger shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. All actuator shafts shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. All exposed nuts, bolts, and washers shall be zinc or cadmium plated. Valve packing adjustment shall be accessible without disassembly of the actuator.

55. 9 VALVE BOXES

Requirements specified in Section 42.5 shall apply, except that covers shall have the words "SEWER" cast into the top.

55.10 SEPARATION OF FORCE MAINS AND WATER MAINS

Requirements specified in Section 41.3 shall apply.

55.11 FORCE MAIN CONSTRUCTION

Requirements specified in Section 41.4 shall apply.

55.12 HYDROSTATIC TESTS

Requirements specified in Section 41.5 shall apply with the exception that the test pressure shall be 100 p.s.i.

55.13 FINAL CLEANING

Prior to final inspection and acceptance of the force main by the CITY, CONTRACTOR shall flush and clean all parts of the system. Flushing and cleaning shall include the removal of all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system at or near the downstream end.

Upon the CITY's final inspection of the pressure pipe systems, if any foreign matter is still present in the system, CONTRACTOR shall clean the sections and portions of the lines as required.

55.14 LOCATION AND IDENTIFICATION

All lettering shall be legible and colors correct for the intended use. See STANDARD DETAILS.

SECTION 56 – WASTEWATER PUMP STATION CONSTRUCTION

56. 1 GENERAL

This Section includes the specifications for equipment, materials, site work, fences, and appurtenances for the installation of wastewater pump stations, submersible and above ground.

56. 2 WET WELL

56. 2. 1 GENERAL

Wet well for pump stations shall be constructed as shown on the applicable STANDARD DETAILS and in conformance with the specifications outlined in Section 52. The interior surfaces of wet wells, including the tops, shall have a full height integrally attached fiberglass interior light colored liner. The thickness of the liner shall be as shown in the STANDARD DETAILS as approved by the DIRECTOR. Exterior joints shall be sealed using a heat shrinking polymer material as required and approved by the DIRECTOR.

56. 6. 2 MATERIALS

Wet well bases, sections and miscellaneous structures shall conform to the requirements of ASTM C478 (specification for precast concrete manhole sections and structures) except as modified herein. Cement shall meet the requirements of ASTM C150 (specification for Portland cement, type II). Concrete shall meet the minimum requirements for H-20 traffic loading per Florida Department of Transportation reinforced concrete design criteria. Minimum wall thickness shall be 1/12 the inside diameter in inches plus 1 inch. Rings shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations. The Contractor shall submit shop drawings consisting of manufacturer's standard details of various sections, for approval, before placing order for structures.

56. 6. 3 BASES

Bases for wet wells shall be cast integrally with the bottom section. The base section shall be set in a 12 inch (minimum) leveling course of granular material (57 stone) as shown on the drawings. For concrete base and riser's the reinforcing steel shall be designed, signed and sealed by a Florida Registered Structural Engineer and shall be submitted with the shop drawings.

56. 3 ACCESS FRAMES AND COVERS

The wet well for pump stations shall be furnished with an aluminum access frame and cover, as applicable. Equipment furnished shall include the necessary aluminum access frames, complete with hinged and slide bar equipped covers, stainless steel upper guide holder, and level sensor cable holder. Hatches shall be sized to provide a 4-inch minimum clearance between hatch and pump volute (measured from all sides and includes the pump and rail system. Minimum size total hatch opening shall be 36 inches by 48 inches for duplex stations and 36 inches by 96 inches for triplex stations. All hinges, fasteners, and miscellaneous hardware shall be 316 stainless steel. The frames shall be securely mounted above the pumps. Doors shall be of aluminum checkered plate. The access cover and frame with stainless steel hardware shall be sized as shown on the DRAWINGS. See Appendix A.

56. 4 PUMPS AND CONTROLS

Pumps and miscellaneous accessories shall be as specified in Section 57. Controls and miscellaneous accessories shall be as specified in Section 58.

56. 5 PIPING, VALVES, AND ACCESSORIES

56. 5. 1 PIPING

Influent piping to the wet well shall meet the requirements of Sections 50 and 55. All pipe inside the wet well shall be 316 Stainless Steel (Schedule 10) as shown on the STANDARD DETAILS.

56. 5. 2 PLUG VALVES

Plug valves shall meet the requirements of Section 55.8.

56. 5. 3 CHECK VALVES

Check valves for ductile iron pipelines shall be the swing type and shall meet the material requirements of AWWA C500. The valves shall be iron body, bronze mounted, single disc, 150 psi working water pressure, non-shock, and hydrostatically tested at 300 psi. Ends shall be 125 pound ANSI B16.1 flanges.

When there is no flow through the line, the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway.

Check valves shall have a bronze seat and body rings, extended bronze hinge pins, and stainless steel nuts on the bolts of bolted covers.

Valves shall be so constructed that disc and body seats may easily be removed and replaced without removing the valve from the line. Valves shall be fitted with an

extended hinge arm with outside lever and weight. If pump shut off head exceeds 77 feet, then an air cushioned assembly shall be installed.

56. 5. 4 PRESSURE GAUGES

Pressure gauges shall be installed on each discharge pipe as indicated on the STANDARD DETAILS. Each pressure gauge shall be direct mounted, stainless steel case, stainless steel sensing element, liquid filled, with a 4-1/2-inch diameter dial, furnished with a clear glass crystal window, and a 1/4-inch shut-off (damper) valve. All gauges shall be weatherproofed. The face dial shall be white finished aluminum with jet black graduations and figures. The face dial shall indicate the units of pressure measured in pounds per square inch (PSI), with a 0-60 psi ranges.

Pressure gauges shall not be installed until after the substantial completion date unless otherwise requested by the CITY. See Appendix A.

56. 5. 5 ACCESSORIES

All fittings, nuts, bolts, and accessories within the wet well shall be 316 stainless steel.

56. 5. 6 PAINT COATINGS

All above ground pipe, fittings, and valves shall receive two coats of an exterior coating of “moisture cured aluminized urethane”. Moisture cured (aluminum and primers, grey or silver color), paint shall be by “POR-15” or COSA approved equal. Surface preparation shall be in accordance with the paint manufactures recommendation.

56. 6 STANDBY POWER GENERATOR SYSTEM

56. 6. 1 GENERAL

A standby power generator system installed onsite as required by the DIRECTOR, shall be dedicated to the CITY by the DEVELOPER for each pump station as required by Section 23.5 for electrical power during the loss of normal power.

56. 6. 2 GENERATOR SET

56. 6. 2. 1 GENERAL

The Generator Supplier shall furnish, place in operation, field test and provide training for one new skid mounted diesel engine driven generator unit with weatherproof sound attenuated enclosure and sub-base mounted fuel lank and required supporting systems as specified herein. Provide modular weatherproof enclosure large enough to house all generator equipment including generator control panel, batteries, battery charger, day

tank, etc., and all associated appurtenances. The generator unit shall be arranged for automatic starting and stopping, and load transfer upon failure of the normal source of power. The unit controls shall provide for automatic exercising on a weekly basis. Parallel operation with the Power Company is not required.

56. 6. 2. 2 QUALITY ASSURANCE

The generator unit shall be as manufactured by Caterpillar, Olympian, Cummins, or approved equal. The engine-generator set shall be the standard product of a Manufacturer regularly engaged in the production of this type of equipment and which maintains a permanent service organization and supply of spare parts in place at the time of the installation within 150 miles of the project site. The unit to be furnished shall be built from components which have proven compatibility, reliability and are coordinated to operate as a unit. To qualify as a Manufacturer, the engine must be the principal item manufactured and the completed engine generator set shall be supplied by that Manufacturer's authorized dealer only (the Supplier). The dealer shall have a minimum of ten (10) years experience in the field of power generation.

The Generator Supplier shall require that the standby generator manufacturer coordinate his design with the Supplier of the variable frequency drives, to assure that sufficient generator reactance is provided to limit the line harmonics to acceptable levels as specified in IEEE Standard 519,1992 and to assure that the generator voltage control system will provide stable operation in the presence of such harmonics.

All mechanical equipment shall be designed and built for 24 hour continuous service at any and all points within the specified range of operation without overheating or excessive vibration or strain, and require only that degree of maintenance generally accepted as peculiar to the specific type of equipment required. All parts and components of the unit shall be designed and built for interchangeability so that replacement parts may be installed without any additional fitting or machining.

Components of mechanical and electrical equipment shall be the products of Manufacturers who can produce evidence of their ability to promptly furnish any and all interchangeable replacement parts as may be needed at any time within the expected life of the equipment.

The Generator Supplier shall submit information on torsional forces on the engine generator and upon request, any additional information that the ENGINEER may deem necessary to determine the ability of the Manufacturer to produce the specified equipment.

The Manufacturer shall have suitable testing facilities adequate for performing the shop tests and inspections specified herein. Equipment shall be completely assembled and tested at the factory prior to shipment. Certified copies of the data obtained during these tests shall be submitted to the CITY.

Final tests shall be conducted at the site, after installation has been completed, in the presence of the CITY'S representative. The Manufacturer shall furnish a service representative to operate the engine during the tests, to check all details of the installation, and to instruct the CITY'S representatives in proper equipment operation.

Field tests include operating the diesel generating set for a minimum of four (4) hours while carrying full capacity pump station loads. The CONTRACTOR shall refill the main fuel tank at the completion of the tests.

56. 6. 2. 3 SUBMITTALS

Submit four copies of shop drawings and product data. Shop drawings and product data shall include the following:

1. Shop drawings, catalog cuts, internal wiring schematics and other materials required to completely describe the systems and equipment being furnished.
2. Identification, description and dimensions for each separately installed sub-assembly or piece of equipment and associated piping and electrical connection schematics.
3. Foundation drawings, indicating size and location of anchor bolts.
4. The Generator Supplier shall be responsible to generate and provide to the CITY scaled layout drawings clearly depicting detailed dimensions of the mechanical installation of all generator equipment including generator set, vibration isolators, generator control panel, starting batteries, battery charger, battery heater, fuel tank and associated piping, exhaust flex and muffler and associated piping as intended to be physically located and installed on the equipment pad. The scaled installation drawings shall be provided in the Generator Supplier's shop drawing submittals and shall indicate satisfactory installation and appropriate clearances for all installed generator equipment and associated piping systems.
5. Performance specifications of all items of equipment.
6. Detailed description of jacket water treatment materials and procedures.
7. Engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, fuel consumption, etc.
8. Control panel layout drawings showing interior and exterior views, dimensions, paint finish specifications and component bill of materials.
9. Complete electrical, instrumentation, control and wiring diagrams in sufficient detail to allow installation of instrumentation and controls and electrical components. Specifically, the following is required:
    a. Complete instrumentation and control schematics, presented in conformance with Instrument Society of America Bulletin S5.1, latest edition and NFPA 79, latest edition.
    b. Complete electrical circuit schematics, including all generator control, alarms, and power to motors, accessories, instruments, etc. Schematics shall include all termination points in each control panel. All wiring shall be identified by numbers and every termination point shall be assigned a number. Termination

point number (including wire number) shall appear on the schematics for each wiring termination shown.

c. Complete external electrical interconnection diagrams for wiring between control panels, switchgear and engine terminal boxes.

10. Complete Operations and Maintenance Manuals, three (3) bound copies, covering all equipment furnished, annotated to reference only the specific model numbers supplied. Include parts lists and parts prices current to the dale of submittal; include information relevant to parts supply and ordering. It is essential that this information be received prior to the startup and testing of the engine/generator unit.

Submit design data for engine, generator, and accessories in format indicated below (for rated kw capacity):

1. Engine Data:
   a. Manufacturer
   b. Model
   c. Number and arrangement of cylinders
   d. RPM
   e. Bore x stroke
   f. Maximum power at rated RPM
   g. BMEP at rated kw (including any parasitic loads and generator efficiency)
   h. Piston speed, feet per minute
   i. Make and model of governor
2. Generator Data:
   a. Manufacturer
   b. Model
   c. Rated KVA
   d. Rated KW
   e. Voltage
   f. Temperature rise above 40 degrees C ambient
      1) Stator by thermometer __ degrees C
      2) Field by resistance __ degrees C
      3) Class of insulation __ degrees C
3. Generator efficiency including excitation losses and at 80 percent PF:
   a. Full load _ percent
   b. Three-quarters load __ percent
   c. Half load __ percent
4. Guaranteed fuel consumption rate (at generator terminals/I 38,000 BTU/gallon):
   a. Full load, gal/hr ___
   b. Three-quarters load, gal/hr ___
   c. Half load, gal/hr ___
5. Generator unit and accessories:
   a. Weight of skid mounted unit ____ lbs.
   b. Overall length ____ inches
   c. Overall width ____ inches
   d. Overall height ____ inches

e. Exhaust pipe size ____ inches

6. Exhaust gas emissions data, maximum values at loads varying from full to 1/4 load:
   a. Temperature___ degrees F
   b. Flow___ ACFM (mass and volume)
   c. Carbon Monoxide (CO) ___ grams/BHP-hr
   d. Nitrogen Oxides (NOx) ___ grams/BHP-hr
   e. Hydrocarbons (HC)___ grams/BHP-hr
   f. *Sulfur Dioxide (S02) ___ grams/BHP-hr
   g. *Based on __ percent sulfur content by weight in the fuel.
7. CFM of air required for combustion and ventilation based upon inlet air temperature of 40 degrees C: __ CFM
8. Heat radiated to room by engine and generator: __ BTU/min
9. Heat rejected to jacket water including lubricating oil and intercooler (if required) __ BTU/min
10. Height from bottom of skid required for removing piston with connecting rod; (also for removing cylinder liner): __-ft
11. The unit guaranteed to be adequate for motor starling as required by Paragraph 1.06C of this Specification.
12. Radiator (engine driven) fan cooling air volume and required BHP: ____ BHP

56. 6. 2. 4 OPERATING INSTRUCTIONS

Operating and maintenance manuals shall be furnished. The manuals shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment.

56. 6. 2. 5 UNIT PERFORMANCE

The voltage regulation shall be within plus or minus one percent from zero load to full-rated load. Upon application or removal of full-rated load in one step, the transient voltage, and recovery to steady state operation shall be within (5) seconds.

Stable or steady state operation is defined as operation with the frequency variation not exceeding plus or minus 0.22 percent (0.15 Hertz) and voltage variation plus or minus one percent of their mean value for constant load from zero load to full rated load. A rheostat shall provide a minimum of plus or minus five percent voltage adjustment from rated voltage.

The generator shall be designed for use with variable frequency drives.

The generator Manufacturer shall coordinate with the Manufacturer of the variable frequency drive to provide generator reactance data for harmonic analysis and shall ensure that the generator voltage control system will provide stable operation in the presence of such harmonics.

56. 6. 2. 6 SPECIAL TOOLS AND SPARE PARTS

The Generator Supplier shall furnish any special tools required for normal operation and maintenance of the equipment being furnished. The Generator Supplier shall furnish two (2) complete spare replacement sets of all filter elements supplied with the generator unit.

56. 6. 2. 7 PRODUCT HANDLING

All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the unit and equipment are ready for operation.

All equipment and parts must be properly protected against any damage during a prolonged period at the site.

Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the CITY.

Finished surface of all exposed openings (exhaust, etc.) shall be protected by wooden blanks, strongly built and securely bolted thereto.

Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

Proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

Each box or package shall be properly marked to show its net weight in addition to its contents.

Space heater shall be energized during storage.

56. 6. 2. 8 WARRANTY

All equipment supplied under this section shall be warranted for a period of one (1) year from the CITY's acceptance of the generator start-up operation. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine and the unit restored to service at no expense to the CITY.

56. 6. 2. 9 RATINGS

The ratings of the generator sets shall not exceed the Manufacturer's published standby rating. The gross engine horsepower required to produce the standby rating shall not exceed the Manufacturer's published continuous duty rating by more than 150 percent. Continuous duty rating shall be as defined as BS649 or DIN6270 but in no case shall it exceed the Manufacturer's published continuous duty rating for the engine as used in continuous rated pump drive applications. The gross engine horsepower required for the generator set standby rating described above shall include all parasitic demands such as generator inefficiencies, fuel pumps, water pumps, radiator fan (for fan cooled models) and all accessories necessary to the unit's proper operation while operating at rated load and at a rotative speed not to exceed 1800 rpm.

The diesel engine driven generator sets shall be capable of producing the specified standby KW ratings for continuous electrical service during interruption of the normal utility source and shall be certified to this effect by the Manufacturer for the actual unit supplied.

56. 6. 2.10 ENGINES

The engines shall be full compression ignition, four cycle, single acting, solid injection engines, either vertical or "V" type. Speed shall not exceed 1800 revolutions per minute at normal full load operation. The engine governor shall be a ± 3 percent accuracy Hydra-Mechanical type governor.

The engine shall be capable of satisfactory performance on No. 2 fuel oil (ASTM Designation D396). Diesel engines requiring a premium fuel will not be considered.

The engine shall be capable of operating at light loads for extended periods of time and shall provide a means to reduce carbonization. Periodic cleaning of exhaust ports shall not be required.

The engine shall be equipped with fuel filters, lube oil filters, intake air filters, lube oil cooler, fuel transfer pump, fuel priming pump, service meter, engine driven water pump, and unit mounted instruments. Unit mounted instruments shall include a fuel pressure gauge, water temperature gauge, and lubrication oil pressure gauge. The engine shall be provided with low oil pressure, high water temperature and over speed safety shutdowns of the manual reset type.

Injection pumps and injection valves shall be a type not requiring adjustment in service and shall be of a design allowing quick replacement by ordinary mechanics without special diesel experience. The engines shall have an individual mechanical injection pump and injection valve for each cylinder, any one of which may be removed and replaced from parts stock. Fuel injection pumps shall be positive action, constant-stroke

pumps, activated by a cam driven by gears from the engine crankshaft. Fuel lines between injection pumps and valves shall be of heavy seamless tubing.

The fuel system shall be equipped with fuel filters with replaceable elements. Filter elements shall be easily removable from their housing for replacing without breaking any fuel line connections, or disturbing the fuel pump, or any other part of the engine. All fuel filters shall be conveniently located in one accessible housing, ahead of the injection pumps so that the fuel will have been thoroughly filtered before it reaches the pump. No screens or filters requiring cleaning or replacement shall be used in the injection pump or injection valve assemblies. The engines shall be equipped with a built-in gear-type, engine-driven fuel transfer pump, capable of supplying fuel through the filters to the injection pump at constant pressure.

In addition to the standard fuel filters provided by the engine manufacturer, there shall also be installed a primary fuel filter and a water separator in the fuel inlet line to the engine.

The engine shall be provided with removable wet-type cylinder liners of close grained alloy iron, heat treated for proper hardness as required for maximum liner life. The cylinder block shall be a one piece stress relieved grey iron casting.

The engine shall have a gear-type lubricating oil pump for supplying oil under pressure to main bearings, crank pin bearings, pistons, piston pins, timing gears, camshaft bearings, valve rocker mechanism and governor. Effective lubricating oil filters shall be provided and so located and connected that all oil being circulated is continuously filtered and cleaned. Filters shall be accessible, easily removed and cleaned and shall be equipped with a spring-loaded by-pass valve as an insurance against stopping of lubricating oil circulation in the event the filters become clogged. The engine shall have a suitable water cooled lubricating oil cooler.

The engine shall be provided with one or more engine mounted dry type air cleaners of sufficient capacity to protect effectively the working parts of the engine from dust and grit.

During each initial start of the engine, if oil does not meet parameters, the engine shall shut down on “low oil pressure” alarm.

56. 6. 2.11 COOLING SYSTEMS

The engine shall be furnished with a unit mounted engine driven radiator-type cooling system having sufficient capacity for cooling the engine when the diesel generator set is delivering full rated load in an ambient temperature not to exceed 110 degrees F. The engine shall be provided with a thermostatic valve placed in the jacket water outlet, between the engine and the cooling source. This valve shall maintain the proper jacket water temperature under all load conditions.

Closed circuit jacket water systems shall be treated with a rust inhibitor as recommended by the engine manufacturer.

One (1) unit mounted thermal circulation type water healer incorporating a thermostatic switch shall be furnished to maintain engine jacket water to 70 degrees F. The heater shall be 120 volt, single-phase, 60 Hertz.

56. 6. 2.12 FUEL OIL SYSTEM

The fuel system shall be integral with the engine. It shall consist of a fuel filtration system; engine mounted mechanically driven transfer pump, injection pumps, supply and return fuel lines, and fuel injectors. The transfer pump shall be engine driven and shall deliver fuel under low pressure to individual injection pumps. The generator set shall be installed on top of the sub base diesel fuel oil tank and the designed and installed fuel system shall be capable of delivering fuel flow from the sub base fuel tank to the engine fuel inlets or nozzles, at any level of fuel within the tank, sufficient for full rated operation of the engine under all ambient temperature conditions and shall return any unused fuel to the sub base tank.

Provide a fuel filter/water separator system installed on the engine and flexibly connected to the sub base tank engine fuel supply. The filter shall be of the replaceable filter type, with clear water/sediment trap bowls for each. Fuel shall be piped with flexible connections from the filter/water separator system to the intake of the engine fuel pump and then from the engine's fuel return to the sub base tank engine fuel return. Provide a foot valve at the bottom of the sub base tank engine supply tube.

Provide fuel lines as required to complete the connections of the fuel supply and fuel return between the engine and the sub base tank. Use diesel fuel oil impervious flexible connections at die engine fuel supply and return connections.

The generator set shall be equipped with a double walled sub base diesel fuel oil tank, UL142 Listed and nameplate labeled for stationary installation. A sub base tank electronic leak detection system shall be provided and an alarm contact shall be provided for annunciation at the automatic transfer switch. The sub base tank and all parts of the fuel system shall meet the approval of, and be installed in complete compliance with, all applicable local, state and federal codes, laws and regulations.

Diesel fuel oil generator set sub base fuel oil tank construction:

The UL142 generator set sub base tank shall be of all corrosion-resistant steel construction and double walled for 110% secondary containment. The sub base tank shall be designed and constructed in accordance with UL requirements to support the total wet weight of the generator set and contained fuel. The primary tank shall be sized so as to provide 500 gallons of useable diesel fuel oil. The tank design shall allow for additional capacity in the top of the tank to prevent spillage as fuel heats

and additional capacity at the bottom of the lank to prevent entry of fuel sludge buildup into the engine.

The sub base fuel oil tank shall be designed and constructed so as to allow proper installation of the generator set on the sub base tank.

The tank shall incorporate steel plate lifting points constructed so as to lift the installed sub base tank and generator set, less fuel oil weight. The tank shall be manufactured with four (4) lifting points, approved by UL with a 4 to 1 safety factor consisting of minimum of 1.25 inch thick (nominal) steel plates welded into the tank base perimeter with eyelets designed and installed so as to allow single point lifting of the empty sub base tank with the generator set installed on top of the sub base tank.

The sub base tank shall incorporate appropriately spaced external cross support channels installed on the bottom of the tank across the width of the sub base tank as required to properly support the sub base tank, generator set, and fuel weight and provide a two inch air space between the bottom of the tank and the top of the concrete foundation. Each cross support channel shall include mounting restraint points on both ends to allow for adequate attachment of the sub base tank to the site's mounting foundation. Provide drawing indicating dimensional locations for each of the foundation mounting attachment points for the sub base tank.

The tank shall be provided with a minimum of generator supply and return, lockable covered fuel fill, mechanical fuel level gage, required primary and secondary tank primary and emergency vents, low fuel level, high fuel level, and fuel leakage float sensors, primary and secondary tank drains with fittings. It shall include inner and outer tank standard and emergency venting with vent caps as required by UL142 and NFPA. Engine fuel supply and return fuel line flexible connections are to be furnished and installed. Furnish a removable foot valve in the bottom of the sub base tank's engine supply drop tube piping.

The tank shall be furnished with low fuel level, high fuel level and fuel leak float sensors/switches. These alarm contacts shall be provided for annunciation at the automatic transfer switch. The low and high level switches shall monitor the primary fuel tank and the leak detector switch shall sense the interstitial tank. All tank level sensor penetrations shall exit the top of the tank. All level switches / sensors and wiring and conduit are to be installed in the sub base tank and wired to the generator set for local and remote alarms.

Provide an approved sub base tank installed and an interior-located covered fuel fill/overspill lockable fuel oil containment box, minimum of seven (7) gallon capacity positive fuel containment box with approved anti-siphon valve and mechanical duel fill limiter with tight fill connection inside of the containment box to shut off the flow of filling fuel at 95 % of tank capacity. Provide a spring loaded drain pull to allow fuel contained within the fill box to be returned directly into the primary fuel tank.

Provide an installed mechanical fuel level gauge to monitor fuel tank fuel level range from empty to frill. The gage shall be suitable for outdoor use and shall be located and installed on top of the sub base tank near the tank's fuel fill location.

Provide complete dimensional and weight information for the generator set and sub base tank assembly, including detailed mounting information for generator site foundation construction considerations. An engine driven fuel pump, taking its suction from the day tank shall deliver the fuel oil to the engine injection system through a duplex oil filter of the replaceable element type. The excess fuel supplied to the engine shall be returned to the above ground main supply fuel storage tank.

The fuel piping material and size between the day service tank and the engine shall be as recommended by the engine manufacturer and shall include flexible hose connections in both the supply and return piping. A preferred or equal 1-inch size Fusomatic valve shall be installed in the engine suction supply line between the day tank and the diesel engine.

All parts of the fuel system shall meet the approval of, and be installed in complete compliance with, all applicable local, state and federal codes, laws and regulations.

56. 6. 2.13 EXHAUST SYSTEMS

A critical type silencer shall be furnished for mounting above the engine. Mounting arrangements for each installation will be confirmed by the CITY ENGINEER during the shop drawing review process, and shall meet the Manufacturer's recommendations. Silencers shall be constructed with inlet and outlet, required number of appropriate mounting brackets and ½-inch N.P.T. drain connection. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust back pressure does not exceed the maximum limitations specified by the engine manufacturer. So called "spiral" or truck mufflers are disallowed and will not be considered as equal to the industrial quality silencers specified above. Silencers shall be Maxim Model M-51, equal product by Burgess Manning, or equal. All exhaust equipment must be rated to withstand temperatures of approximately 1,000 degrees F. A flexible stainless steel pipe connection shall be provided for installation between the engine exhaust stack and exhaust piping. One stainless steel silencer rain cap with counter weight shall be provided for each unit. Lagging of all exposed piping and silencer shall be furnished and accomplished by the installing Generator Supplier and will be 4-inch thick 1,200 degree Kaylo or equal by Owens Corning, or equal (on interior installations only). The Manufacturer shall furnish a complete exhaust system, together with the silencer and piping insulation.

56. 6. 2.14 AUTOMATIC STARTING SYSTEMS

A DC electric starting system with positive engagement shall be furnished. The starting motor voltage shall be as recommended by the engine manufacturer.

An engine control shall be furnished as an integral part of the electric set to start and stop the engine as signaled by the automatic transfer switch. The control shall start the engine by adjustable timed cranking cycles for a total period of not less than one minute. The crank and rest cycles shall be individually adjustable. The starting circuit shall open, and the control shall activate an alarm circuit if the engine does not start. The control shall be equipped with automatic safety shutdowns so that upon signal of a low oil pressure, high water temperature, or over speed condition of the engine, the control shall immediately stop the engine. The control shall be equipped with signal lights to indicate any of the engine failures and also with a 3-position control switch identified for "automatic-off-manual" to be externally mounted.

Engine Cranking Batteries:

The batteries shall be of the lead acid type, and shall be of domestic manufacture. The batteries shall be designed for engine cranking service and shall be capable of cranking a diesel engine, of the size supplied for three 20-second cranking periods without being recharged. The batteries shall be mounted in suitable free standing covered racks. Battery rack shall be mounted on the generator skid. The Manufacturer shall provide the required lengths of all interconnecting battery cables. Minimum wire size and type shall be 2/0 welding cable. The battery set shall be sized for 40°F ambient starting duty.

There shall be furnished transistor control mag amp design integrally mounted battery chargers with float equalize ability, an equalizing timer, and a low DC voltage alarm relay, and on/off circuit breaker type switches. Chargers shall be suitable for and sized for use with lead-acid type batteries. Input shall be 115 volt AC, single phase. Ammeters, voltmeters and other control devices, switches, etc., shall be door mounted for good visual reference. Chargers shall be mounted on the generator skid.

56. 6. 2.15 GENERATORS

The generator shall be ball bearing construction rotating field, synchronous type built to NEMA standards. A voltage regulator shall be provided to match the characteristics of the generator and engine. Voltage regulation shall be ± 2% from no load to full rated load. Readily accessible voltage droops, voltage level and voltage gain controls shall be provided. Voltage level adjustment shall be a minimum of ± 5%. Generator and exciter shall be inherently capable of parallel operation with other power sources of equivalent electrical characteristics. The generator shall be a single bearing type, 4 pole revolving field, connected directly to the fly wheel housing, brushless type, temperature rise not to exceed 90°C (both armature and field) over a 40°C ambient when operating at the kw rating as stated herein. Voltage Dip shall not exceed 30%.

The generator shall be of open drip proof construction, self ventilated and air cooled. A single row ball bearing sized for a minimum of 40,000 hours and to be furnished with a grease fitting.

Other features shall include volts per Hertz regulator, TIF less than 50, provide 300 percent short circuit sustaining capability, suitable for external SCR controlled equipment, and a large terminal box with bus bar terminal strips for load lead connections. A current transformer shall be installed in the generator terminal box for connecting to a around sensor relay in the control panel.

The Generator Supplier shall require that the standby generator manufacturer coordinate his design with the Supplier of the variable frequency drives to assure that sufficient generator reactance is provided to limit the line harmonics to acceptable levels as specified in IEEE Standard 519, 1992 and to assure that the generator voltage control system will provide stable operation in the presence of such harmonics.

The allowable system voltage dip shall not exceed 30 percent.

56. 6. 2.16 GENERATOR CONTROL PANELS

An engine mounted 14 gauge steel control panel shall be furnished and mounted on the generator skid unit. The panel shall contain, but not be limited to, the following equipment:

Frequency Meter, 3-1/2-inch, dial type.
Voltmeter, 3-1/2-inch, 2 percent accuracy.
Ammeter, 3-1/2-inch, 2 percent accuracy.
Ammeter phase selector switch.
Voltmeter selector switch (4 position) line-to-line.
Automatic starting controls as specified.
Voltage level adjustment rheostat.
Dry contacts for remote alarms wired to terminal strips.
Main line circuit breaker.
Individual fault indicator lights for low oil pressure, high water temperature, over speed, and over crank with pre-alarm and remote alarm contacts.
Four position function switch marked "auto," "manual," "off/reset," and "stop."
Running time meter, oil pressure and water temperature gauges.
Panel lights, transformers, fuses, etc., as required.
Panel mounted kilowatt meter.
Provide transducers on the voltmeter and kw meter with 4-20 ma transmitters for telemetry use.
Unit mounted annunciator with audio/visual alarms and individual fault indicator lights. Provide additional dry contact alarm for each condition.
Emergency stop pushbutton.

The main-line, molded case circuit breaker shall be installed on the generator unit and sized to the output of the generator. The location of the breaker (left or right hand will be continued during the shop drawing review process). The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection.

56. 6. 2.17 AUTOMATIC TRANSFER SWITCHES

The automatic transfer switch shall be mechanically held on both the emergency and the normal side, and rated for continuous duty in an outdoor environment. The switch shall be double throw with the main contacts rigidly and mechanically interlocked to insure only two possible positions; Normal or Emergency. The transfer switch shall be rack mounted, front connected. NEMA 4X 316 stainless steel construction. A manual operator shall be provided to enable manual operation. Two sets of normally closed and open auxiliary switches shall be provided on each breaker in addition to those required for controls.

The transfer switch shall be listed under U.L. 1008. Switches utilizing reversing contactor mechanisms as a means to transfer load will not be considered. Transfer switch shall be of the circuit breaker construction as manufactured by Cutler Hammer or equal.

Automatic load transfer switch shall include the following accessories:

Engine starting contacts to provide for generator starting (2 sets).

Full phase protection. Three phase relays shall be field adjustable, close differential type with 92-95 percent pick-up and 82-85 percent drop-out. Relays are to be connected across live lines.

Test switch, to simulate a power outage.

Adjustable time delay on engine starting to over-ride momentary outages and nuisance voltage dips.

Adjustable time delay on transfer of load to emergency source.

Adjustable time delay to retransfer to normal source after removing generator from load.

Adjustable time delay on retransfer of load to normal with 5 minute cool-down timer wherein the generator set runs unloaded after retransfer to line.

Plant exerciser to start and run the generator set without load each 168 hours for a 30 minute interval.

One auxiliary contact closed on emergency and four auxiliary contacts open on emergency.

Pilot lights to indicate the normal and emergency position of the transfer switch.

Isolated (ungrounded) neutral bar.

The transfer switch shall be rated for 65,000 AIC.

Engine mounted pre-start warning alarm horn controls.

Ground fault protection.

Differential current relay (Three Phase Unit) and associated hardware for generator differential protection.

Controls shall be provided to operate the fuel line shut off solenoid.

Jacket water and space healer controls.

A front door mounted annunciator for all generator failure and warning lights shall be provided.

Ground fault relay and associated hardware for generator ground fault protection.

The ATS shall have bottom conduit entry for generator cables, and top bus duct entry and exit for normal and load feeders.

56. 6. 2.18 ACCESSORY EQUIPMENT

All accessories necessary for complete operating units shall be furnished. These accessories shall include all those described herein and those necessary for the proper functioning of the particular unit supplied.

The complete generator unit shall be mounted on a welded steel sub-base of sufficient rigidity and strength to maintain alignment of the unit. The base shall be suitable for, and there shall be included, spring type vibration isolators for mounting the unit on a level surface of a concrete pad a minimum of 6 inches above the surrounding finished grade. The spring type vibration isolators shall be supplied by the generator unit manufacturer.

56. 6. 2.19 MODULAR SOUND ATTENUATED WEATHERPROOF ENCLOSURES

The complete engine-generator set, main line circuit breaker, critical grade silencer with a rain cap, battery charger, day tank, etc. shall be enclosed within a modular sound-attenuated weatherproof enclosure. The enclosure shall be constructed of removable side panels and end panels and shall be slip-over mounted on the skid. All air inlets shall be louvered to aid in noise reduction.

The top, end and side panels shall be made from 12-gauge aluminum construction. The design of the enclosure shall prevent rodents from entering the unit. The units shall have hinged side doors on each side and double hinged doors to allow access to the engine, alternator, and control panel for servicing and maintenance. To prevent tampering, the enclosures shall have key-lockable doors. The roof overhangs shall have drip ledges which direct rain off the enclosure. All hardware and hinges shall be 316 Series stainless steel. There shall be expanded metal grating in front for the radiator grill and fixed louvered air intake ports on the shelter sides and rear for proper air circulation within the shelter. The complete generator set shall be prime-painted and have two finish coats of protective enamel paint. Paint color shall be as selected by the CITY. Provisions shall be available for crane unloading by providing lifting eyes and spreader bar reinforcement.

The enclosure shall be designed and braced to resist 150-MPH winds, and shall include a minimum of two (2) 75 watt 120 volt lighting fixtures and switches on both sides of the enclosure access doors completely wired ready for field power connection. The lights will be powered from the local lighting panel.

All louvers shall be furnished with 0.125-inch mesh, 0.028-inch diameter 304 stainless steel wire insect screen secured within a heavy-duty two-piece extruded aluminum frame. Screening shall be field-replaceable within extruded frame. The frame shall be mounted on the inside face of the louver and shall be attached by means of self-tapping stainless steel wing screws.

56. 6. 2.20 INSTALLATION

The Generator Supplier shall supply the services of a factory representative to check over the completed generator installations, who will certify to the CITY that the installations meet the approval of the Manufacturer.

The Generator Supplier shall furnish and install suitable jacket water additives as recommended by the engine manufacturer and approved by the CITY, for prevention of both scale formation and corrosion in the water jacket and cooling system components which are in contact with the engine jacket water. These additives shall be added to the cooling system prior to running the field acceptance test.

56. 6. 2.21 PAINTING

The engine generator set and associated equipment shall be shop primed and finish coated in accordance with the Manufacturer's standard practice prior to shipment. Color shall be as approved by the CITY and an adequate supply of touch-up paint shall be supplied by the Manufacturer.

56. 6. 2.22 INSPECTION AND TESTING

Prior to acceptance of the installations, equipment shall be tested by the Generator Supplier to show they are free of any defects and will start automatically to be subjected to full load lest through the use of portable dry type load banks supplied for this purpose at the job site by generator set Supplier. After acceptance of the installation, the fuel tank shall be filled.

The load bank will be capable of definite and precise incremental loading and shall not be dependent on the generator control instrumentation to read amperage and voltage of each phase. Rather, the test instrumentation will serve as a check of the generator set meters. Readings will be taken and recorded at 30 minute intervals during the test and at each occurrence of a load change.

Salt water brine tanks or those load banks requiring water as a source for cooling are not acceptable for this purpose and shall not be utilized for this test.

Load bank testing shall be done in the presence of the Owner and the ENGINEER only after the unit is permanently installed in accordance with the plans and specifications. Testing shall be for a period of two (2) hours under full load.

In order to forecast and minimize engine failure, the Supplier of the equipment shall include as part of his proposal quarterly (every three months) oil sampling analysis for a period of one year from date of acceptance.

All equipment needed to take oil samples shall be provided in kit form at the time of acceptance and shall include the following:

Sample gun kit (1)
Bottles (5)
Mailers (5)
Written instruction (1)

Scheduled oil sampling shall be of the Atomic Absorption Spectrophotometry and shall be accurate to within a fraction of one part per million for the following elements:

Iron
Chromium
Copper
Aluminum
Silicon
Water and fuel dilution

Immediate notification shall be provided to the CITY when analysis results show any critical reading. If readings are normal, a report showing that the equipment is operating within established requirements shall be provided.

This scheduled oil sampling program shall be made available at additional cost to the CITY beyond the mandatory one year time specified above and shall be optional for the CITY to continue the program after that time period has lapsed.

56. 7 FLOW MONITORING SYSTEM

56. 7. 1 GENERAL

When indicated on the DRAWINGS or as required by Section 23.4, a flow monitoring system capable of indicating, recording, and totalizing wastewater flows shall be provided. The system shall include magnetic flow meter and transmitter, electronic recording receiver, and miscellaneous related accessories as specified herein. It shall be the CONTRACTOR's responsibility to provide and install such equipment resulting in a completely operational flow monitoring system.

56. 7. 2 MAGNETIC FLOWMETER/TRANSMITTERS

The magnetic flow meter shall be of the low frequency electromagnetic induction type and shall produce a DC pulse signal directly proportional and linear to the liquid flow rate. The meter shall be designed for operation on 120 VAC ± 10 percent, 60 Hz ± 5 percent with a power consumption of less than 20 watts for sizes through 12-inches.

The metering tubes shall be constructed of stainless steel. All magnetic flow meters shall be designed to mount directly in the pipe between ANSI Class 150 flanges and shall consist of a flanged pipe spool piece with a laying length as recommended by the manufacturer. Meters shall have polyurethane liners with stainless steel electrodes.

The electronics portion of the magnetic flow meter shall include both a magnet driver to power the magnet coils and a signal converter. The signal converter shall be integrally mounted. The converter shall include a separate customer connection section to isolate the electronics compartment and protect the electronics from the environment. A separate terminal strip for power connection shall be supplied. The electronics shall be of the solid state, feedback type and utilize integrated circuitry. The input span of the signal converter shall be continuously adjustable between 0-1 and 0-31 fps for both analog and frequency outputs. The converter shall not be affected by quadrature noise nor shall it require zero adjustment or special tools for start-up.

Input and output signals shall be fully isolated. The converter output shall be 4 to 20 ma DC into 0 to 900 ohms.

Meter shall be suitable for outdoor installation and shall be furnished complete with grounding rings and installation hardware including studs, nuts, gaskets, and flange adapter hardware.

The converter shall include an integral zero return to provide a constant zero output signal in response to an external dry contact closure.

Converter shall also include digital type switches for direct adjustment of scaling factor in engineering units along with integral calibration self-test feature to verify proper operation of the electronics.

The meter shall be hydraulically calibrated at a facility located in the United States and the calibration shall be traceable to the National Bureau of Standards. A computer printout of the actual calibration data giving indicated versus actual flows at a minimum of three (3) flow rates shall be provided with the meter. A certification letter shall accompany the computer printout of the calibration data for each meter referencing the meter's serial number. The accuracy of the metering system shall be 1 percent of rate from 10 to 100 percent of flow for maximum flow velocities of 3 to 31 feet per second.

Complete zero stability shall be an inherent characteristic of the meter system to

eliminate the need to zero adjust the system with a full pipe at zero flow.

The meter housing shall be splash-proof and weather resistant design. The meter shall be capable of accidental submergence in up to 30 feet of water for up to 48 hours without damage to the electronics or interruption of the flow measurement.

56. 7. 3 ELECTRONIC RECORDING RECEIVER

The electronic recording receiver shall be of the solid state, null-balance, servo operated potentiometer type.

The instrument shall contain a differential amplifier, a TORQ-ER driving motor to position the pen, and a Flux Bridge solid state position feedback device for balancing. The instrument shall be capable of receiving one process variable input. Inputs shall be provided with electrical isolation. The instrument shall accept an input signal of 4 to 20 MADC. Electrical zero and span adjustments shall be provided. Power requirements shall be 120 VAC ± 10 percent, 60 Hz. A power supply shall be provided for two-wire transmitters. Accuracy shall be ± 0.5 percent of span, with repeatability of ± 0.2 percent of span.

The receiver shall be provided with an indicating 5-inch segmental scale.

The electronic recording receiver shall be housed in a cast aluminum case suitable for panel mounting. The case shall have a gasket type door with glass window. A 12-inch circular chart shall be provided, with 7 day/rev. and chart rotation. An eight (8) digit electronic totalizing counter shall also be provided.

56. 7. 4 WARRANTY AND SERVICE

WARRANTY

Products shall be guaranteed to be free from defects in material and workmanship under normal use and service for a period of two (2) years after start-up.

SERVICE

Service shall be available for onsite repair of the products. Manufacturer's repair personnel shall be based in Florida to ensure a reasonable response time of not more than two (2) working days.

56. 8 CHAIN LINK FENCING

56. 8. 1 GENERAL

The CONTRACTOR shall furnish and erect the chain link fence and gate in accordance

with these specifications and in conformity with the lines, grades, notes, and typical sections shown on the DRAWINGS and the STANDARD DETAILS.

56. 8. 2 MATERIALS

The fabric, posts, fastenings, fittings, and other accessories for chain link fence shall meet the requirements of AASHTO M 181 with the following changes:

1. The weight of coating of wire fabric shall be 1.2 ounces of zinc per square foot (Class B). Aluminized fabric shall be considered as an alternative.
2. The galvanizing of steel materials shall be hot-dipped galvanized.
3. The weight of coating on posts and braces shall be 1.8 ounces of zinc per square foot, both inside and outside to meet the requirements of AASHTO M 111.

The base metal of the fabric shall be a good commercial quality 9 gauge steel wire. The fabric shall be of uniform quality and 6 foot high with a 2 inch mesh size.

All posts and rails shall be in accordance with the following schedule:

End, corner, and pull posts - 3 inches overall diameter, Schedule 40.

Line posts and gate frames - 2 inches overall diameter, Schedule 40.

Gate Posts - 3 inches overall diameter, Schedule 40.

Post braces and top rail - 1 5/8 inches overall diameter, Schedule 20.

Tension wire shall be 0.177 inch coiled spring wire tensioned along the bottom of the fabric and shall be coated similarly to the wire fabric.

Miscellaneous fittings and hardware shall be zinc coated commercial quality or better steel or zinc coated cast or malleable iron as appropriate for the article.

Post caps, designed to provide a drive fit over the top of the tubular post to exclude moisture, shall be provided.

56. 8. 3 INSTALLATION

POST SETTING

All posts shall be set three (3) feet deep in concrete footings, 12 inches in diameter for line, gate, and corner posts. The fence shall be graded smooth and at final grade before setting posts.

After the post has been set, aligned, and plumbed, the hole shall be filled with 3,000 PSI. concrete. The concrete shall be thoroughly worked into the hole so as to leave no voids.

The exposed surface of the concrete shall be crowned to shed water.

End, corner, pull and gate posts shall be braced to the nearest post with horizontal brace used as a compression member, a galvanized 3/8 inch steel truss rod and truss tightener used as a tension member. Corner posts and corner bracing shall be constructed at all changes of fence alignment of 30 degrees or more. The chain link fence shall be constructed with a top rail and bottom tension wire.

GATES

Swing gates shall be two 6-feet minimum width double hung gates as indicated on the STANDARD DETAILS and hinged to swing through 180 degrees from closed to open and shall be complete with latches, locking device, stops keeper, hinges, fabric, and braces. Gates shall be the same height as the fence and the gate fabric shall be the same as the fence fabric.

Gate leaves less than 8 feet wide shall have truss rods or intermediate braces. Leaves 8 feet or more in width shall have intermediate braces and diagonal truss rods or shall have tubular members as necessary to provide rigid construction, free from sag or twist.

PLACING FABRIC

The fabric shall not be placed until the posts have been permanently positioned and concrete foundations have attained adequate strength. The fabric shall be placed by securing one end and applying sufficient tension to remove all slack before making permanent attachments at intermediate points.

The fabric shall be fastened to all corner, end, and pull posts by substantial and approved means. Tension for stretching the fabric shall be applied by mechanical fence stretchers. A maximum of three (3) inches shall be allowed between the bottom of the fabric and final grade.

56. 9 REQUIRED SUBMITTALS

Submittals shall be provided to the CITY, if not contained within the STANDARD DETAILS, of the following:

1. Shop and erection drawings showing all important details of construction, dimensions, and anchor bolt locations.

2. Descriptive literature, bulletins, and/or catalogs of the equipment, including valves, fittings, wet well construction, etc.

3. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units,

which show that they meet the specified requirements for head, capacity, efficiency, NPSHR, submergence, and horsepower. Curves shall be submitted on eight and one-half (8 1/2) inch by eleven (11) inch sheets, at as large a scale as is practical. Curves shall be plotted from no flow at shut off head to maximum manufacturer recommended pump capacity. Catalog sheets showing a family of curves will not be acceptable.

4. Complete layouts, wiring diagrams, and elementary or control schematics, including coordination with other electrical control devices operating in conjunction with the pump control system. Suitable outline drawings shall be furnished for approval before proceeding with manufacture of any equipment. Standard preprinted sheets or drawings simply marked to indicate applicability will not be acceptable.

5. A drawing showing the layout of the pump control panel shall be furnished. The layout shall indicate and completely identify all devices mounted on the door and in the panel.

6. The weight of each pump.

7. Three sets each of Operation and Maintenance Manuals for the pump station, generator set, and other related equipment.

8. Complete motor data shall be submitted including:

    - Nameplate identification
    - No-load current
    - Full load current
    - Full load efficiency
    - Locked rotor current
    - High potential test data
    - Bearing Inspection report

56.10 ELECTRICAL GROUNDING SYSTEM

56.10 .1 GENERAL

A grounding system shall be installed as per National Electrical Code, Local Codes and Ordinances. The DRAWINGS shall clearly show the Electrical Grounding System. An underground perimeter cable grounding system shall be installed with connections to at least the following equipment:

1. Wet Well Cover
2. Control Panels
3. Generator (as applicable)

4. Utility Company Transformer
5. Main Disconnect Switch
6. Fence

56.10. 2 MATERIAL AND INSTALLATION

The DRAWINGS shall show details of material and installation to construct a completely functional and operational Electrical Grounding System.

56.11 INSPECTION AND TESTING

A factory representative knowledgeable in pump operation and maintenance shall inspect and supervise a test run at the pumping station covered by this MANUAL. Additional test run time made necessary by faulty or incomplete WORK or equipment malfunctions shall be taken so that the requirements of this MANUAL are met at no additional cost to the CITY. Upon satisfactory completion of the test run, the factory representative shall issue the required manufacturer's certificate.

The test run shall demonstrate that all items of the MANUAL have been met by the equipment as installed and shall include, but not be limited to, the following tests:

1. That all units have been properly installed

2. That the units operate without overheating or overloading any parts and without objectionable vibration.

3. That there are no mechanical defects in any of the parts.

4. That the pumps can deliver the specified pressure and quantity.

5. That the pumps are capable of pumping the specified material.

6. That the pump controls perform satisfactorily.

The CONTRACTOR shall furnish the water for the test run either through the use of a fire hydrant meter or water truck.

56.12 PUMPING STATION CONSTRUCTION INVOLVING ACTIVE SANITARY SEWER SYSTEMS (BY-PASS PUMPING)

56.12.1 GENERAL

For the placement or rehabilitation of any pumping station(s) which involves an existing active sanitary sewer system going into or out of the proposed pumping station(s), the Contractor shall

establish a bypass system for the sanitary sewer such that service is not interrupted at any time during construction. The contractor shall supply all equipment (pumps, trunk lines, generators, etc.) and labor to establish the bypass at no cost to the owner. The methodology of establishing the bypass including the capacity of the bypass pump(s) shall be approved by the COSA, prior to commencing construction. The contractor shall submit to COSA three (3) sets of shop drawings of all equipment and materials including diagrams showing the bypass layout for approval. In selecting the bypass pumps, the contractor shall obtain form COSA the appropriate flow rate and head pressure as it pertains to each location of the sanitary sewer system which is to be impacted by the construction.

SECTION 57 – WASTEWATER PUMPS AND MOTORS

57. 1 GENERAL

The equipment covered by these specifications is intended to be FLYGT submersible pumping equipment as specified in Appendix A. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods, and shall operate satisfactorily when installed as shown on the DRAWINGS.

All parts shall be so designed and proportioned as to have liberal strength, stiffness, and to be especially adapted for the work to be done. Ample space shall be provided for inspection, repairs, and adjustment. All necessary foundation bolts, plates, nuts, and washers shall be furnished by the equipment manufacturer and be of Type 304 stainless steel. Brass or stainless steel nameplates giving the name of the manufacturer, voltage, phase, rated horsepower, speed, and any other pertinent data shall be attached to each pump with stainless steel rivets. The nameplate rating of the motors shall not be exceeded.

The pumps shall be capable of handling raw unscreened domestic wastewater and minimum 3 inch diameter solid spheres. Pump operation shall be controlled automatically by means of pressure sensor or MultiTrode probe liquid level sensors in the wet well. Submersible pumps shall be mounted in the wet well as shown on the STANDARD DETAILS and Appendix A.

57. 2 PUMP CONSTRUCTION

57. 2. 1 SHAFT

The pump shaft shall be of Series 300 or 400 stainless steel or carbon steel. When a carbon steel shaft is provided, the manufacturer shall demonstrate that any part of the shaft which will normally come in contact with the wastewater has proven to be corrosion resistant in this application. The shaft and bearings shall be adequately designed to meet the maximum torque required for any start-up or operating condition and to minimize vibration and shaft deflection. As a minimum, the pump shaft shall rotate on two (2) permanently lubricated bearings. The upper bearing shall be a single row ball bearing. The lower bearing shall be a two row angular contact ball bearing, if required to minimize vibration and provide maximum bearing life.

57. 2. 2 IMPELLER

The impeller shall be constructed of bronze, stainless steel, cast iron or ductile iron. All external bolts and nuts shall be of Type 304 stainless steel. Each pump shall be provided with a replaceable metallic wear ring system to maintain pump efficiency. As a minimum one stationary wear ring provided in the pump volute or one rotating wear ring provide

on the pump impeller shall be required. A two part system is acceptable.

57. 2. 3 MECHANICAL SEAL

Each pump shall be provided with a tandem double mechanical seal as specified below, composed of two separate lapped face seals, each consisting of one stationary and one rotating tungsten carbide ring with each pair held in contact by a separate spring, so that the outside pressure assists spring compression in preventing the seal faces from opening. Silicon carbide may be used in place of tungsten carbide for the lower seal. The pumped liquid shall be sealed from the oil reservoir by one face seal and the oil reservoir from the air-filled motor chamber by the other. The seals shall require neither maintenance nor adjustment and shall be easily replaced. Conventional double mechanical seals with a single spring between the rotating faces, requiring constant differential pressure to effect sealing which are subject to opening and penetration by pumping forces shall not be considered equal to tandem seal specified and required.

57. 2. 4 GUIDES FOR SUBMERSIBLE PUMPS

A sliding guide bracket for submersible pumps shall be an integral part of the pump casing. Said bracket shall have a machined connecting flange to connect with the cast iron discharge connection, which shall be bolted to the floor of the wet well with stainless steel anchor bolts and so designed as to receive the pump discharge flange without the need of any bolts or nuts. Sealing of the pumps to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided by no less than two (2) Type 316 seamless tubular stainless steel guides which will press it tightly against the discharge connection. No portion of the pump shall bear directly on the floor of the wet well and no rotary motion of the pump shall be required for sealing. Sealing at the discharge connection by means of a diaphragm or similar method of sealing will not be accepted as an equal to a metal to metal contact of the pump discharge and mating discharge connection. Approved pump manufacturers, if necessary to meet the above specification, shall provide a sliding guide bracket adapter. The design shall be such that the pumps shall be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts, or fastenings to be removed for this purpose. Said installation shall not require personnel to enter the wet well. Each pump shall be fitted with a Type 304 stainless steel 3/4 inch lifting chain of adequate strength. A 1/4 inch stainless steel cable, air craft rating, shall be provided between the cable holder and the lifting chain.

57. 3 MOTORS

57. 3. 1 GENERAL REQUIREMENTS

All motors shall be built in accordance with latest NEMA, IEEE, ANSI, and AFBMA Standards where applicable. Pump motors shall be housed in an air-filled, water-tight

casing, and have Class F insulated windings which shall be moisture resistant. Motors shall be NEMA Design B rated at 155 degrees C maximum. Pump motors shall have cooling characteristics suitable to permit continuous operation, in a totally, partially, or non-submerged condition as required for the individual pump type. Submersible pumps shall be capable of running continuously in a non-submerged condition under full load without damage for extended periods. The motor shall be capable of a minimum of 10 starts per hour. If required by the CITY, before final acceptance, a field running test demonstrating this ability, with 24 hours of continuous operation under the above conditions, shall be performed for all pumps being supplied. Motors 25 horsepower and below shall be rated 230/460 volt 3 phase. Motors greater than 25 horsepower shall be 460 volt 3 phase.

57. 3. 2 HEAT AND MOISTURE SENSORS

Each motor shall incorporate a minimum of one ambient temperature compensated overheat sensing device and one moisture sensing device. These protective devices shall be wired into the pump controls in such a way that if excessive temperature or moisture is detected the pump will shut down. These devices shall be self-resetting.

In lieu of moisture and temperature sensors, each pump motor may have its motor winding insulation resistance monitored automatically by an solid state electronics module. Each automatic module must have an individual disconnect terminal plug, manual shut off switch, three lights to indicate 10 M ohm, 5 M ohm, and 1 M ohm resistance values, two output circuits for external alarms, and two switches (one for heat, one for moisture) for manual testing. The power source shall be 110 VAC fused at 0.24 AMP. The test voltage shall be 500-700 volts d.c. The automatic module shall monitor the motor resistance only when the motor is off and shall activate an alarm system when the motor resistance drops to 1 M ohm.

57. 3. 3 CABLES

Cables shall be designed specifically for submersible or above ground pump applications, as required, and shall be properly sealed. A type CGB water-tight connector with a neoprene gland shall be furnished with each pump to seal the cable entry at the control panel. The pump cable entry seal design shall preclude specific torque requirements to insure a water-tight and submersible seal. The cable entry shall be comprised of a single cylindrical elastomeric grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable. The assembly shall bear against a shoulder in the pump top. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. Secondary sealing systems utilizing epoxy potting compounds may be used. When this type of sealing system is used, the manufacturer shall supply a cable cap as part of the spare parts for each pump. All cables shall be continuous, without splices

from the motor to the control panel. The junction chamber, containing the terminal board, shall be completely leak proof.

57. 4 PUMP CONTROL SYSTEM

Refer to Section 58 for control system specifications.

57. 5 SHOP PAINTING

Before exposure to weather and prior to shop painting, all surfaces shall be thoroughly cleaned, dry, and free from all mill-scale, rust, grease, dirt and other foreign matter. All pumps and motors shall be shop coated with a corrosion resistant paint proven to withstand an environment of raw wastewater. All nameplates shall be properly protected during painting.

Gears, bearing surfaces, and other similar surfaces obviously not intended to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to the CITY up to the time of the final acceptance test.

57. 6 HANDLING

All parts and equipment shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation. Finished surfaces of all exposed pump openings shall be protected by wooded planks, strongly built, and securely bolted thereto. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

57. 7 WARRANTY

The pump manufacturer shall warrant the units being supplied to the CITY against defects in workmanship and material for a period of five (5) years or 10,000 hours.

57. 8 TOOLS

One (1) set of all special tools required for normal operation and maintenance shall be provided for each new pumping station. All such tools shall be delivered to the CITY at or prior to the time of the station start-up.

SECTION 58 – PUMP STATION ELECTRICAL POWER AND CONTROLS

58. 1 GENERAL

This Section specifies the electrical power and control system requirements for wastewater pump stations. These requirements apply to duplex pump panels. Similar requirements shall apply when more than two pumps are involved, except for the quantity of control equipment and panel size shall be increased accordingly. The manufacturer of the control panel shall provide data to indicate that the manufacturer has a minimum of 3 years experience in the building of pump control panels.

A pump station control panel shall be provided for each wastewater pump station. See Appendix A. The control panel shall respond to pressure sensor or MultiTrode probe liquid level sensors to automatically start and stop pumps as well as sound an alarm upon high or low wet well levels. The control panel shall operate two (2) electrical submersible pumps at the power characteristics stipulated. The control function shall provide for the operation of the lead pump under normal conditions. If the incoming flow exceeds the pumping capacity of the lead pump, the lag pump shall automatically start to handle this increased flow. As the flow decreases, pumps shall be cut off at elevation as shown on the PLANS. Pumps shall alternate positions as lead pump at the end of each cycle. A failure of the alternator shall not disable the pumping system. The alternator shall include a safe and convenient method of manual alternation with provisions to prevent automatic alternation without disturbing any wiring. Should the "pump off" regulator fail, the system shall keep the station in operation and provide a visual indication of the regulator failure.

The control panel shall consist of main circuit breakers and generator breaker with mechanical interlock, an emergency power receptacle, a circuit breaker and magnetic starter for each pump motor, and 15 ampere, 120 volt circuit breakers as required. All pump control operations shall be accomplished by a float type liquid level control system with all control components mounted in one common enclosure. Control switches shall provide means to operate each pump manually or automatically. When operated in the automatic mode, the control assembly shall provide means to manually select or automatically alternate the position of the "lead" and "lag" pumps after each pumping cycle. A float type liquid level control system shall continuously monitor the wet well liquid level and control operation of the low-level cutoff for the pumps while operating off a 24 volt circuit.

58. 2 PANEL CONSTRUCTION

The duplex pump panel shall be housed in a NEMA 4X, Type 304, 14 Gauge stainless steel enclosure with 30 percent extra mounting space for additional equipment. The enclosure shall have provisions for padlocking the door and a dead front inner door unit for mounting controls. All exterior hardware and hinges shall be stainless steel.

There shall be permanently affixed to the interior side of the exterior enclosure door both a nameplate and a 10 inch x 12 inch pocket for log sheet storage. The nameplate shall contain the following information, voltage, phase, rated horsepower, speed, and date manufactured. Also contained shall be the pump and control panel manufacturer's name, address, and telephone number, pump data, including impeller data, operating point and head, kilowatt input, amps at the operating point, and at least two other points on the pump curve.

The control panel enclosure shall be Underwriters Laboratories (UL) 50 type 4X listed.

58. 3 POWER SUPPLY AND MAIN DISCONNECT

Power supply to the control panel shall be either 240 volt, 3 phase, 4 wire or 480 volt, 3 phase, 4 wire. Minimum service shall be 100 AMP. Single phase power shall not be accepted unless specifically approved in writing by the DIRECTOR. The main disconnect box shall be made of either aluminum or stainless steel.

Non-fusible safety service main disconnects shall be installed at all stations. In all 240 volt systems, disconnects should be installed between the meter and the panel and on all 480 volt systems disconnect should be installed ahead of the meter, or as directed by the electric supply company. LED power available indicators shall be supplied on all legs.

58. 4 CIRCUIT BREAKERS

58. 4. 1 MAIN BREAKERS

The panel shall have an interlock system between the normal power main breaker and the emergency breaker to ensure only one breaker is in the "on" position at a time. Both breakers shall be equal in size. See approved manufacturers' list in Appendix A.

58. 4. 2 CIRCUIT BREAKERS

All circuit breakers shall be heavy duty molded case breakers. The handle on the circuit breakers shall be operational through the inner door. See approved manufacturers' list in Appendix A.

58. 5 MOTOR CIRCUIT PROTECTORS

Each pump motor shall be protected by a 3-pole motor circuit protector. See approved manufacturers' list in Appendix A. The motor circuit protector shall be operated by a toggle-type handle and have a quick-make, quick-break over center switching mechanism that is mechanically trip-free from the handle so that the contacts cannot be held closed against a short circuit and abnormal currents which cause the motor circuit protection to trip. Tripping shall be clearly indicated by the handle automatically assuming a position midway between the normal ON and OFF positions. All latch surfaces shall be ground

and polished. All poles shall be so constructed that they open, close, and trip simultaneously. Motor circuit protector shall be completely enclosed in a high-strength glass polyester molded case. Ampere ratings shall be clearly visible. Contacts shall be of non-welding silver alloy. Arc extinction shall be accomplished by means of arc chutes. A manual push-to-trip button shall be provided for manual exercising of the trip mechanism. Each pole of these motor circuit protectors shall provide instantaneous short circuit protection by means of an adjustable magnetic-only element.

58. 6 MOTOR STARTER AND SELECTOR SWITCHES

The panel shall contain two motor starters. The motor starter shall be across the line magnetic starter with individual overload protection on each power leg with reset installed through the inner door unit. See Appendix A. Local power company regulations shall govern.

Selector switches shall be installed on the face of the inner door unit. Selector switch shall be a heavy duty oil tight "Hand-Off-Auto" three position switch to control the operation mode of each pump motor starter.

58. 7 PUMP ALTERNATOR

An eight pin plug-in solid state alternator (see Appendix A) shall be provided to change the pump starting sequence on each pumping cycle. A three position alternator test switch shall be provided to control the alternation operation. Switch positions to include the "Auto" to provide normal automatic sequence, "Off" position to disable alternator, and "test" position with a spring return to allow the alternating of the pump sequence to check alternator operation.

58. 8 LIGHTS AND ALARMS

58. 8. 1 INDICATOR LIGHTS

There shall be installed on the face of the inner door unit, heavy duty oil tight indicator lights as shown on the STANDARD DETAILS.

58. 8. 2 HIGH LEVEL ALARM

A vapor proof red light and weather proof horn for high level alarm shall be mounted to and connected to the bottom of the panel by a water tight electrical conduit. The bottom of said light shall be at least 1 foot above the top of the control panel. Also, there shall be an alarm silence pushbutton on the inner door and a silence relay which will silence the horn and automatically reset when these signals are restored to normal. The pushbutton shall be heavy duty oil tight. The red globe shall be the screw-on type.

58. 9 EMERGENCY POWER RECEPTACLE

Emergency power receptacles shall be required on stations that do not have a permanent standby generator system. The panel shall have external mounted generator receptacle of the required size. See approved manufacturer's list.

58.10 ADDITIONAL REQUIREMENTS

58.10. 1 WIRING

All power wires shall be THWN 75 Degree C insulated stranded copper conductors and appropriately sized for the given load application. All control circuit wire shall be type THWN; Size 14, stranded type. All wiring within the enclosure shall be neatly routed by the use of slotted type wiring duct with snap on type covers. Wiring on the rear of the inner door shall be neatly bundled with nylon ties and include sufficient loop across the hinges to prevent wire damage, with each end of conductor permanently identified with terminal number, Color: red, 24 volt; white, neutral; and black, 120 volts.

58.10. 2 TERMINAL POINTS

Terminal points of all terminal strips shall be permanently identified. All terminal numbers and identifying nomenclature shall correspond to and be shown on electrical diagrams. All wiring shall be permanently shown on electrical schematic diagrams.

58.10. 3 ENGRAVED NAMEPLATES

All circuit breakers, control switches, indicator pilot lights and other control devices shall be identified with permanently affixed legend plates and laminate core type engraved nameplates where applicable.

58.10. 4 SURGE PROTECTOR

A surge protector shall be included and wired to protect motors and control equipment from lighting induced line surges. All surge protectors shall be U.L. approved, installed, and attached to the main disconnects per respective power company requirements and manufacturer's specifications.

58.10. 5 ELAPSED TIME METERS

Elapsed time meters shall be 115 volt non-reset type and totalize pump running time in hours and tenths of hours to 99999.9 hours.

58.10. 6 CONVENIENCE RECEPTACLE

On the face of the inner door unit, there shall be installed a 15 AMP 120 volt, duplex

convenience receptacle, GFCI protected. It shall be provided with its own single pole 15 AMP circuit breaker for protection.

58.10. 7 CONTROL TERMINAL BLOCKS

Control terminal blocks shall be of the clamp screw type rated for 600 volts. Amperage rating shall accommodate the control circuit amperage. An additional 30 space terminal strip shall be installed in the cabinet for future use, with RTU equipment.

58.10. 8 CONTROL POWER TRANSFORMERS

There shall be a control power transformer with a minimum size of 500VA to provide 120VAC power to the coils for starters, 15A duplex receptacle, indicator pilot lights, alarm horn, alarm light, pump alternator, elapsed time meters, etc. The secondary side shall have one leg fused and the other grounded. This control power transformer is required only on 480 volt control panels.

The signal required by the float switches and relays shall be 24VAC. This shall be provided by a 24VAC control power transformer properly sized with a fused secondary.

58.10. 9 ELECTRICAL SCHEMATIC

There shall be permanently affixed to the interior side of the exterior enclosure door an electrical schematic diagram and a copy supplied to the CITY at start-up. The schematic diagram shall include the rated amperage and voltage for all components, and a component description with manufacturer’s name and catalog number.

58.10.10 PHASE MONITOR

For all 240 volt stations, an eight pin plug-in type phase monitor shall be provided for protection of electrical components due to phase loss. Adequate dummy pin protection shall be provided to prevent accidental interchanging of the eight pin phase monitor with the eight pin alternator. All 480 volt stations shall have surface mount type phase monitors.

58.11 RADIO TELEMETRY AND MONITORING SYSTEM

Each pump station shall be equipped with a radio telemetry unit (RTU) capable of communicating with the existing Central Telemetry Unit (CTU) located at the CITY's Water Treatment Facility via a state-of-the-art packet-switched technology radio and modem transceiver unit. All equipment, cabinets, and devices shall be of the field expandable heavy duty modular type designed for continuous industrial level service and produced, insofar as possible, by a single manufacturer.

58.11. 1 GENERAL

The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions. Field cabinets and enclosures shall be NEMA 4X stainless steel and provided with thermostatically controlled temperature and humidity controls to prevent condensation. The equipment furnished shall be designed to operate satisfactorily within officially recorded high and low temperature ranges for the CITY area and up to 95 percent humidity.

All equipment shall be designed to operate from a 60 Hertz alternating current power source at a nominal 110 volts, plus or minus 10 percent, except where specifically approved by the DIRECTOR. All regulators and power supplies required for compliance with the above shall be provided.

Where regulation requires, constant voltage transformers shall be provided. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 VA, unless otherwise approved by the DIRECTOR. Materials and equipment used shall be U.L. approved wherever possible. All equipment shall be designed and constructed so that in the event of a power interruption, said equipment shall resume normal operation without manual resetting when power is restored.

58.11. 2 LIGHTNING AND SURGE PROTECTION

Lightning and surge protection shall be provided to protect the telemetry system from surges propagating along the signal and power supply lines. The protection systems shall provide a protective level that does not interfere with normal operation, is lower than the instrument surge withstand level, and be maintenance-free and self-restoring. All ground protection shall be in accordance with FIPS Publication 94 "Guideline on Electrical Power for ADP Installation".

58.11. 3 REMOTE TELEMETRY UNIT

The Remote Telemetry Unit (RTU) shall be a completely self-contained, state-of-the-art, programmable controller-base data acquisition and control unit designed for monitor and control applications. The RTU shall be capable of communicating via a direct RS-232C data link, leased telephone line, or two way radio communications link in the frequency licensed for the application. The RTU shall be designed to accommodate plug-in Input/Output (I/O) modules that may be installed, without special tools, in the field by the CITY.

The RTU shall be programmable using relay ladder logic instructions from a DOS-base laptop computer or remotely over the communications medium. The minimum memory size of the RTU shall be 1.5K of 16-bit relay logic memory and 2K of the 16-bit register storage. Applications requiring more than 1.5K of ladder logic memory shall utilize a 4K or 8K logic CPU. The relay logic instructions of the programmable controller shall

include normally open, normally closed, transitional positive and negative contacts, timers with 0.01, 0.1, and 1.0 second resolution, and up/down counters. Register and table instructions shall include block moves, table to register, register to table, FIFO, table search, and table to table. Register matrix operations shall include bit sense, bit set/clear, and, or, exclusive or, bit rotate, and complement. The programming language shall be the same across all models of the programmable controller family, allowing programs written in the smallest unit to be directly uploaded into a larger CPU. The application development software shall support all existing programmable controllers located in the treatment plant facilities as well as all existing and future remote units.

The RTU shall operate as a slave to the master site and only respond to polls addressed to the appropriate RTU. Control command from the central site shall be immediately executed in the logic of the RTU.

The RTU design shall utilize a low power CMOS design to allow for AC, DC battery, or solar power operation. The CPU shall be powered from a 24 VDC source. The programmable controller shall support a slot mounted AC power supply where required. The power supply shall be surge protected, accept input voltages of 95 to 270vac and short circuit protected by circuit limiting. Solar powered or battery-backed RTU operation applications shall require a dry lead-acid battery on float charge with a minimum float life of five years. The power supply and battery shall be housed in the RTU enclosure.

58.11. 4 INPUT/OUTPUT MODULE

The I/O module shall be designed for ease of maintenance and future expansion. All I/O modules shall have a mechanical mechanism to prevent improper installation. All I/O points must be designed with surge suppression on all inputs and outputs in conformance with IEEE 472-1974. The configuration of additional modules shall be software configurable. The primary CPU and I/O chassis shall support the CPU, AC/DC power, if used, and two additional I/O modules of any type. Up to three additional I/O chassis may be added to the unit, each chassis shall house up to five I/O modules. Any I/O module of any type, digital and/or analog, shall be capable of being located in any unused I/O chassis slot.

The RTU shall support up to 256 digital inputs and outputs with a minimum of eight digital inputs and four digital outputs. 32 analog inputs and outputs shall be supported with four analog inputs and two analog outputs.

58.11. 5 COMMUNICATION MEDIUM

The RTU shall be capable of two-way radio communications with the CITY's Water Treatment Facility (WTF) using a continuous polling method at a minimum rate of 1200 baud. All radio equipment shall be FCC accepted for telemetry use under FCC Regulations Part 94 at a frequency of 450 MHZ. Each message shall contain CRC-16

checksum for error checking. The unit shall have at least one communications interface which shall control the modem during the polling sequence.

58.11. 6 RADIO TRANSCEIVER

The RTU shall have a solid-state FM radio transceiver with sufficient power to assure a 99 percent availability of signal from the remote site to the Water Treatment Facility. The remote unit shall be of the same equipment manufacturer as the central unit. The communications modem shall be based on industry standard X.25 packet switch communications technology which shall support RSG communications at baud rates up to 9600 baud. The appropriate high gain antenna mounted on a 2 inch schedule 40 aluminum pole shall be installed as shown on the STANDARD DETAILS. The coax cable utilized to connect the antenna to the RTU shall be a low loss type with an inert semi-liquid compound flooding all the voids between the polyethylene dielectric and the outer jacket. The flooding compound shall prevent water or water vapor from entering the cable even in the event that the outer jacket is cut.

58. 12 TESTING, SERVICE, AND WARRANTY

58.12. 1 TESTING

After fabrication in the manufacturer's plant, an operational test shall be performed to check out the equipment before delivery. Three phase source voltage shall be used for the testing.

58.12. 2 SERVICE

The manufacturer shall maintain a service organization in the Orlando Metropolitan Area.

58.12. 3 WARRANTY

The manufacturer shall furnish a five (5) year warranty against defects in materials and workmanship covering parts and labor on all items supplied under this Section.

INTRODUCTION TO STANDARD DETAILS

APPLICATION

The following STANDARD DETAILS shall apply to all new water and wastewater systems, both private and public, and to all alterations, modifications, retrofits, additions, or extensions to any new or existing water or wastewater system.

Note: Any and all use or reproduction of CITY Standard Details shall be in entirety, including border, title block and CITY emblem, exactly as downloaded from CITY website, unless specifically requested otherwise by CITY staff.

The CITY requires that all STANDARD DETAILS deemed applicable to the PLANS and WORK be shown on and made part of the PLANS. It shall be the responsibility of the DEVELOPER'S ENGINEER to ensure the accuracy and completeness of the STANDARD DETAILS shown on the plans. The CITY reserves the right to require the DEVELOPER'S ENGINEER to revise the STANDARD DETAILS to fit specific conditions and requirements of the PLANS and WORK. The CITY reserves the right to require the DEVELOPER'S ENGINEER to add construction details to the PLANS as deemed applicable, whether these details are of the STANDARD DETAILS or of a separate source.

Requirements shown in the STANDARD DETAILS are not intended to be discriminatory against materials, products, or construction techniques of demonstrated capabilities.

When field conditions dictate, or where good engineering practices indicate, appropriate variations of these STANDARD DETAILS which produce an equal or better end-product may be submitted to the CITY for review on a case by case basis. Any request for such a variation must be brought to the attention of the CITY and must be accompanied by supporting documentation and calculations.

The STANDARD DETAILS shall not apply to utility systems owned and/or operated by the COUNTY.

PURPOSE

These STANDARD DETAILS are adopted to establish minimum acceptable standards for the design and construction of water distribution/transmission facilities and wastewater collection/transmission facilities that are to be dedicated to the CITY, or facilities that interconnect to utilities owned by the CITY. Such facilities include water mains, gravity sewer mains, wastewater force mains, wastewater pump stations, reuse mains and miscellaneous related appurtenances associated with such systems.

The CITY reserves the right to make changes to the STANDARD DETAILS at any time.

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SANITARY SEWER AND WATER DETAILS

INDEX

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Detail	Description
SS-31&W-16	Valve Box Cover
SS-32&W-17	Valve Box
SS-33&W-19	Valve Jacket "Adjusted"
SS-34&W-20	Valve Jacket Lowered for Milling
SS-35&W-21	Pipe Hanger Detail
SS-36&W-22	Pipe Support Saddle Assembly for Pressure Main
SS-37&W-23	Pipe Support Saddle Assembly for Pressure Main
SS-38&W-31	Mechanical Restraint Details
SS-38A&W-31A	Mechanical Restraint Details
SS-38B&W-31B	Mechanical Restraint Details
SS-39&W-32	Adjustment Over Existing Utilities – Mechanical Restraint Devices (Case A)
SS-41&W-34	Adjustment Under Existing Utilities – Mechanical Restraint Devices (Case B)
SS-42&W-35	Utility Separation Requirements
SS-44&W-37	Plugged Dead End Mechanical Restraints
SS-55&W-55	Locate Wire Box
SS-60&W-60	Air Release Valve Manhole
W-1	Water Meter Locations – 3/4" – 2" Meters
W-2A	3/4" and 1" Residential Tap and Water Service Detail
W-2B	3/4" and 1" Tap / Water Meter Set-Up with Backflow Preventer Configuration
W-2C	2" Tap and Water Meter Set-Up with Backflow Preventer Configuration
W-2D-ALT	3" or 4" Water Meter Set-Up with Backflow Preventer Configuration
W-3	Manifold Installation for Multiple Small Meters (Limit 3 Meters)
W-3A	Manifold Installation for Multiple Small Meters (Limit 6 Meters)
W-12	Fire Hydrant Installation
W-14	Hydrant Installation Limited Space

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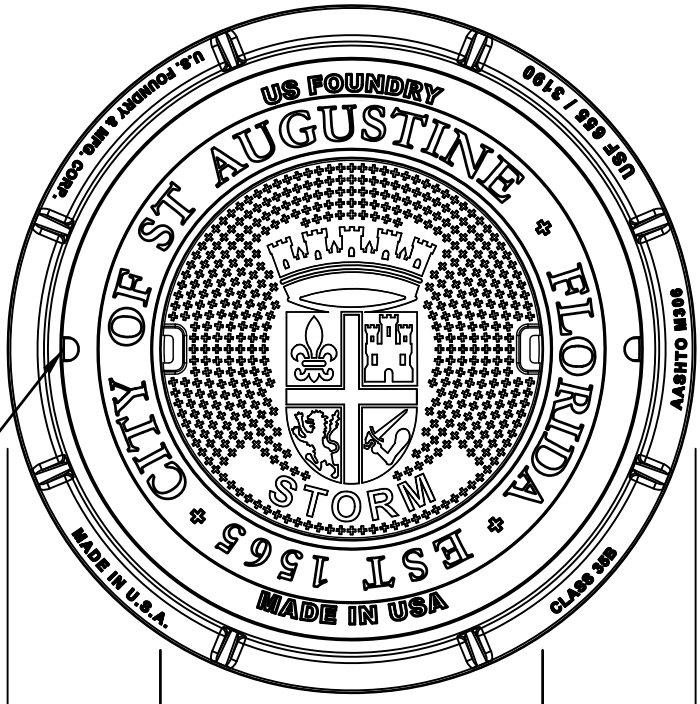
Detail	Description
W-15	Hydrant Sump
W-25	Temporary Sample Tap Along Pipe
W-26	Temporary Sample Tap for Stub Out
W-27	Temporary Sample Alternative Methods
W-28	Flushing Valve Below Grade
W-28A	Temporary Sample Tap in Below Grade Flushing Valve
W-48	Fire Service 4" – 10"
W-56	Locate Wire Construction for Water Main System
W-57	Locate Wire Construction for Branch Water Mains and Large Services
W-60	Manhole Detail for Air Release Valves on Water Mains
W-61	Air Release Valve for use on Water Mains
W-62	Offset Air Release Valve for use on Water Mains
LS-1	Lift Station – Duplex Pumping Station
LS-2	Lift Station – Triplex Pumping Station
LS-3	Lift Station – Electrical Panel
LS-4	Lift Station – Single Line Diagram
LS-5	Lift Station – Typical Electrical Equipment Installation
LS-6	Lift Station – Supplementary Details
LS-7	Lift Station – Emergency Generator
N-1	City of St. Augustine Water and Sewer General Notes
N-2	Storm Water Pollution Prevention Plan
N-3	City of St. Augustine Horizontal Directional Drill Construction Requirements

U.S. FOUNDRY
CAST NUMBER
USF655–WC–MN

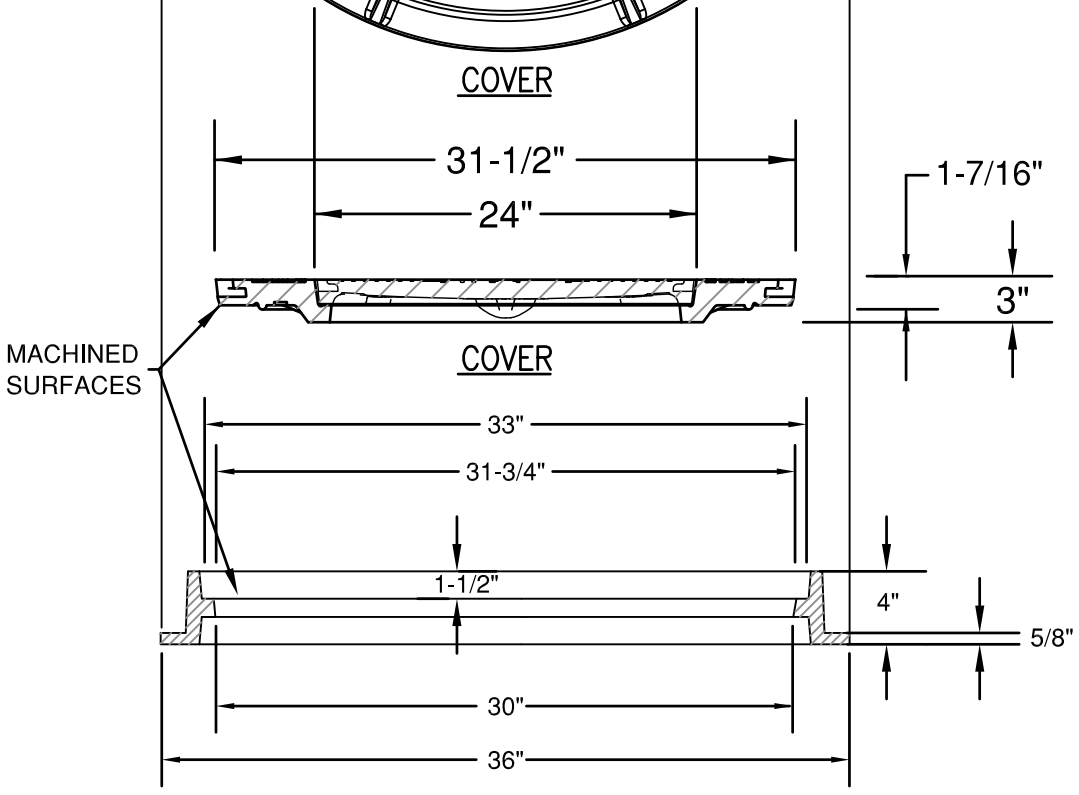
NOTE:
COVER SHALL BE STAMPED "SEWER" OR "STORM" AS APPROPRIATE



2–CONCEALED PICKHOLES

NOTE:
1. FRAME & COVER SHALL BE MACHINED OR GROUND AT ALL BEARING SURFACES SO AS TO SEAT FIRMLY AND PREVENT ROCKING.
2. COVER SHALL BE STAMPED "SEWER" OR "STORM" AS APPROPRIATE.
3. ALL MANHOLES SHALL INCLUDE INSERT PAN.

COVER



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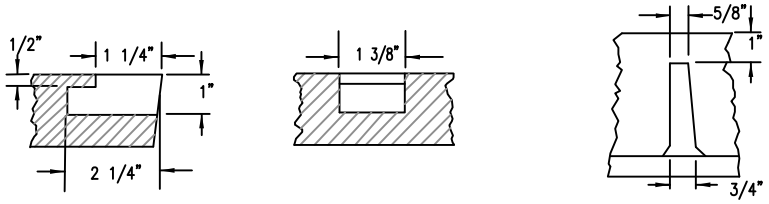


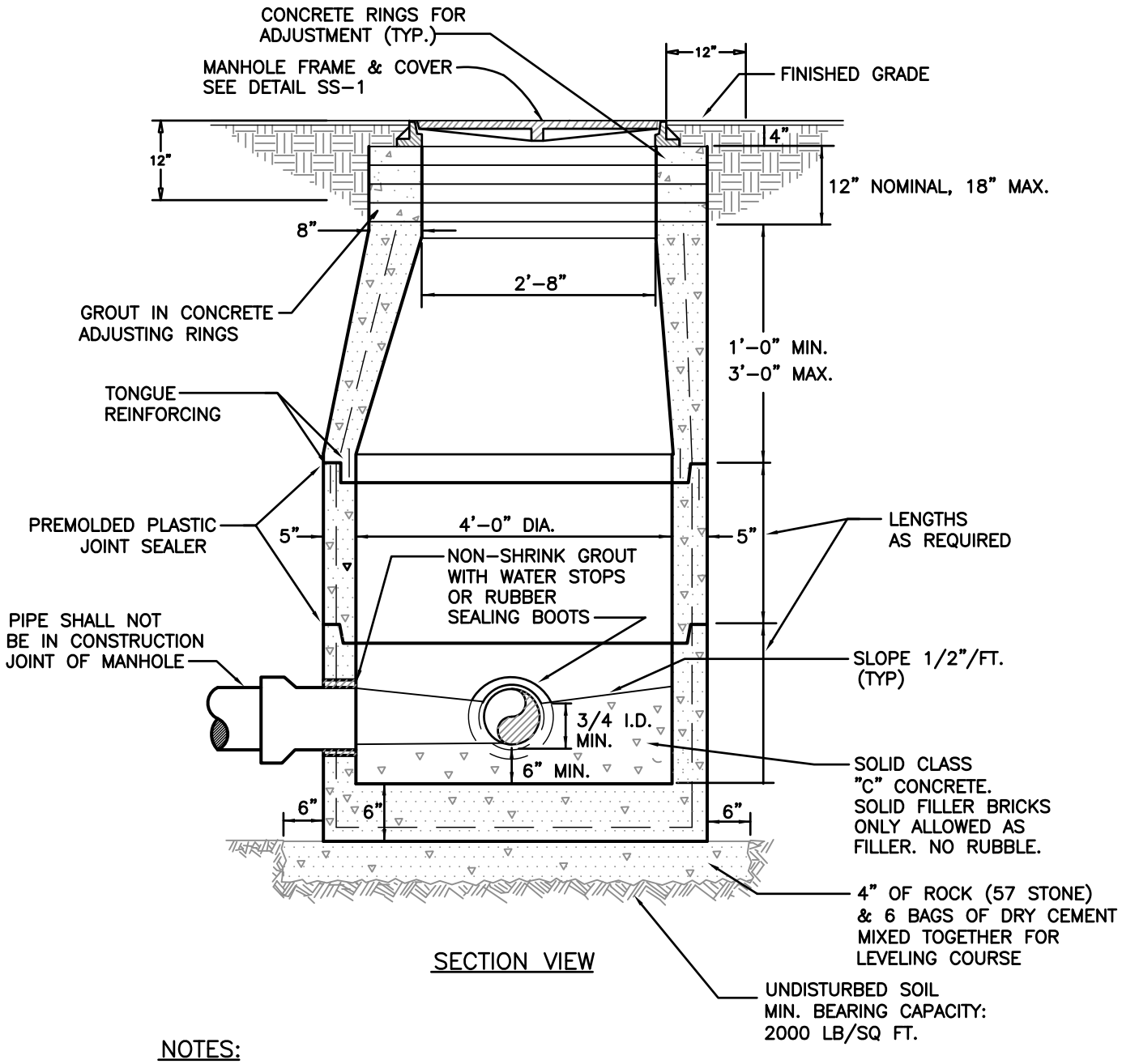
PICKHOLE DETAILS

RIB DETAIL

C.O.S.A.

STORM/SEWER MANHOLE COVER AND FRAME

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–1



SECTION VIEW

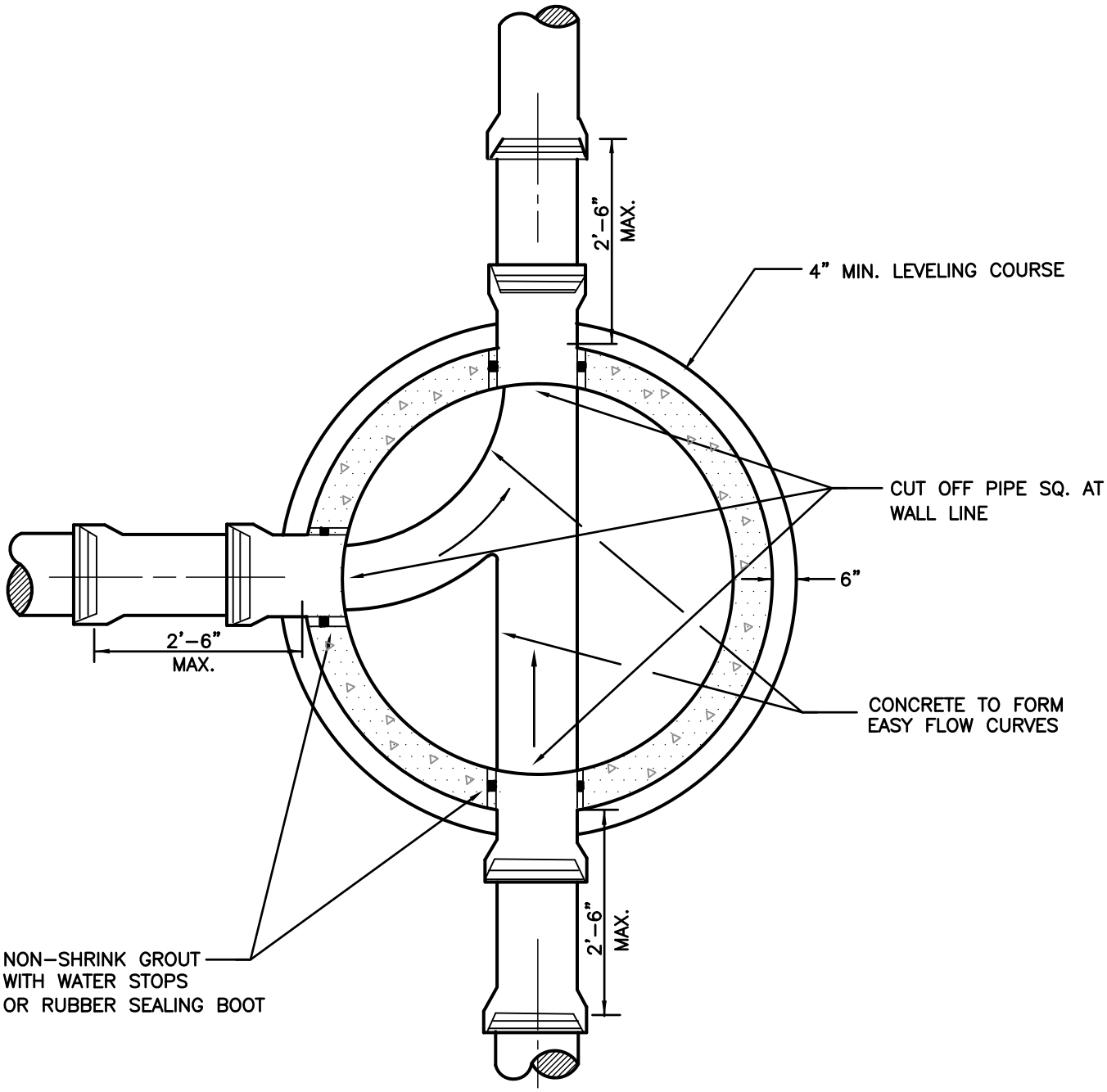
NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH LATEST EDITIONS OF ASTM C478 WITH 4000 PSI CONCRETE, TYPE II CEMENT.
2. THE EXTERIOR OF MANHOLE AND ADJUSTMENT RINGS SHALL BE GIVEN TWO COATS OF WATERPROOFING MATERIAL. CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES.
3. THE INTERIOR SURFACE SHALL BE COATED WITH SEWPERCOAT OR SPECTRASHIELD PROTECTIVE COATING SYSTEM TO PREVENT CONCRETE DETERIORATION FROM HYDROGEN SULFIDE AND OTHER CORROSIVE GASES.
4. IF SPECIALTY LINER TO BE INSTALLED ON INSIDE OF MANHOLE, INTERIOR COATING SHALL BE OMITTED.
5. MANHOLES IMMEDIATELY UPSTREAM OF PUMPING STATIONS REQUIRE FIBERGLASS LINING. MANHOLES RECEIVING FORCE MAIN FLOW LESS THAN OR EQUAL TO 4-INCH FORCE MAIN MAY BE LINED WITH SEWPERCOAT OR SPECTRASHIELD. MANHOLES RECEIVING FORCE MAIN FLOW GREATER THAN 4-INCH FORCE MAIN REQUIRE FIBERGLASS LINING.

C.O.S.A.

SANITARY SEWER
TYPE "A" MANHOLE
8" - 21" SEWERS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-2

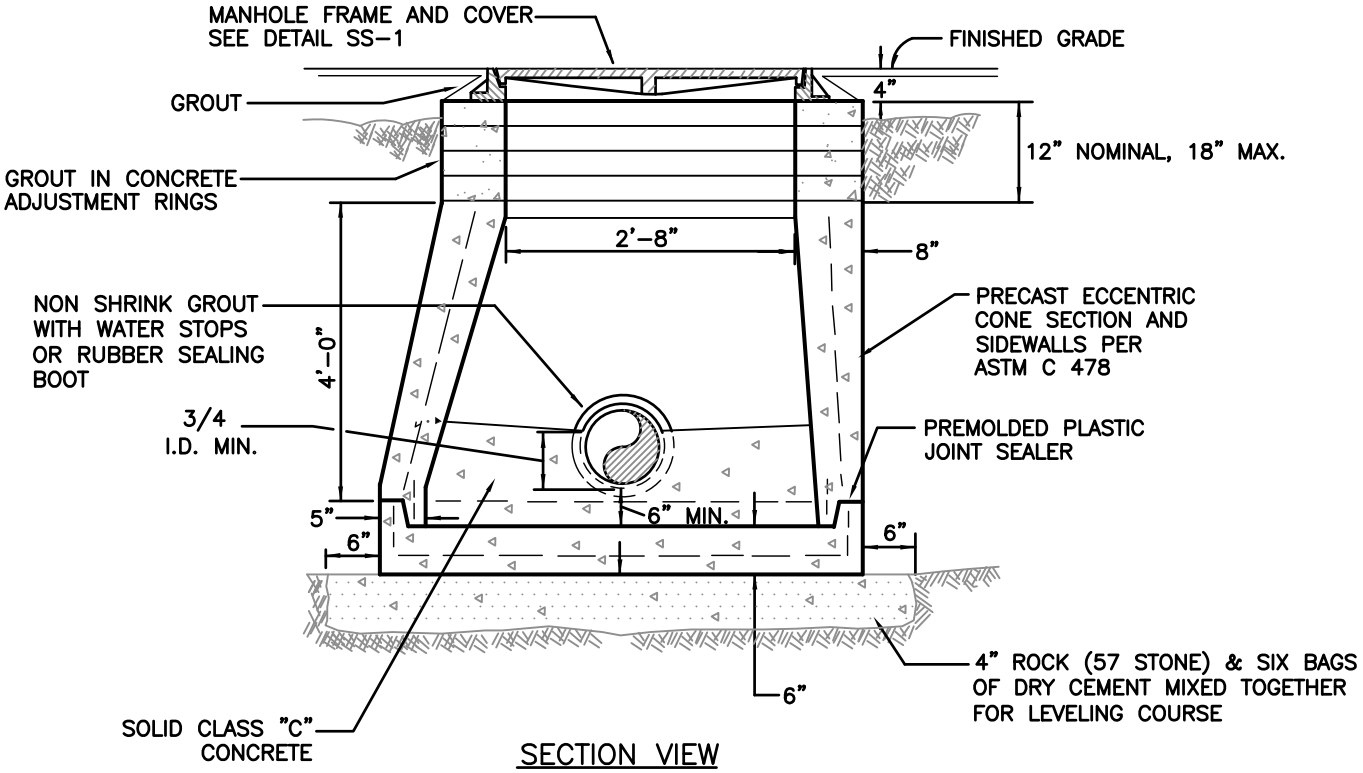


PLAN VIEW

C.O.S.A.

PLAN VIEW TYPE "A" MANHOLE 8" – 21" SEWERS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-3



SECTION VIEW

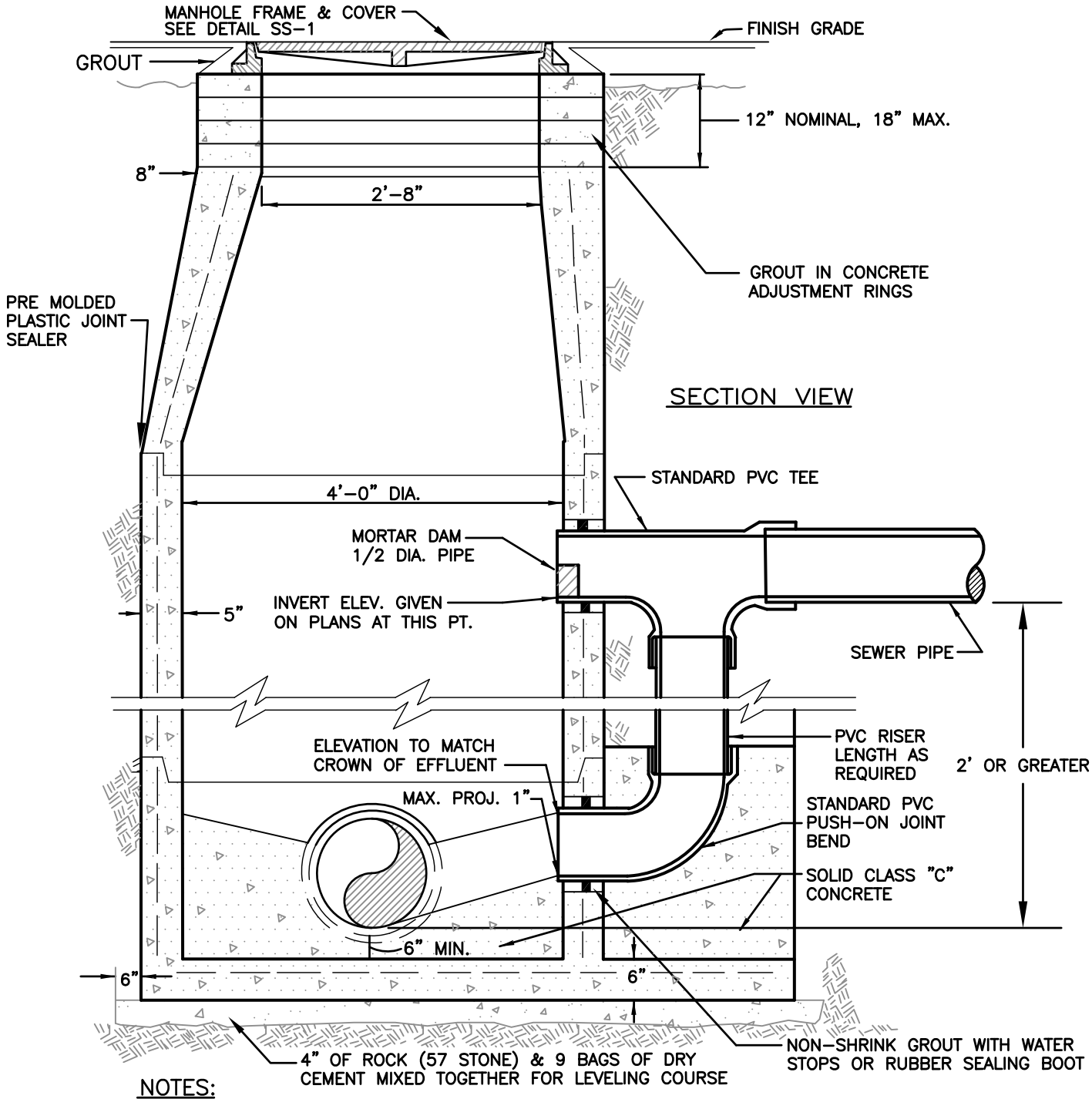
NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH LATEST EDITIONS OF ASTM C478 WITH 4000 PSI CONCRETE, TYPE II CEMENT.
2. THE EXTERIOR OF MANHOLE AND ADJUSTMENT RINGS SHALL BE GIVEN TWO COATS OF WATERPROOFING MATERIAL. CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES.
3. THE INTERIOR SURFACE SHALL BE COATED WITH SEWPERCOAT OR SPECTRASHIELD PROTECTIVE COATING SYSTEM TO PREVENT CONCRETE DETERIORATION FROM HYDROGEN SULFIDE AND OTHER CORROSIVE GASES.
4. IF SPECIALTY LINER TO BE INSTALLED ON INSIDE OF MANHOLE, INTERIOR COATING SHALL BE OMITTED.
5. MANHOLES IMMEDIATELY UPSTREAM OF PUMPING STATIONS REQUIRE FIBERGLASS LINING. MANHOLES RECEIVING FORCE MAIN FLOW LESS THAN OR EQUAL TO 4-INCH FORCE MAIN MAY BE LINED WITH SEWPERCOAT OR SPECTRASHIELD. MANHOLES RECEIVING FORCE MAIN FLOW GREATER THAN 4-INCH FORCE MAIN REQUIRE FIBERGLASS LINING.

C.O.S.A.

SANITARY SEWER
TYPE "C" MANHOLE
8" - 21" SEWERS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-6



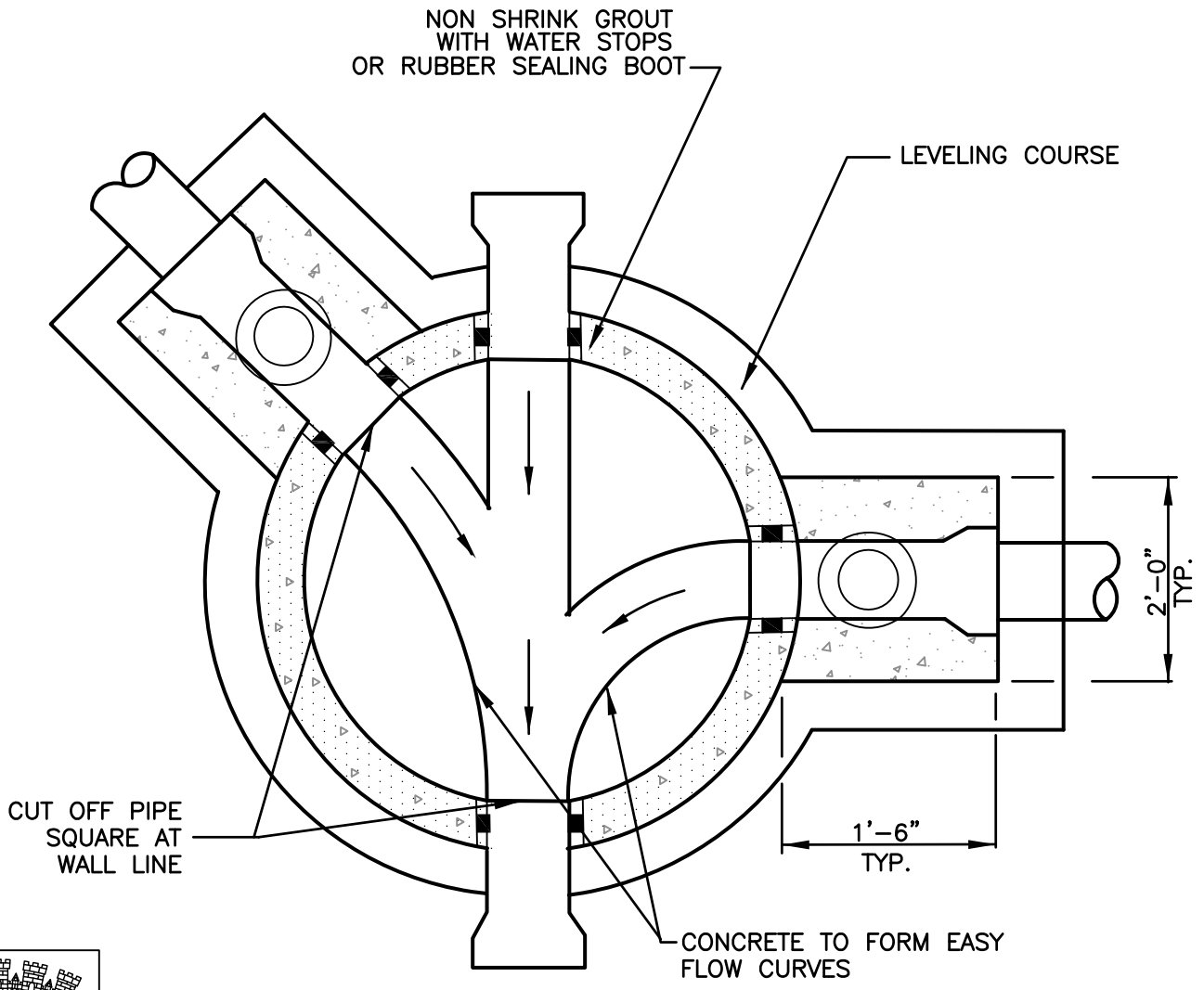
NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH LATEST EDITIONS OF ASTM C478 WITH 4000 PSI CONCRETE, TYPE II CEMENT.
2. THE EXTERIOR OF MANHOLE AND ADJUSTMENT RINGS SHALL BE GIVEN TWO COATS OF WATERPROOFING MATERIAL. CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES.
3. THE INTERIOR SURFACE SHALL BE COATED WITH SEWPERCOAT OR SPECTRASHIELD PROTECTIVE COATING SYSTEM TO PREVENT CONCRETE DETERIORATION FROM HYDROGEN SULFIDE AND OTHER CORROSIVE GASES.
4. IF SPECIALTY LINER TO BE INSTALLED ON INSIDE OF MANHOLE, INTERIOR COATING SHALL BE OMITTED.
5. MANHOLES IMMEDIATELY UPSTREAM OF PUMPING STATIONS REQUIRE FIBERGLASS LINING. MANHOLES RECEIVING FORCE MAIN FLOW LESS THAN OR EQUAL TO 4-INCH FORCE MAIN MAY BE LINED WITH SEWPERCOAT OR SPECTRASHIELD. MANHOLES RECEIVING FORCE MAIN FLOW GREATER THAN 4-INCH FORCE MAIN REQUIRE FIBERGLASS LINING.
6. TYPE "D" MANHOLE MUST BE USED FOR 2' OR GREATER INFLUENT DROP AND MULTIPLE DROPS.

C.O.S.A.

SANITARY SEWER
TYPE "D" MANHOLE
8" - 21" SEWERS

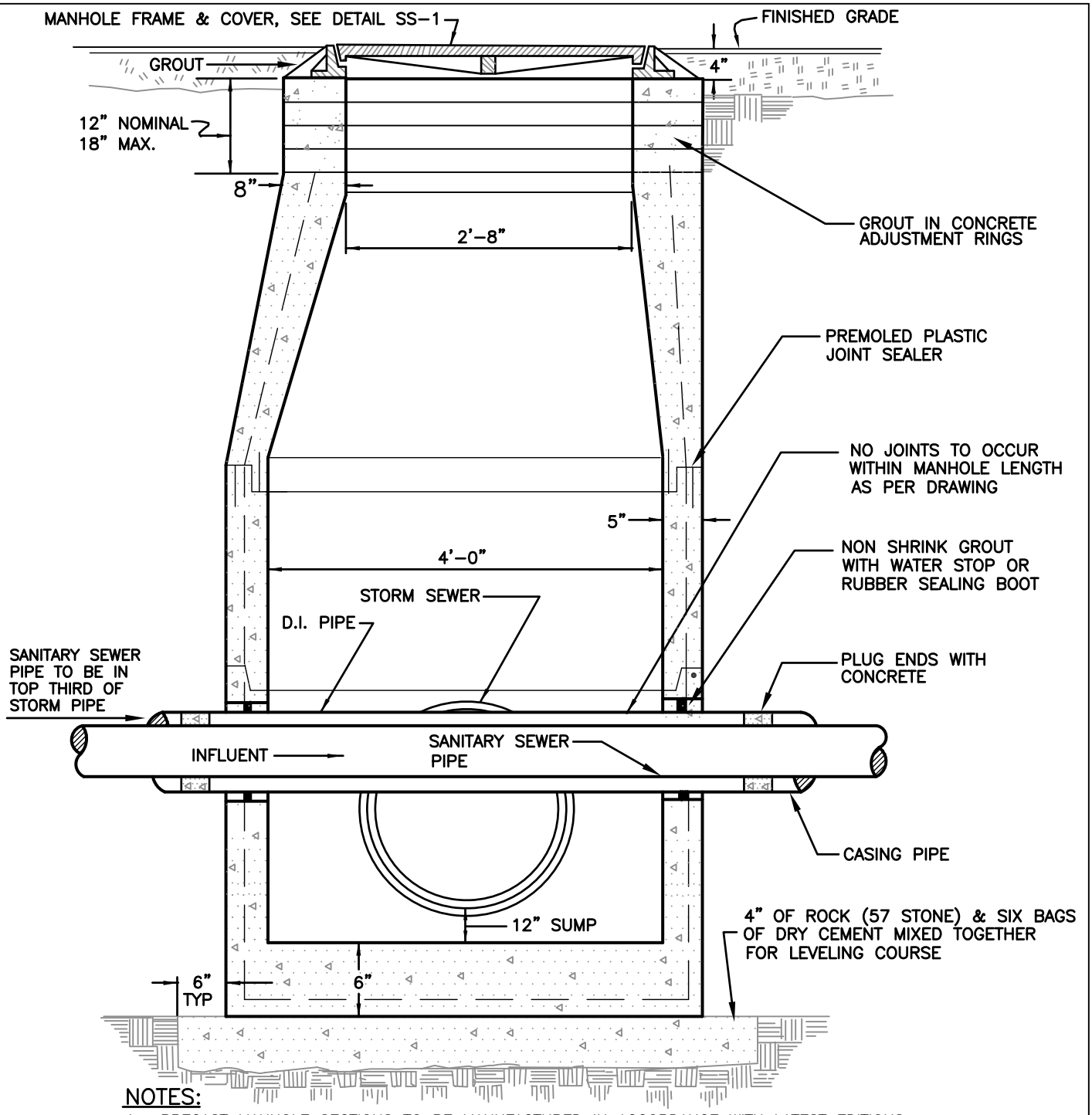
REVISION DATE:	FEB 2017
NOT TO SCALE	SS-7



C.O.S.A.

PLAN VIEW TYPE "D" MANHOLE
8" – 21" SEWERS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–8



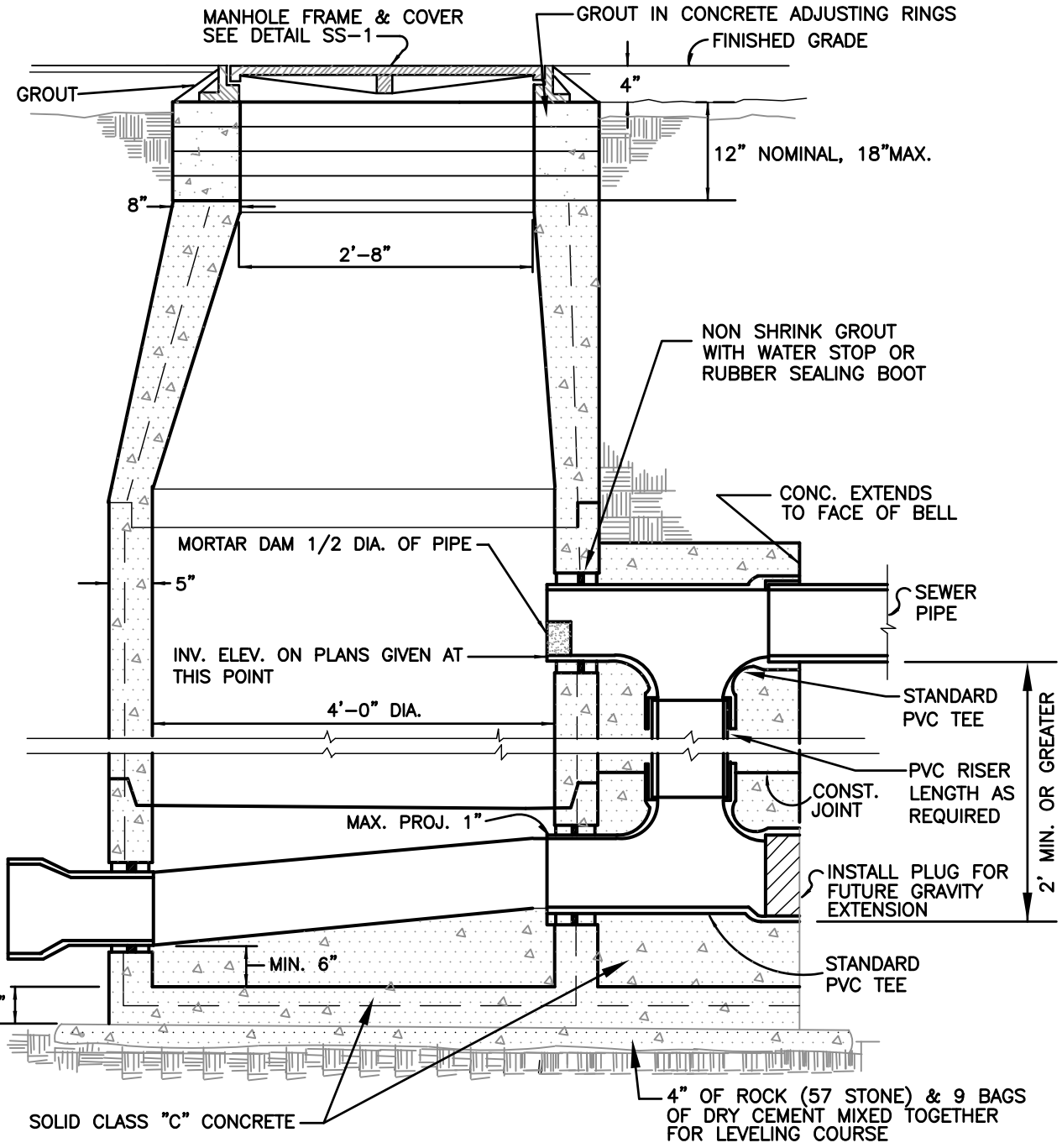
NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH LATEST EDITIONS OF ASTM C478 WITH 4000 PSI CONCRETE, TYPE II CEMENT.
2. THE EXTERIOR OF MANHOLE AND ADJUSTMENT RINGS SHALL BE GIVEN TWO COATS OF WATERPROOFING MATERIAL. CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES.
3. THE INTERIOR SURFACE SHALL BE COATED WITH SEWPERCOAT OR SPECTRASHIELD PROTECTIVE COATING SYSTEM TO PREVENT CONCRETE DETERIORATION FROM HYDROGEN SULFIDE AND OTHER CORROSIVE GASES.
4. IF SPECIALTY LINER TO BE INSTALLED ON INSIDE OF MANHOLE, INTERIOR COATING SHALL BE OMITTED.
5. MANHOLES IMMEDIATELY UPSTREAM OF PUMPING STATIONS REQUIRE FIBERGLASS LINING. MANHOLES RECEIVING FORCE MAIN FLOW LESS THAN OR EQUAL TO 4-INCH FORCE MAIN MAY BE LINED WITH SEWPERCOAT OR SPECTRASHIELD. MANHOLES RECEIVING FORCE MAIN FLOW GREATER THAN 4-INCH FORCE MAIN REQUIRE FIBERGLASS LINING.
6. THESE MANHOLES APPROVED BY CITY ENGINEER ON A CASE BY CASE BASIS.

C.O.S.A.

SANITARY SEWER TYPE "E" MANHOLE

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-9



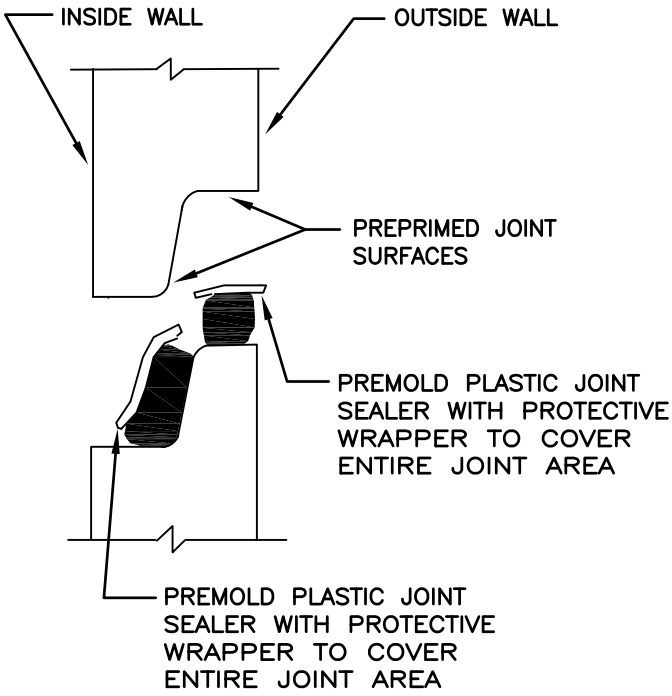
NOTES:

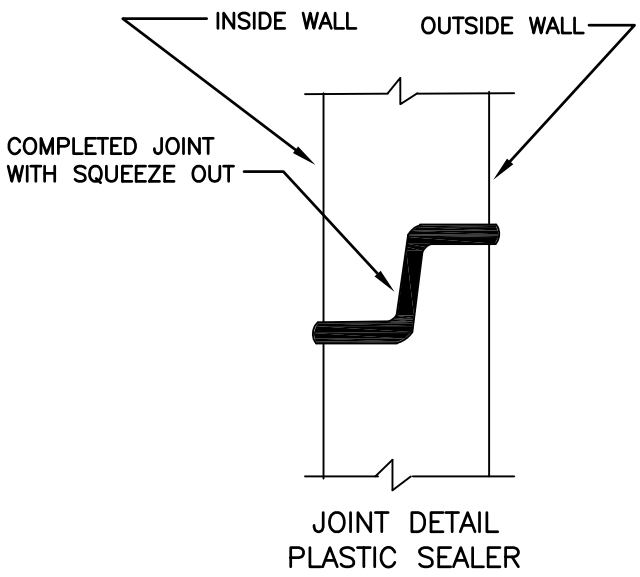
1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH LATEST EDITIONS OF ASTM C478 WITH 4000 PSI CONCRETE, TYPE II CEMENT.
2. THE EXTERIOR OF MANHOLE AND ADJUSTMENT RINGS SHALL BE GIVEN TWO COATS OF WATERPROOFING MATERIAL. CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES.
3. THE INTERIOR SURFACE SHALL BE COATED WITH SEWPERCOAT OR SPECTRASHIELD PROTECTIVE COATING SYSTEM TO PREVENT CONCRETE DETERIORATION FROM HYDROGEN SULFIDE AND OTHER CORROSIVE GASES.
4. IF SPECIALTY LINER TO BE INSTALLED ON INSIDE OF MANHOLE, INTERIOR COATING SHALL BE OMITTED.
5. MANHOLES IMMEDIATELY UPSTREAM OF PUMPING STATIONS REQUIRE FIBERGLASS LINING. MANHOLES RECEIVING FORCE MAIN FLOW LESS THAN OR EQUAL TO 4-INCH FORCE MAIN MAY BE LINED WITH SEWPERCOAT OR SPECTRASHIELD. MANHOLES RECEIVING FORCE MAIN FLOW GREATER THAN 4-INCH FORCE MAIN REQUIRE FIBERGLASS LINING.
6. THIS DETAIL FOR 2' OR GREATER ELEVATION DIFFRENCE BETWEEN INVERT OF INCOMING PIPE AND OUTGOING PIPE.

C.O.S.A.

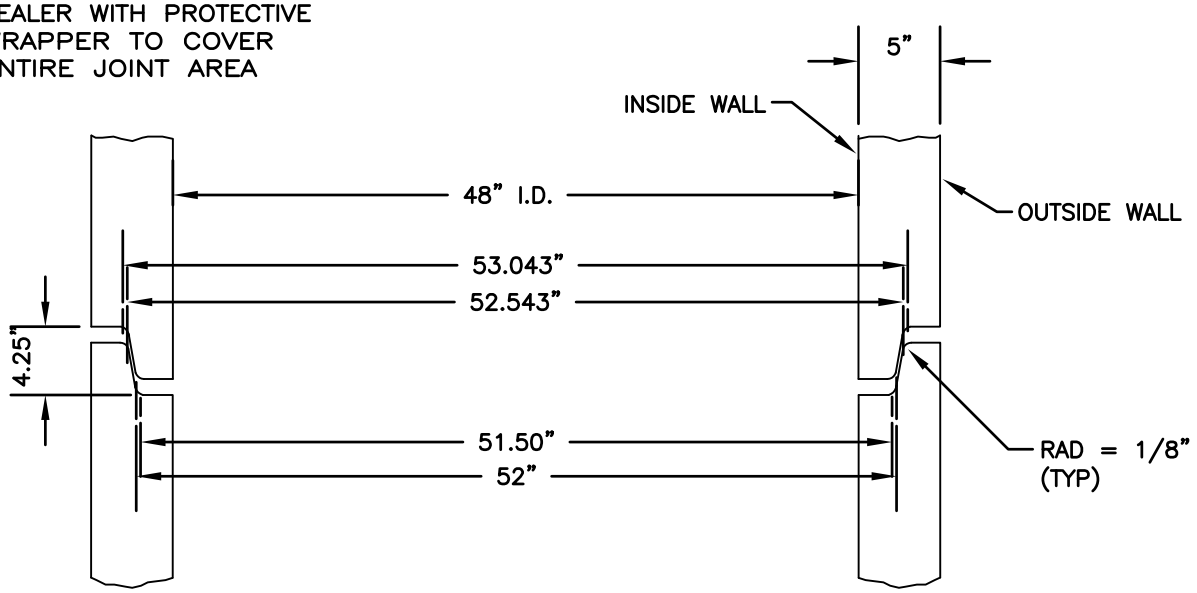
SANITARY SEWER
TYPE "F" MANHOLE
8" - 21" SEWERS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-10





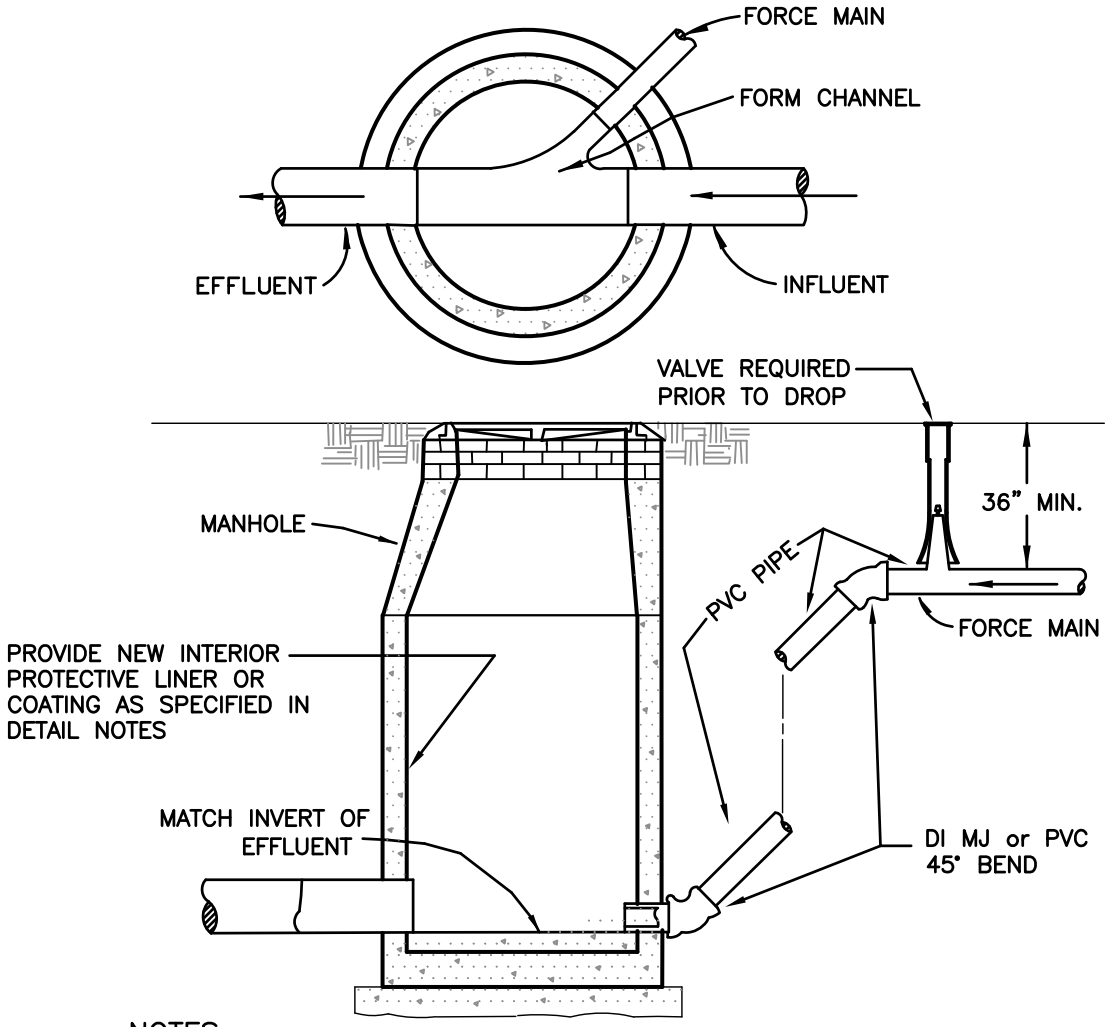
JOINT DETAIL
PLASTIC SEALER



C.O.S.A.

PRECAST SEWER MANHOLE JOINT DETAIL (7 DEGREE ANGLE)

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-17



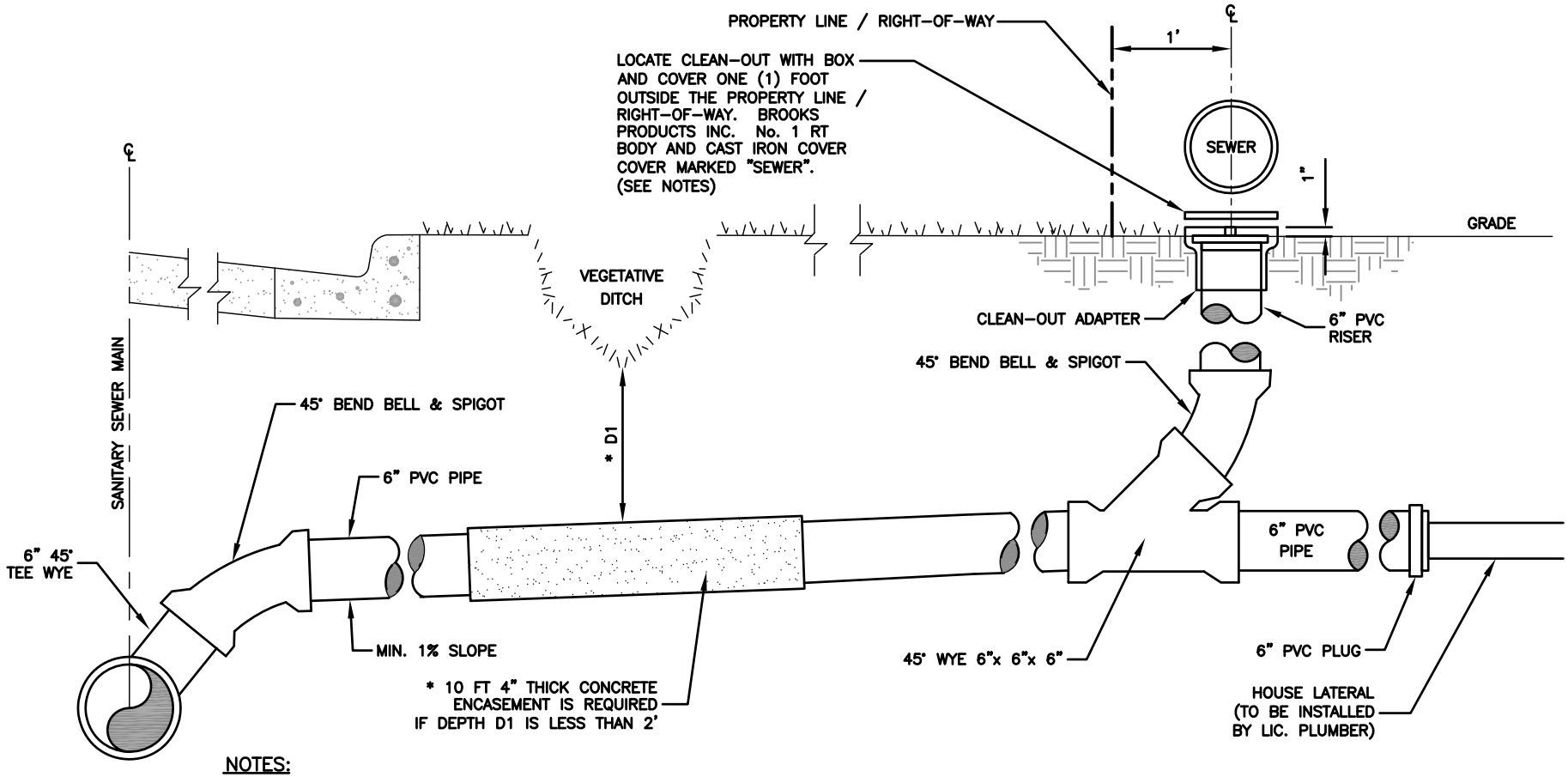
NOTES:

1. PROVIDE FIBERGLASS LINER FOR INSIDE WALL OF MANHOLE WHEN FORCE MAIN IS 4 INCHES OR LARGER IN DIAMETER.
2. WHEN FORCE MAIN IS LESS THAN 4 INCHES IN DIAMETER, THE INTERIOR MANHOLE SURFACE SHALL BE COATED WITH SEWPERCOAT OR SPECTRASHIELD PROTECTIVE COATING SYSTEM.

C.O.S.A.

TYPICAL FORCE MAIN CONNECTION TO MANHOLE

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–18



NOTES:

1. LATERALS AND FITTINGS SHALL BE A MINIMUM OF SIX (6) INCHES IN DIAMETER. SERVICES AND FITTINGS SHALL BE A MINIMUM OF SIX (6) INCHES IN DIAMETER FOR SINGLE FAMILY RESIDENTIAL INSTALLATIONS AND SIX (6) INCHES IN DIAMETER FOR ALL OTHER INSTALLATIONS. SINGLE LATERALS ONLY SHALL BE ALLOWED.

2. ALL LATERALS SHALL EXTEND FROM THE SEWER MAIN TO ONE (1) FOOT OUTSIDE THE RIGHT-OF-WAY TERMINATING WITH A TWO-WAY CLEANOUT TO BE INSTALLED ONE (1) FOOT OUTSIDE THE RIGHT-OF-WAY BY THE CONTRACTOR. PAYMENT TO THE CITY FOR THE RIGHT-OF-WAY CLEANOUT SHALL BE MADE BY THE OWNER AS PART OF THE SEWER SERVICE CONNECTION FEE. THE RIGHT-OF-WAY CLEANOUT SHALL BE MAINTAINED BY THE OWNER.

3. IN ADDITION TO THE RIGHT-OF-WAY CLEANOUT, A CLEANOUT AT EACH BUILDING SHALL BE INSTALLED BY THE BUILDING CONTRACTOR.

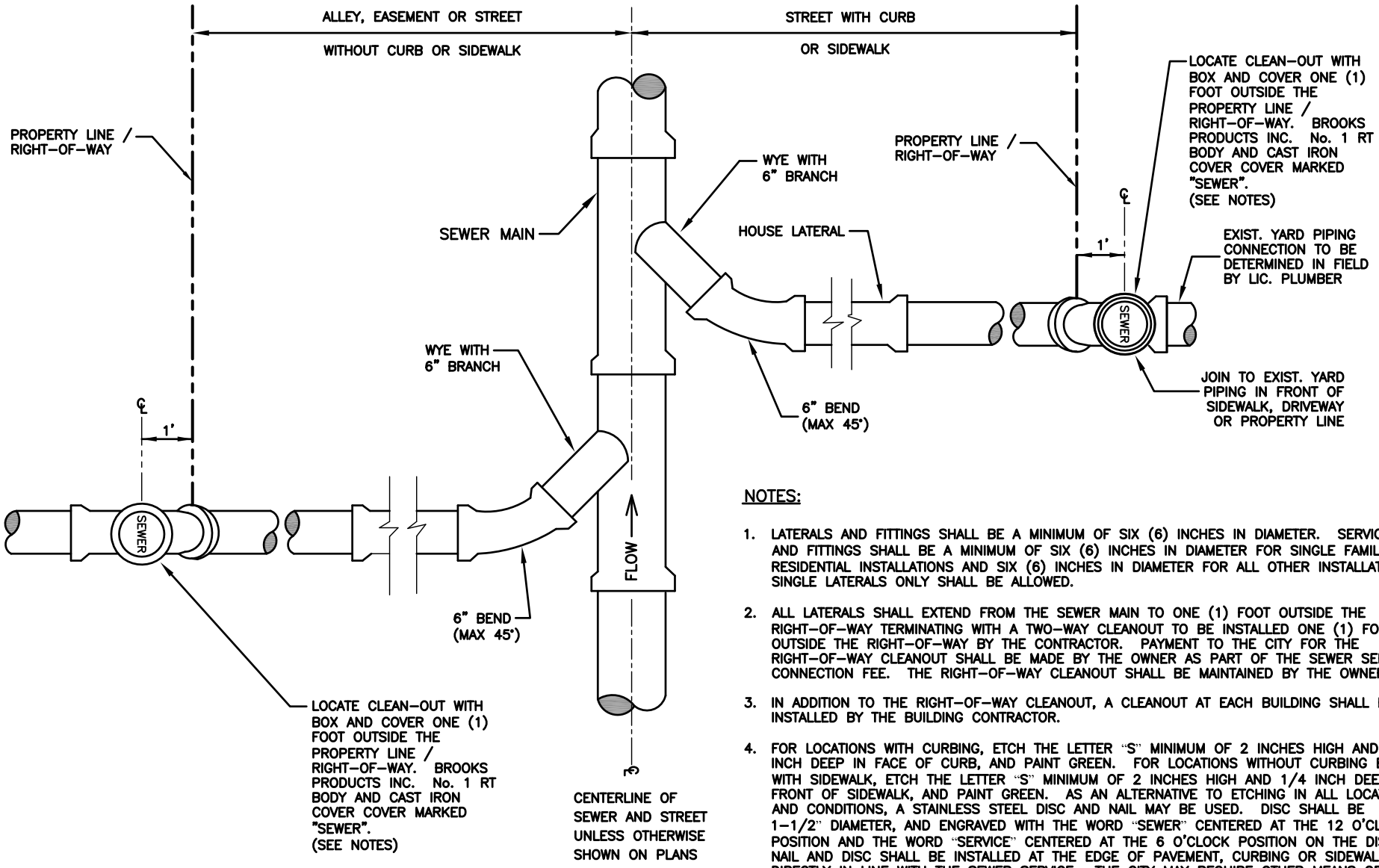
4. FOR LOCATIONS WITH CURBING, ETCH THE LETTER "S" MINIMUM OF 2 INCHES HIGH AND 1/4 INCH DEEP IN FACE OF CURB, AND PAINT GREEN. FOR LOCATIONS WITHOUT CURBING BUT WITH SIDEWALK, ETCH THE LETTER "S" MINIMUM OF 2 INCHES HIGH AND 1/4 INCH DEEP IN FRONT OF SIDEWALK, AND PAINT GREEN. AS AN ALTERNATIVE TO ETCHING IN ALL LOCATIONS AND CONDITIONS, A STAINLESS STEEL DISC AND NAIL MAY BE USED. DISC SHALL BE 1-1/2" DIAMETER, AND ENGRAVED WITH THE WORD "SEWER" CENTERED AT THE 12 O'CLOCK POSITION AND THE WORD "SERVICE" CENTERED AT THE 6 O'CLOCK POSITION ON THE DISC. NAIL AND DISC SHALL BE INSTALLED AT THE EDGE OF PAVEMENT, CURBING OR SIDEWALK DIRECTLY IN LINE WITH THE SEWER SERVICE. THE CITY MAY REQUIRE OTHER MEANS OF IDENTIFICATION, SUCH AS TREATED FENCE POSTS PAINTED GREEN ON TOP TO MARK SERVICES FOR FUTURE DEVELOPMENT.

5. SEE ALSO DETAIL SS-20.

C.O.S.A.

GRAVITY SEWER SERVICE CONNECTION

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-19



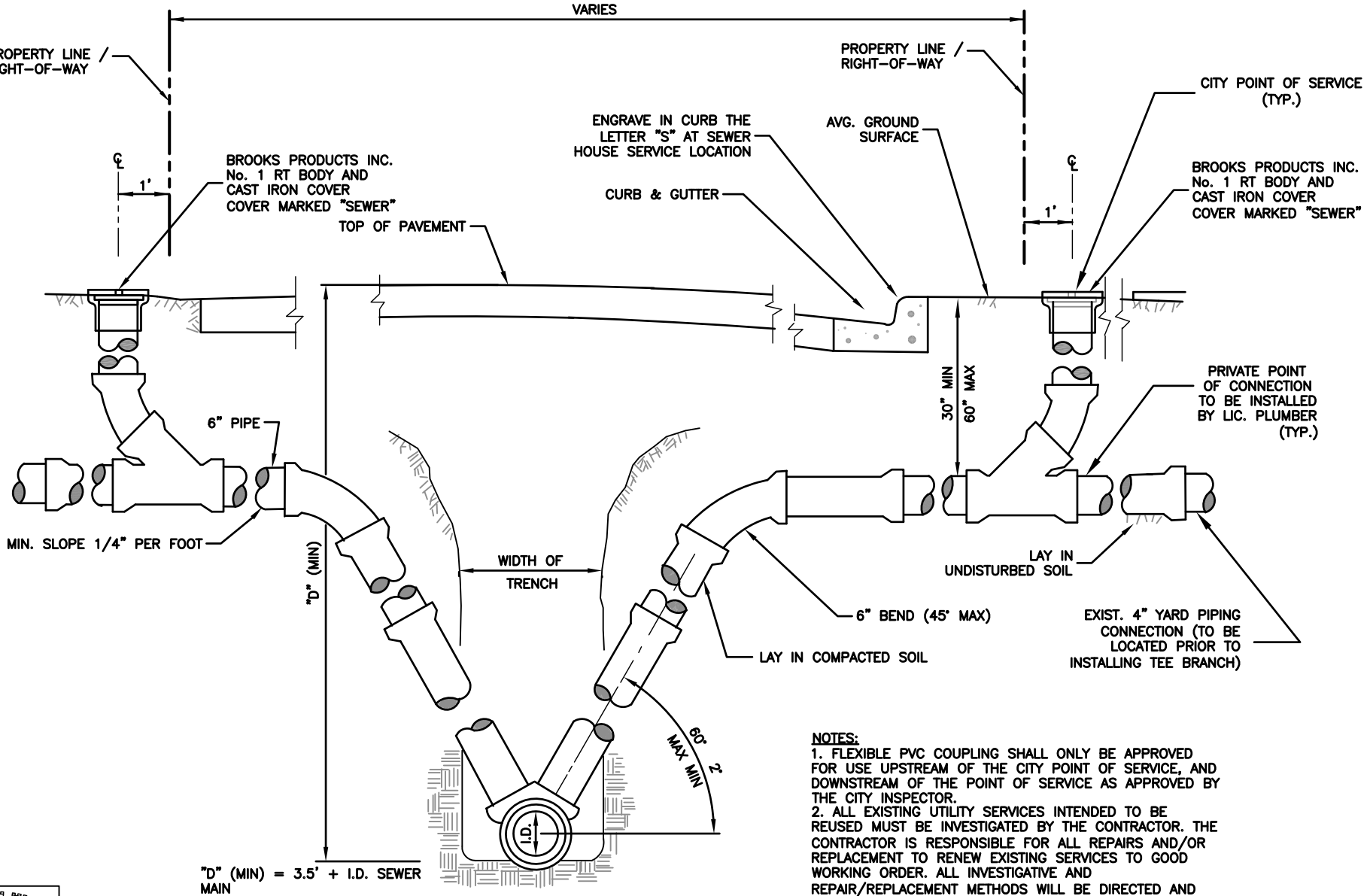
NOTES:

1. LATERALS AND FITTINGS SHALL BE A MINIMUM OF SIX (6) INCHES IN DIAMETER. SERVICES AND FITTINGS SHALL BE A MINIMUM OF SIX (6) INCHES IN DIAMETER FOR SINGLE FAMILY RESIDENTIAL INSTALLATIONS AND SIX (6) INCHES IN DIAMETER FOR ALL OTHER INSTALLATIONS. SINGLE LATERALS ONLY SHALL BE ALLOWED.
2. ALL LATERALS SHALL EXTEND FROM THE SEWER MAIN TO ONE (1) FOOT OUTSIDE THE RIGHT-OF-WAY TERMINATING WITH A TWO-WAY CLEANOUT TO BE INSTALLED ONE (1) FOOT OUTSIDE THE RIGHT-OF-WAY BY THE CONTRACTOR. PAYMENT TO THE CITY FOR THE RIGHT-OF-WAY CLEANOUT SHALL BE MADE BY THE OWNER AS PART OF THE SEWER SERVICE CONNECTION FEE. THE RIGHT-OF-WAY CLEANOUT SHALL BE MAINTAINED BY THE OWNER.
3. IN ADDITION TO THE RIGHT-OF-WAY CLEANOUT, A CLEANOUT AT EACH BUILDING SHALL BE INSTALLED BY THE BUILDING CONTRACTOR.
4. FOR LOCATIONS WITH CURBING, ETCH THE LETTER "S" MINIMUM OF 2 INCHES HIGH AND 1/4 INCH DEEP IN FACE OF CURB, AND PAINT GREEN. FOR LOCATIONS WITHOUT CURBING BUT WITH SIDEWALK, ETCH THE LETTER "S" MINIMUM OF 2 INCHES HIGH AND 1/4 INCH DEEP IN FRONT OF SIDEWALK, AND PAINT GREEN. AS AN ALTERNATIVE TO ETCHING IN ALL LOCATIONS AND CONDITIONS, A STAINLESS STEEL DISC AND NAIL MAY BE USED. DISC SHALL BE 1-1/2" DIAMETER, AND ENGRAVED WITH THE WORD "SEWER" CENTERED AT THE 12 O'CLOCK POSITION AND THE WORD "SERVICE" CENTERED AT THE 6 O'CLOCK POSITION ON THE DISC. NAIL AND DISC SHALL BE INSTALLED AT THE EDGE OF PAVEMENT, CURBING OR SIDEWALK DIRECTLY IN LINE WITH THE SEWER SERVICE. THE CITY MAY REQUIRE OTHER MEANS OF IDENTIFICATION, SUCH AS TREATED FENCE POSTS PAINTED GREEN ON TOP TO MARK SERVICES FOR FUTURE DEVELOPMENT.
5. SEE ALSO DETAIL SS-19.

C.O.S.A.

HOUSE LATERAL PLAN

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-20

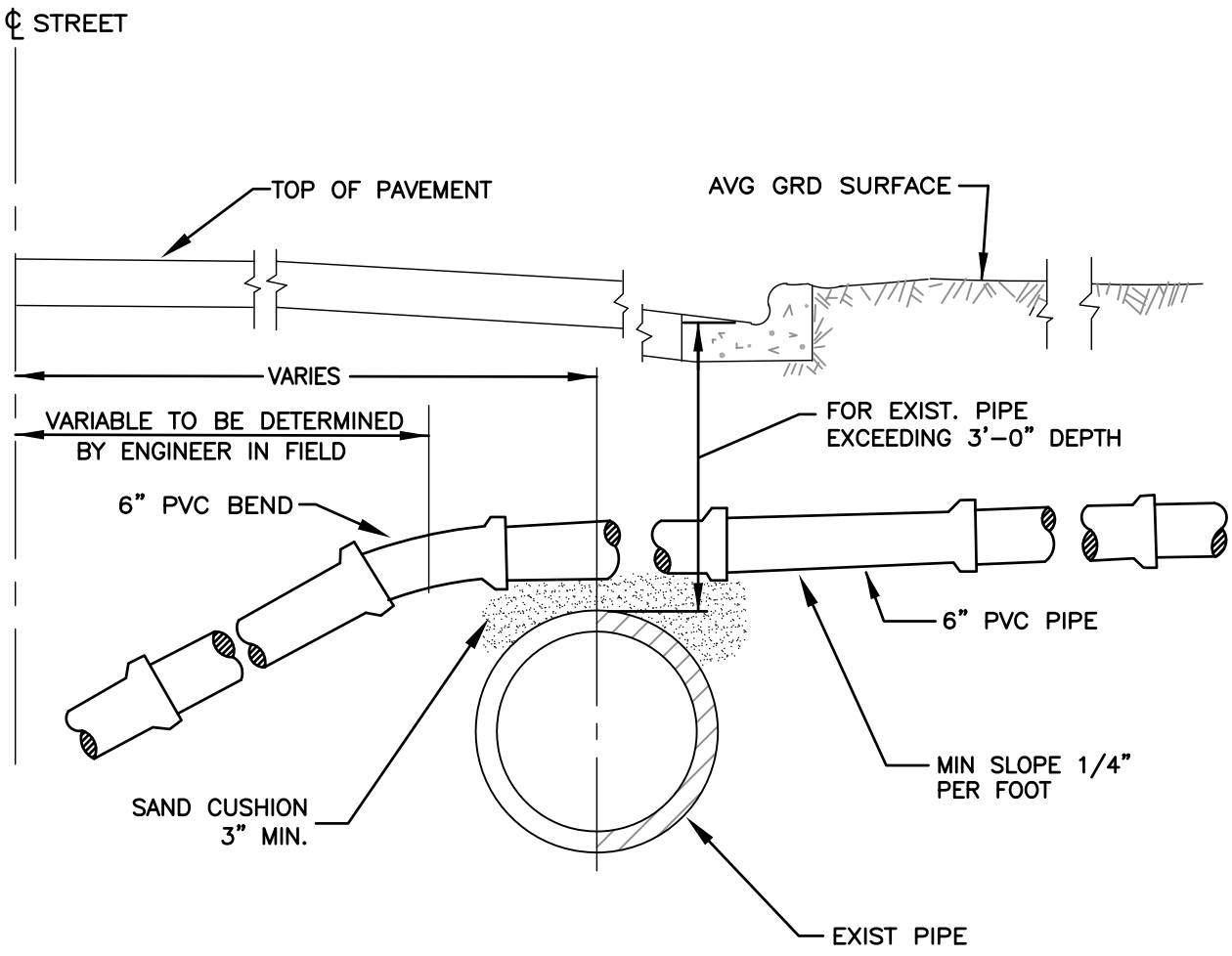


NOTES:
1. FLEXIBLE PVC COUPLING SHALL ONLY BE APPROVED FOR USE UPSTREAM OF THE CITY POINT OF SERVICE, AND DOWNSTREAM OF THE POINT OF SERVICE AS APPROVED BY THE CITY INSPECTOR.
2. ALL EXISTING UTILITY SERVICES INTENDED TO BE REUSED MUST BE INVESTIGATED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL REPAIRS AND/OR REPLACEMENT TO RENEW EXISTING SERVICES TO GOOD WORKING ORDER. ALL INVESTIGATIVE AND REPAIR/REPLACEMENT METHODS WILL BE DIRECTED AND OBSERVED BY THE CITY INSPECTOR. EXCAVATION AND OTHER PROCEDURES SUCH AS CLOSED-CIRCUIT TV INSPECTION MAY BE REQUIRED FOR EVALUATING EXISTING SERVICES.

C.O.S.A.

HOUSE LATERAL SECTION

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-21



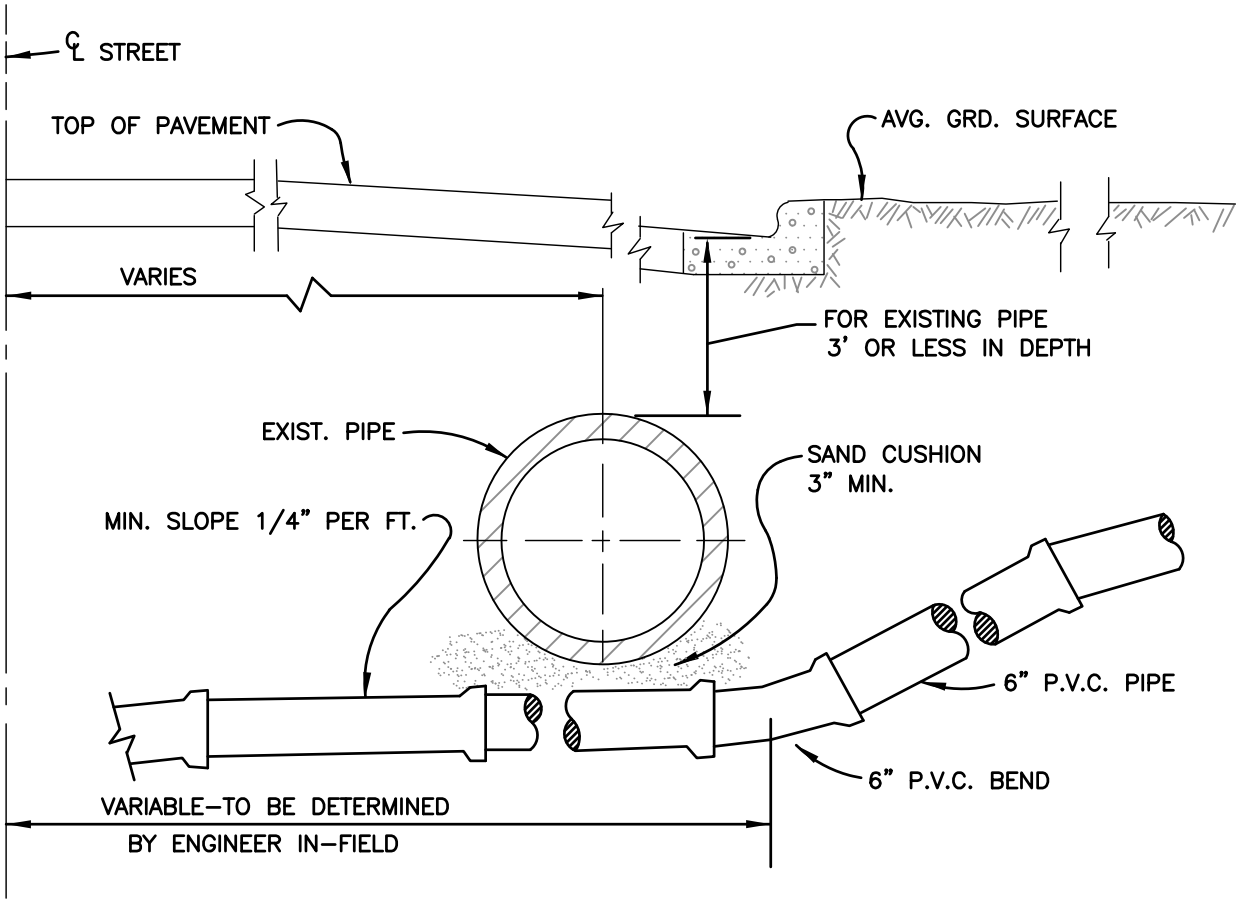
NOTE:

ALTERNATE GRADIENT FOR 6 INCH LATERAL SEWERS AT CONFLICTS WITH EXISTING UTILITIES.

C.O.S.A.

6 INCH PVC HOUSE LATERAL CONNECTION (OVER CONFLICT)

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–23



NOTE:

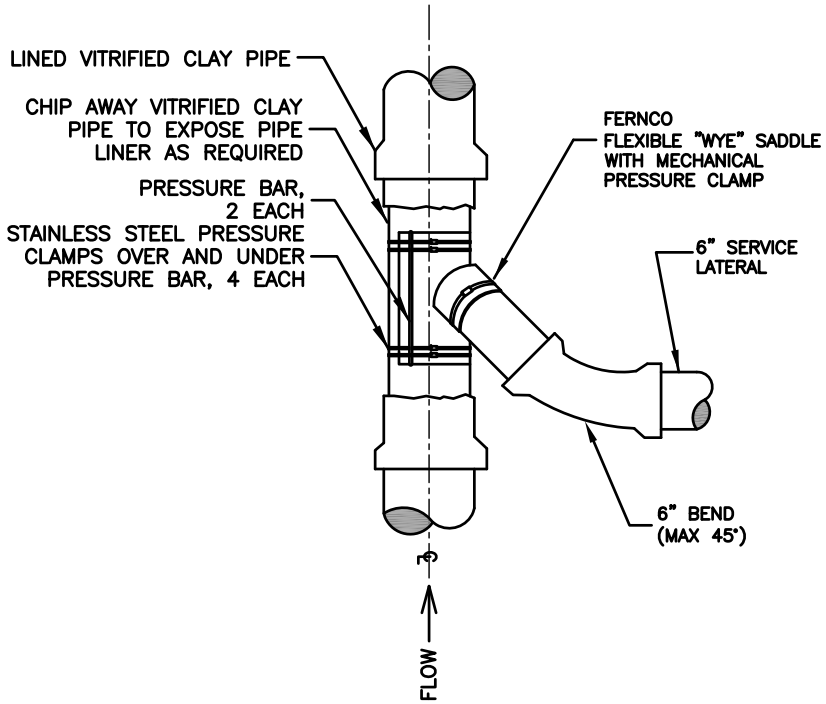
ALTERNATE GRADIENT FOR 6 INCH LATERAL SEWERS AT CONFLICTS WITH EXISTING UTILITIES.

C.O.S.A.

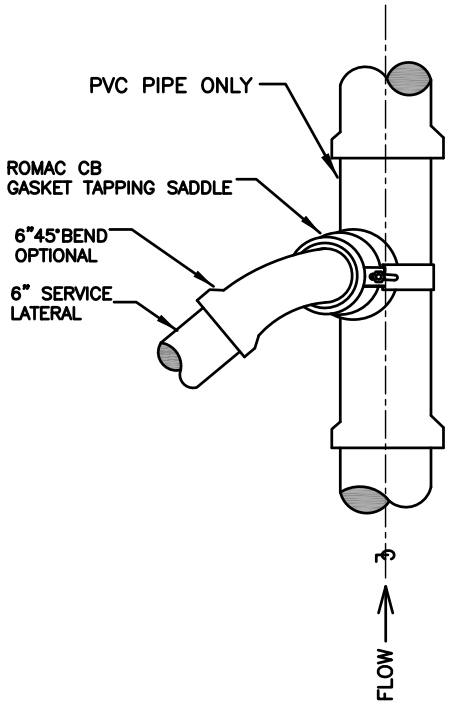
6 INCH PVC HOUSE LATERAL CONNECTION (UNDER CONFLICT)

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–24

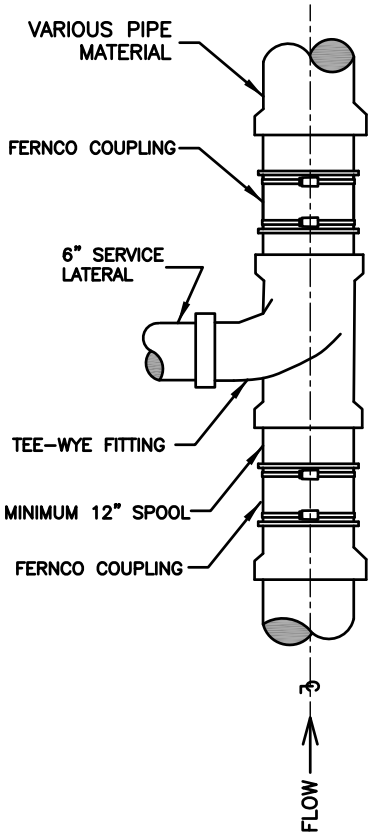
SEWER SERVICE CONNECTION EXISTING LINED GRAVITY SEWER MAIN



SEWER SERVICE CONNECTION EXISTING PVC GRAVITY SEWER MAIN



CUT IN TEE-WYE SEWER SERVICE CONNECTION EXISTING GRAVITY SEWER MAIN



NOTES:

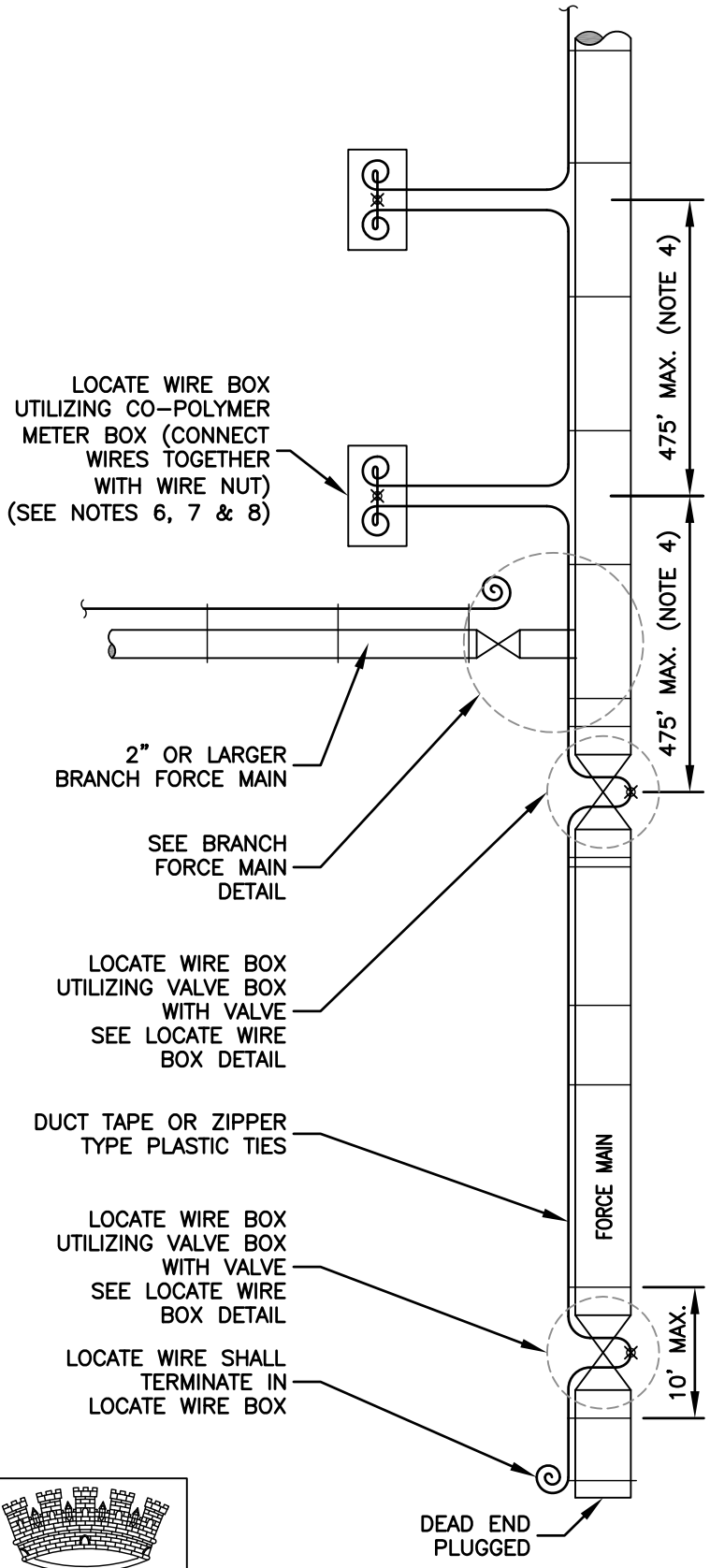
CONTRACTOR TO PROVIDE SMOOTH FLOW LINE BETWEEN CONNECTION FITTING AND GRAVITY SEWER PIPE. CUT AND GRIND PIPE SUCH THAT A SMOOTH FLOW LINE IS PROVIDED.

PLACE CONNECTION FITTING ON THE 10 OR 2 O'CLOCK POSITION ON THE GRAVITY SEWER MAIN.

C.O.S.A.

NEW CONNECTION TO EXISTING GRAVITY SEWER MAIN

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-25



NOTES:

1. LOCATING WIRE TO BE INSTALLED IN EITHER THE ONE OR ELEVEN O'CLOCK POSITION ON ALL DUCTILE IRON OR PVC (PRESSURE MAINS). LOCATE WIRE SHALL ALSO BE INSTALLED ON ALL (HDPE) POLY MAIN PIPING (1:00 OR 11:00 POSITION, IF POSSIBLE).

2. SECURE LOCATING WIRE TO PVC & D.I.P. FORCE MAIN BY USE OF DUCT TAPE OR ZIPPER TYPE PLASTIC TIE STRAPS SPACED AT A MAXIMUM DISTANCE OF TEN (10') AND AT EACH SIDE OF BELL JOINT OR FITTING.

3. THE ENTIRE LOCATING SYSTEM SHALL BE INSPECTED BY THE COSA PRIOR TO BACKFILLING. AFTER BACKFILLING, THE ENTIRE LOCATING SYSTEM SHALL BE TESTED BY A CERTIFIED UTILITY LOCATOR OR BY A LICENSED ELECTRICAL CONTRACTOR TO DETERMINE ITS RELIABILITY AND CONTINUITY, WITH THE TEST REPORT SUBMITTED TO THE COSA. THE COSA SHALL BE NOTIFIED 72 HOURS IN ADVANCE OF ANY LOCATE WIRE TESTING. WHERE INSTALLED UNDER PAVEMENT AREAS, TESTING SHALL BE DONE PRIOR TO THE PLACEMENT OF PAVEMENT. IF ANY LOCATION IS IDENTIFIED WHERE THE TRACER WIRE IS NOT CONTINUOUS, THE CONTRACTOR, AT NO ADDITIONAL COST TO THE OWNER, SHALL MAKE NECESSARY REPAIRS.

4. LOCATING WIRE SHALL TERMINATE WITHIN AN ACTIVE VALVE BOX (WITH A VALVE) OR A METER BOX (IF NO VALVE) AT MAXIMUM 475' INTERVALS. SEE DETAIL LOCATE WIRE BOX. WIRE CONNECTIONS BELOW GROUND (OUTSIDE OF A BOX) SHALL BE AVOIDED.

5. LOCATING WIRE SHALL BE 10 GAUGE, SINGLE STRAND, UF RATED (DIRECT BURIAL), COPPER WIRE WITH 30 MIL (MIN.) INSULATION WITH EITHER WHITE OR YELLOW COLOR. FOR HDD INSTALLATIONS, THE LOCATE WIRE SHALL BE 12 AWG COPPER-CLAD CARBON STEEL WITH 30 MILS (MIN) INSULATION, AS SPECIFIED IN SECTION 33 – DIRECTIONAL DRILLING – OF THE COSA STANDARDS AND SPECIFICATIONS DESIGN MANUAL, LATEST EDITION.

6. " ⊠ " INDICATES THAT THE WIRES ARE CONNECTED TOGETHER.

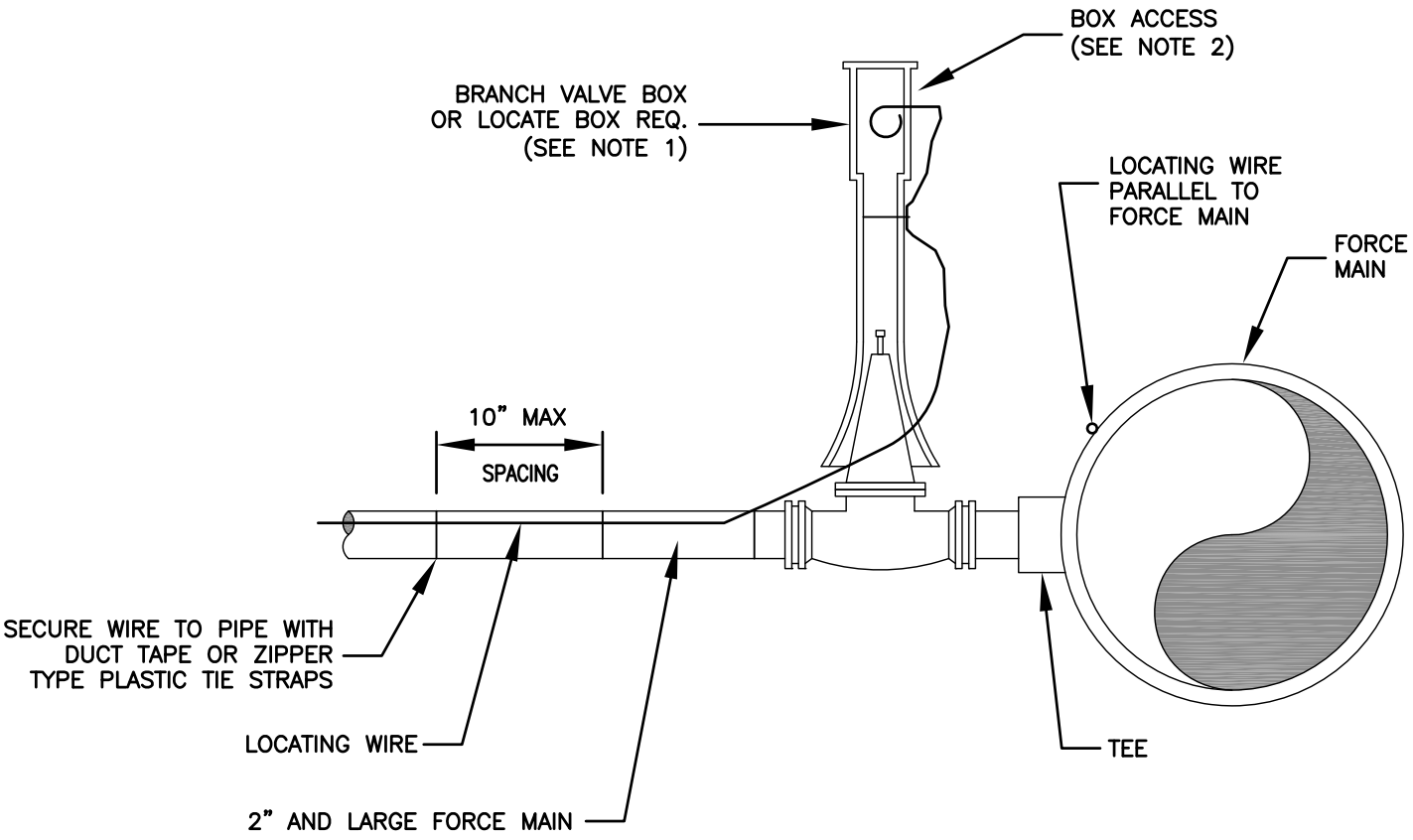
7. " @ " INDICATES A WIRE PIG-TAIL (12" LONG).

8. AN "LW" CUT SHALL BE CARVED IN THE CONCRETE CURB AND PAINTED AT ALL LOCATE WIRE BOXES.

C.O.S.A.

LOCATE WIRE CONSTRUCTION FOR FORCE MAINS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-56



2" AND LARGER FORCE MAIN

NOTES:

1. BE AWARE THAT THE BRANCH WIRE IS NOT CONNECTED TO THE MAIN WIRE.

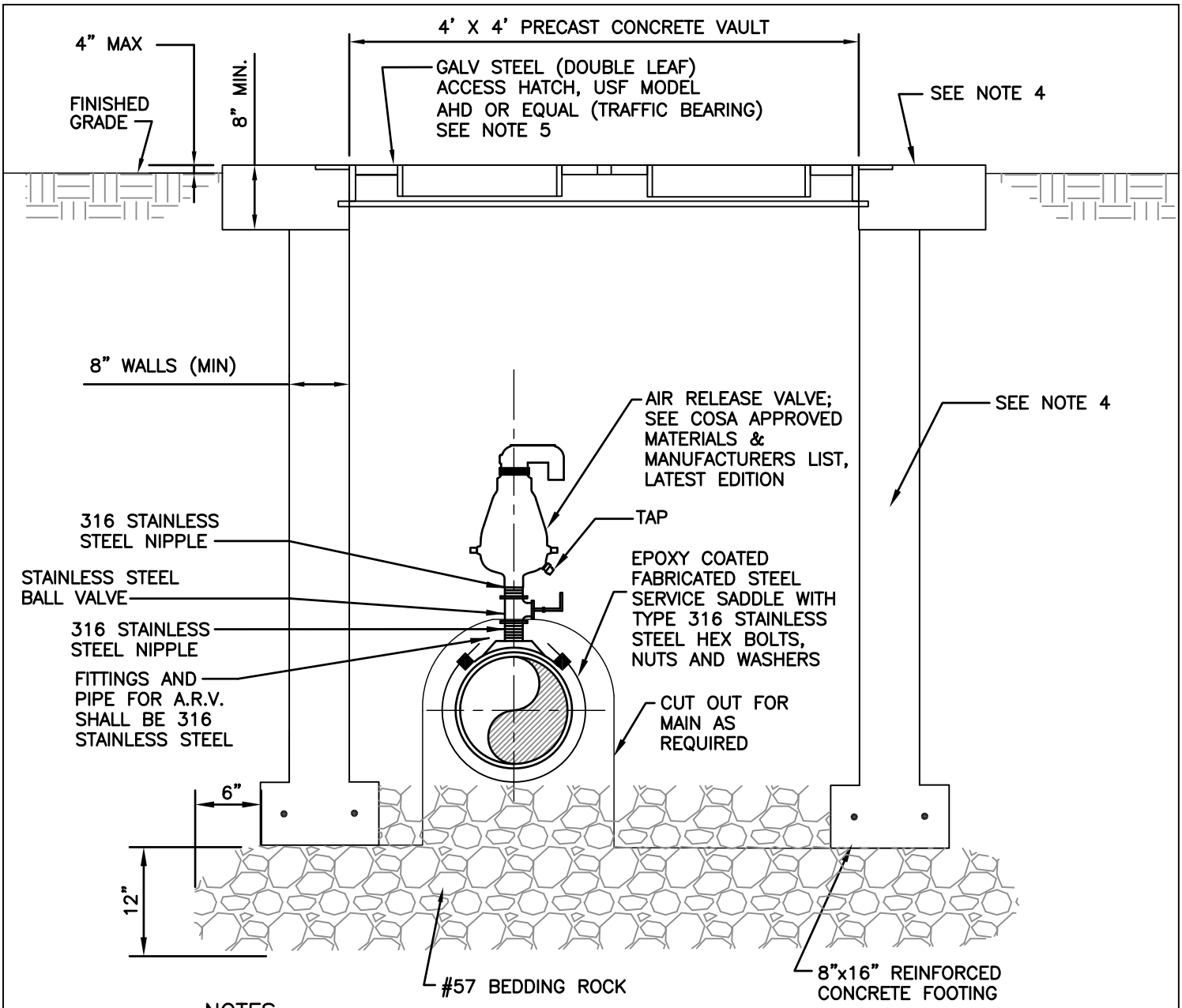
2. LOCATE WIRE SHALL ENTER THE VALVE BOX THROUGH A 3/4"ø (MIN) HOLE OR SHALL BE ROUTED THROUGH THE JOINTS OF THE VALVE BOX ADJUSTMENT SECTION.

3. SEE ADDITIONAL NOTES AND REQUIREMENTS ON DETAIL SS-56.

C.O.S.A.

LOCATE WIRE FOR BRANCH FORCE MAIN

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-57



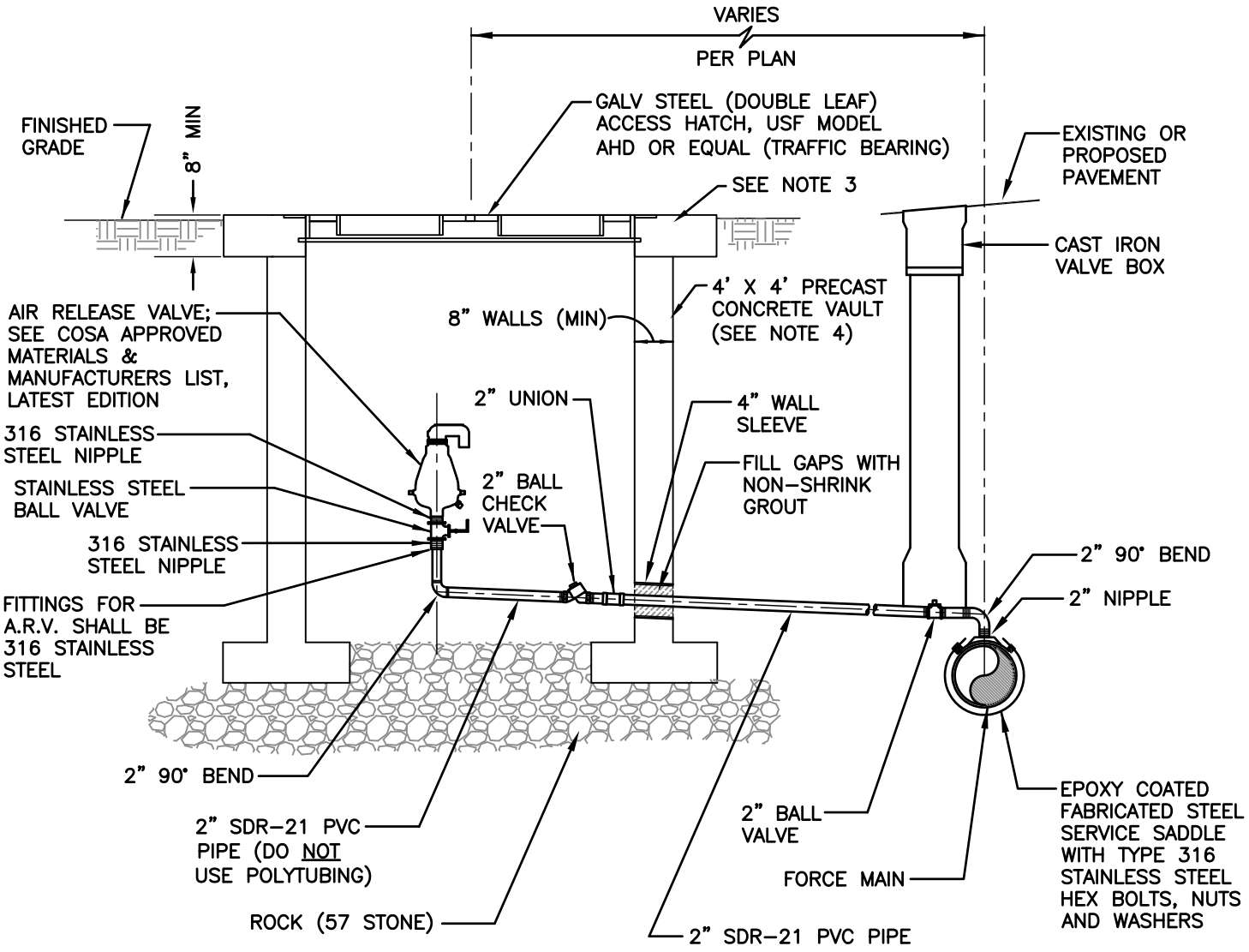
NOTES:

1. REFER TO COSA APPROVED MATERIALS & MANUFACTURERS LIST, LATEST EDITION, FOR APPROVED AIR RELEASE VALVES.
2. AIR RELEASE VALVE ASSEMBLIES TO BE LOCATED OUTSIDE ROADWAY PAVING. IF FORCE MAIN LOCATION IS INSIDE PAVED AREA, OFFSET AIR RELEASE VALVE DETAIL SHALL BE USED.
3. TOP SLAB SHALL BE 6'-0" X 6'-0" AND REINFORCED WITH #6 @ 6" OCEW.
4. PRECAST VAULT SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH LATEST EDITIONS OF ASTM C478 WITH 4000 PSI CONCRETE, TYPE II CEMENT. BASE SLAB AND WALLS SHALL CONTAIN 4"X4", W4.1/W4.1 WWM & #3@ 10" OCEW. THE EXTERIOR OF VAULT SHALL BE GIVEN TWO COATS OF WATERPROOFING MATERIAL; CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES. THE INTERIOR SURFACE SHALL BE COATED WITH SEWPERCOAT OR SPECTRASHIELD PROTECTIVE COATING SYSTEM TO PREVENT CONCRETE DETERIORATION FROM HYDROGEN SULFIDE AND OTHER CORROSIVE GASES.
5. HATCH SHALL BE 4'-0" X 4'-0" AND HOT-DIPPED GALVANIZED.
6. THIS DETAIL TO BE USED FOR FORCE MAINS ONLY.

C.O.S.A.

AIR RELEASE VALVE DETAIL FOR USE ON FORCE MAINS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-61



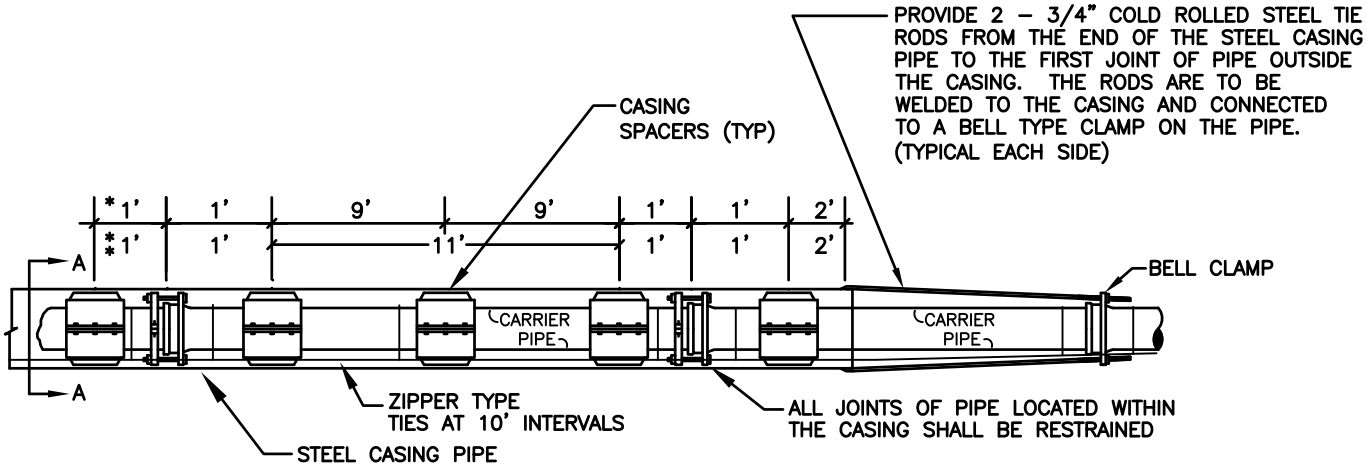
NOTES:

1. REFER TO COSA APPROVED MATERIALS & MANUFACTURERS LIST, LATEST EDITION, FOR APPROVED AIR RELEASE VALVES.
2. AIR RELEASE VALVE ASSEMBLIES TO BE LOCATED OUTSIDE ROADWAY PAVING. IF FORCE MAIN LOCATION IS INSIDE PAVED AREA, OFFSET AIR RELEASE VALVE DETAIL SHALL BE USED.
3. TOP SLAB SHALL BE 6'-0" X 6'-0" AND REINFORCED WITH #6 @ 6" OCEW.
4. PRECAST VAULT SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH LATEST EDITIONS OF ASTM C478 WITH 4000 PSI CONCRETE, TYPE II CEMENT. BASE SLAB AND WALLS SHALL CONTAIN 4"X4", W4.1/W4.1 WWM & #3@ 10" OCEW. THE EXTERIOR OF VAULT SHALL BE GIVEN TWO COATS OF WATERPROOFING MATERIAL; CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES. THE INTERIOR SURFACE SHALL BE COATED WITH SEWPERCOAT OR SPECTRASHIELD PROTECTIVE COATING SYSTEM TO PREVENT CONCRETE DETERIORATION FROM HYDROGEN SULFIDE AND OTHER CORROSIVE GASES.
5. HATCH SHALL BE 4'-0" X 4'-0" AND HOT-DIPPED GALVANIZED.
6. THIS DETAIL TO BE USED FOR FORCE MAINS ONLY.

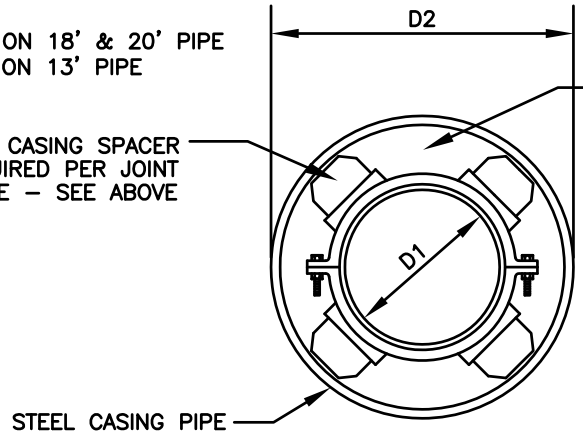
C.O.S.A.

OFFSET AIR RELEASE VALVE DETAIL FOR USE ON FORCE MAINS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-62



* FOR USE ON 18' & 20' PIPE
** FOR USE ON 13' PIPE



NOTE: VENT THE CASING WITH VENT PIPES HAVING INSIDE DIAMETER EQUAL TO 10% OF NOMINAL SIZE OF THE CARRIER PIPE BUT NOT LESS THAN 2 INCHES AND EXTENDING NOT LESS THAN 4 FEET ABOVE FINISHED GRADE. VENT PIPE AT LOW END OF CASING SHALL BE CONNECTED WITH BOTTOM OF CASING AND VENT AT HIGH END SHALL BE CONNECTED WITH TOP OF CASING. TOP OF VENT SHALL BE FITTED WITH PROPERTY SCREENED DOWN–TURNED ELBOW.

CASING SPACER DETAIL

	CARRIER PIPE AND CASING PIPE SIZES (MIN.) IN INCHES								
CARRIER PIPE NOM. DIA. (D_1)	4	6	8	10	12	16	18	20	24
CASING PIPE NOM. DIA (D_2)	14	16	20	20	24	30	30	36	42
WALL THICKNESS FDOT & RR	0.25	0.375	0.375	0.375	0.375	0.50	0.50	0.625	0.625

MAIN CROSSINGS FOR RAILROADS, ROADWAYS AND/OR OTHER AREAS AS SHOWN ON PLANS

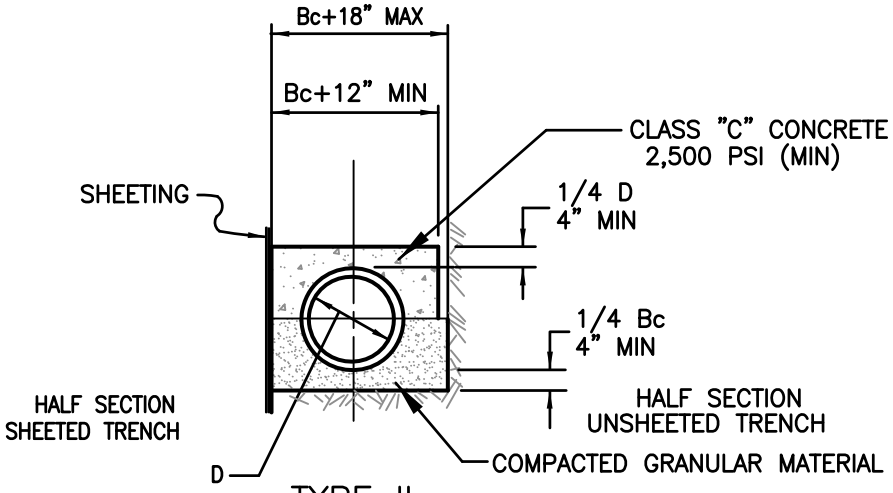
NOTES:

1. MIN. COVER TO TOP OF CASING: a) FDOT=3.0' b) RAILROAD=6' TO BASE OF TIES. (CONTRACTOR TO CONFIRM MIN. COVER WITH RESPECTIVE AGENCIES.)
2. THE INSIDE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 6 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL OR COUPLING.
3. ALL JOINTS WITHIN CARRIER PIPE SHALL BE MECHANICALLY RESTRAINED.
4. FOR STREET USES WHICH ARE NOT FDOT OR RAILROAD, USE FDOT CASING THICKNESS UNLESS OTHERWISE INDICATED BY ENGINEER.
5. FOR CARRIER PIPES LESS THAN 4" NOM. DIAMETER:
   A. USE 4" PVC CASING PIPE FOR 2" POLY CARRIER PIPE. USE END–SEAL PRODUCT BY PIPE SEAL & INSULATOR, INC., MODEL "C" PULL ON END SEAL (SEE WWW.PIPELINESEAL.COM), OR FERNCO COUPLING.
   B. USE 2" CASING PIPE FOR 1" POLY CARRIER PIPE. USE FERNCO PIPE SLEEVE SEAL DTC 210 2" TO 1".

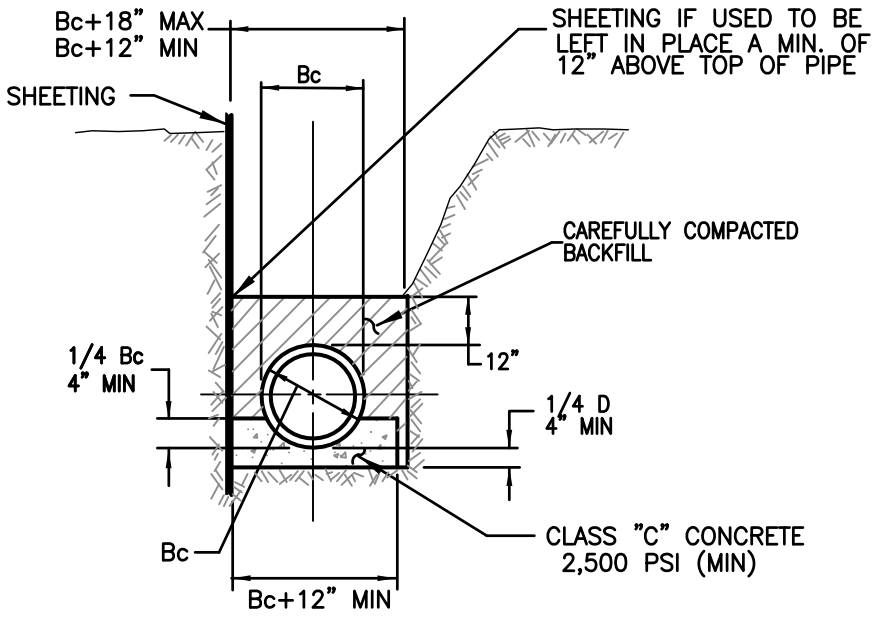
C.O.S.A.

TYPICAL CASING DETAIL

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–25&W–30



TYPE II
CONCRETE ARCH

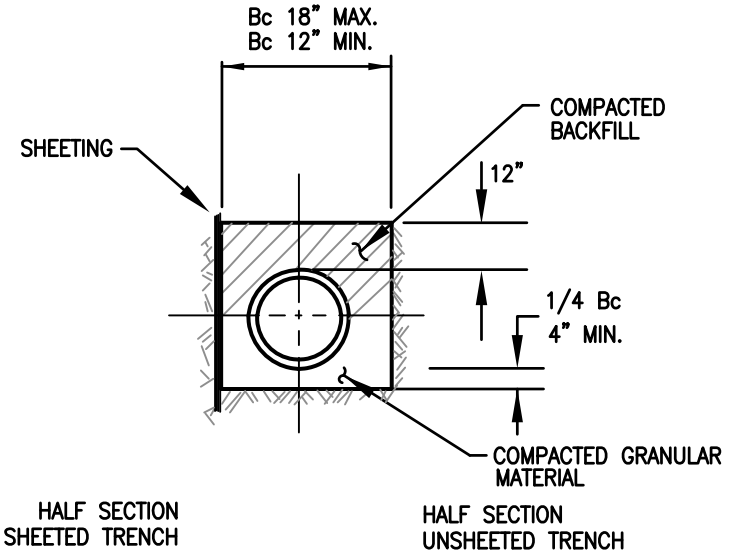


TYPE I
WITH TYPICAL TRENCH DETAIL CONCRETE CRADLE

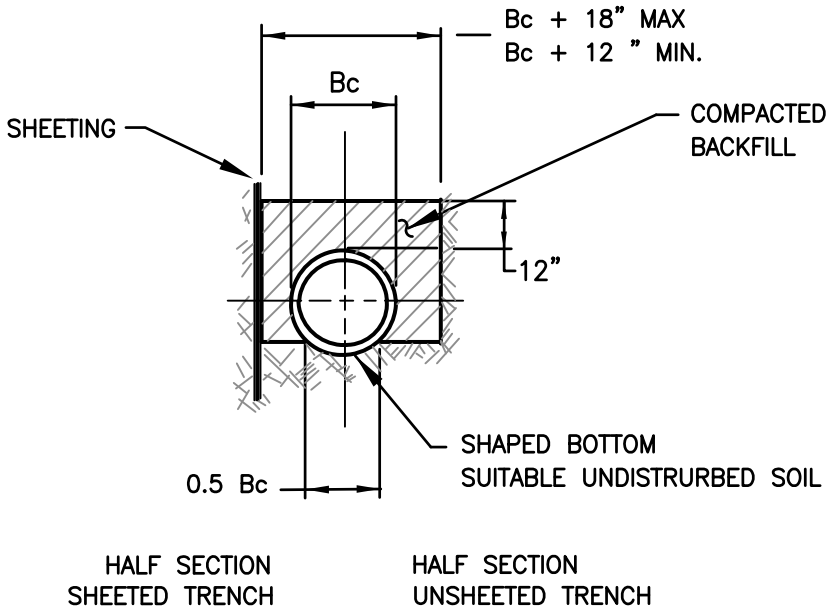
C.O.S.A.

BEDDING DETAILS
CLASS A

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-26&W-42



TYPE II
COMPACTED GRANULAR BEDDING



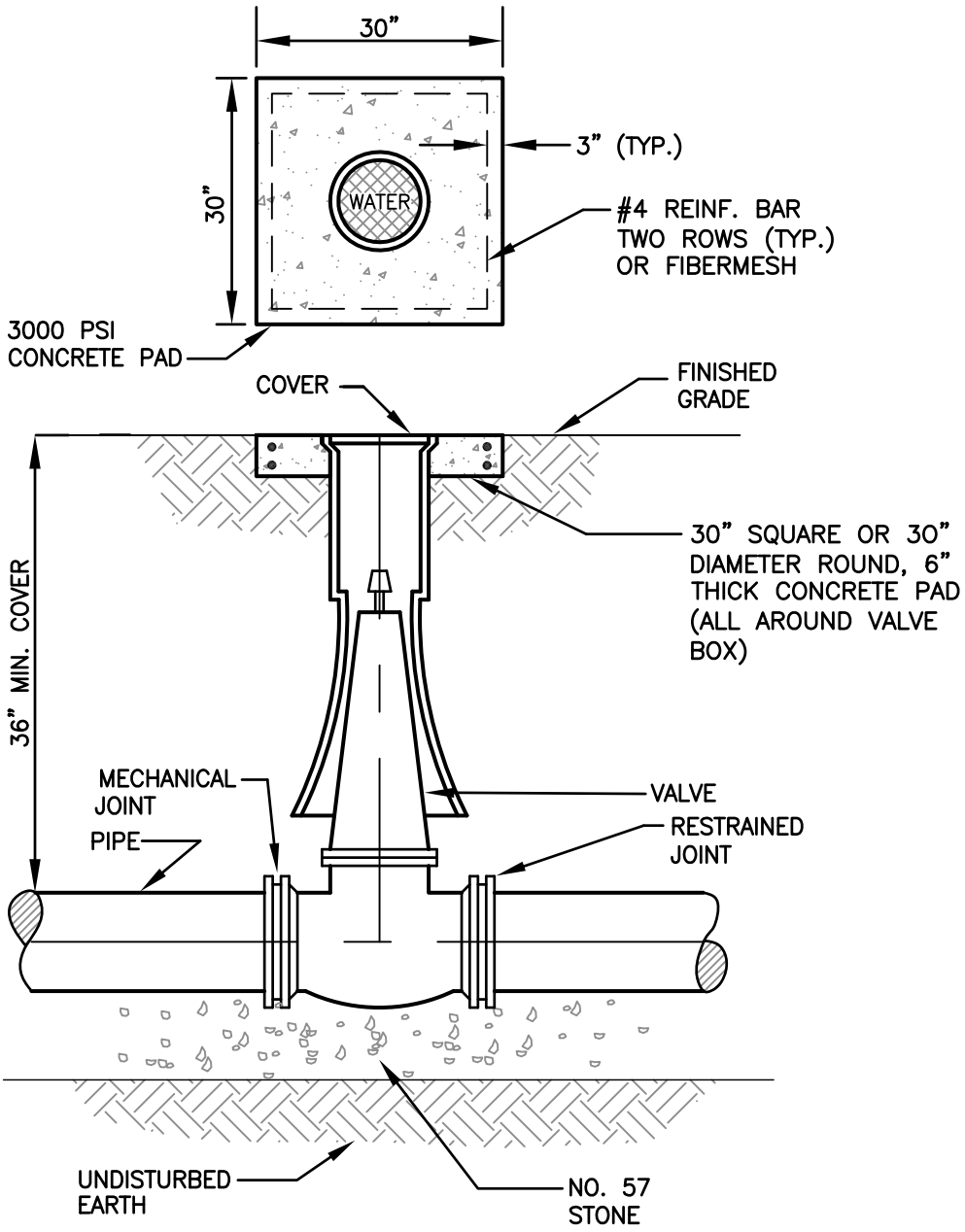
TYPE I
SHAPED BOTTOM WITH TAMPED BACKFILL

NOTE:
COMPLY WITH FLORIDA TRENCH SAFETY ACT.

C.O.S.A.

BEDDING DETAILS
CLASS B

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-27&W-43



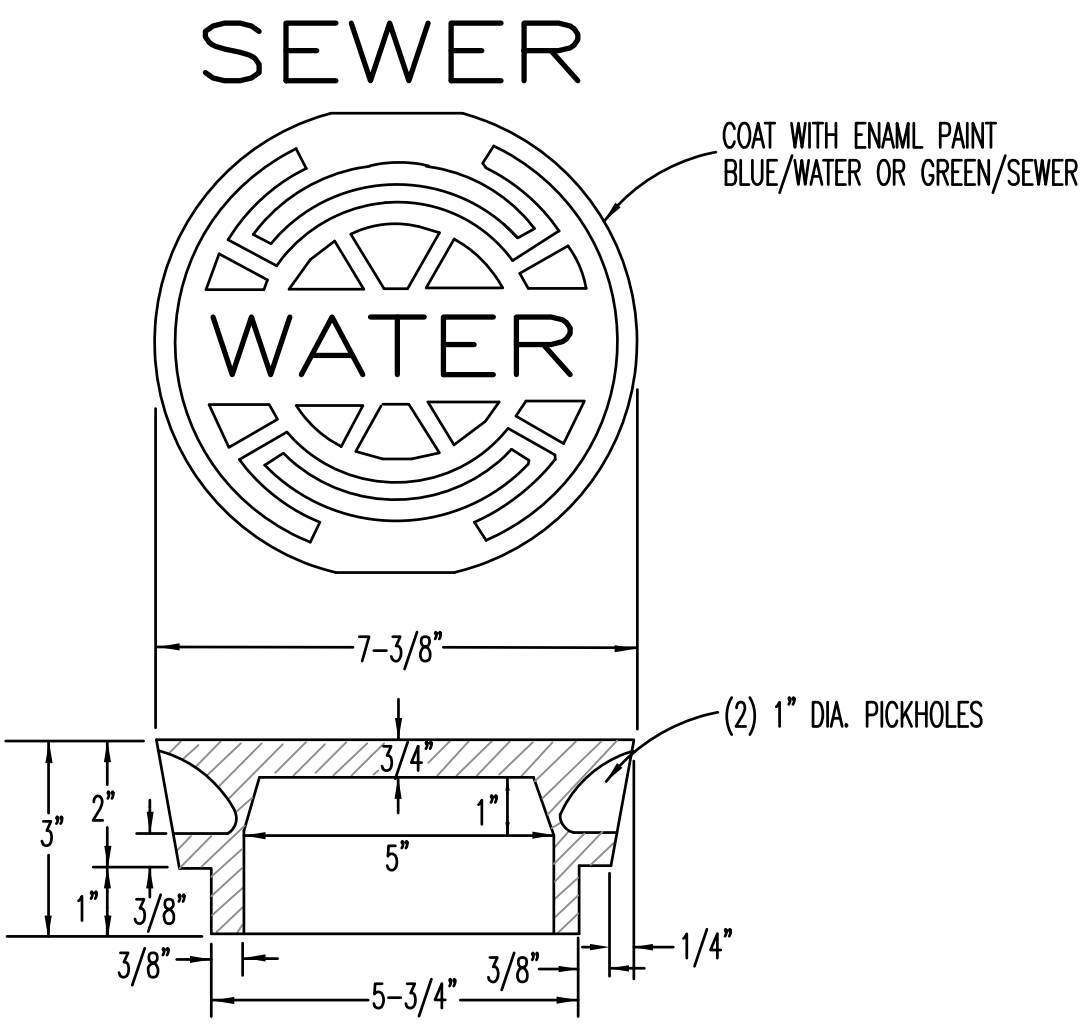
NOTES:

1. POURED IN PLACE (NOT PRECAST) CONCRETE SHALL BE FLUSH WITH GRADE.
2. COVER SHALL BE STAMPED "WATER" OR "SEWER" AS APPROPRIATE.
3. ALL UNDERGROUND VALVES SHALL BE INSTALLED WITH AN ADJUSTABLE CAST IRON VALVE BOX WITH TOP SET TO FINAL GRADE. ALL VALVES SHALL HAVE ELECTRONIC MARKER BLUE FOR WATER AND GREEN FOR SEWER SEE W–57.
4. ALL UNDERGROUND VALVES SHALL BE INSTALLED SO THAT THE OPERATING NUT IS ACCESSIBLE USING A STANDARD VALVE KEY. VALVE EXTENSIONS SHALL BE INSTALLED AS NECESSARY SO THAT THE OPERATING NUT IS A MAXIMUM OF 36" BELOW FINAL GRADE.
5. COVER SHALL BE COATED WITH ENAMLE PAINT BLUE/WATER OR GREEN/SEWER AS APPROPRIATE.

C.O.S.A.

VALVE BOX & COVER
UNPAVED LOCATION
NEW CONSTRUCTION

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–30&W–18

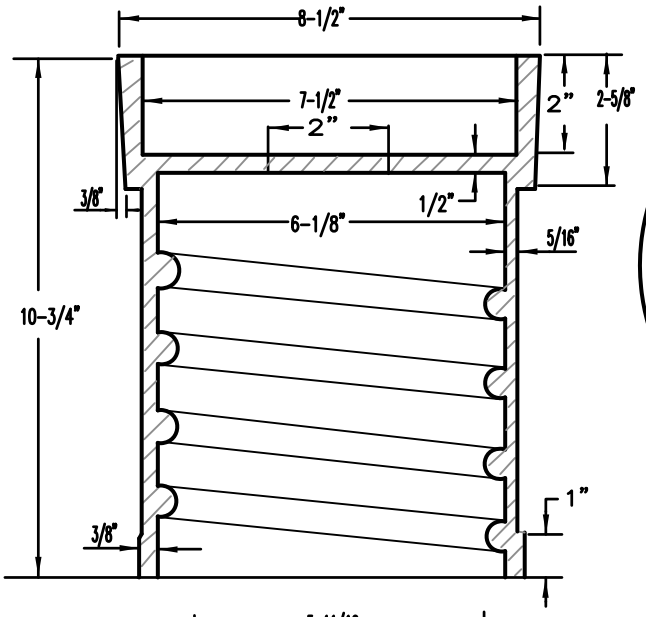


NOTE:
COVER SHALL BE STAMPED "WATER" OR "SEWER" AS APPROPRIATE.

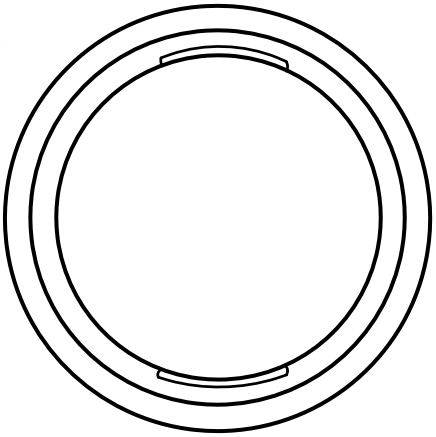
C.O.S.A.

VALVE BOX COVER

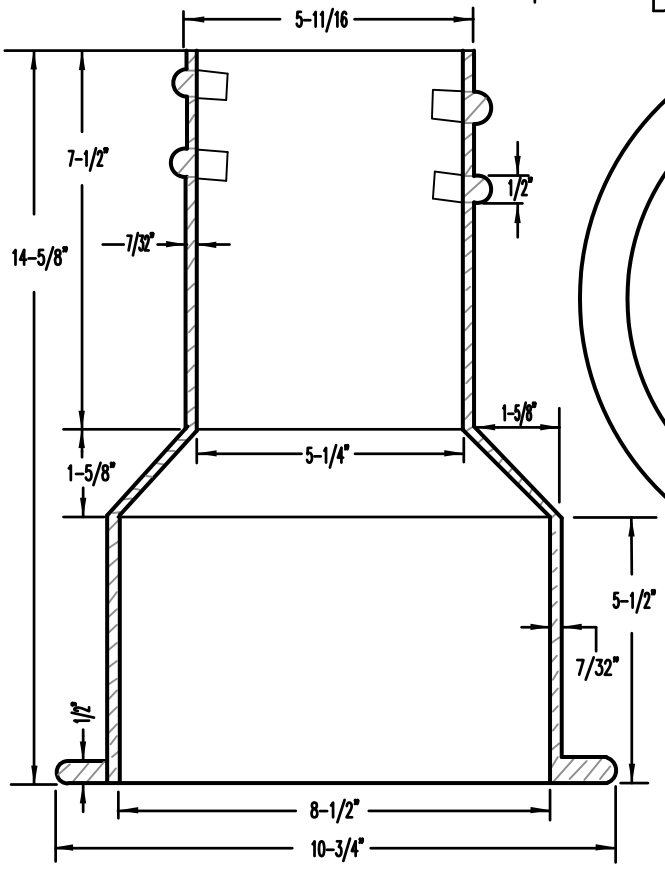
REVISION DATE:	FEB 2017
NOT TO SCALE	SS-31&W-16



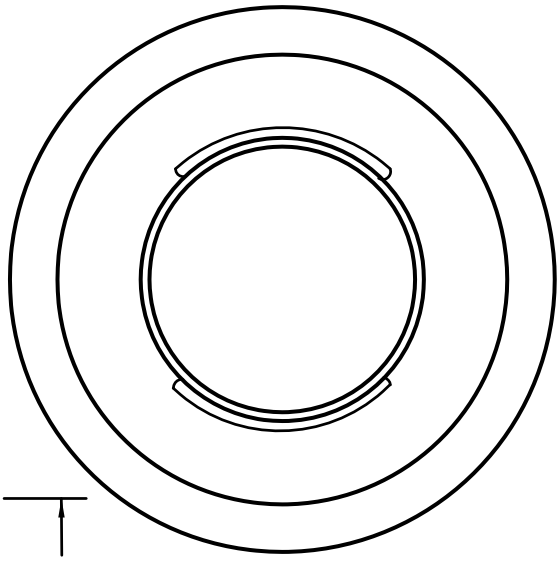
TOP SECTION VIEW



(23 LBS APPROX.)



BOTTOM SECTION VIEW



(26 LBS APPROX.)

NOTE: THREE SECTION VALVE BOXES ALSO ACCEPTABLE

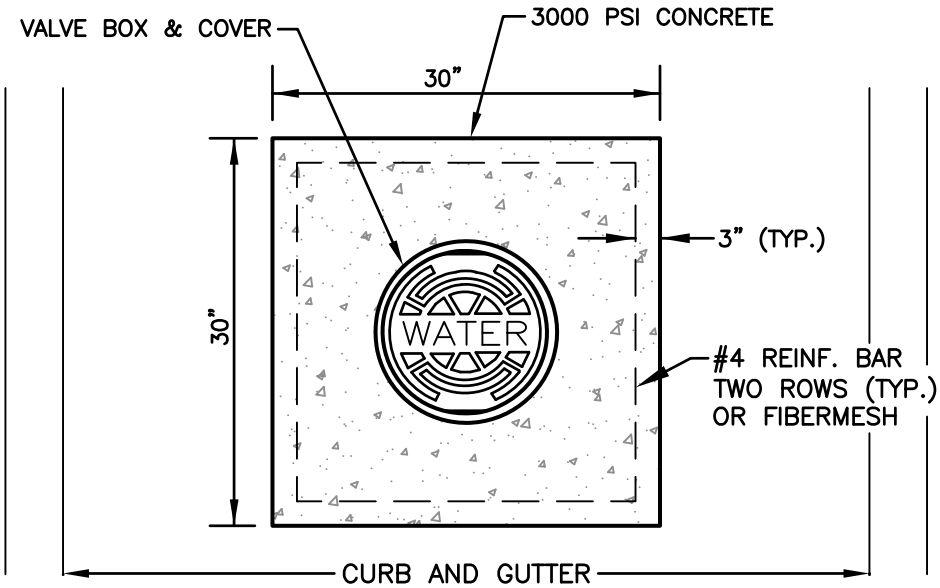
NOTES:

1. ALL UNDERGROUND VALVES SHALL BE INSTALLED WITH AN ADJUSTABLE CAST IRON VALVE BOX WITH TOP SET TO FINAL GRADE. ALL VALVES SHALL HAVE PEG LOCATORS (145.7 KILOHERTZ).
2. ALL UNDERGROUND VALVES SHALL BE INSTALLED SO THAT THE OPERATING NUT IS ACCESSIBLE USING A STANDARD VALVE KEY. VALVE EXTENSIONS SHALL BE INSTALLED AS NECESSARY SO THAT THE OPERATING NUT IS A MAXIMUM OF 36" BELOW FINAL GRADE.

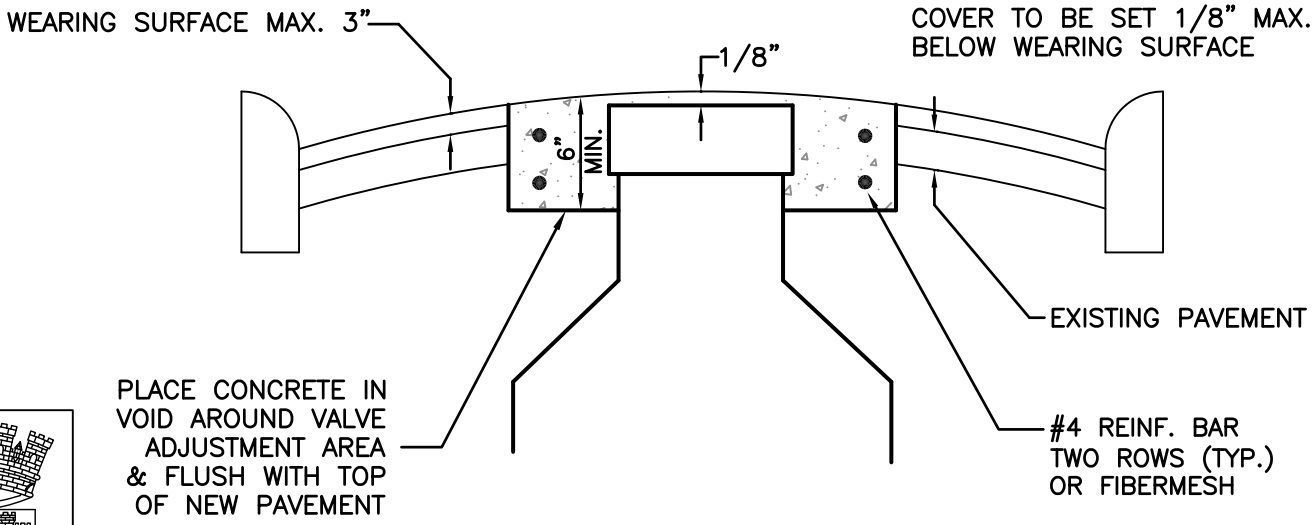
C.O.S.A.

VALVE BOX

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-32&W-17



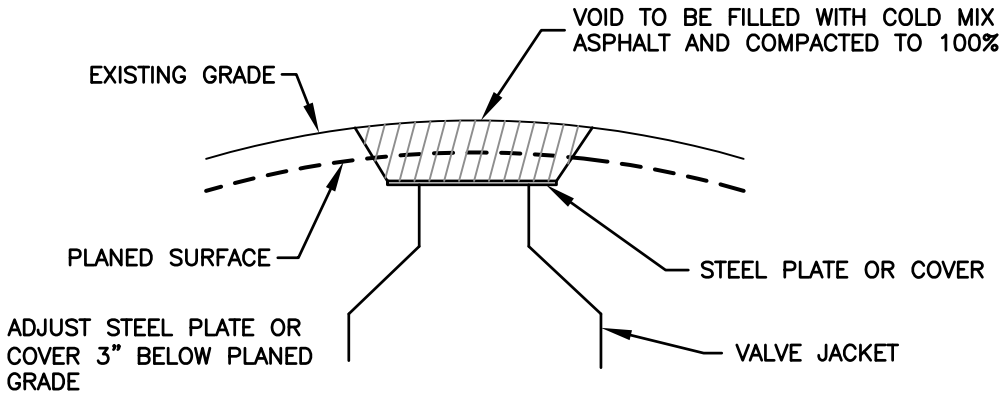
NOTE:
COVER SHALL BE STAMPED "WATER" OR "SEWER" AS APPROPRIATE.



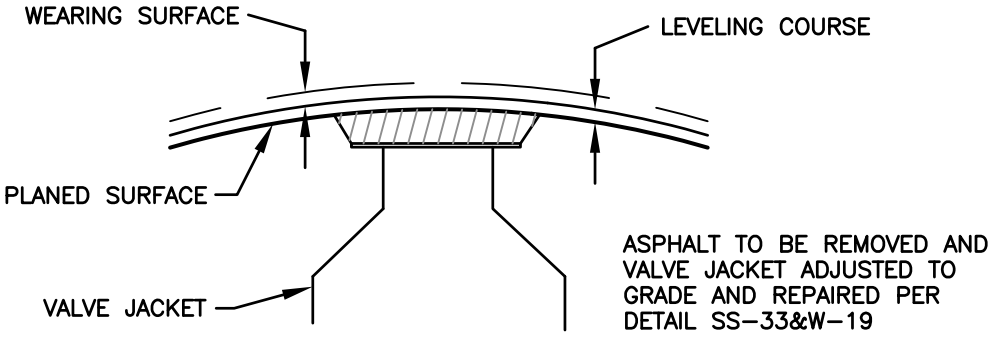
C.O.S.A.

VALVE JACKET "ADJUSTED"

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-33&W-19



BEFORE PLANING

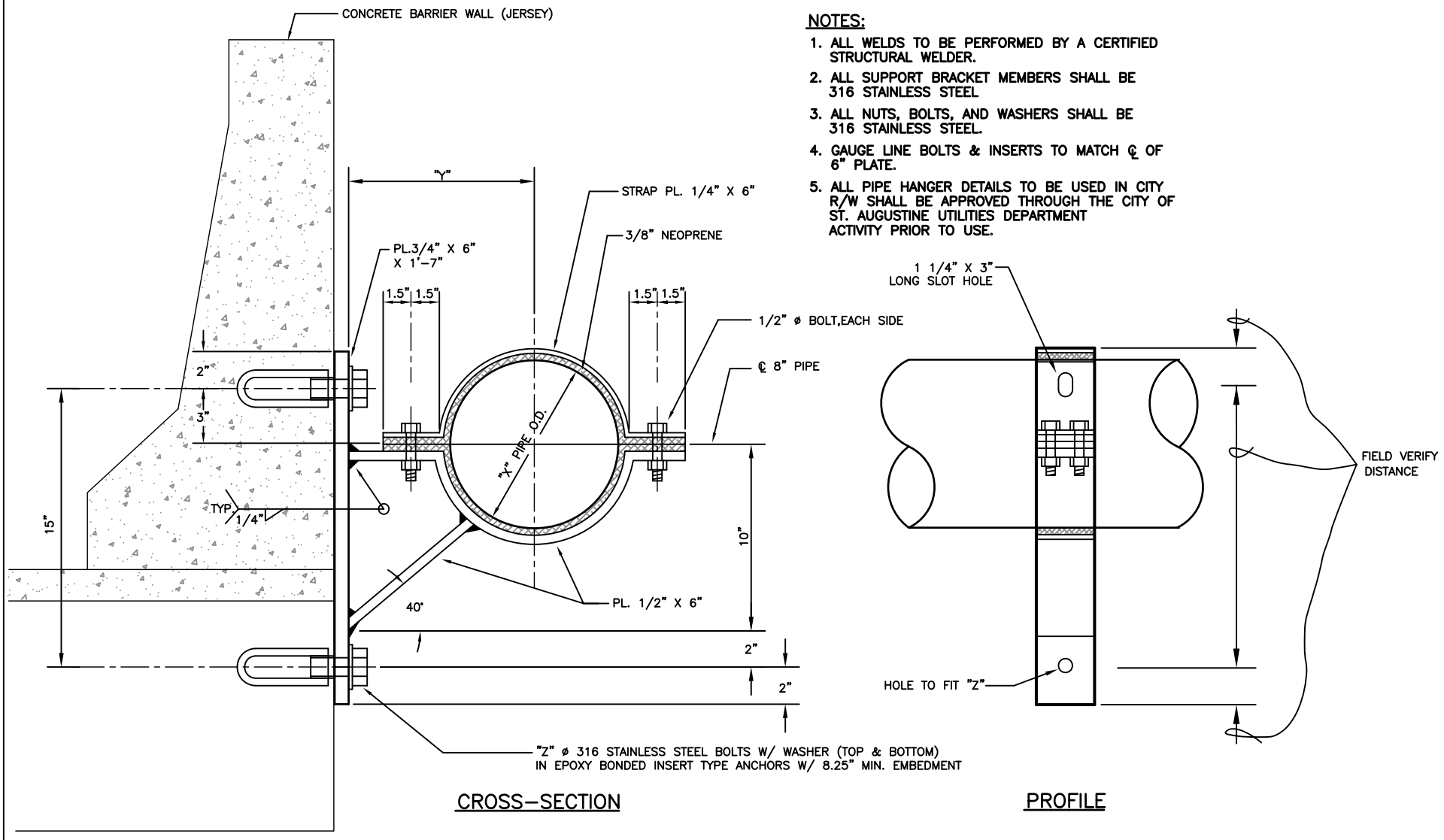


AFTER PLANING

C.O.S.A.

VALVE JACKET LOWERED FOR MILLING

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-34&W-20



CROSS–SECTION

PROFILE

NOTES:

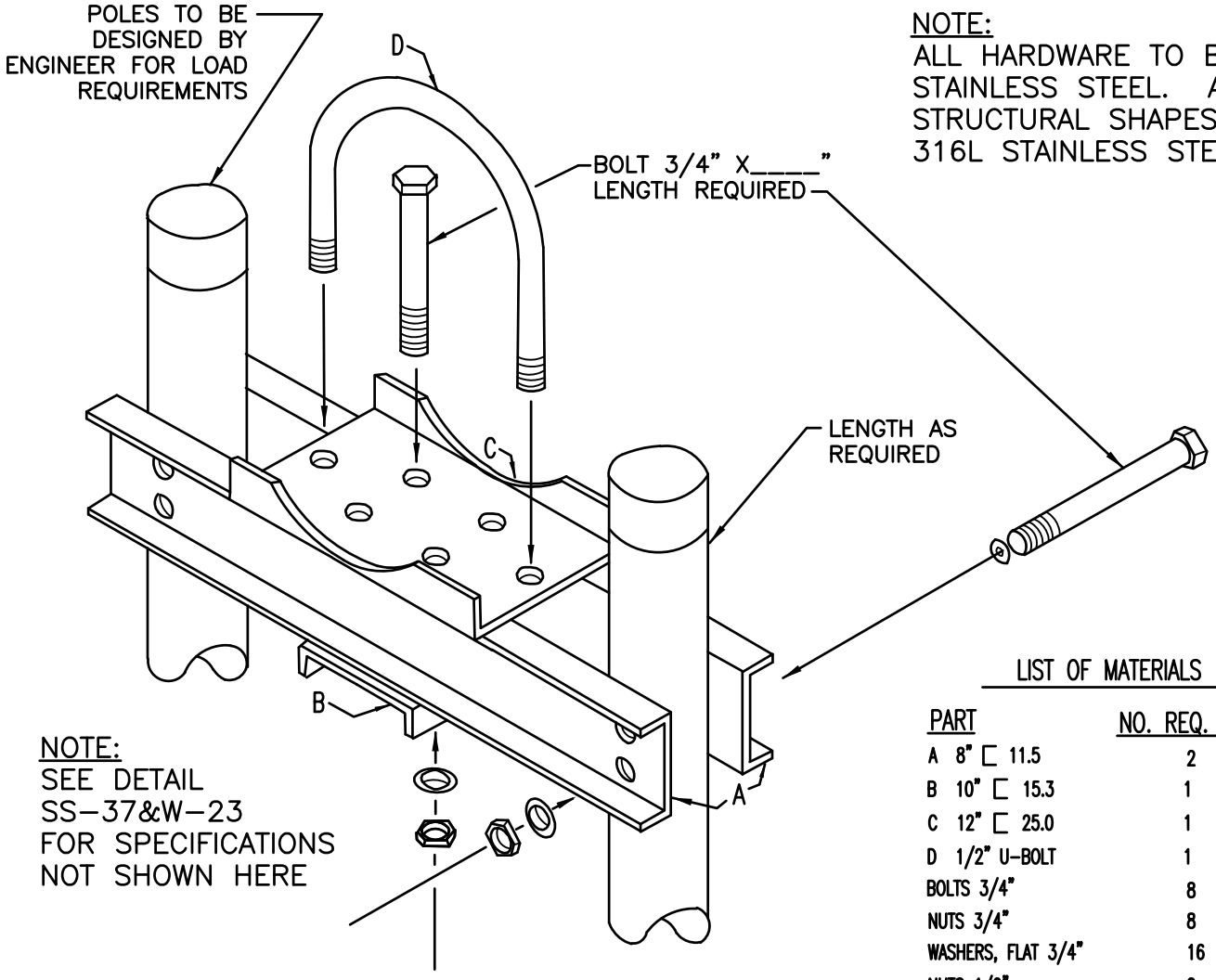
1. ALL WELDS TO BE PERFORMED BY A CERTIFIED STRUCTURAL WELDER.
2. ALL SUPPORT BRACKET MEMBERS SHALL BE 316 STAINLESS STEEL
3. ALL NUTS, BOLTS, AND WASHERS SHALL BE 316 STAINLESS STEEL.
4. GAUGE LINE BOLTS & INSERTS TO MATCH ℄ OF 6" PLATE.
5. ALL PIPE HANGER DETAILS TO BE USED IN CITY R/W SHALL BE APPROVED THROUGH THE CITY OF ST. AUGUSTINE UTILITIES DEPARTMENT ACTIVITY PRIOR TO USE.

PIPE SIZE	4"	6"	8"	10"	12"	16"	20"	24"
X	4.80"	6.90"	9.05"	11.10"	13.20	17.40"	21.60"	25.80"
Y	8"	9"	10"	12"	13"	15"	17"	19"
Z	3/4"	3/4"	3/4"	1"	1"	1"	1–1/4"	1–1/4"

C.O.S.A.

PIPE HANGER DETAIL

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–35&W–21



NOTE:
ALL HARDWARE TO BE 316 STAINLESS STEEL. ALL STRUCTURAL SHAPES TO BE 316L STAINLESS STEEL.

NOTE:
SEE DETAIL SS-37&W-23 FOR SPECIFICATIONS NOT SHOWN HERE

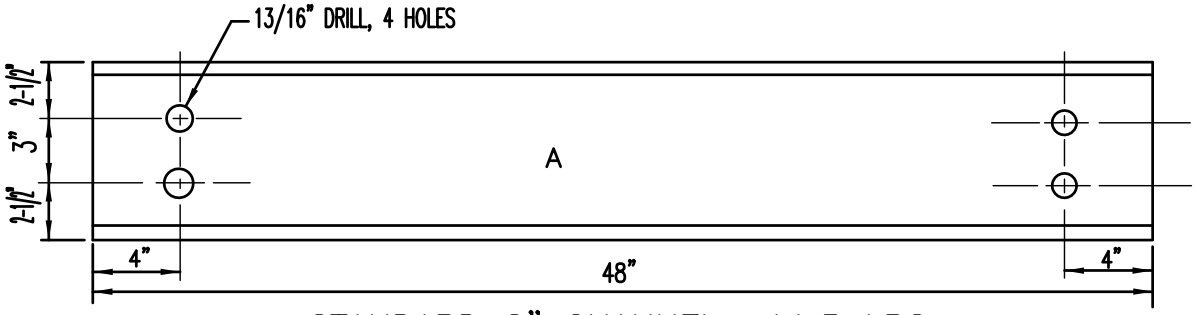
LIST OF MATERIALS

PART	NO. REQ. PER ASSMB.
A 8" ⊏ 11.5	2
B 10" ⊏ 15.3	1
C 12" ⊏ 25.0	1
D 1/2" U-BOLT	1
BOLTS 3/4"	8
NUTS 3/4"	8
WASHERS, FLAT 3/4"	16
NUTS 1/2"	2
WASHERS, FLAT 1/2"	2
POLES	2
CAPS	2

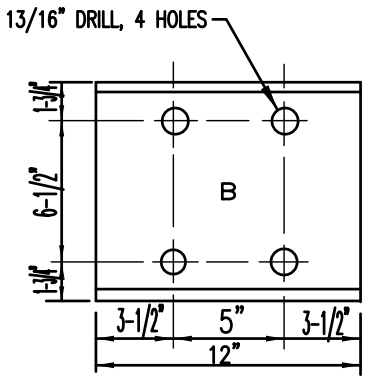
C.O.S.A.

PIPE SUPPORT SADDLE ASSEMBLY FOR PRESSURE MAIN

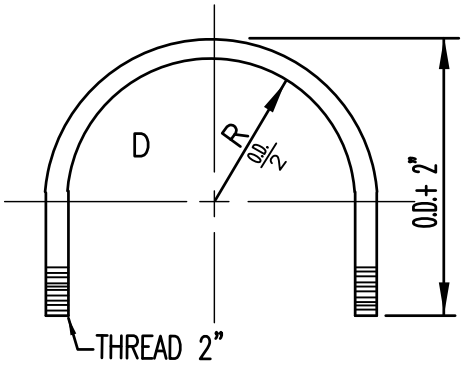
REVISION DATE:	FEB 2017
NOT TO SCALE	SS-36&W-22



STANDARD 8" CHANNEL 11.5 LBS.

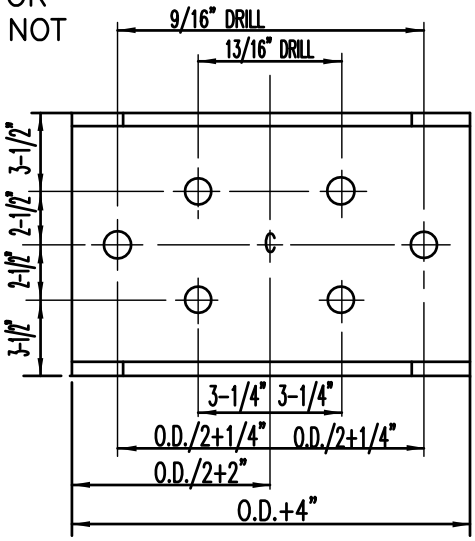


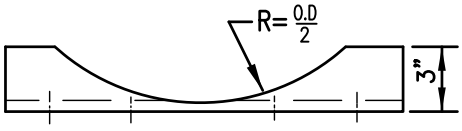
STANDARD 10" CHANNEL 15.3 LBS.



1/2" U-BOLT

NOTE:
SEE DETAIL SS-36&W-22 FOR SPECIFICATIONS NOT SHOWN HERE





STANDARD 12" CHANNEL 25 LBS.

TABLE 2

PIPE	O.D.
3"	3.96"
4"	4.80"
6"	6.90"
8"	9.05"
10"	11.10"
12"	13.20"
14"	15.30"
16"	17.40"

NOTE:
ALL HARDWARE TO BE 316 STAINLESS STEEL. ALL STRUCTURAL SHAPES TO BE 316L STAINLESS STEEL.

C.O.S.A.

PIPE SUPPORT SADDLE ASSEMBLY FOR PRESSURE MAIN

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-37&W-23

MINIMUM RESTRAINED LENGTH (L) IN FEET

NOMINAL PIPE SIZE	SAND (SP)					SAND–CLAY MIX (SC)					CLAY (CL)					SILT (ML)				
	ELBOWS (DEG.)				DEAD END	ELBOWS (DEG.)				DEAD END	ELBOWS (DEG.)				DEAD END	ELBOWS (DEG.)				DEAD END
	11	22	45	90		11	22	45	90		11	22	45	90		11	22	45	90	
4"	2	4	9	22	49	2	3	7	16	36	2	3	7	17	29	3	6	12	28	69
6"	3	6	12	30	69	2	5	10	23	50	2	5	10	24	41	4	8	16	39	96
8"	4	8	16	39	90	3	6	12	30	66	3	6	13	31	55	5	10	21	50	125
10"	5	9	19	46	107	4	7	15	36	80	4	7	15	37	66	6	12	24	59	148
12"	5	11	22	54	126	4	8	17	42	94	4	9	18	44	79	7	14	28	68	174

NOTE: BASED ON THE THRUST FORCE IN TABLE ABOVE.

NOTES:

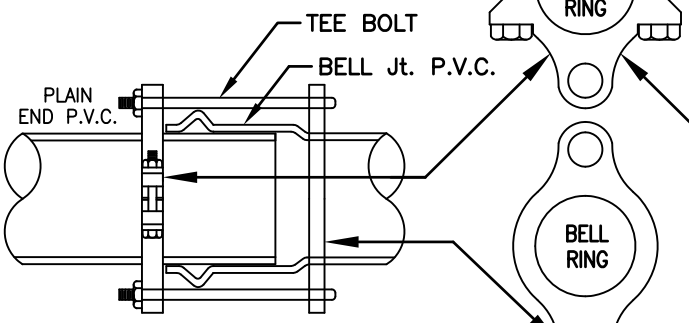
1. CONTRACTOR TO USE PROPER NUMBER OF RESTRAINERS.
2. ALSO SEE DETAILS SS–38A&W31A, AND SS–38B&W31B.
3. ALL VALVES SHALL BE TREATED AS DEAD ENDS.
4. ALL CROSSES AND TEE'S SHALL BE RESTRAINED AS DIRECTED BY CITY INSPECTOR.
5. ALL UTILITY UPGRADES SHALL REQUIRE VISUAL VERIFICATION OF RESTRAINT PER THIS DETAIL.

C.O.S.A.

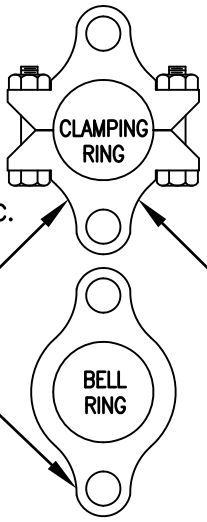
MECHANICAL RESTRAINT DETAILS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–38&W–31

TYPICAL PROFILE *
BELL Jt. TO PLAIN END
w/MECHANICAL RESTRAINERS

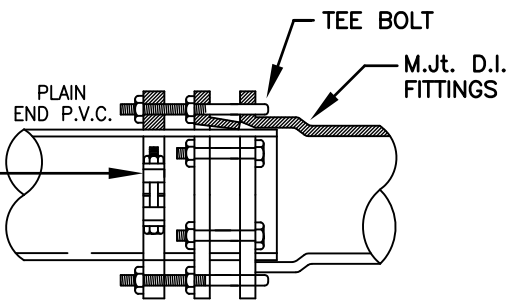


RESTRAINED
BELL JOINT



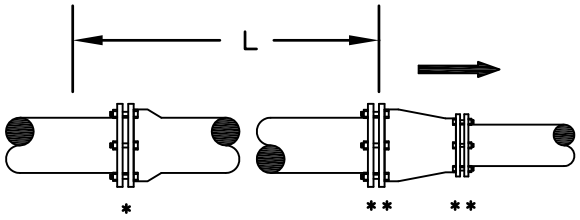
SECTIONS

TYPICAL PROFILE **
MECHANICAL Jt. TO PLAIN END
w/MECHANICAL RESTRAINERS

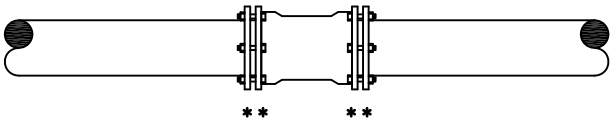


RESTRAINED
MECHANICAL JOINT

NOTE:
L = MIN. LENGTH OF PIPE TO BE RESTRAINED ON EACH SIDE OF FITTING (SEE DETAIL SS-38&W-31).



REDUCER

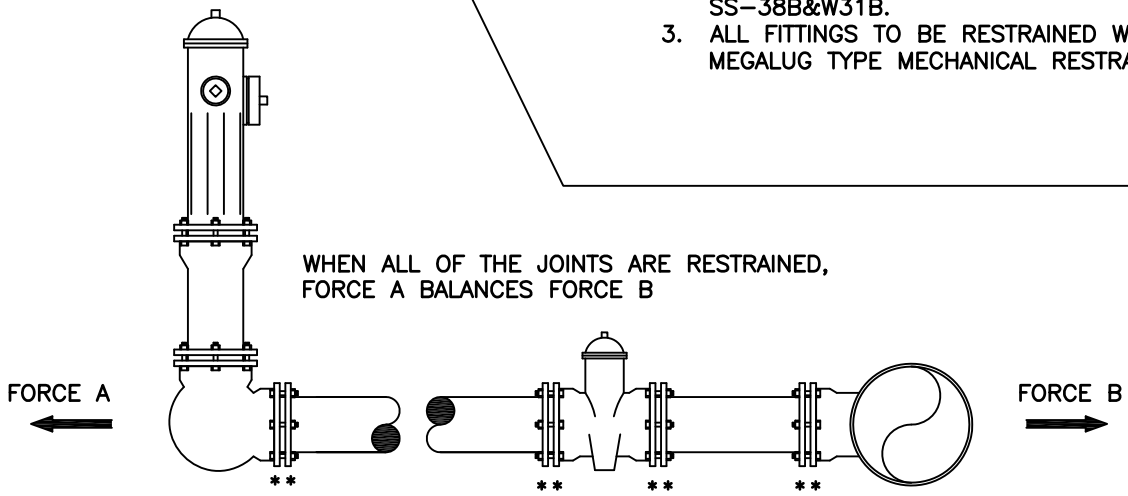


MECHANICAL JOINT SLEEVES

NOTES:

1. CONTRACTOR TO USE PROPER NUMBER OF RESTRAINTS.
2. ALSO SEE DETAILS SS-38&W31, AND SS-38B&W31B.
3. ALL FITTINGS TO BE RESTRAINED WITH MEGALUG TYPE MECHANICAL RESTRAINT.

WHEN ALL OF THE JOINTS ARE RESTRAINED,
FORCE A BALANCES FORCE B

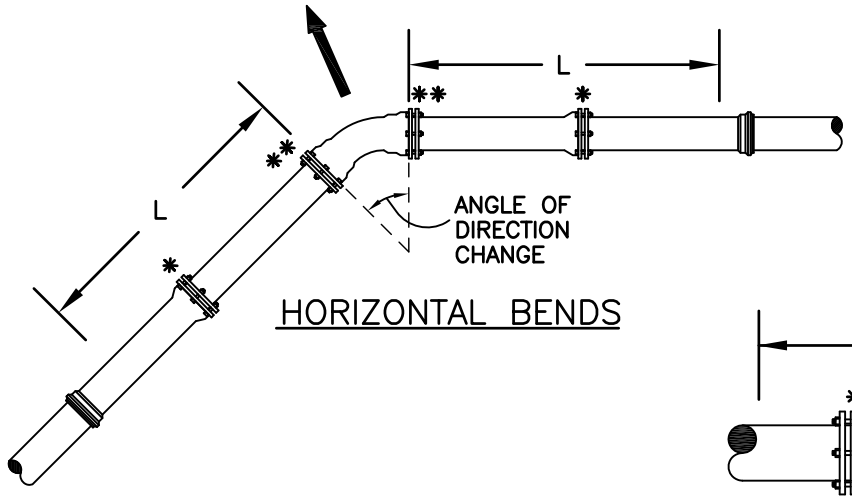


FIRE HYDRANT LATERAL
(FOR WATER ONLY)

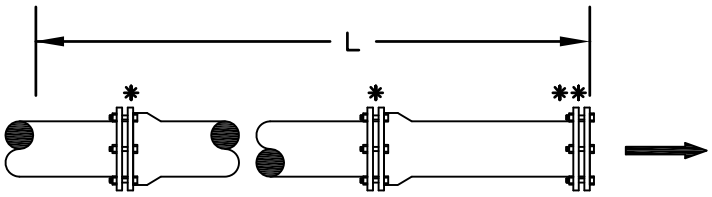
C.O.S.A.

MECHANICAL RESTRAINT DETAILS

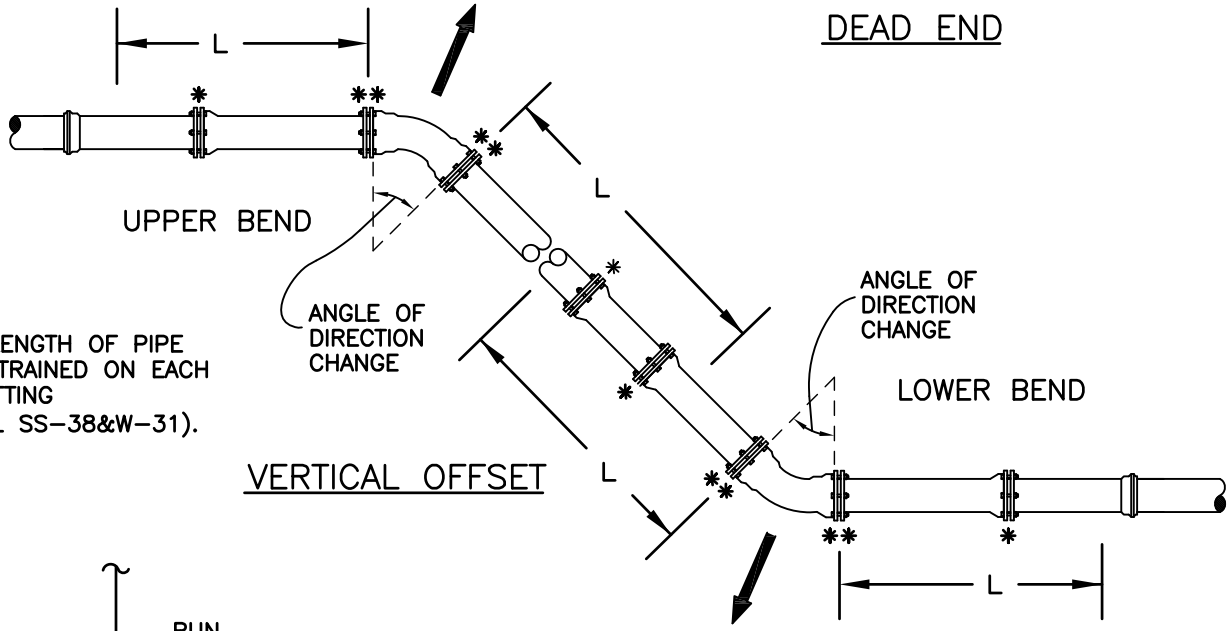
REVISION DATE:	FEB 2017
NOT TO SCALE	SS-38A&W-31A



HORIZONTAL BENDS

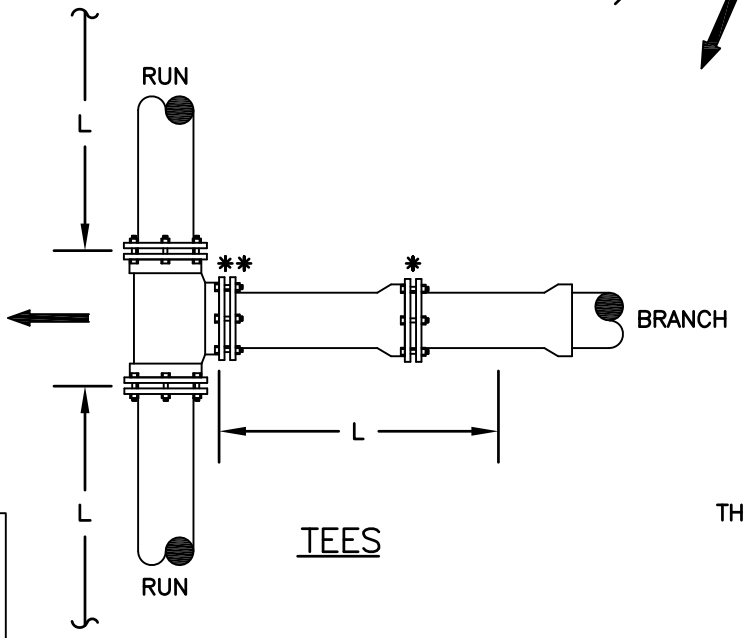


DEAD END



VERTICAL OFFSET

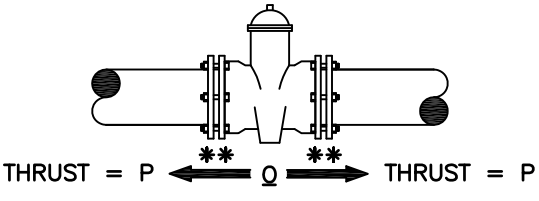
NOTE:
L = MIN. LENGTH OF PIPE TO BE RESTRAINED ON EACH SIDE OF FITTING (SEE DETAIL SS-38&W-31).



TEES

NOTES:

1. CONTRACTOR TO USE PROPER NUMBER OF RESTRAINERS.
2. ALSO SEE DETAILS SS-38&W31, AND SS-38A&W31A.

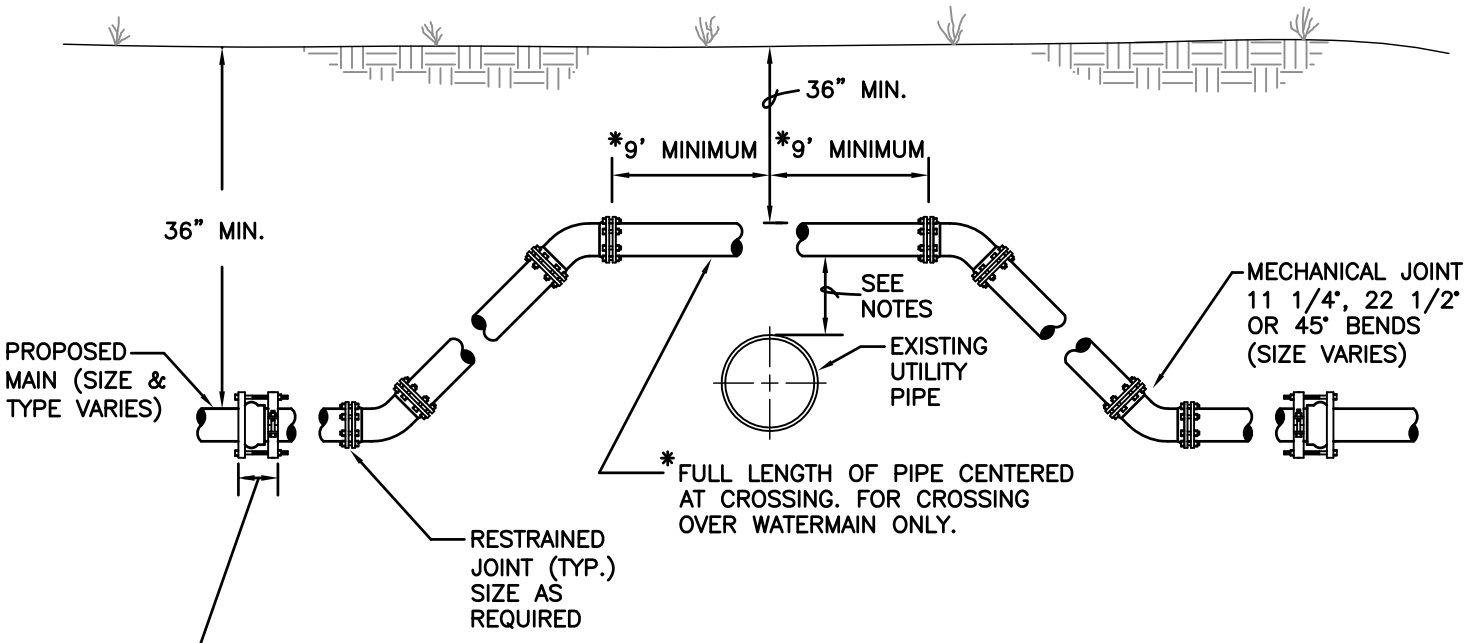


IN LINE VALVE

C.O.S.A.

MECHANICAL RESTRAINT DETAILS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-38B&W-31B



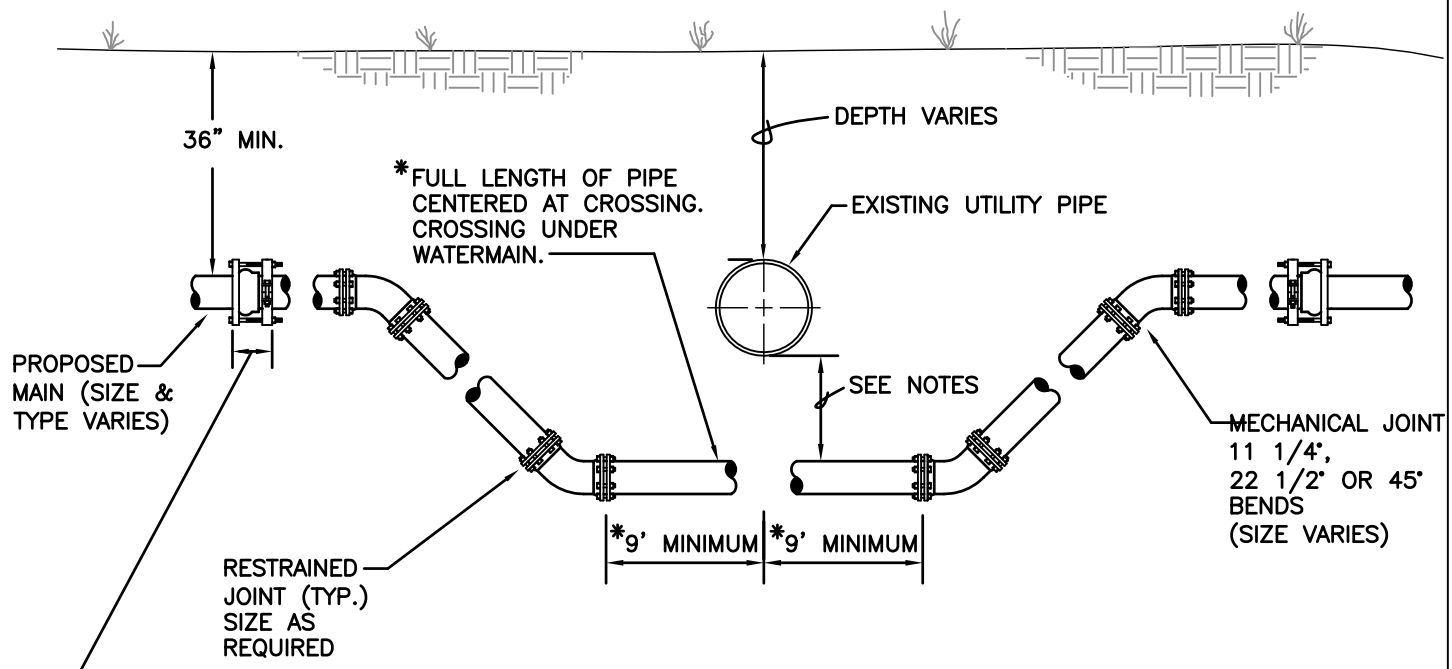
NOTES:

1. SEPARATION REQUIREMENTS SHALL BE PER F.A.C. CHAPTER 62-555.314.
2. NOT ALLOWED FOR GRAVITY SANITARY SEWERS. FORCEMAINS ONLY.

C.O.S.A.

ADJUSTMENT OVER EXISTING UTILITIES – MECHANICAL RESTRAINT DEVICES (CASE A)

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-39&W-32



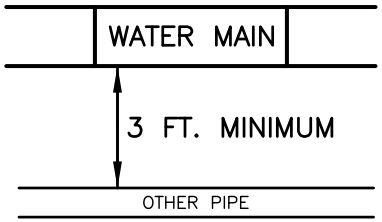
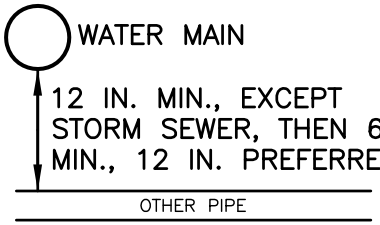
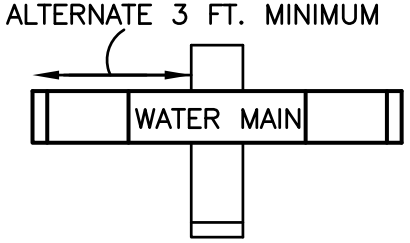
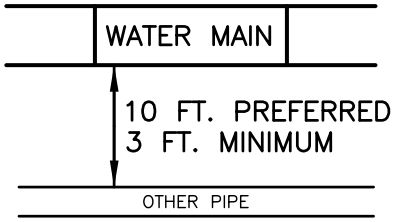
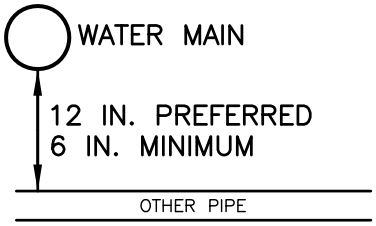
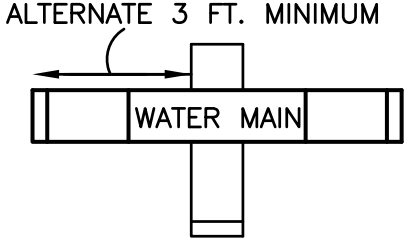
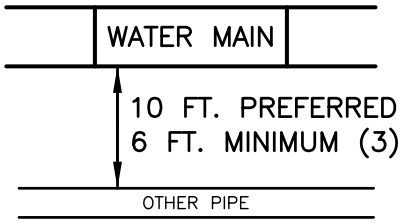
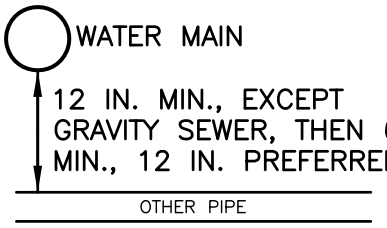
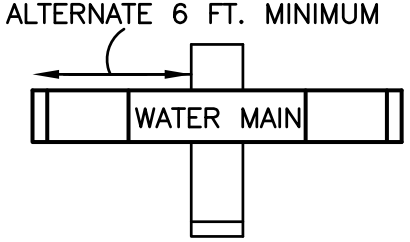
NOTES:

1. SEPARATION REQUIREMENTS SHALL BE PER F.A.C. CHAPTER 62-555.314.
2. NOT ALLOWED FOR GRAVITY SANITARY SEWERS. FORCEMAINS ONLY.

C.O.S.A.

ADJUSTMENT UNDER EXISTING UTILITIES – MECHANICAL RESTRAINT DEVICES (CASE B)

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-41&W-34

OTHER PIPE	HORIZONTAL SEPARATION	CROSSINGS (1)	JOINT SPACING @ CROSSINGS (FULL JOINT CENTERED)
STORM SEWER, STORMWATER FORCE MAIN RECLAIMED WATER (2)			
VACUUM SANITARY SEWER			
GRAVITY OR PRESSURE SANITARY SEWER, SANITARY SEWER FORCE MAIN, RECLAIMED WATER (4)			
ON–SITE SEWAGE TREATMENT & DISPOSAL SYSTEM	10 FT. MINIMUM	——	——

ALL DISTANCES ARE TO OUTER PIPE WALL.

(1) WATER MAIN SHOULD CROSS ABOVE OTHER PIPE WHEN AT ALL POSSIBLE. WHEN WATER MAIN MUST BE BELOW OTHER PIPE, THE MINIMUM SEPARATION IS 18 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.

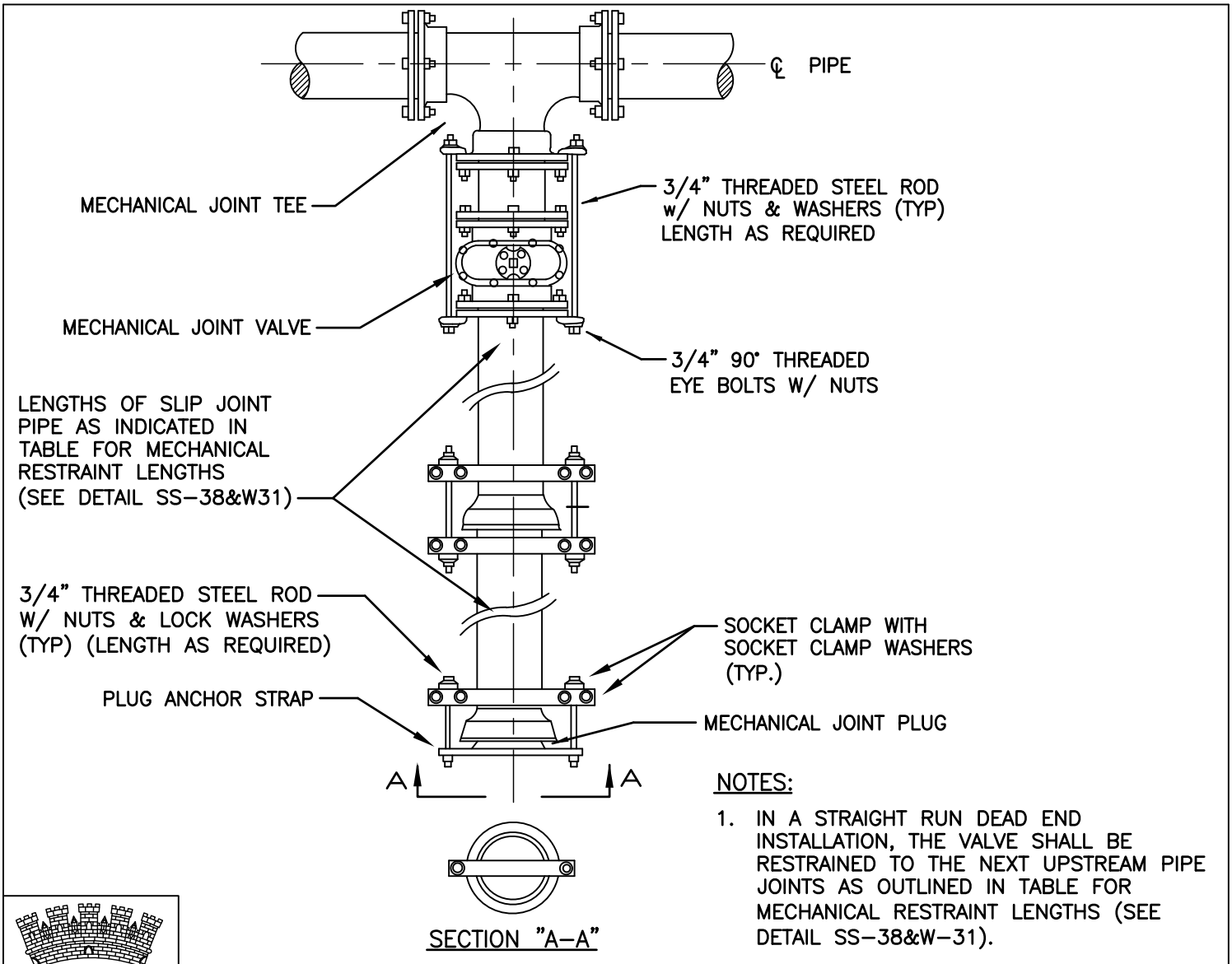
DESIGN SEPARATION SHALL BE GREATER THAN MINIMUMS TO ALLOW FOR TOLERANCE IN FIELD.
CITY INSPECTOR MAY DIRECT ALTERNATE SEPARATION REQUIREMENTS BASED ON FIELD CONDITIONS.

DISCLAIMER – THIS DETAIL IS PROVIDED FOR CONVENIENCE ONLY. PLEASE REFER TO F.A.C. RULE 62–555.314 AND C.O.S.A. STANDARDS AND SPECIFICATIONS DESIGN MANUAL AND DETAILS FOR ADDITIONAL CONSTRUCTION REQUIREMENTS.

C.O.S.A.

UTILITY SEPARATION REQUIREMENTS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS–42&W–35



SECTION "A-A"

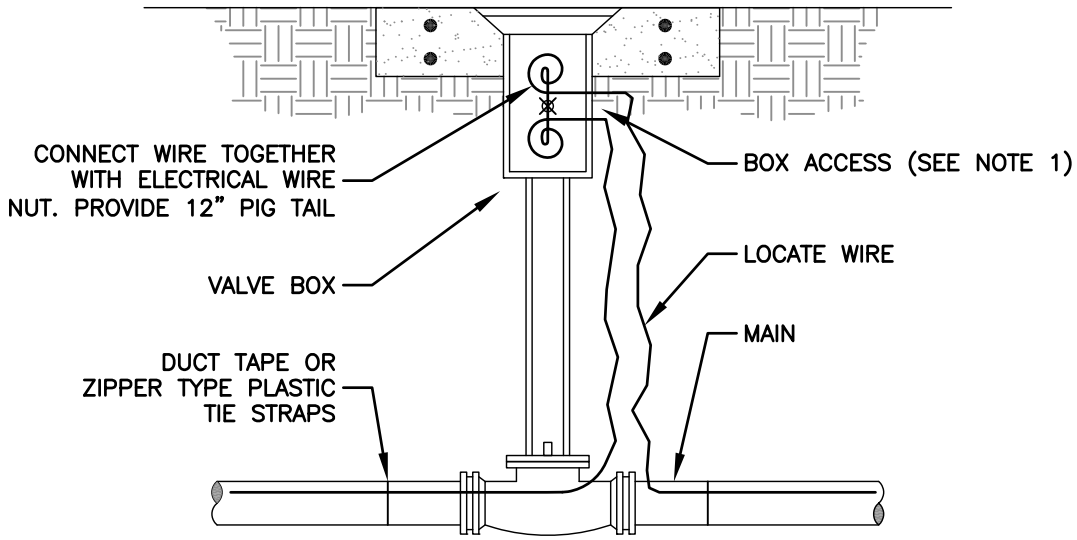
NOTES:

1. IN A STRAIGHT RUN DEAD END INSTALLATION, THE VALVE SHALL BE RESTRAINED TO THE NEXT UPSTREAM PIPE JOINTS AS OUTLINED IN TABLE FOR MECHANICAL RESTRAINT LENGTHS (SEE DETAIL SS-38&W-31).
2. ALL PIPE & FITTINGS SHOWN VARY IN SIZE.

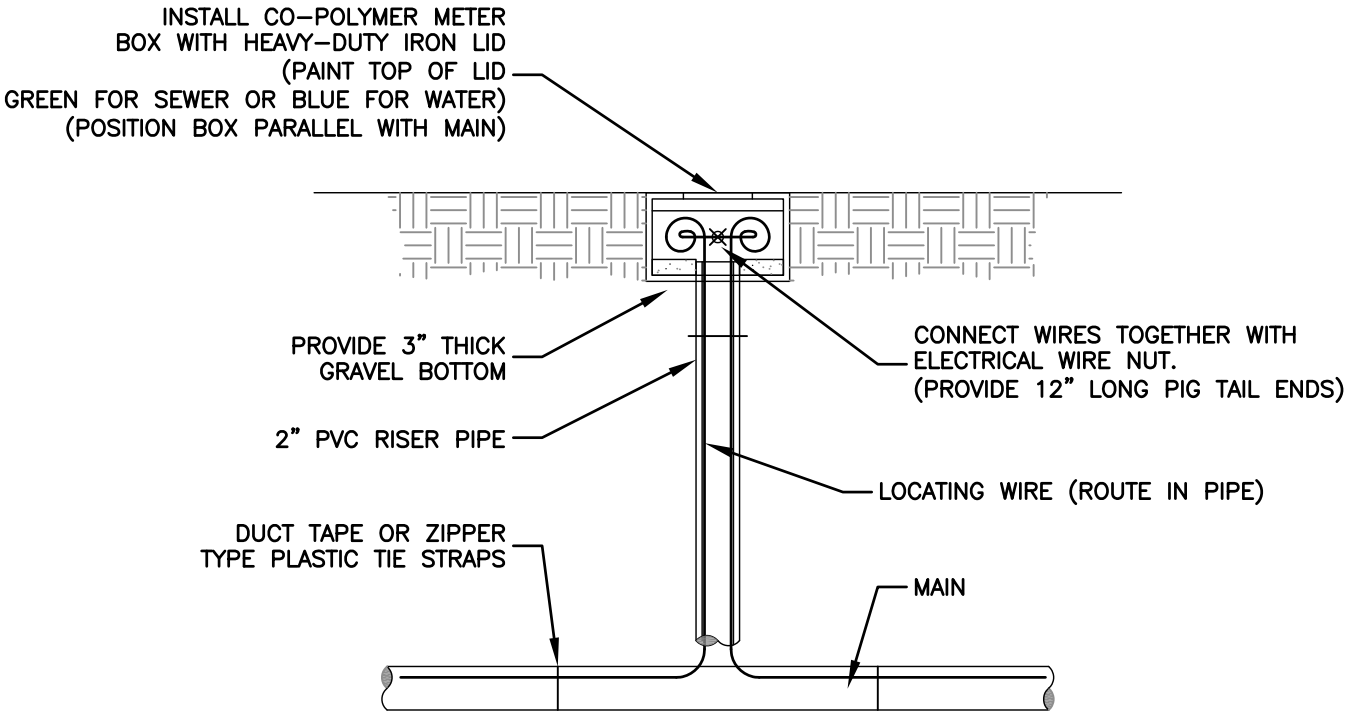
C.O.S.A.

PLUGGED DEAD END MECHANICAL RESTRAINTS

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-44&W-37



LOCATE WIRE BOX UTILIZING VALVE BOX



LOCATE WIRE BOX UTILIZING METER BOX

NOTES:

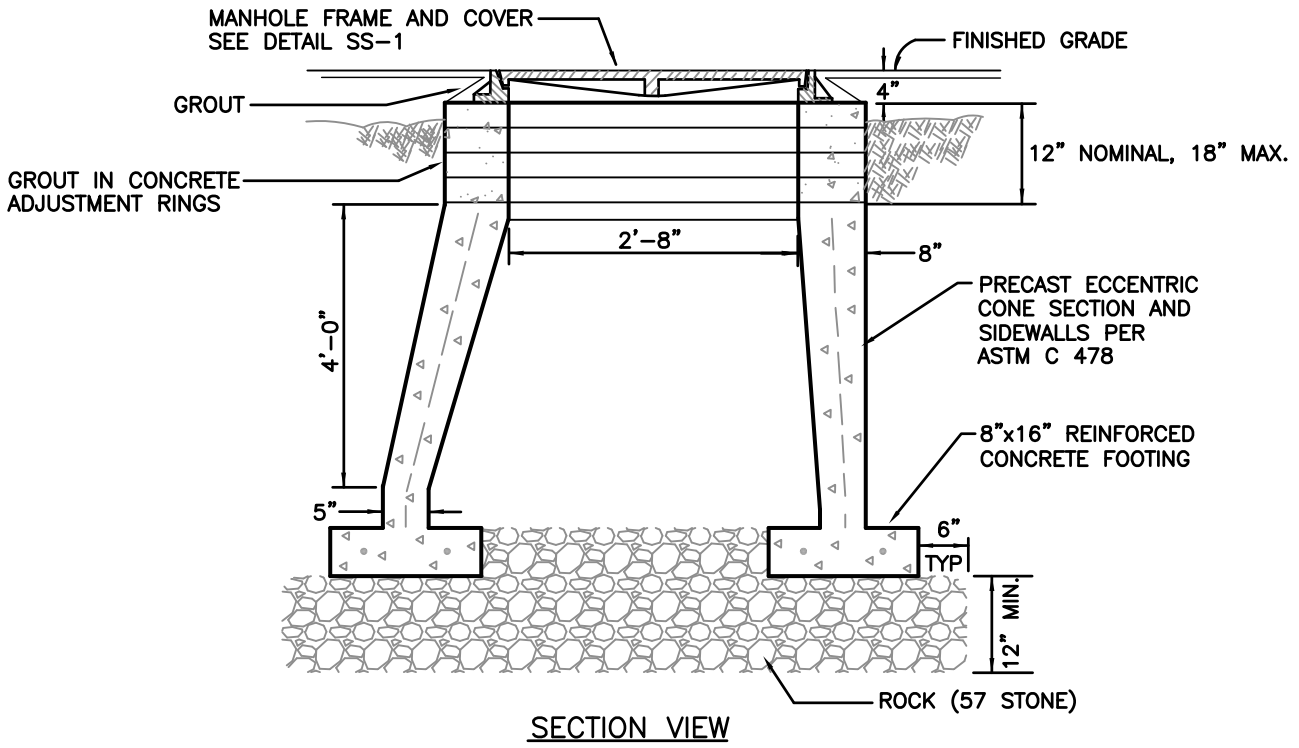
1. LOCATE WIRE SHALL ENTER THE VALVE BOX THROUGH A 3/4"ø (MIN) HOLE OR SHALL BE ROUTED THROUGH THE JOINTS OF THE VALVE BOX ADJUSTMENT SECTION.

2. SEE ADDITIONAL NOTES AND REQUIREMENTS ON DETAILS SS-56 AND W-56.

C.O.S.A.

LOCATE WIRE BOX

REVISION DATE:	FEB 2017
NOT TO SCALE	SS-55&W-55



SECTION VIEW

NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH LATEST EDITIONS OF ASTM C478 WITH 4000 PSI CONCRETE, TYPE II CEMENT.

2. FOR AIR RELEASE VALVES FOR USE ON WATER MAINS:
   THE INTERIOR AND EXTERIOR OF MANHOLE AND ADJUSTMENT RINGS SHALL BE GIVEN ONE COAT OF WATERPROOFING MATERIAL. CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES.

3. FOR AIR RELEASE VALVES FOR USE ON FORCE MAINS:
   THE EXTERIOR OF MANHOLE AND ADJUSTMENT RINGS SHALL BE GIVEN TWO COATS OF WATERPROOFING MATERIAL. CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES.

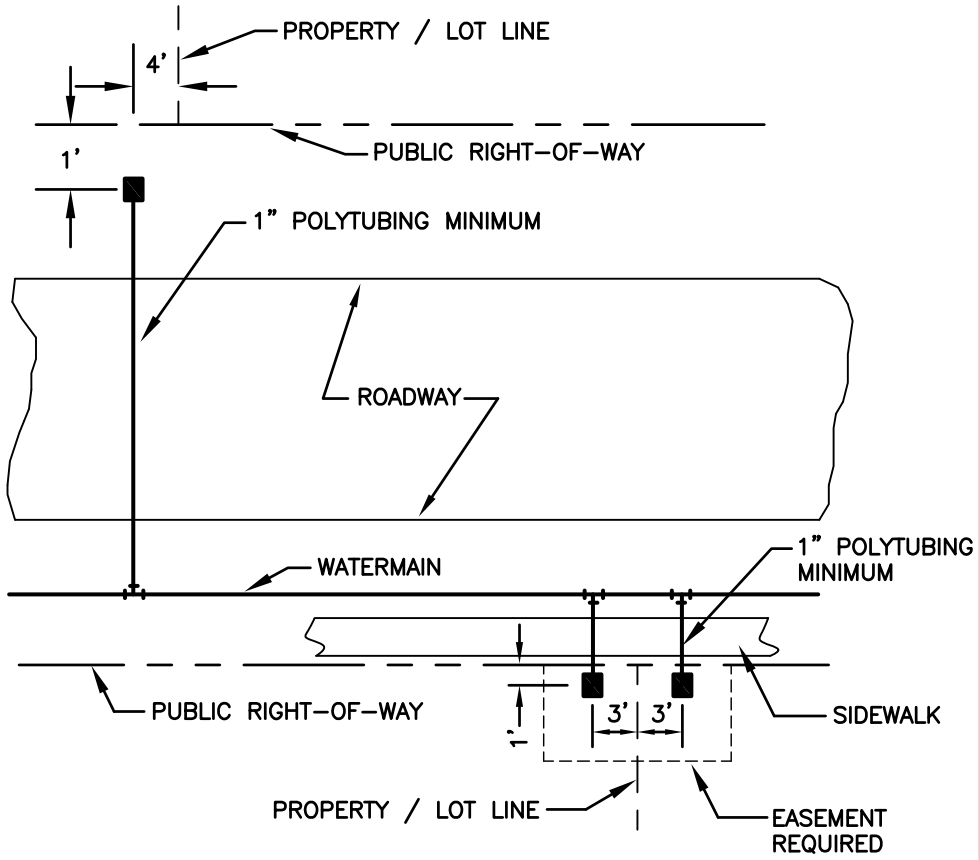
   THE INTERIOR SURFACE SHALL BE COATED WITH SEWPERCOAT OR SPECTRASHIELD PROTECTIVE COATING SYSTEM TO PREVENT CONCRETE DETERIORATION FROM HYDROGEN SULFIDE AND OTHER CORROSIVE GASES.

C.O.S.A.

MANHOLE DETAIL FOR AIR RELEASE VALVES

REVISION DATE:	**FEB 2017**
NOT TO SCALE	**SS-60&W-60**

NOTE:
FOR LOCATIONS WITH CURBING, ETCH THE LETTER "W" MINIMUM OF 2 INCHES HIGH AND 1/4 INCH DEEP IN FACE OF CURB, AND PAINT BLUE. FOR LOCATIONS WITHOUT CURBING BUT WITH SIDEWALK, ETCH THE LETTER "W" MINIMUM OF 2 INCHES HIGH AND 1/4 INCH DEEP IN FRONT OF SIDEWALK, AND PAINT BLUE. AS AN ALTERNATIVE TO ETCHING IN ALL LOCATIONS AND CONDITIONS, A STAINLESS STEEL DISC AND NAIL MAY BE USED. DISC SHALL BE 1–1/2" DIAMETER, AND ENGRAVED WITH THE WORD "WATER" CENTERED AT THE 12 O'CLOCK POSITION AND THE WORD "SERVICE" CENTERED AT THE 6 O'CLOCK POSITION ON THE DISC. NAIL AND DISC SHALL BE INSTALLED AT THE EDGE OF PAVEMENT, CURBING OR SIDEWALK DIRECTLY IN LINE WITH THE WATER SERVICE. THE CITY MAY REQUIRE OTHER MEANS OF IDENTIFICATION, SUCH AS TREATED FENCE POSTS PAINTED BLUE ON TOP TO MARK SERVICES FOR FUTURE DEVELOPMENT.



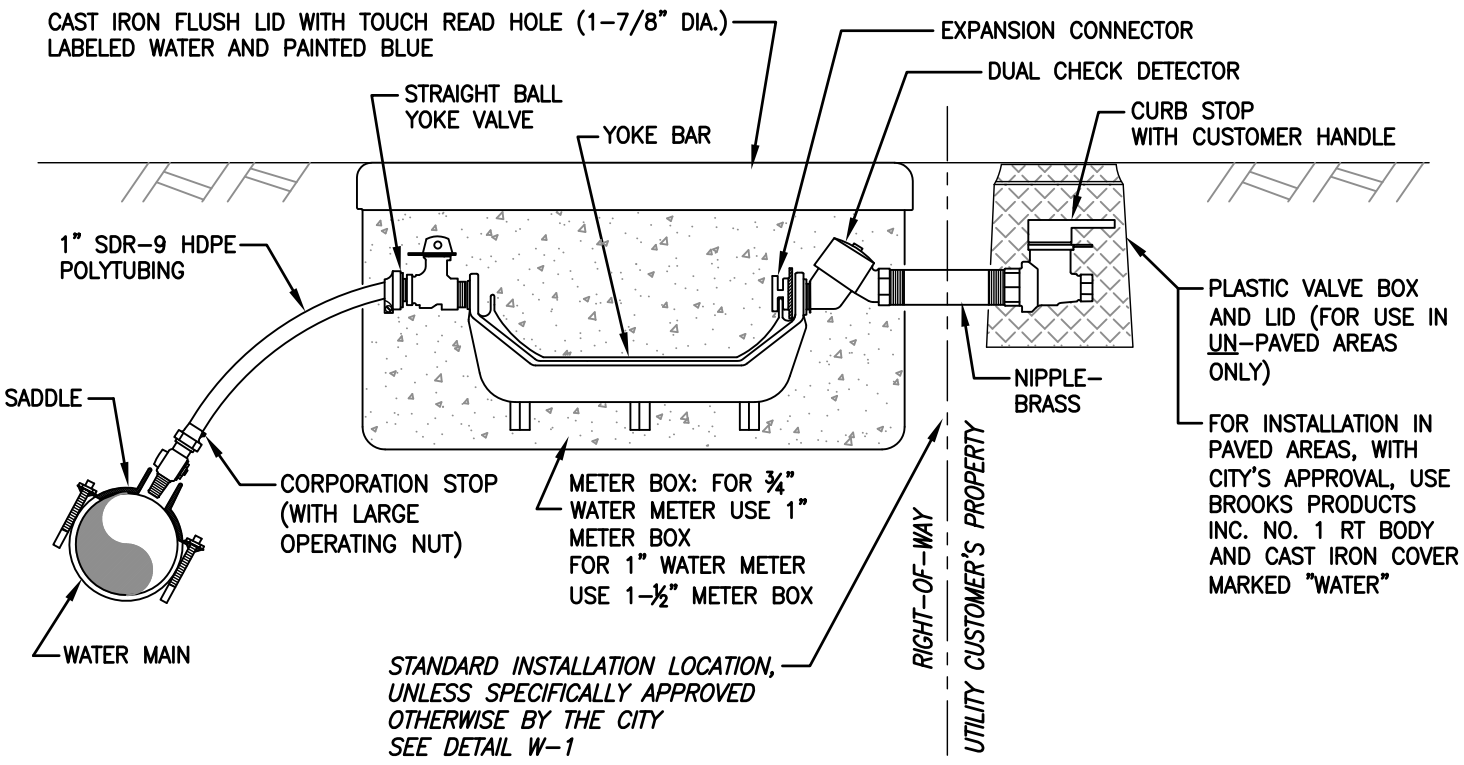
NOTES:

1. THE SKETCHES ABOVE ARE SUGGESTIONS FOR SOME TYPICAL INSTALLATIONS. ACTUAL INSTALLATIONS MAY VARY SLIGHTLY ACCORDING TO FIELD CONDITIONS. CITY INSPECTOR SHALL DIRECT METER BOX LOCATIONS FOR A–TYPICAL INSTALLATIONS.
2. IF AN EASEMENT IS LOCATED BETWEEN LOTS, METERS TO BE LOCATED 3' OUTSIDE OF EASEMENT LINE.
3. WHENEVER POSSIBLE, METER BOXES SHALL BE LOCATED OUTSIDE OF PAVEMENT.
4. METER BOXES SHALL BE INSTALLED ON LEVEL GROUND.
5. WHERE METER BOXES ARE INSTALLED ON PRIVATE PROPERTY, A UTILITY EASEMENT WILL BE REQUIRED.

C.O.S.A.

WATER METER LOCATIONS
3/4" – 2" METERS

REVISION DATE:	FEB 2017
NOT TO SCALE	W–1



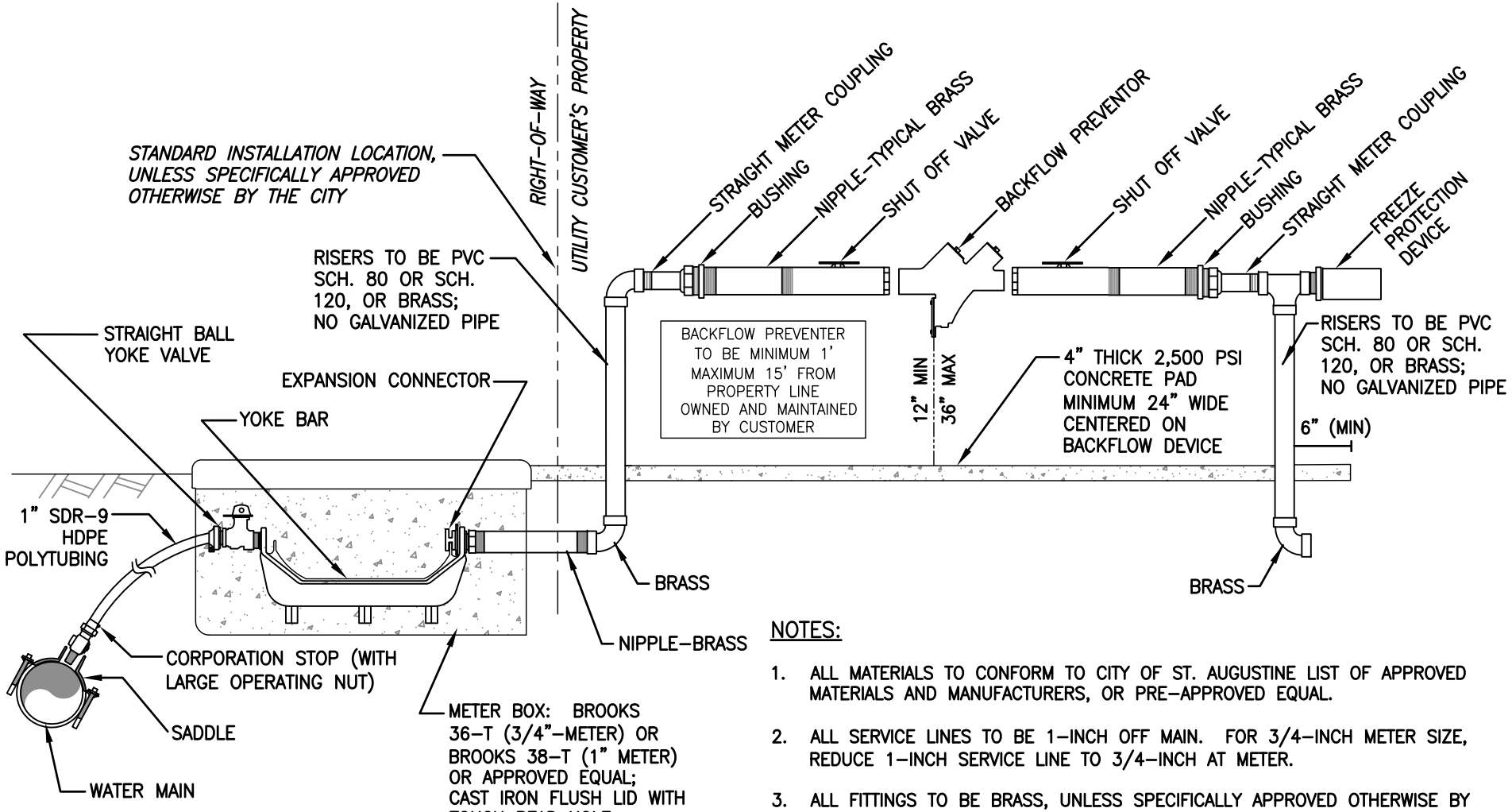
NOTES:

1. ALL MATERIALS TO CONFORM TO CITY OF ST. AUGUSTINE LIST OF APPROVED MATERIALS AND MANUFACTURERS, OR PRE-APPROVED EQUAL.
2. ALL RESIDENTIAL SERVICE LINES TO BE 1-INCH OFF MAIN. FOR 3/4-INCH METER SIZE, REDUCE 1-INCH SERVICE LINE TO 3/4-INCH AT METER.
3. ALL FITTINGS TO BE BRASS, UNLESS SPECIFICALLY APPROVED OTHERWISE BY THE CITY.
4. CONTRACTOR TO PROVIDE AND INSTALL ALL MATERIALS EXCEPT THE WATER METER. CITY OF ST. AUGUSTINE WILL INSTALL THE WATER METER IN THE METER BOX ASSEMBLY THAT IS FULLY CONSTRUCTED BY THE CONTRACTOR.

C.O.S.A.

3/4" AND 1" RESIDENTIAL TAP AND WATER SERVICE DETAIL

REVISION DATE:	FEB 2017
NOT TO SCALE	W-2A



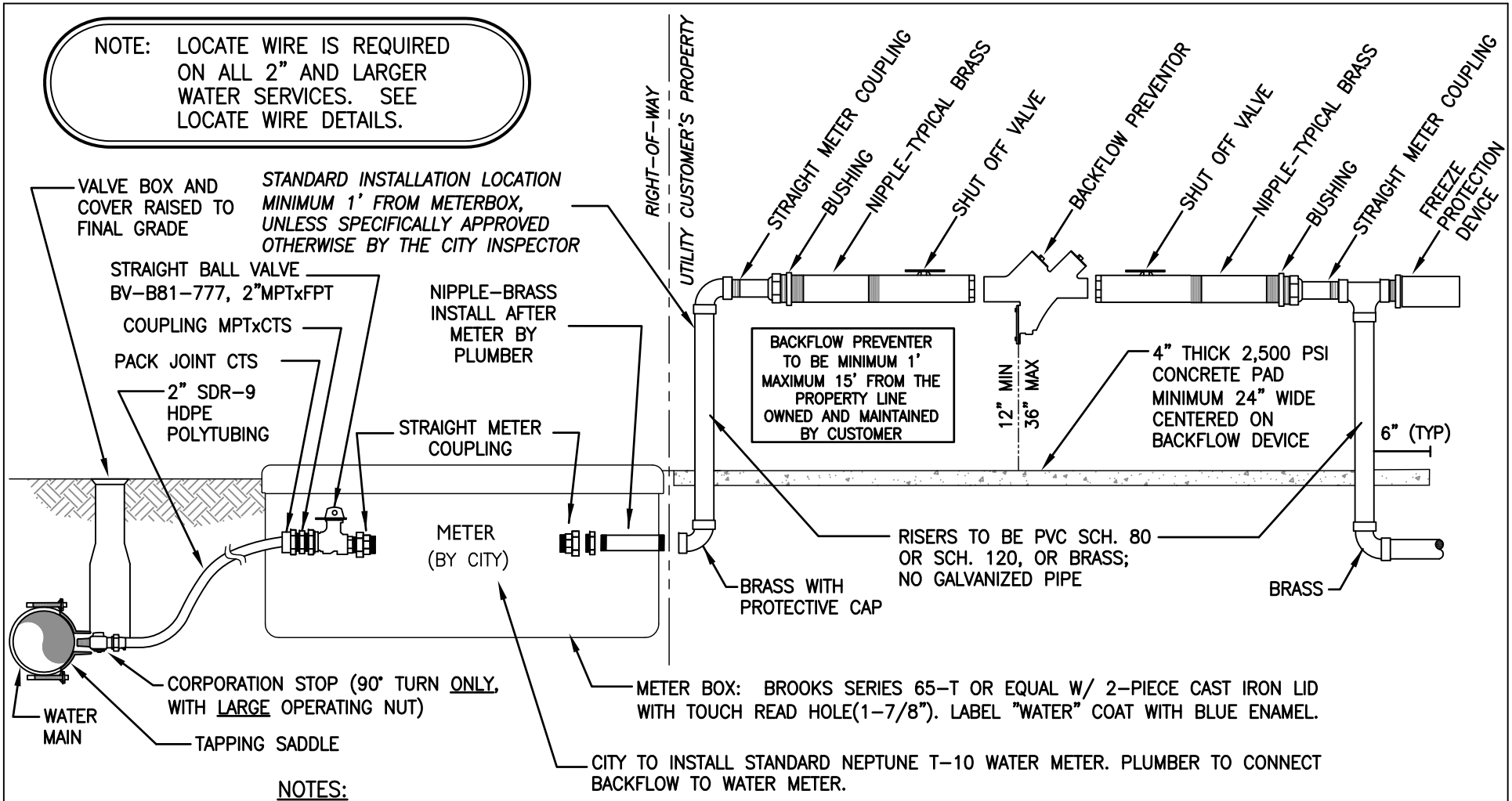
NOTES:

1. ALL MATERIALS TO CONFORM TO CITY OF ST. AUGUSTINE LIST OF APPROVED MATERIALS AND MANUFACTURERS, OR PRE-APPROVED EQUAL.
2. ALL SERVICE LINES TO BE 1-INCH OFF MAIN. FOR 3/4-INCH METER SIZE, REDUCE 1-INCH SERVICE LINE TO 3/4-INCH AT METER.
3. ALL FITTINGS TO BE BRASS, UNLESS SPECIFICALLY APPROVED OTHERWISE BY THE CITY.
4. CONTRACTOR TO PROVIDE AND INSTALL ALL MATERIALS EXCEPT THE WATER METER. CITY OF ST. AUGUSTINE WILL INSTALL THE WATER METER IN THE METER BOX ASSEMBLY THAT IS FULLY CONSTRUCTED BY THE CONTRACTOR.

C.O.S.A.

3/4" AND 1" TAP / WATER METER SET-UP WITH BACKFLOW PREVENTER CONFIGURATION

REVISION DATE:	FEB 2017
NOT TO SCALE	W-2B



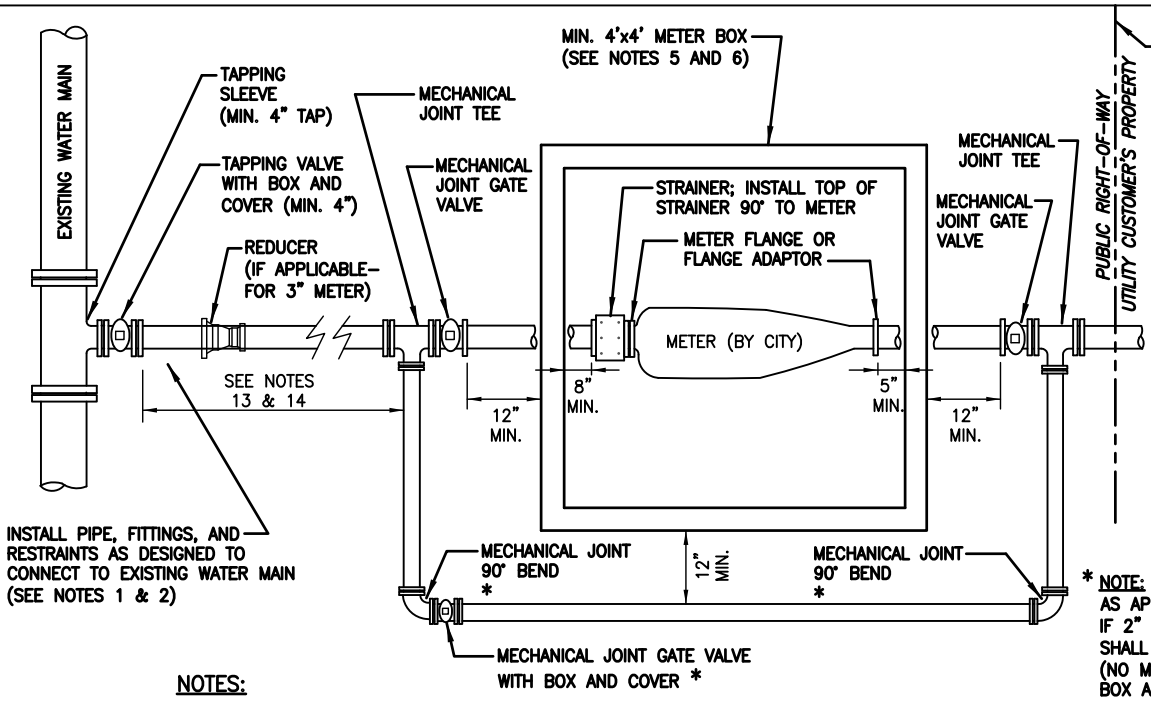
NOTES:

1. ALL MATERIALS TO CONFORM TO CITY OF ST. AUGUSTINE LIST OF APPROVED MATERIALS AND MANUFACTURERS, OR PRE-APPROVED EQUAL.
2. ALL FITTINGS TO BE BRASS, UNLESS SPECIFICALLY APPROVED OTHERWISE BY THE CITY.
3. CONTRACTOR TO PROVIDE AND INSTALL ALL MATERIALS EXCEPT THE WATER METER. CITY OF ST. AUGUSTINE WILL INSTALL THE WATER METER IN THE METER BOX ASSEMBLY THAT IS FULLY CONSTRUCTED BY THE CONTRACTOR IN ACCORDANCE WITH THIS DETAIL.

C.O.S.A.

2" TAP AND WATER METER SET-UP WITH BACKFLOW PREVENTER CONFIGURATION

REVISION DATE:	FEB 2017
NOT TO SCALE	W-2C



IF METER ASSEMBLY LOCATION IS NOT WITHIN A PUBLIC RIGHT–OF–WAY, THEN A UTILITY EASEMENT THAT IS DEDICATED TO THE CITY OF ST. AUGUSTINE IS REQUIRED.

BACKFLOW PREVENTER TO BE MIN. 1', MAX. 15' FROM THE PROPERTY LINE. STANDARD LOCATION IS 1' FROM METER BOX UNLESS SPECIFICALLY APPROVED OTHERWISE IN ADVANCE BY THE CITY INSPECTOR.

BACKFLOW PREVENTER TO BE PROVIDED, INSTALLED, OWNED AND MAINTAINED BY CUSTOMER.

CONTRACTOR TO SUBMIT DEVICE SPECIFICATIONS TO CITY FOR APPROVAL PRIOR TO ORDERING AND INSTALLATION.

BACKFLOW TEST REPORT IS REQUIRED IMMEDIATELY FOLLOWING METER INSTALLATION.

* NOTE: BYPASS SIZE CAN BE REDUCED, AS APPROVED IN ADVANCE BY THE CITY. IF 2" BYPASS IS APPROVED, THEN PIPE SHALL BE 2" SDR–9 HDPE POLYTUBING (NO MJ BENDS) WITH BALL VALVE WITH BOX AND COVER.

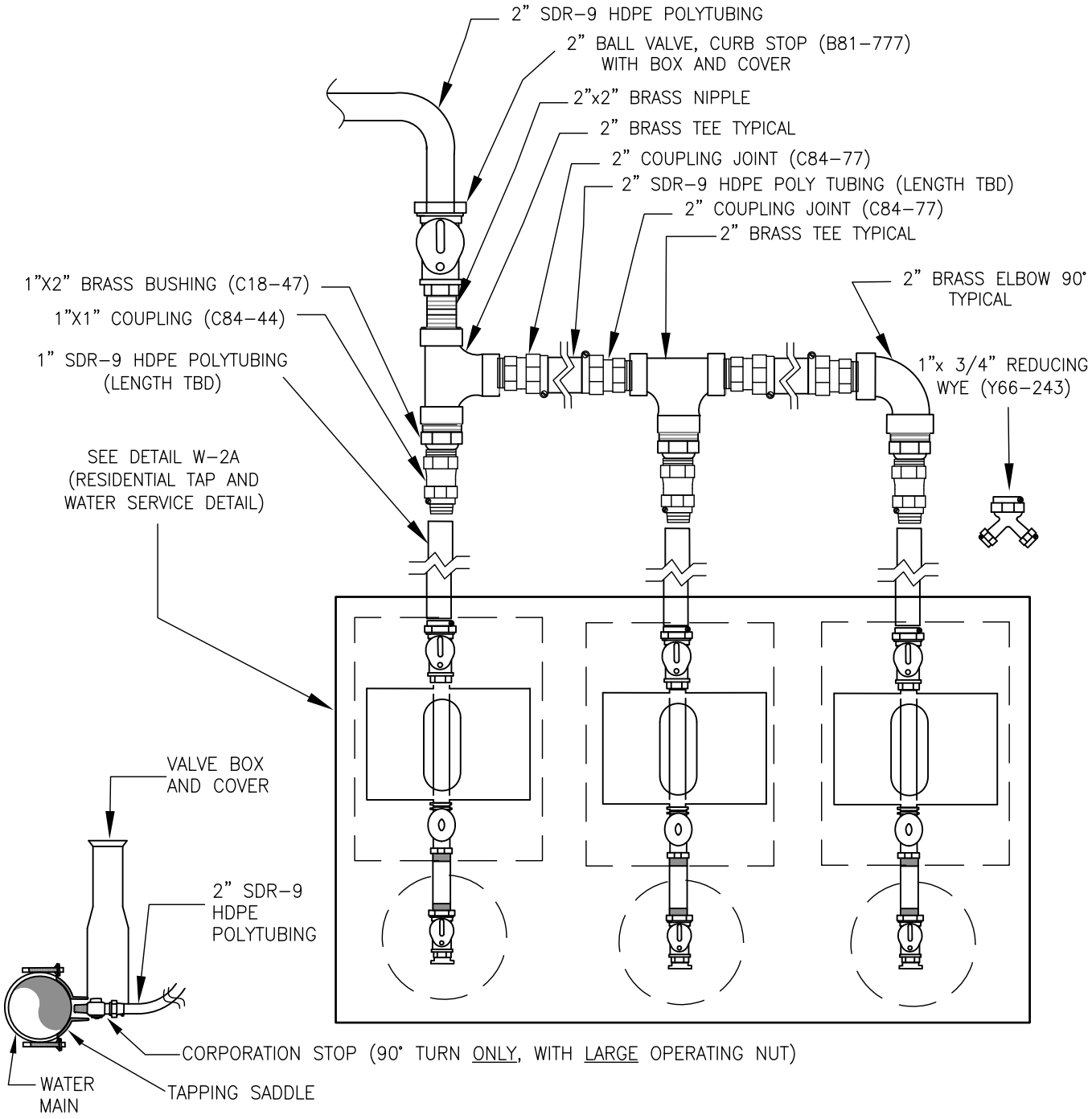
NOTES:

1. THIS DETAIL IS MEANT TO PROVIDE THE INTENDED LAYOUT FOR LARGE TAPS AND METERS. THIS DETAIL WILL NOT APPLY EXACTLY AS DRAWN TO ALL INSTALLATIONS DUE TO SPECIFIC SITE CONDITIONS.
2. THE PROJECT ENGINEER SHALL PROVIDE A SITE–SPECIFIC DRAWING TO THE CITY ENGINEER FOR APPROVAL PRIOR TO ORDERING MATERIALS AND PRIOR TO INSTALLATION.
3. CONTRACTOR TO PROVIDE AND INSTALL ALL MATERIALS EXCEPT THE WATER METER. CITY OF ST. AUGUSTINE WILL INSTALL THE WATER METER IN THE METER BOX ASSEMBLY THAT IS FULLY CONSTRUCTED BY THE CONTRACTOR IN ACCORDANCE WITH THIS DETAIL.
4. ALL MATERIALS TO CONFORM TO CITY OF ST. AUGUSTINE LIST OF APPROVED MATERIALS AND MANUFACTURERS, OR PRE–APPROVED EQUAL.
5. SHOP DRAWINGS ARE REQUIRED FOR METER BOX. BOX TO BE LARGE ENOUGH TO ACCOMMODATE MINIMUM CLEARANCE DIMENSIONS SHOWN ON THIS DETAIL.
6. LID TO BE DOUBLE–HATCHED ALUMINUM WITH HANDLES. (PROVIDE SHOP DRAWING.)
7. LOCATE WIRE IS REQUIRED FROM EXISTING WATER MAIN TO METER BOX. SEE LOCATE WIRE DETAILS.
8. METER ASSEMBLY AND BYPASS PIPE TO BE DUCTILE IRON, UNLESS APPROVED OTHERWISE IN ADVANCE BY THE CITY ENGINEER. PVC C–900 MAY BE USED BETWEEN TAP AND BYPASS TEE, IF APPROVED BY CITY ENGINEER.
9. ALL VALVES AND FITTINGS TO BE DUCTILE IRON RESTRAINED JOINT, UNLESS APPROVED OTHERWISE IN ADVANCE BY THE CITY ENGINEER.
10. PIPE FROM TAP TO BYPASS TEE SHALL BE RESTRAINED AS NECESSARY. SEE MECHANICAL RESTRAINT DETAILS.
11. PIPE AND FITTINGS TO BE SAME SIZE AS METER. MINIMUM 4" TAP (3" TAPS ARE NOT ALLOWED). SERVICE LINE MAY BE REDUCED TO 3" AFTER TAPPING VALVE FOR 3" METER. BYPASS SIZE MAY BE REDUCED, AS APPROVED IN ADVANCE BY THE CITY ENGINEER.
12. MAXIMUM DEPTH OF LARGE WATER METERS SHALL BE 36".
13. MINIMUM SPOOL PIECE LENGTH IS 30".
14. MINIMUM LENGTH OF STRAIGHT PIPE TO BE INSTALLED FROM TAPPING VALVE TO METER BOX SHALL BE EQUAL TO 8 PIPE DIAMETERS, AND SHALL NOT BE LESS THAN 30", UNLESS APPROVED OTHERWISE BY THE CITY ENGINEER.
15. TURBINE METER INSTALLATIONS REQUIRE A TEST TEE TO BE INSTALLED BETWEEN THE METER AND VALVE ON THE CUSTOMER SIDE OF THE METER.

C.O.S.A.

3" OR 4" WATER METER SET–UP WITH BACKFLOW PREVENTER CONFIGURATION (ALTERNATE)

REVISION DATE:	FEB 2017
NOT TO SCALE	W–2D (ALT)



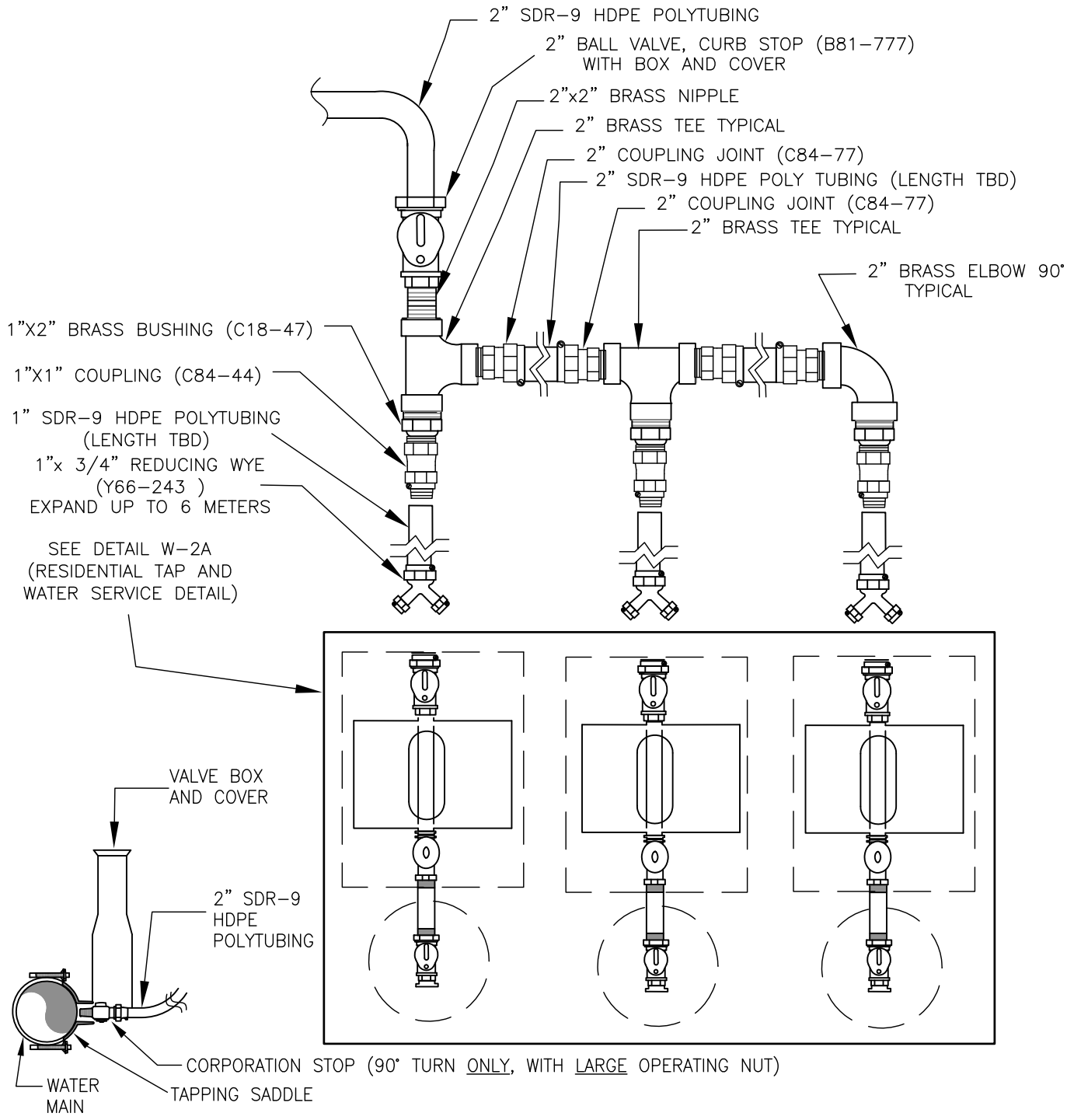
NOTES:

1. METER MANIFOLD MAY BE EXTENDED UP TO A MAXIMUM OF SIX (6) METERS.
2. METER YOKE AND BOX DETAIL AT W-2A (3/4" AND 1" RESIDENTIAL TAP AND WATER SERVICE DETAIL).
3. ALL MATERIALS MUST CONFORM TO CITY OF ST. AUGUSTINE LIST OF APPROVED MATERIALS AND MANUFACTURERS, OR PRE-APPROVED EQUAL.
4. ALL FITTINGS TO BE BRASS, UNLESS SPECIFICALLY APPROVED OTHERWISE BY THE CITY.
5. CONTRACTOR TO PROVIDE AND INSTALL ALL MATERIALS EXCEPT THE WATER METER. CITY OF ST. AUGUSTINE WILL INSTALL THE WATER METER IN THE METER BOX ASSEMBLY THAT IS FULLY CONSTRUCTED BY THE CONTRACTOR IN ACCORDANCE WITH THIS DETAIL.

C.O.S.A.

MANIFOLD INSTALLATION FOR MULTIPLE SMALL METERS (LIMIT 3 METERS)

REVISION DATE:	FEB 2017
NOT TO SCALE	W-3



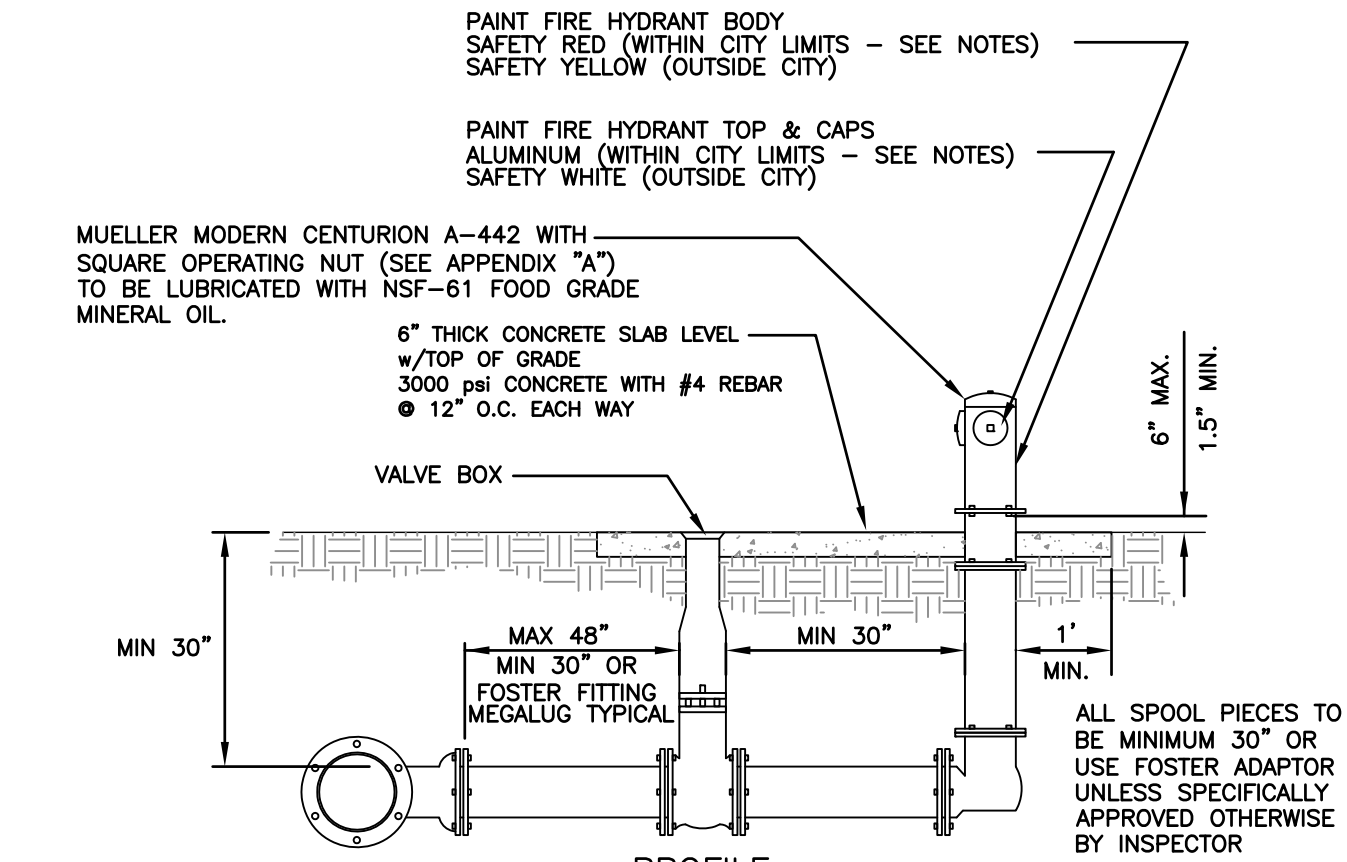
NOTES:

1. METER MANIFOLD MAY BE EXTENDED UP TO A MAXIMUM OF SIX (6) METERS.
2. METER YOKE AND BOX DETAIL AT W-2A (3/4" AND 1" RESIDENTIAL TAP AND WATER SERVICE DETAIL).
3. ALL MATERIALS MUST CONFORM TO CITY OF ST. AUGUSTINE LIST OF APPROVED MATERIALS AND MANUFACTURERS, OR PRE-APPROVED EQUAL.
4. ALL FITTINGS TO BE BRASS, UNLESS SPECIFICALLY APPROVED OTHERWISE BY THE CITY.
5. CONTRACTOR TO PROVIDE AND INSTALL ALL MATERIALS EXCEPT THE WATER METER. CITY OF ST. AUGUSTINE WILL INSTALL THE WATER METER IN THE METER BOX ASSEMBLY THAT IS FULLY CONSTRUCTED BY THE CONTRACTOR IN ACCORDANCE WITH THIS DETAIL.

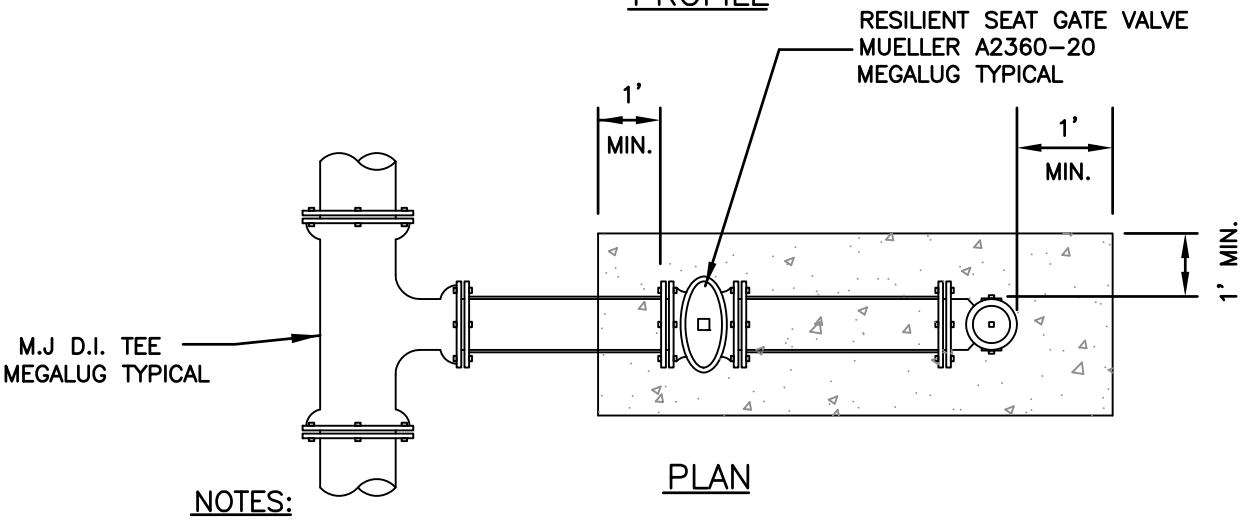
C.O.S.A.

MANIFOLD INSTALLATION FOR MULTIPLE SMALL METERS (LIMIT 6 METERS)

REVISION DATE:	FEB 2017
NOT TO SCALE	W-3A



PROFILE



PLAN

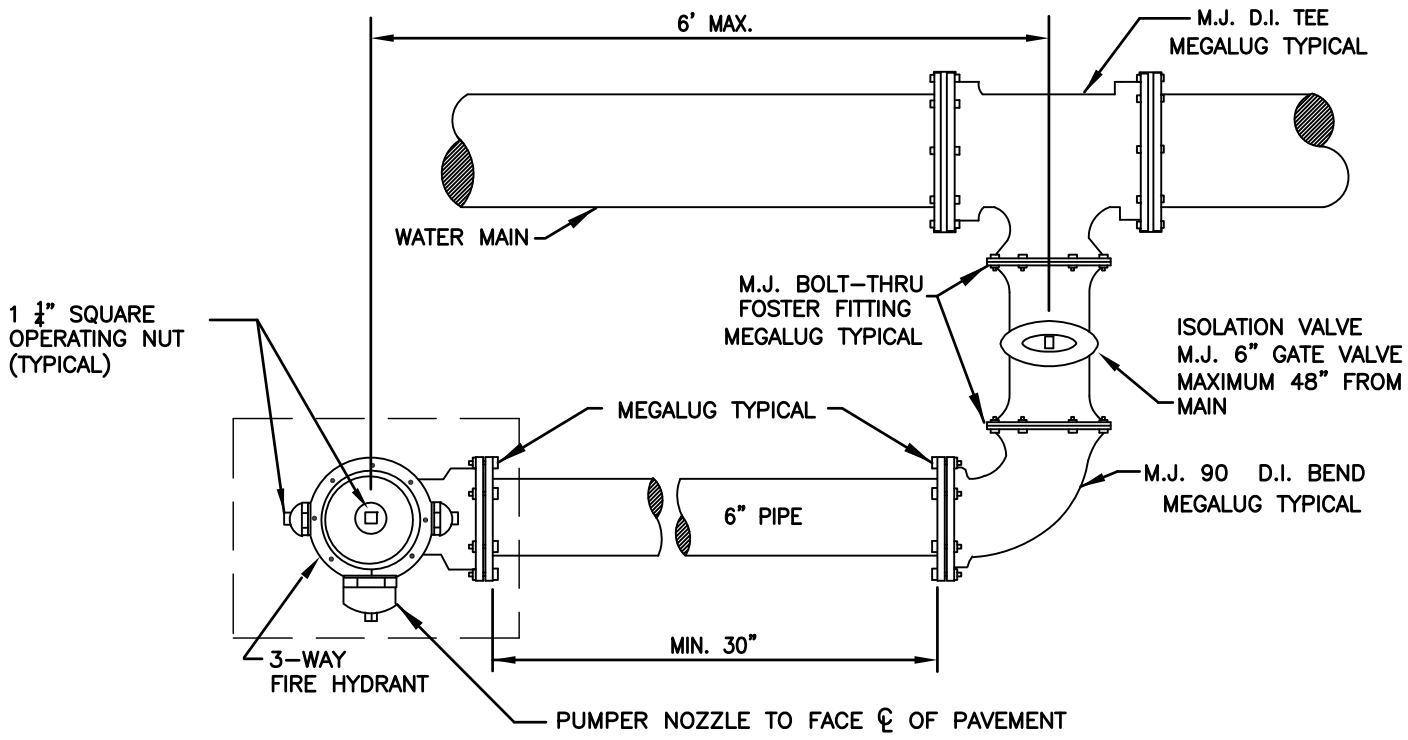
NOTES:

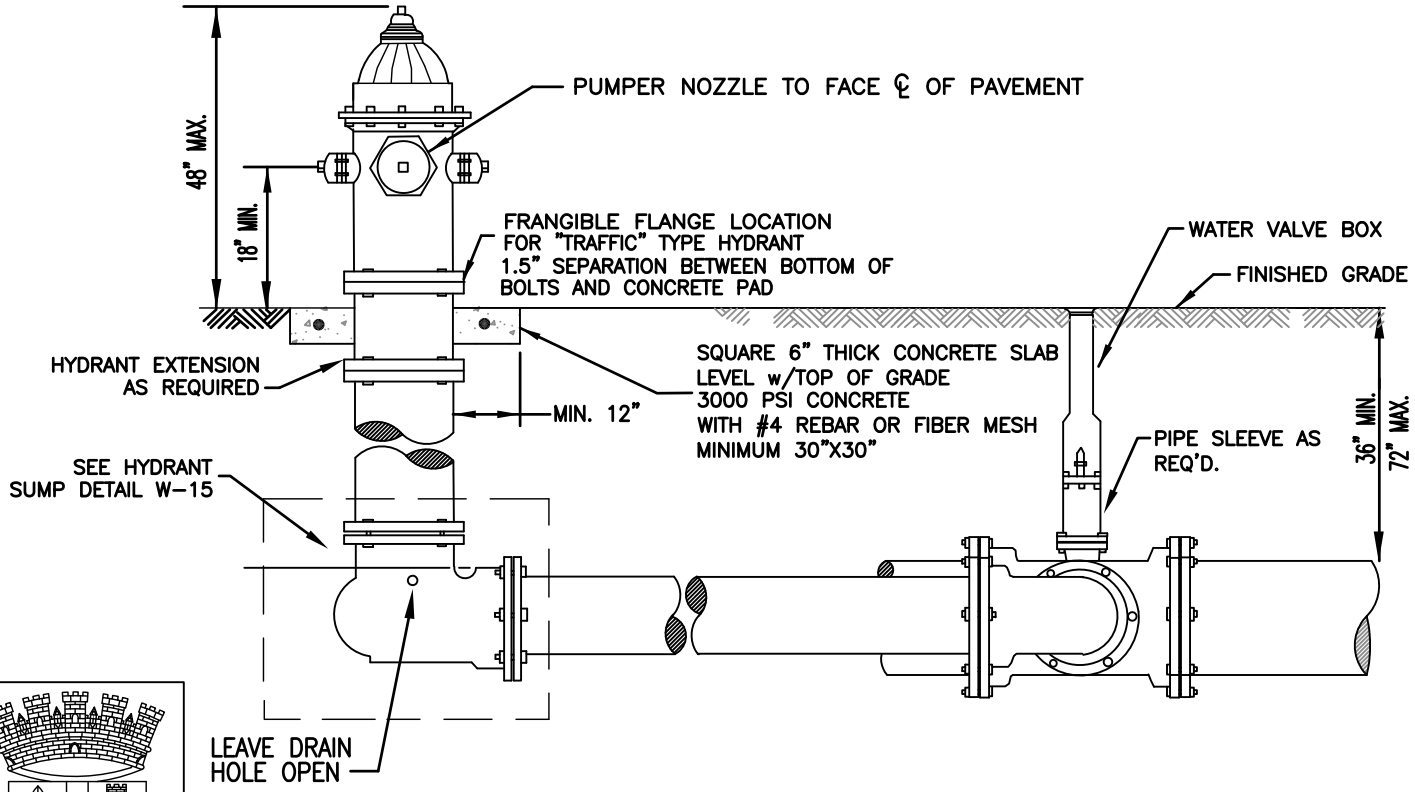
1. ALL METAL PARTS OF THE HYDRANT BOTH INSIDE AND OUTSIDE SHALL BE PAINTED BY THE CONTRACTOR IN ACCORDANCE WITH AWWA C501.
2. ALL INSIDE SURFACES AND THE OUTSIDE SURFACES BELOW THE GROUND LINE SHALL BE COATED WITH TWO (2) COATS OF ASPHALT VARNISH IN COMPLIANCE WITH NSF–61, THE FIRST COAT HAVING DRIED THOROUGHLY BEFORE THE SECOND IS APPLIED.
3. THE OUTSIDE OF THE HYDRANT ABOVE THE FINISHED GRADE LINE SHALL BE THOROUGHLY CLEANED AND PAINTED BY THE CONTRACTOR WITH ONE (1) COAT OF PRIMER PAINT OF A DURABLE COMPOSITION.
4. HYDRANTS LOCATED WITHIN CITY LIMITS SHALL BE PAINTED BY THE CONTRACTOR WITH ONE (1) ADDITIONAL COAT OF SAFETY RED AND ALUMINUM GLOSS ENAMEL PAINT, URETHANE ALKYD OR OTHER INDUSTRIAL COATING (SEE DETAIL). HYDRANTS LOCATED OUTSIDE CITY LIMITS SHALL BE PAINTED ACCORDING TO COUNTY SPECIFICATIONS.
5. SPOOL PIECE TO BE MIN. 30" OR USE FOSTER ADAPTOR APPROVED IN ADVANCE BY CITY.

C.O.S.A.

FIRE HYDRANT INSTALLATION

REVISION DATE:	FEB 2017
NOT TO SCALE	W–12

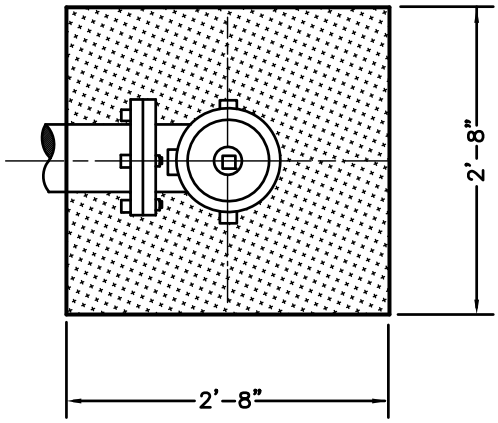


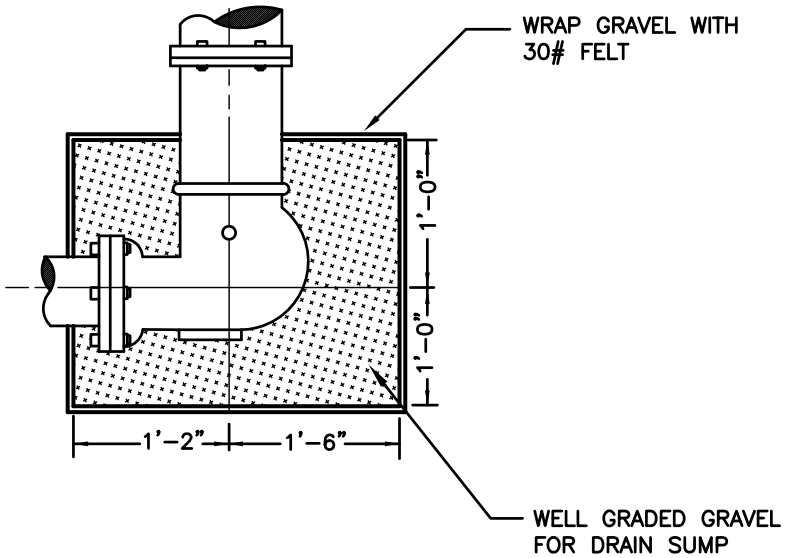


C.O.S.A.

HYDRANT INSTALLATION LIMITED SPACE

REVISION DATE:	FEB 2017
NOT TO SCALE	W-14

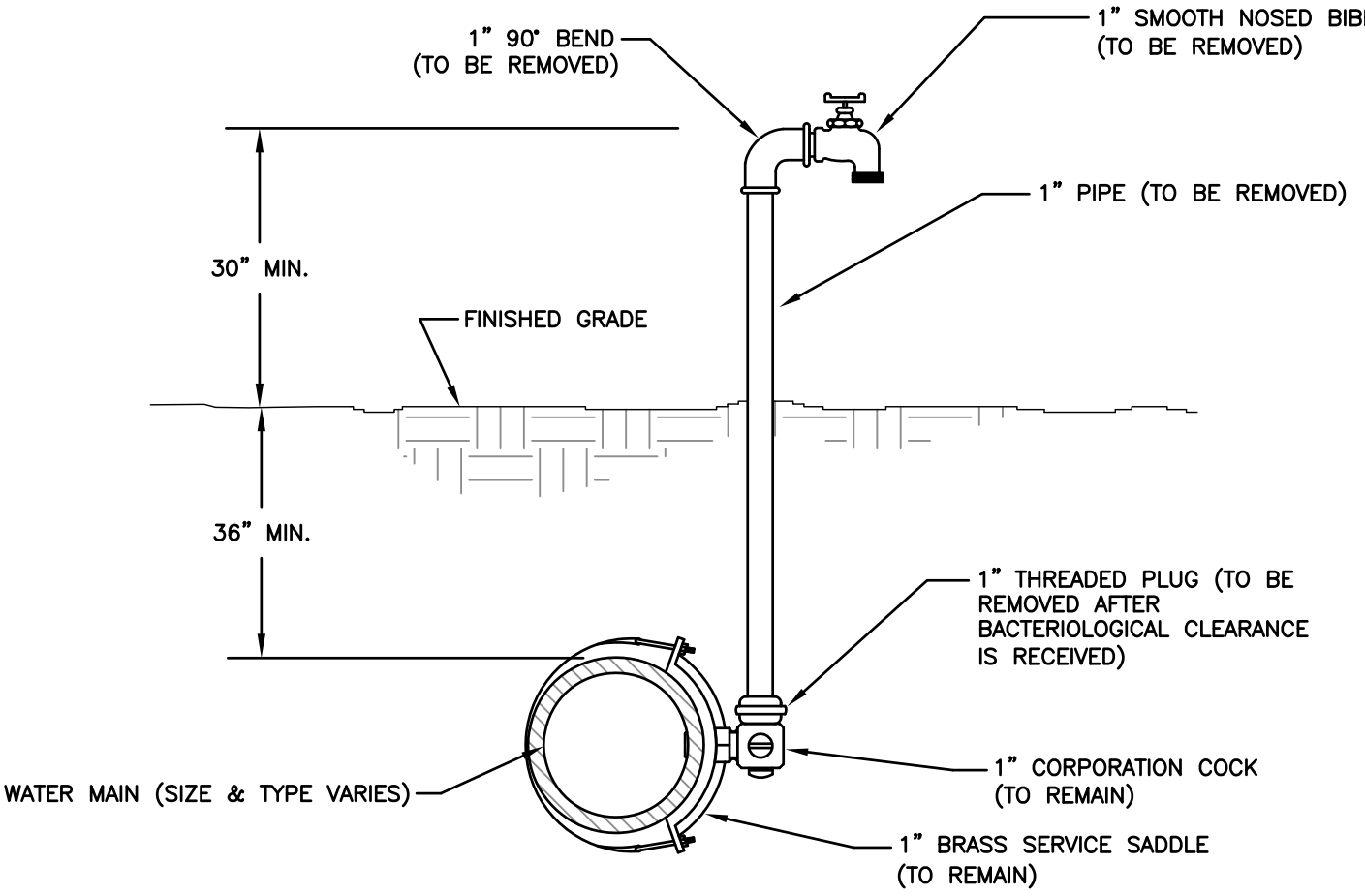




C.O.S.A.

FIRE HYDRANT SUMP

REVISION DATE:	FEB 2017
NOT TO SCALE	W–15



NOTES:

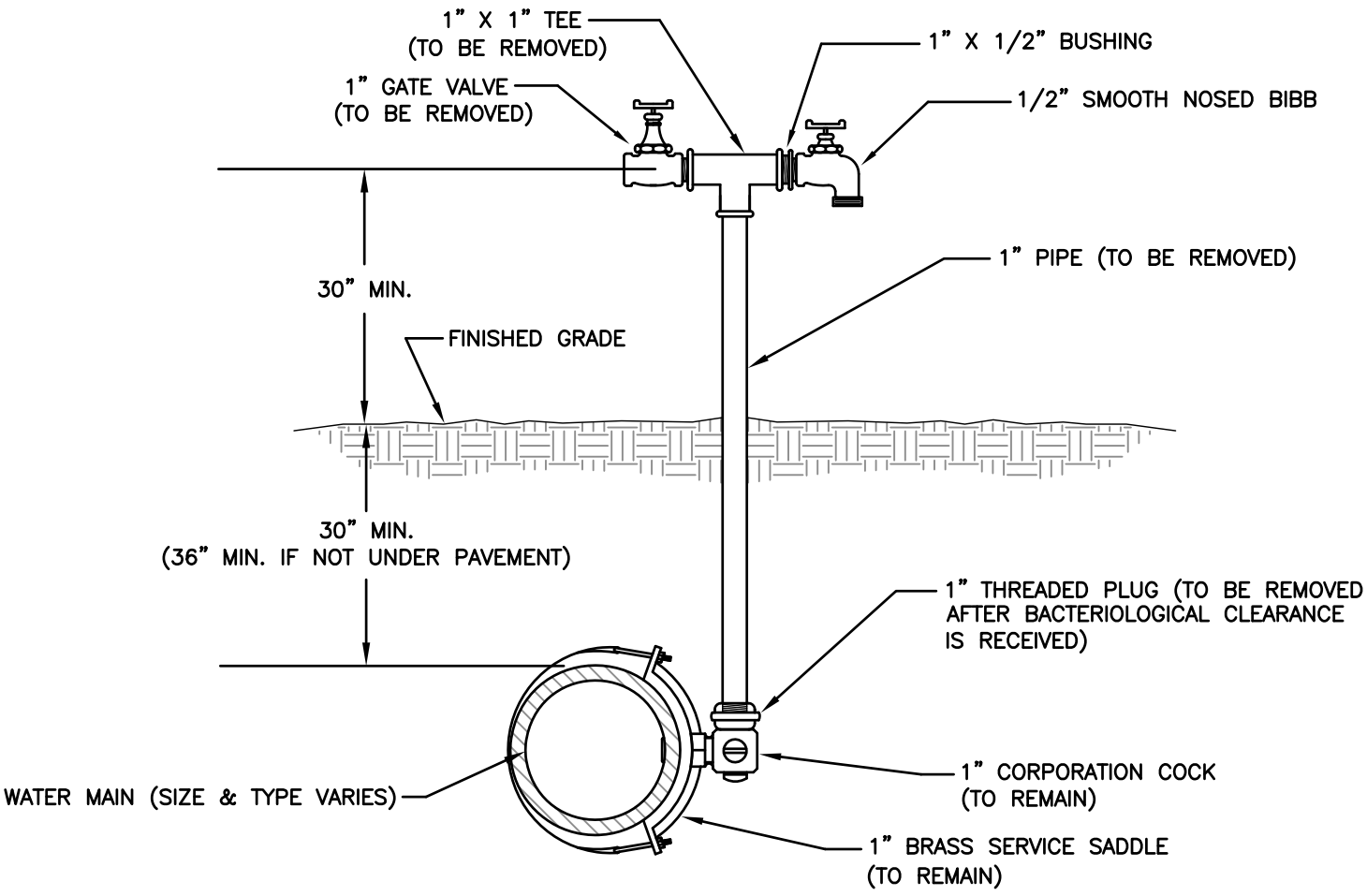
1) LOCATION OF SAMPLE POINT BIBB SHALL NOT BE WITHIN THE ROADWAY BUT SHALL BE ROUTED TO THE ROADWAY SHOULDERS (NON-TRAFFIC AREAS) OF THE ROAD (WHERE APPLICABLE).

2) THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL PIPING & FITTINGS (AS NOTED IN THIS DETAIL) AFTER BACTERIOLOGICAL CLEARANCE IS RECEIVED.

C.O.S.A.

TEMPORARY SAMPLE TAP ALONG PIPE

REVISION DATE:	FEB 2017
NOT TO SCALE	W-25



NOTES:

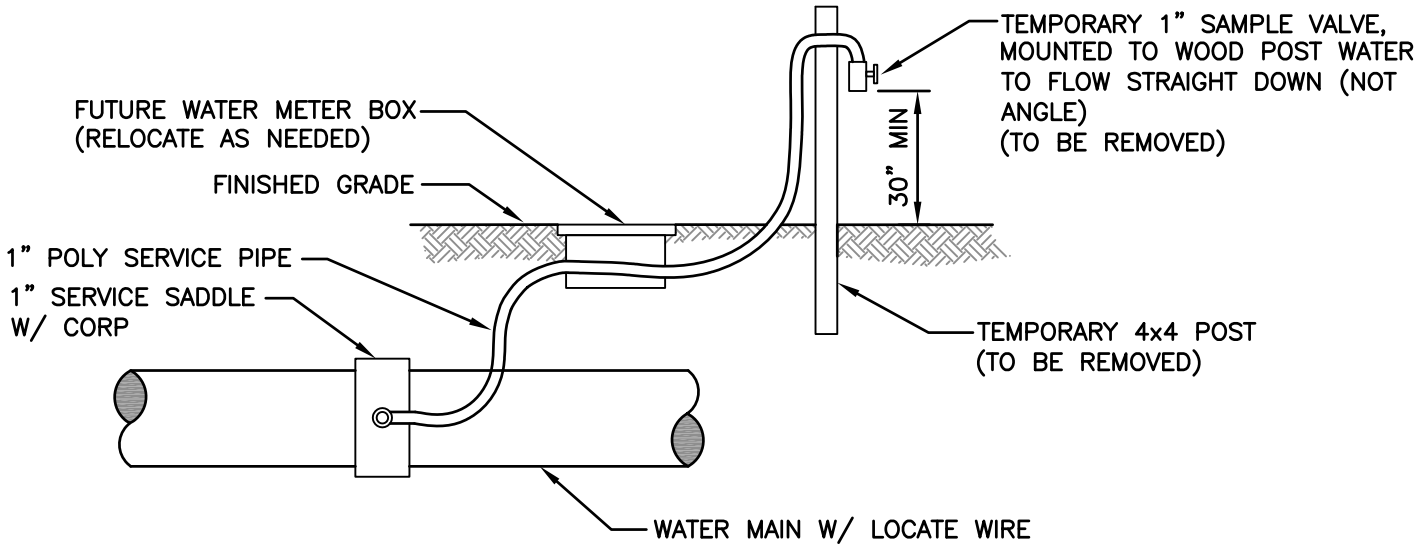
1) LOCATION OF SAMPLE POINT BIBB SHALL NOT BE WITHIN THE ROADWAY BUT SHALL BE ROUTED TO THE ROADWAY SHOULDERS (NON-TRAFFIC AREAS) OF THE ROAD (WHERE APPLICABLE).

2) THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL PIPING & FITTINGS (AS NOTED IN THIS DETAIL) AFTER BACTERIOLOGICAL CLEARANCE IS RECEIVED.

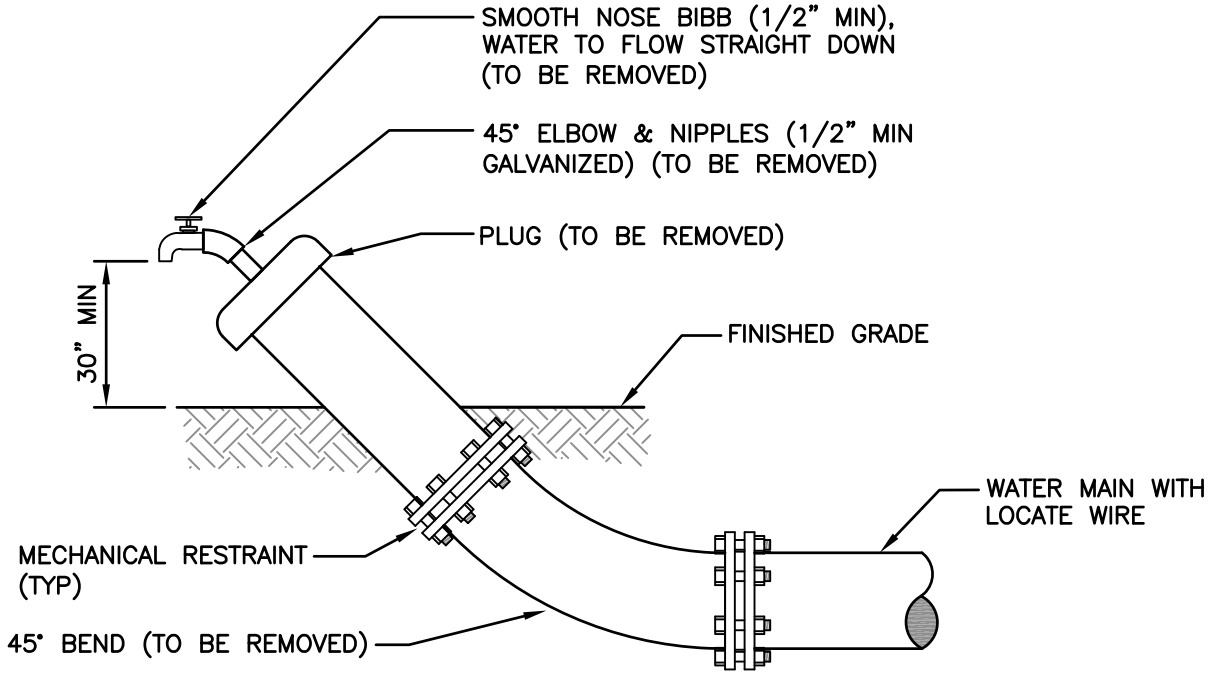
C.O.S.A.

TEMPORARY SAMPLE TAP FOR STUB OUT

REVISION DATE:	FEB 2017
NOT TO SCALE	W-26



TEMPORARY SAMPLE TAP UTILIZING A NEW 1" WATER SERVICE



TEMPORARY SAMPLE TAP UTILIZING PLUG AT FLUSHING LOCATION

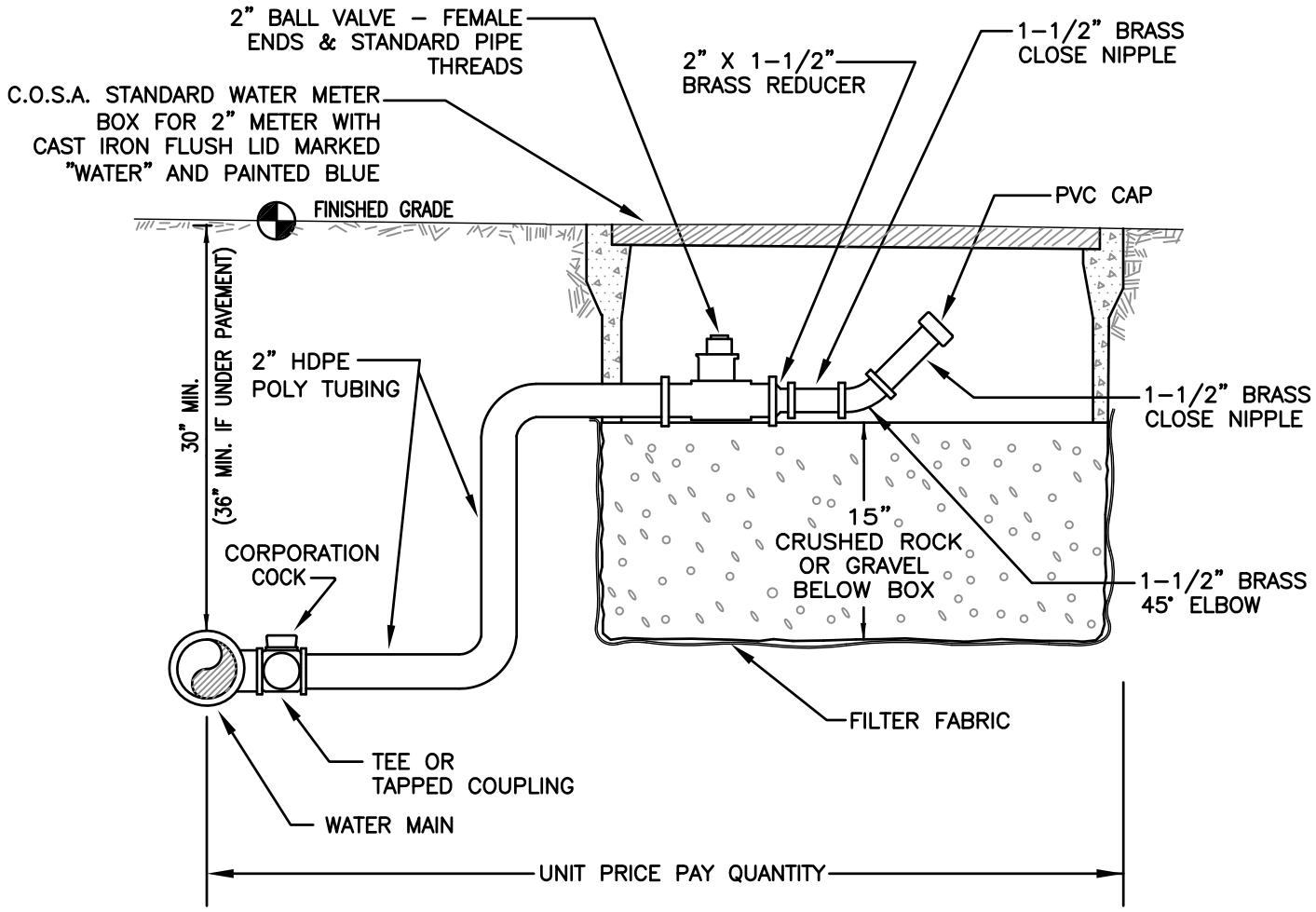
NOTES:

1. LOCATION OF SAMPLE POINT BIBB SHALL NOT BE WITHIN THE ROADWAY BUT ROUTED TO THE ROAD SHOULDERS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL TEMPORARY PIPING & FITTINGS (AS NOTED) AFTER BACTERIOLOGICAL CLEARANCE IS RECEIVED.
3. THE CONTRACTOR SHALL UTILIZE THE ABOVE ALTERNATIVE METHODS FOR CONSTRUCTION OF TEMPORARY SAMPLE POINTS IN ALL AREAS, WHERE POSSIBLE.
4. THE CONTRACTOR SHALL COMPLY WITH ALL C.O.S.A. RULES AND POLICIES AS OUTLINED BY C.O.S.A'S INSPECTOR OR C.O.S.A'S ENGINEER AND OTHER ASSOCIATED C.O.S.A. STANDARDS.

C.O.S.A.

TEMPORARY SAMPLE TAP ALTERNATIVE METHODS

REVISION DATE:	FEB 2017
NOT TO SCALE	W–27



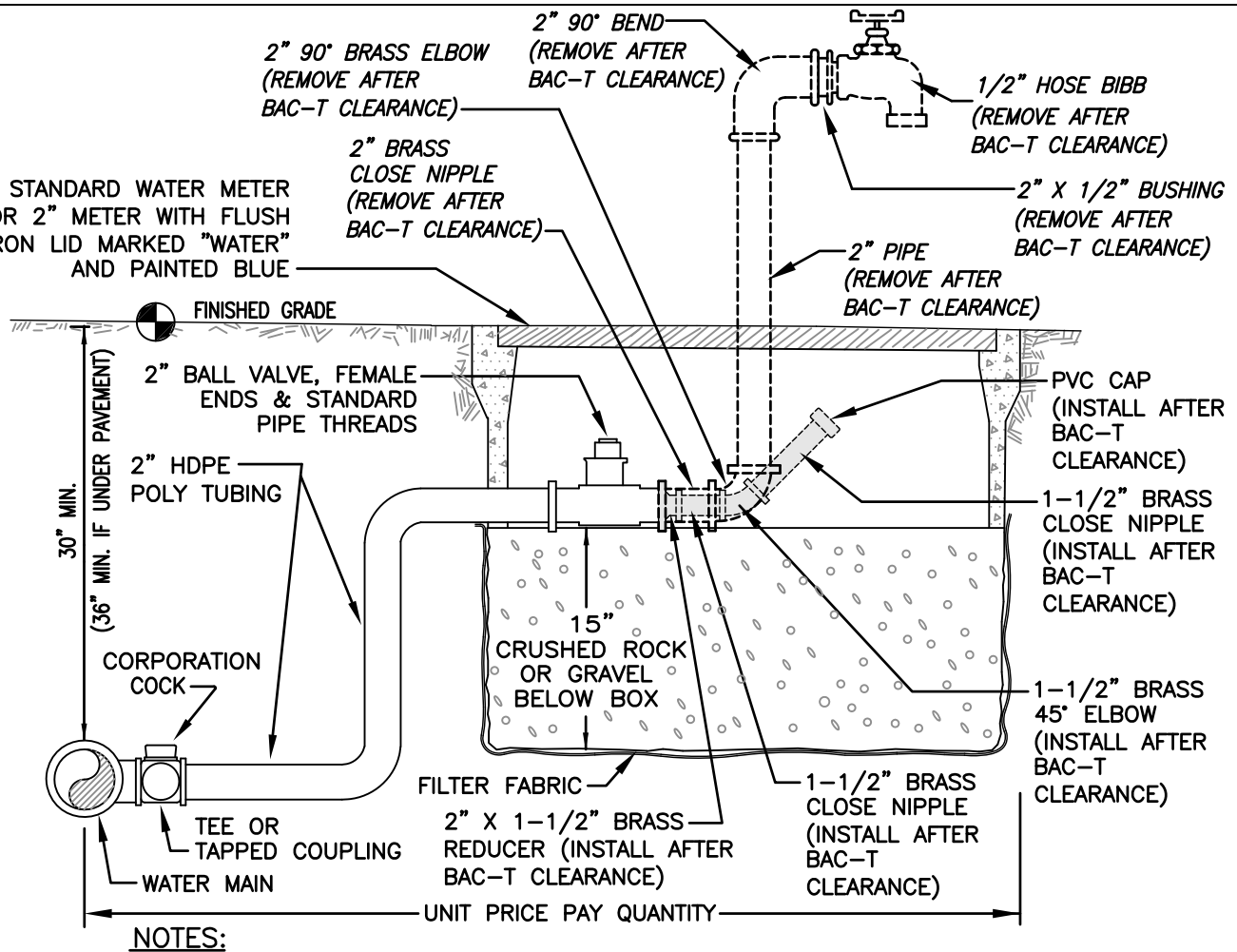
NOTES:

1) TO BE USED ONLY IN AREAS NOT SUBJECT TO FLOODING.
2) BELOW GRADE FLUSHING VALVES REQUIRED ON ALL DEAD ENDS & STUB OUTS NOT IN FLOOD AREAS.

C.O.S.A.

FLUSHING VALVE BELOW GRADE

REVISION DATE:	FEB 2017
NOT TO SCALE	W–28



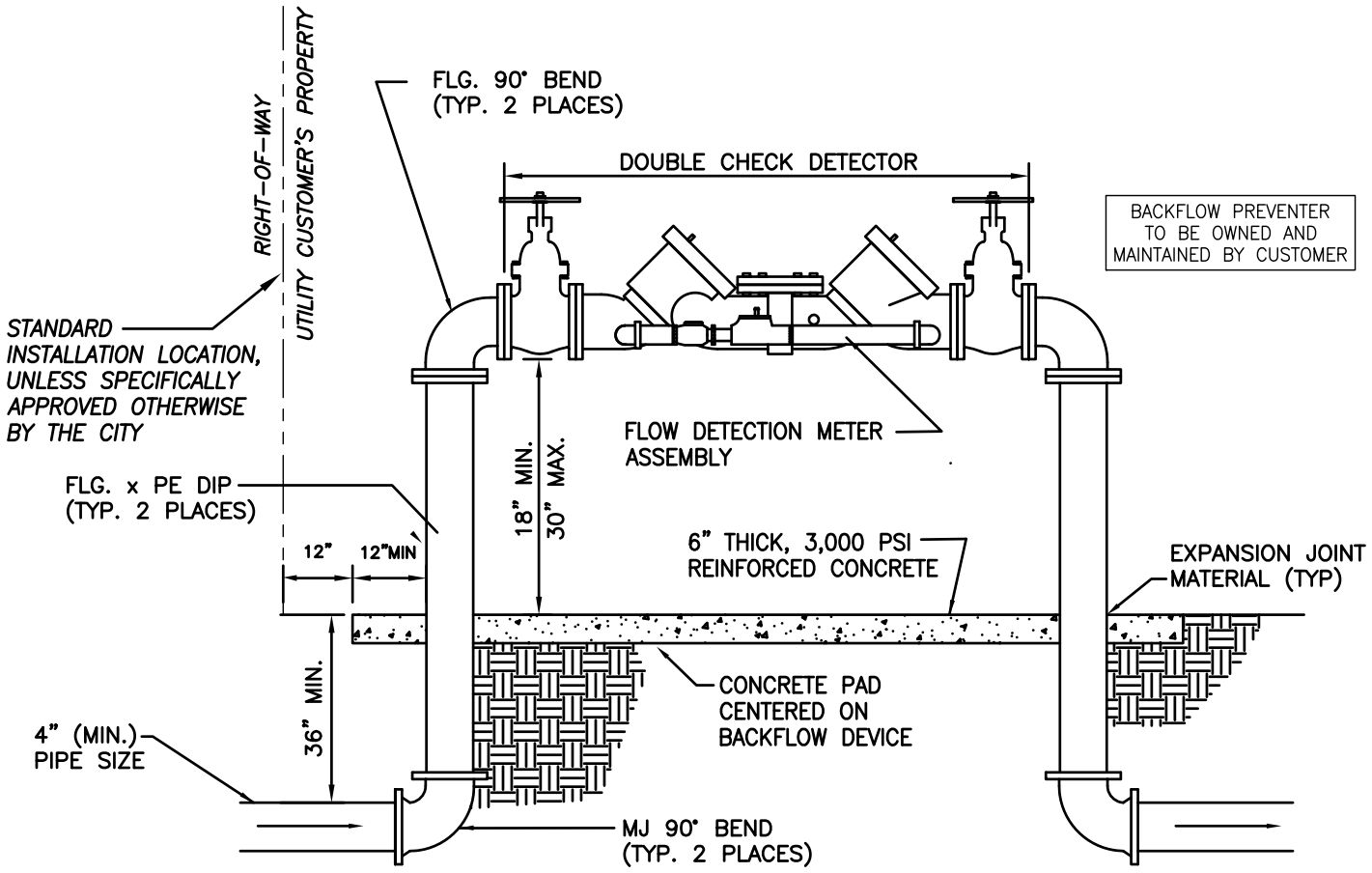
NOTES:

1) TO BE USED ONLY IN AREAS NOT SUBJECT TO FLOODING.
2) BELOW GRADE FLUSHING VALVES REQUIRED ON ALL DEAD ENDS & STUB OUTS NOT IN FLOOD AREAS. SEE ALSO BELOW GRADE FLUSHING VALVE DETAIL W-28.
3) THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL PIPING & FITTINGS (AS NOTED IN THIS DETAIL) AFTER BACTERIOLOGICAL CLEARANCE IS RECEIVED.
4) THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF ALL PIPING & FITTINGS (AS NOTED IN THIS DETAIL) AFTER BACTERIOLOGICAL CLEARANCE IS RECEIVED.

C.O.S.A.

TEMPORARY SAMPLE TAP IN BELOW GRADE FLUSHING VALVE

REVISION DATE:	FEB 2017
NOT TO SCALE	W-28A

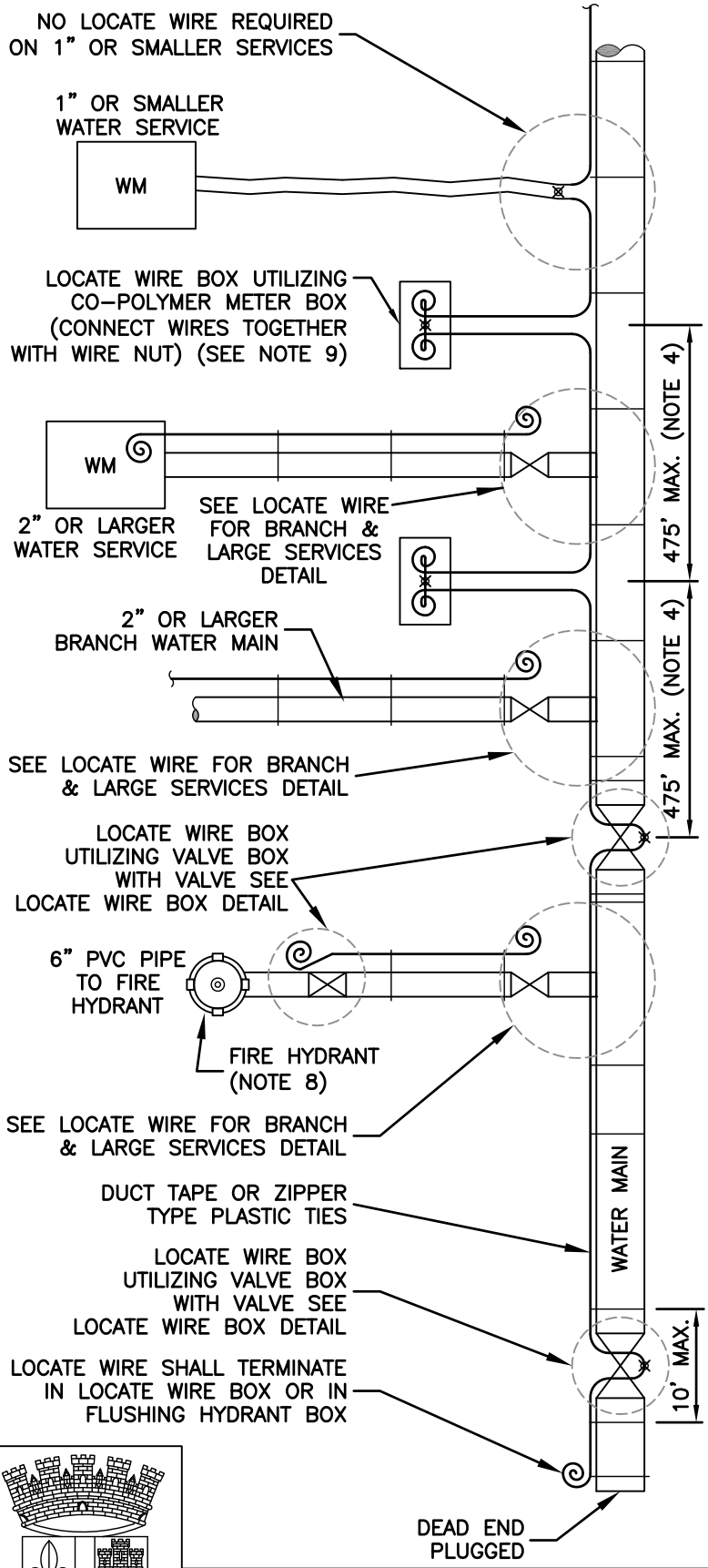


NOTE: 1. LOCATE WIRE IS REQUIRED ON ALL 2" AND LARGER WATER SERVICES. SEE LOCATE WIRE DETAILS.
2. REDUCED PRESSURE DETECTOR ASSEMBLY REQUIRED FOR CHEMICAL FIRE PROTECTION SYSTEMS OR IF CONNECTED TO AUXILIARY WATER SOURCE.

C.O.S.A.

FIRE SERVICE DOUBLE CHECK DETECTOR ASSEMBLY 3" – 10"

REVISION DATE:	FEB 2017
NOT TO SCALE	W–48



NOTES:

1. LOCATING WIRE TO BE INSTALLED IN EITHER THE ONE OR ELEVEN O'CLOCK POSITION ON ALL DUCTILE IRON OR PVC (PRESSURE MAINS). LOCATE WIRE SHALL ALSO BE INSTALLED ON ALL (HDPE) POLY MAIN PIPING (1:00 OR 11:00 POSITION, IF POSSIBLE).

2. SECURE LOCATING WIRE TO PVC & D.I.P. WATER MAIN BY USE OF DUCT TAPE OR ZIPPER TYPE PLASTIC TIE STRAPS SPACED AT A MAXIMUM DISTANCE OF TEN (10') AND AT EACH SIDE OF BELL JOINT OR FITTING.

3. THE ENTIRE LOCATING SYSTEM SHALL BE INSPECTED BY THE COSA PRIOR TO BACKFILLING. AFTER BACKFILLING, THE ENTIRE LOCATING SYSTEM SHALL BE TESTED BY A CERTIFIED UTILITY LOCATOR OR BY A LICENSED ELECTRICAL CONTRACTOR TO DETERMINE ITS RELIABILITY AND CONTINUITY, WITH THE TEST REPORT SUBMITTED TO THE COSA. THE COSA SHALL BE NOTIFIED 72 HOURS IN ADVANCE OF ANY LOCATE WIRE TESTING. WHERE INSTALLED UNDER PAVEMENT AREAS, TESTING SHALL BE DONE PRIOR TO THE PLACEMENT OF PAVEMENT. IF ANY LOCATION IS IDENTIFIED WHERE THE TRACER WIRE IS NOT CONTINUOUS, THE CONTRACTOR, AT NO ADDITIONAL COST TO THE OWNER, SHALL MAKE NECESSARY REPAIRS.

4. LOCATING WIRE SHALL TERMINATE WITHIN AN ACTIVE VALVE BOX (WITH A VALVE) OR A METER BOX (IF NO VALVE) AT MAXIMUM 475' INTERVALS. SEE DETAIL LOCATE WIRE BOX. WIRE CONNECTIONS BELOW GROUND (OUTSIDE OF A BOX) SHALL BE AVOIDED.

5. LOCATING WIRE SHALL BE 10 GAUGE, SINGLE STRAND, UF RATED (DIRECT BURIAL), COPPER WIRE WITH 30 MIL (MIN.) INSULATION WITH EITHER WHITE OR YELLOW COLOR. FOR HDD INSTALLATIONS, THE LOCATE WIRE SHALL BE 12 AWG COPPER-CLAD CARBON STEEL WITH 30 MILS (MIN) INSULATION, AS SPECIFIED IN SECTION 33 OF THE COSA STANDARDS AND SPECIFICATIONS DESIGN MANUAL, LATEST EDITION.

6. "⊠" INDICATES THAT THE WIRES ARE CONNECTED TOGETHER.

7. "@" INDICATES A WIRE PIG-TAIL (12" LONG).

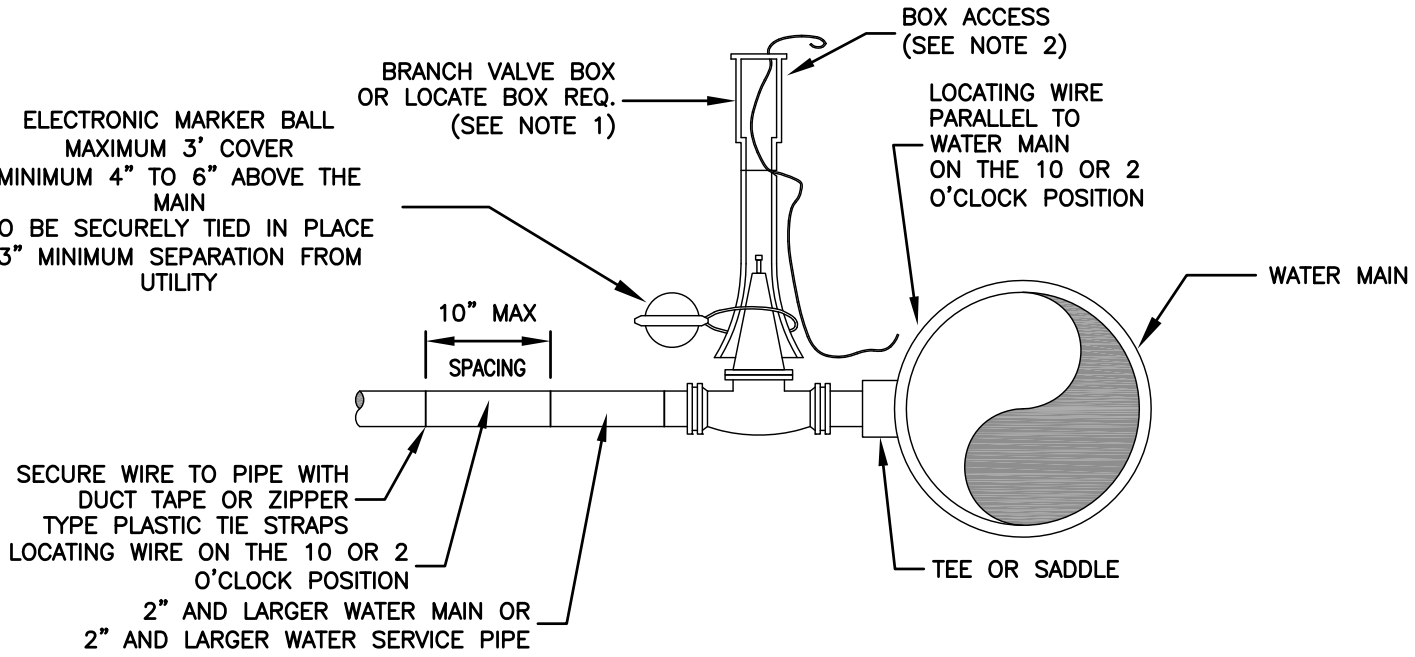
8. FOR FIRE, HYDRANT LOCATE WIRE IS ONLY REQUIRED IF THE DISTANCE BETWEEN TAPPING VALVE AND HYDRANT IS OVER 15 LINEAR FEET. IF LOCATE IS REQUIRED, THE WIRE SHALL BE ROUTED FROM THE TAPPING VALVE TO A LOCATE WIRE BOX (LOCATE NEXT TO HYDRANT).

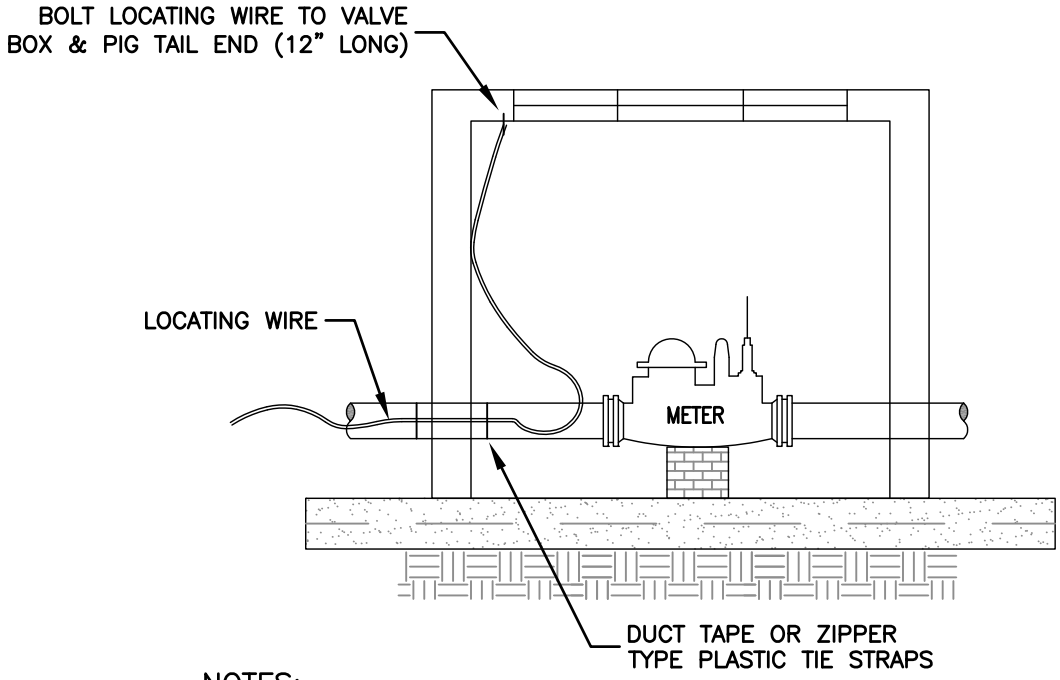
9. AN "LW" CUT SHALL BE CARVED IN THE CONCRETE CURB AND PAINTED AT ALL LOCATE WIRE BOXES.

C.O.S.A.

LOCATE WIRE CONSTRUCTION FOR WATER MAINS

REVISION DATE:	FEB 2017
NOT TO SCALE	W-56





NOTES:

1. BE AWARE THAT THE BRANCH WIRE IS NOT CONNECTED TO THE MAIN WIRE.

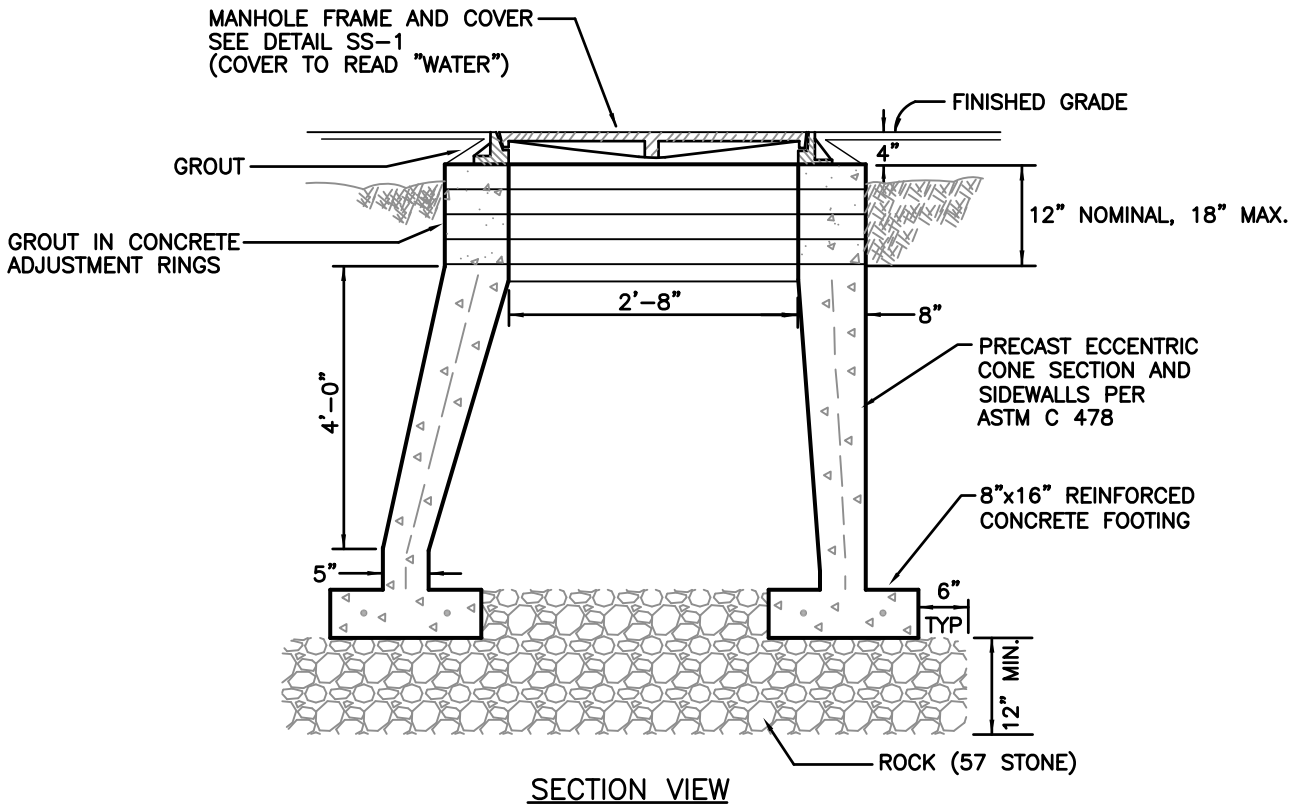
2. LOCATE WIRE SHALL ENTER THE VALVE BOX THROUGH A 3/4"ø (MIN) HOLE OR SHALL BE ROUTED THROUGH THE JOINTS OF THE VALVE BOX ADJUSTMENT SECTION.

3. SEE ADDITIONAL NOTES AND REQUIREMENTS ON DETAIL W-56.

C.O.S.A.

LOCATE WIRE FOR BRANCH WATER MAINS AND LARGE SERVICES

REVISION DATE:	FEB 2017
NOT TO SCALE	W-57



SECTION VIEW

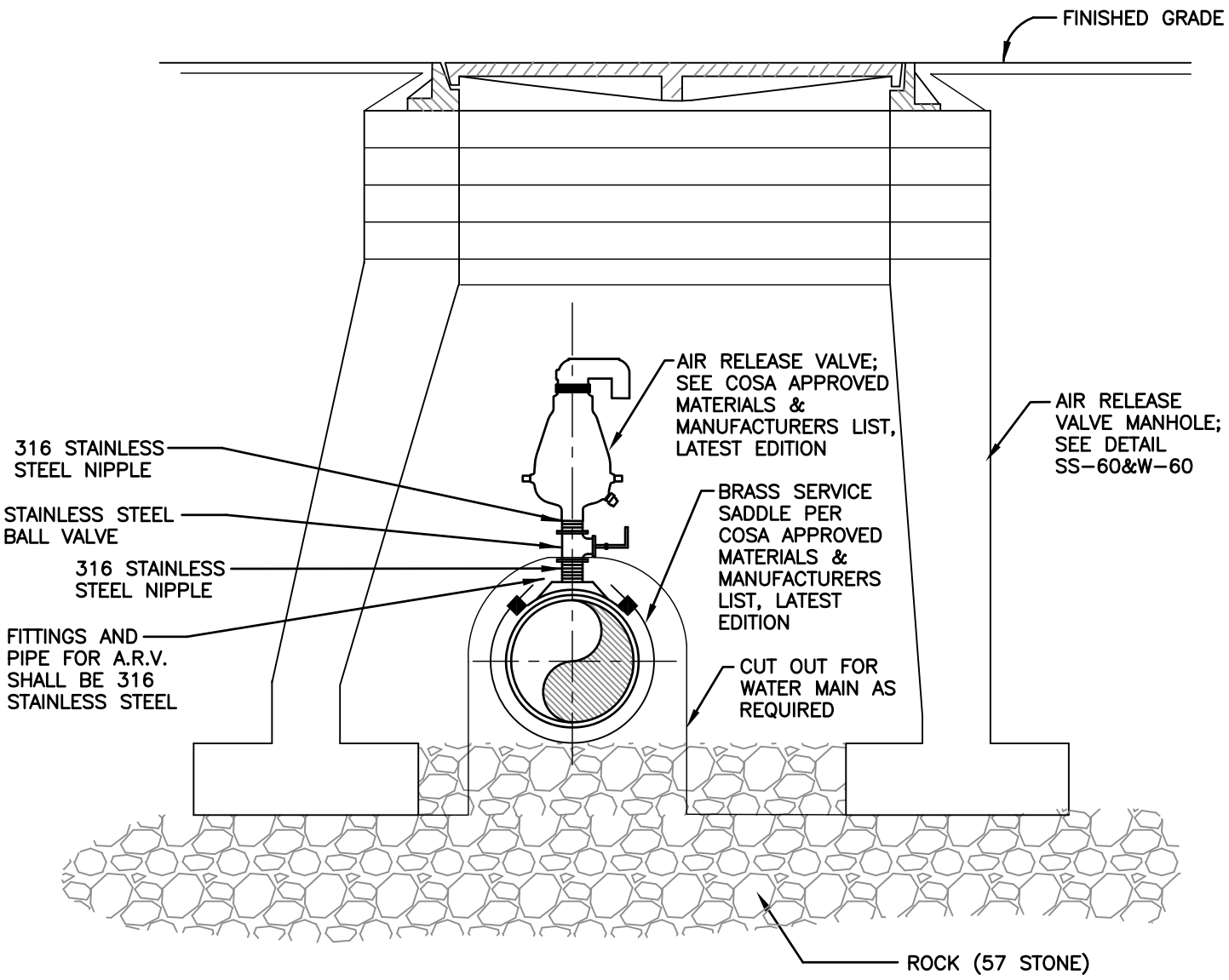
NOTES:

1. PRECAST MANHOLE SECTIONS TO BE MANUFACTURED IN ACCORDANCE WITH LATEST EDITIONS OF ASTM C478 WITH 4000 PSI CONCRETE, TYPE II CEMENT.
2. FOR AIR RELEASE VALVES FOR USE ON WATER MAINS:
   THE INTERIOR AND EXTERIOR OF MANHOLE AND ADJUSTMENT RINGS SHALL BE GIVEN ONE COAT OF WATERPROOFING MATERIAL. CS-55 BY CONCRETE SEALANTS, INC. OR APPROVED EQUAL. DO NOT COAT JOINT OR PIPE OPENING SURFACES.

C.O.S.A.

MANHOLE DETAIL FOR AIR RELEASE VALVES ON WATER MAINS

REVISION DATE:	FEB 2017
NOT TO SCALE	W-60



SECTION VIEW

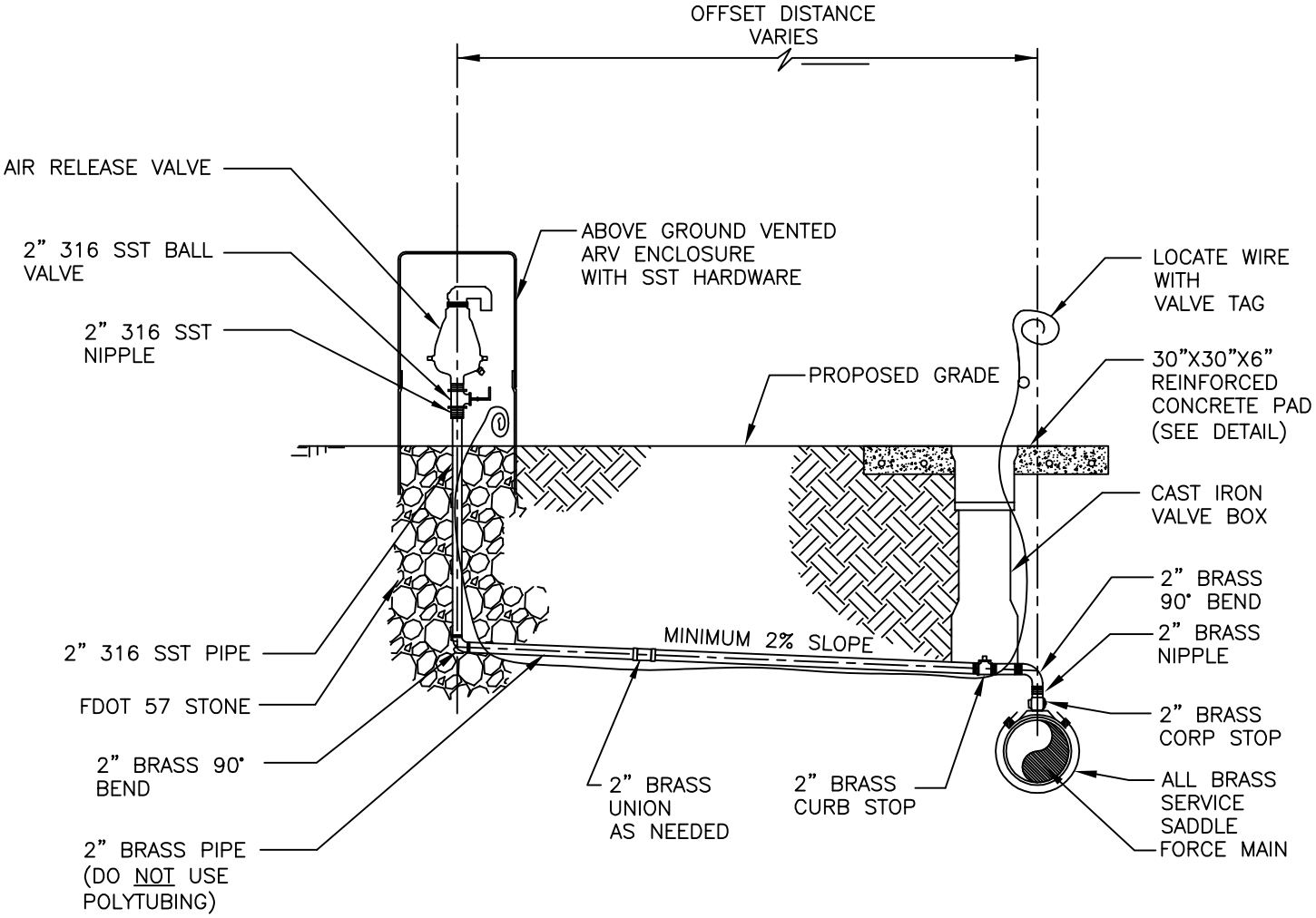
NOTES:

1. REFER TO COSA APPROVED MATERIALS & MANUFACTURERS LIST, LATEST EDITION, FOR APPROVED AIR RELEASE VALVES.
2. AIR RELEASE VALVES ASSEMBLIES TO BE LOCATED OUTSIDE ROADWAY PAVING. IF WATER MAIN LOCATION IS INSIDE PAVED AREA, OFFSET AIR RELEASE VALVE DETAIL SHALL BE USED.
3. REFER TO AIR RELEASE VALVE MANHOLE DETAIL FOR MANHOLE SPECIFICATIONS.

C.O.S.A.

AIR RELEASE VALVE DETAIL FOR USE ON WATER MAINS

REVISION DATE:	**FEB 2017**
NOT TO SCALE	**W-61**



NOTES:

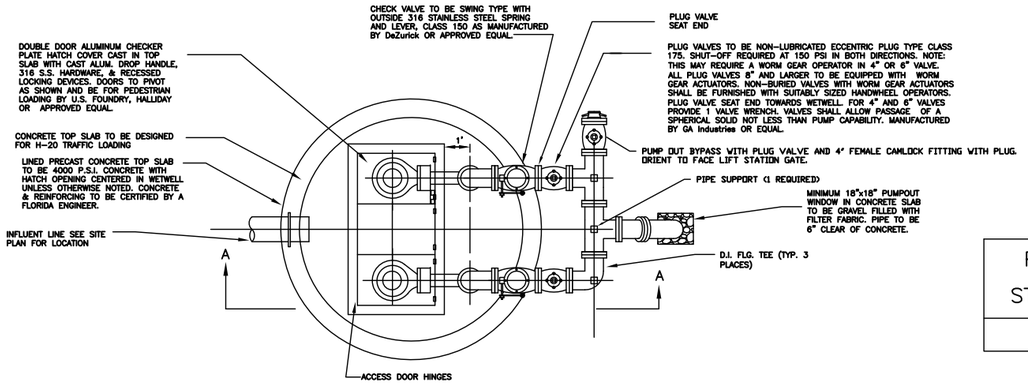
1. REFER TO COSA APPENDIX "A" APPROVED MATERIALS & MANUFACTURERS LIST, LATEST EDITION, FOR ALL MATERIALS.
2. ALL BELOW GROUND PIPE, FITTINGS, AND VALVES TO BE SCH80 BRASS. ALL ABOVE GROUND PIPE, FITTINGS, AND VALVES TO BE 316 STAINLESS STEEL (SST).
3. DO NOT USE POLY TUBE.
4. ISOLATION VALVE TO BE MAXIMUM OF 18" FROM FORCE MAIN TAP.
5. ABOVE GROUND ARV OFF SET DISTANCE TO BE FIELD DETERMINED AND AS CLOSE TO THE RIGHT OF WAY LINE AS POSSIBLE, AND SHALL BE CLEAR OF WALKWAYS AND DRIVEWAYS.

C.O.S.A.

AIR RELEASE VALVE OFFSET ABOVE GROUND DETAIL FOR USE ON FORCE MAINS

REVISION DATE:	AUG 2021
NOT TO SCALE	SS-62

CITY OF ST. AUGUSTINE DUPLEX PUMPING STATION

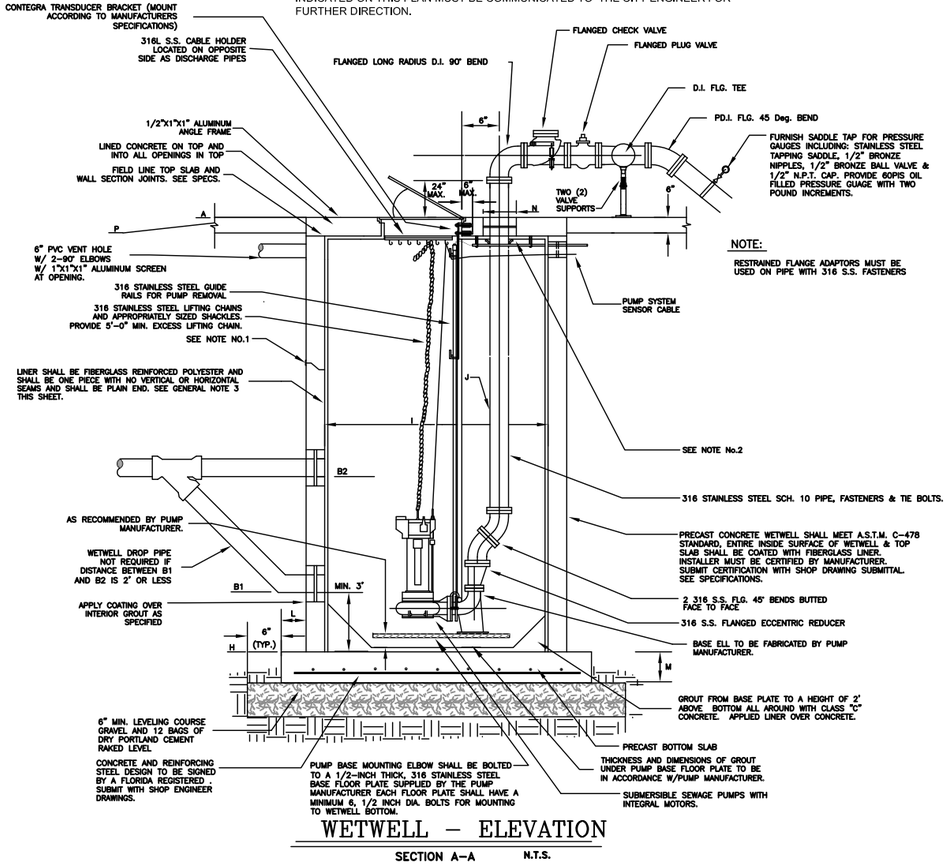


WETWELL – PLAN

N.T.S.

NOTE:

THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL ELEVATIONS CALLED OUT ON THIS PLAN SET FOR THE PUMP STATION PRIOR TO ORDERING OF ANY MATERIALS OR COMPONENTS FOR THE PUMP STATION. ANY DEVIATION OF THE ELEVATIONS INDICATED ON THIS PLAN MUST BE COMMUNICATED TO THE CITY ENGINEER FOR FURTHER DIRECTION.



WETWELL – ELEVATION

SECTION A–A N.T.S.

PUMP STATION INFORMATION

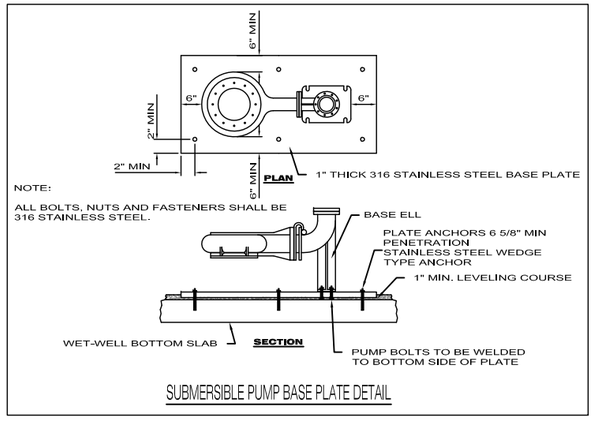
SCHEDULE OF ELEVATIONS:

PUMP STATION STREET ADDRESS	TOP ELEV.	INFLUENT ELEV.	INFLUENT ELEV.	ALARM ELEV.	LEAD PUMP ON ON	LAG PUMP ON ELEV.	BOTH PUMPS OFF ELEV.	BOTTOM ELEV.	WET WELL DIA. (FEET)	DISCHARGE PIPE DIA. (INCHES)	DISCHARGE F.M. DIA. (INCHES)	BOT. SLAB OVERHANG (INCHES)	BOT. SLAB THICKNESS (INCHES)	PIPE HOLE DIAMETER (INCHES)	SITE GRADE ELEV.
	A	B1	B2	C	E	F	G	H	I	J	K	L	M	**N	P

PUMP MANUFACTURER _____
MODEL _____ IMPELLER _____
DISCHARGE _____ MOTOR RPM _____
_____ HP _____VOLTS ____PHASE ____HZ
DESIGN POINT _____ GPM AT _____ FT. TDH
RUNOUT POINT _____ GPM AT _____ FT.TDH
MAX. SPHERE _____ INCHES
PUMP ACCESS HATCH SIZE _____ X _____
PUMP CENTERLINE SEPARATION _____

NOTE: PUMPOUT SIZES

	** DISCHARGE PIPING SIZE	PIPE HOLE DIAMETER (N)
___ 4" FOR 4" & 6" DISCHARGE F.M.	4"	10"
___ 6" FOR 8" DISCHARGE F.M.	6"	12"
___ 8" FOR 10" & 12" DISCHARGE F.M.	8"	14.5"
___ 12" FOR 14" AND LARGER DISCHARGE F.M.	10"	17"
PROVIDE D.I. FLG. REDUCING 90° BEND REDUCING TO 6"ON 8" AND LARGER PUMPOUT CONNECTIONS.	12"	20"



SUBMERSIBLE PUMP BASE PLATE DETAIL

GENERAL NOTES:

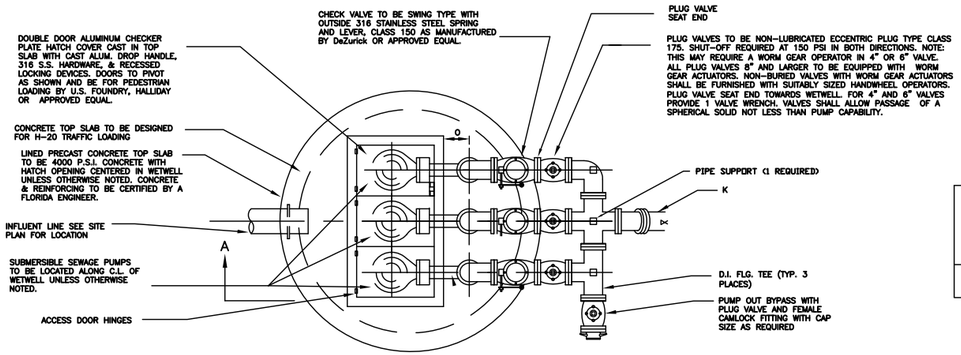
1. ALL EXTERIOR JOINTS OF PRECAST CONCRETE WETWELLS SHALL BE SEALED WITH A RUBBERIZED ASPHALT MEMBRANE TAPE. TAPE SHALL BE PERM-A-BARRIER BY W.R. GRACE, ELASTOPLY BY KARNAK OR EQUAL.
2. ALL ANNULAR OPENINGS IN CONCRETE SHALL BE SEALED WITH NON-SHRINK GROUT AND WATERSTOPS.
3. LINER SHALL BE FIBERGLASS REINFORCED POLYESTER AND SHALL BE ONE PIECE WITH NO VERTICAL OR HORIZONTAL SEAMS AND SHALL BE PLAIN END. THE LINER SHALL BE FABRICATED IN ACCORDANCE WITH NBS PS 15-69 AND SHALL CONSIST OF COMMERCIAL GRADE POLYESTER RESIN, UV INHIBITOR, CHOP STRAND, WOVER ROVING AND CONTINUOUS REINFORCEMENT. MINIMUM LINER THICKNESS SHALL BE ONE HALF INCH FOR ALL DIAMETER WELLS AND SHALL NOT HAVE EXTERNAL RIBS. CONCRETE SURFACE OF WETWELL SHALL BE CLEANED AND REFINISHED PER SPECIFICATIONS PRIOR TO PLACEMENT OF LINER. ANNULAR SPACE BETWEEN FIBERGLASS LINER AND CONCRETE STRUCTURE SHALL BE GROUT FILLED WITH NO VOIDS. ANNULAR SPACE BETWEEN STRUCTURE AND FIBERGLASS LINER SHALL BE 1"-3/4". GROUT TO BE PLACED IN TWO LIFTS WITH 24 HOUR SET PERIOD BETWEEN LIFTS. LINER TO BE PLUMB AND CENTERED.

CITY OF ST. AUGUSTINE
LIFT STATION DETAILS
DUPLEX PUMPING STATION

REVISION DATE:	FEB 2017
NOT TO SCALE	LS-1

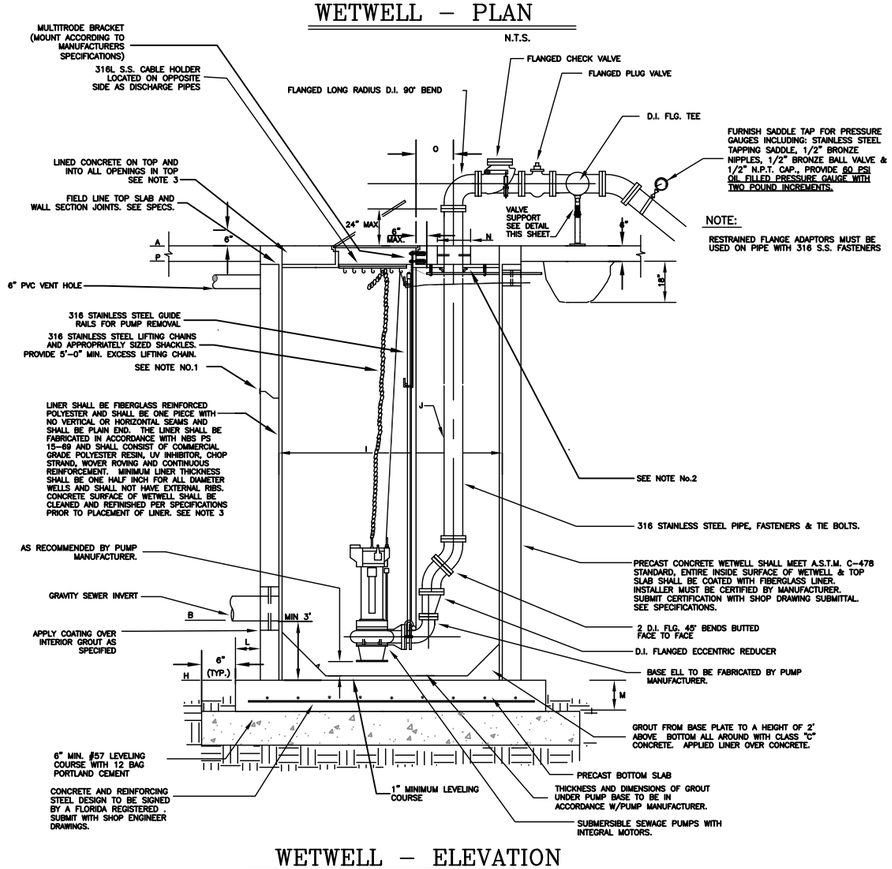
C.O.S.A.

CITY OF ST. AUGUSTINE TRIPLEX PUMPING STATION



WETWELL – PLAN

N.T.S.



WETWELL – ELEVATION

SECTION A–A N.T.S.

PUMP STATION INFORMATION

SCHEDULE OF ELEVATIONS:

PUMP STATION STREET ADDRESS	TOP ELEV.	INFLUENT ELEV.	ALARM ELEV.	LEAD PUMP ON ON	LAG PUMP ON ELEV.	BOTH PUMPS OFF ELEV.	BOTTOM ELEV.	WET WELL DIA. (FEET)	DISCHARGE PIPE DIA. (INCHES)	DISCHARGE F.M. DIA. (INCHES)	BOT. SLAB OVERHANG (INCHES)	BOT. SLAB THICKNESS (INCHES)	PIPE HOLE DIAMETER (INCHES)	SITE GRADE ELEV.
	A	B	C	E	F	G	H	I	J	K	L	M	**N	P

PUMP MANUFACTURER _____
MODEL _____ IMPELLER _____
DISCHARGE _____ MOTOR RPM _____
_____ HP _____VOLTS ____PHASE ____HZ
DESIGN POINT _____ GPM AT _____ FT. TDH
RUNOUT POINT _____ GPM AT _____ FT.TDH
MAX. SPHERE _____ INCHES
PUMP ACCESS HATCH SIZE _____ X _____
PUMP CENTERLINE SEPARATION _____

NOTE: PUMPOUT SIZES

	** DISCHARGE PIPING SIZE	PIPE HOLE DIAMETER (N)
___ 4" FOR 4" & 6" DISCHARGE F.M.	4"	10"
___ 6" FOR 8" DISCHARGE F.M.	6"	12"
___ 8" FOR 10" & 12" DISCHARGE F.M.	8"	14.5"
___ 12" FOR 14" AND LARGER DISCHARGE F.M.	10"	17"
PROVIDE D.I. FLG. REDUCING 90° BEND REDUCING TO 6"ON 8" AND LARGER PUMPOUT CONNECTIONS.	12"	20"

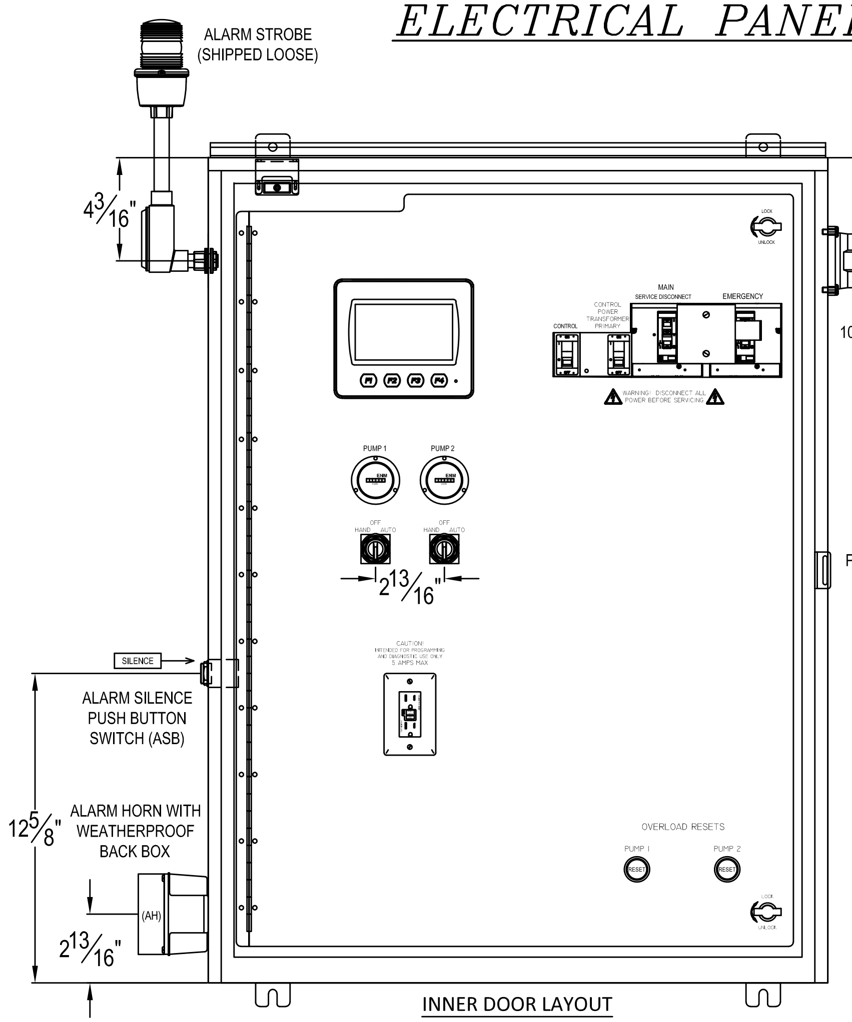
GENERAL NOTES:

1. ALL EXTERIOR JOINTS OF PRECAST CONCRETE WETWELLS SHALL BE SEALED WITH A RUBBERIZED ASPHALT MEMBRANE TAPE. TAPE SHALL BE PERM-A-BARRIER BY W.R. GRACE, ELASTOPLY BY KARNAK OR EQUAL.
2. ALL ANNULAR OPENINGS IN CONCRETE SHALL BE SEALED WITH NON-SHRINK GROUT AND WATERSTOPS.
3. FIBERGLASS LINER TO EXTEND 12" ABOVE PRECAST WETWELL STRUCTURE

CITY OF ST. AUGUSTINE LIFT STATION DETAILS TRIPLEX PUMPING STATION	REVISION DATE:	FEB 2017
	NOT TO SCALE	LS-2

C.O.S.A.

CITY OF ST. AUGUSTINE LIFT STATION DETAILS
ELECTRICAL PANEL



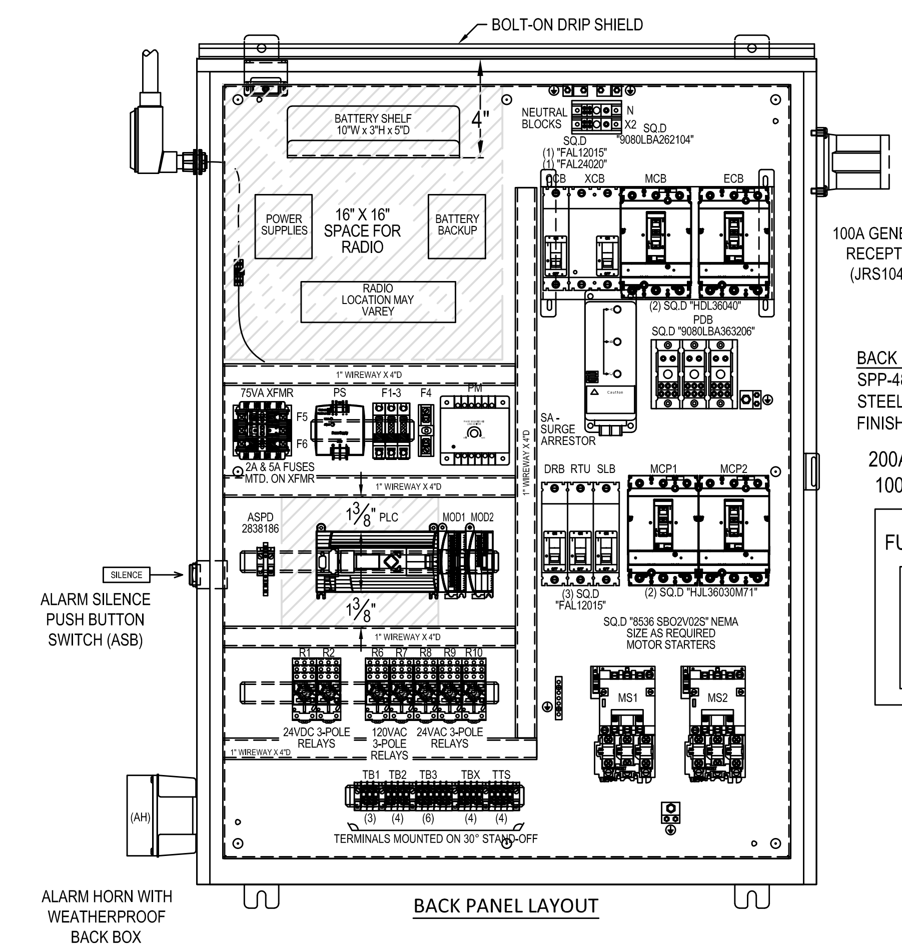
100A GENERATOR RECEPTACLE (JRS1044FR)

PAD-LOCKING HASP

INNER DOOR LAYOUT

ENCLOSURE:
SPN4SS6-483612 (48"H x 36"W x 12"D) NEMA 4X RATED, FABRICATED FROM 14 GA. TYPE 316 STAINLESS STEEL PROUDER COATED WHITE. PADLOCKING PROVISION, WALL MOUNTING BRACKETS, 90° OUTER DOOR STOP, 3-POINT STAINLESS STEEL PADLOCKABLE HANDLE, PRINT POCKET INSIDE OF OUTER DOOR, AND 36" STAINLESS STEEL DRIP SHIELD PROVIDED ON ENCLOSURE.

INNER DOOR:
HID-4836 FABRICATED FROM .125 BLACK ENGRAVED ALUMINUM WITH CONTINUOUS HINGE, TWIST LATCHES, AND 90° STOP.

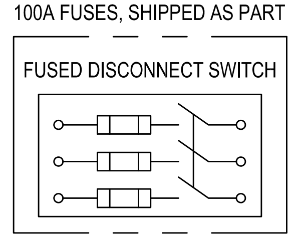


100A GENERATOR RECEPTACLE (JRS1044FR)

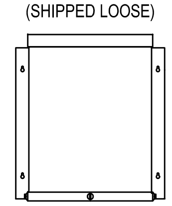
BACK PANEL LAYOUT

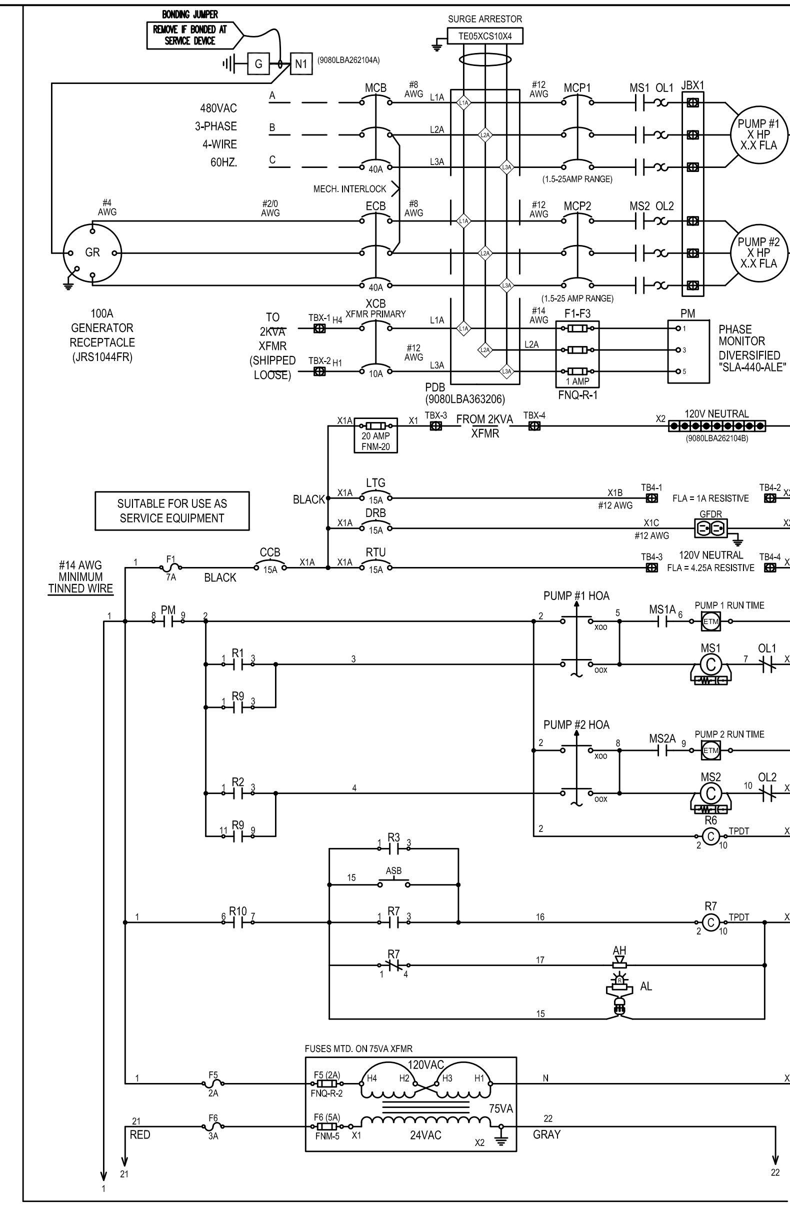
BACK PANEL:
SPP-4836 (45"H X 33"W), FABRICATED FROM 12GA. STEEL WITH WHITE POLYESTER POWDER COAT FINISH.

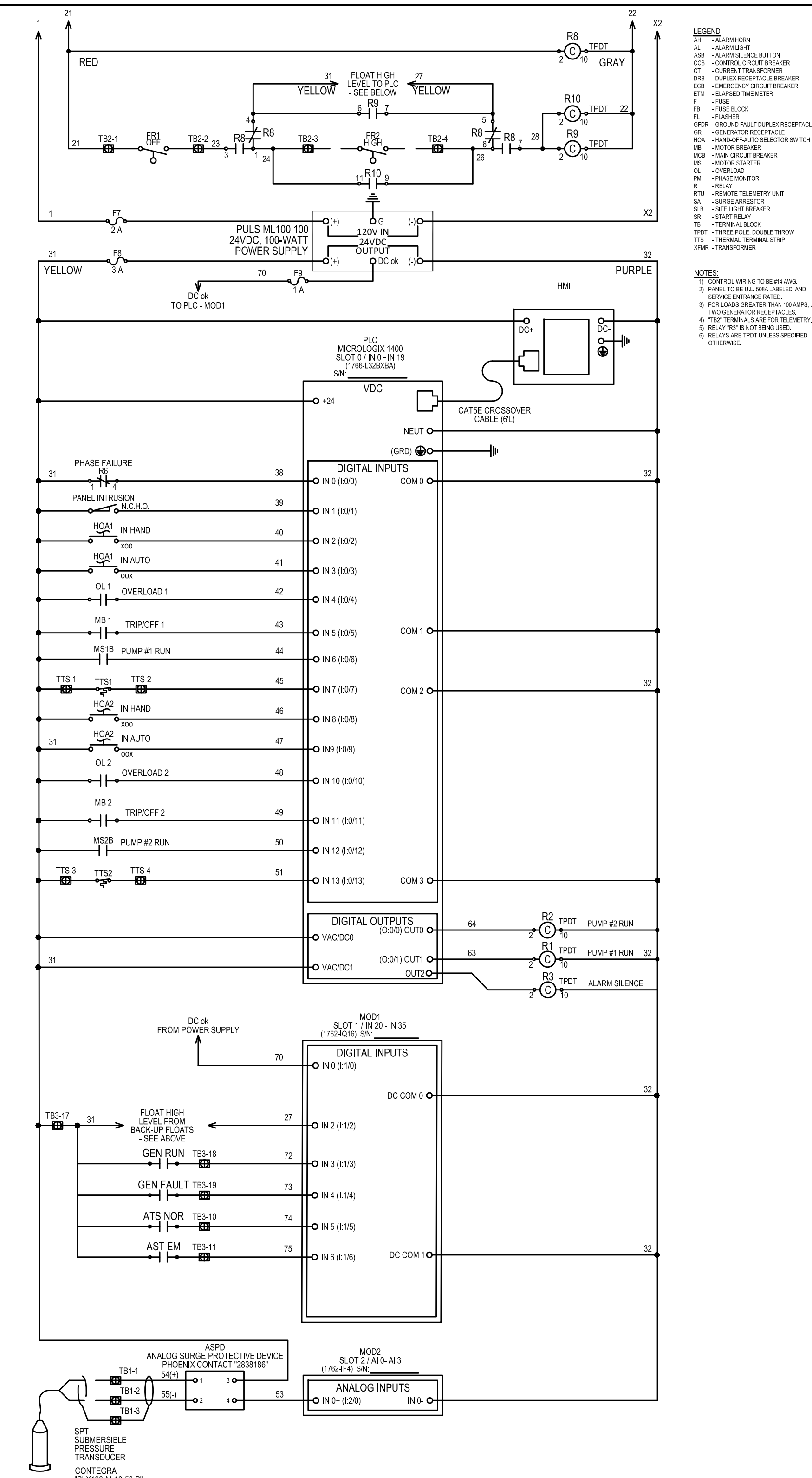
200A DISCONNECT SWITCH WITH 100A FUSES, SHIPPED AS PART



2KVA XFMR (SHIPPED LOOSE)







Item	Description	Manufacturer	Partnumber	Qty	Spares
1	Enclosure, NEMA 4X, Type 316 SS, 48"H X36"W X 12"D	Schaefer	SPN4SS6-483612	1	
2	Back panel, Painted White Steel, 12 Gauge	Schaefer	SPP-4836	1	
3	Hinged Innerdoor,.125 Black Aluminum	ECS	HID-4836	1	
4	Surge Voltage Protection Modular Terimal Block,24Vdc	Phoenix Contact	2838186(TT-2PE-24DC)	1	
5	Lightning Arrestor, 240/120VAC,3 Phase, Delta, 4 Wire (B High Leg) plus Gr	APT	TE03XCS10	1	
6	Generator Receptacle 600V, 100A, 4P, 4W	RussellStoll	JRS1044FR	1	
7	Circuit Breaker, 600VAC, 3Pole	Square D	HDL36100	2	
8	Motor Circuit Protector, 600VAC, 3 Pole, 30-80A	Square D	HJL36100M73	2	
9	Circuit Breaker,120VAC, 1 Pole, 15A, 10KAIC	Square D	FAL12015	4	
10	Circuit Breaker,480VAC, 2 Pole, 20A, 18KAIC	Square D	FAL24020	1	
11	Universal Lockout Plate	ECS	690-002	1	
12	Phase Monitor Relay, 3 phase (Base Mount)	Diversified	SLA-440-ALE	1	1
13	Starter, FVNR, NEMA, 208/240/480V,	Square D	8536SBO2V02S	2	1
14	O/L Heaters, Class 20 Type B	Square D	B10.2	6	
15	Overload Reset Pushbutton, NEMA 1	Square D	9066RA1	2	
16	Transient Suppression Module	Square D	9999ST1	2	
17	Control Power Transformer, 75VA, 120/240-24VAC	Square D	9070TF75D23	1	
18	Fuse, Slo-Blo, Time Delay, 250VAC, 5A	Bussmann	FNM-5	1	1
19	Fuse, Slo-Blo, Time Delay, 250VAC, 20A	Bussmann	FNM-20	1	1
20	Fuse, Slo-Blo, Time Delay, 500VAC, 1A (Rejection Type)	Bussmann	FNQ-R-1	3	3
21	Fuse, Slo-Blo, Time Delay, 500VAC, 2A (Rejection Type)	Bussmann	FNQ-R-2	1	1
22	Fuse Block, 1 Pole	Bussmann	BM6031PQ	1	1
23	Fuse Block, 3 Pole, Class R, Ultrasafe	Wago	811-430	1	
24	DC Power Supply 100 Watt 120/208/240VAC/ 1 Phase / 24-28VDC,4.2 Amps	Puls	ML100.100	1	1
25	PLC, Micrologix 1400	Allen-Bradley	1766-L32BXBA	1	
26	Expansion Module, 16pt. Digital Input	Allen-Bradley	1762-IQ16	1	
27	4 Channel Analog Input - Current/Voltage Module	Allen-Bradley	1762-IF4	1	
28	Maple Industries 7" GRAPHIS HMI	Maple Industries	HMI5070P	1	
29	CAT5 Crossover Enet Patch Cord, 7ft, Blue	AllenTel	AT1507-REC	1	
30	Battery mounting bracket	ECS	BMB11	1	
31	Relay, 11 Pin, Plug-in, 3PDT, 24DC(11 Pin)	Square D	RUMC32BD	2	1
32	Relay, 11 Pin, Plug-in, 3PDT, 120VAC(11 Pin)	Square D	RUMC32F7	2	1
33	Relay, 11 Pin, Plug-in, 3PDT, 24VAC(11 Pin)	Square D	RUMC32B7	3	1
34	Pushbutton, 30 mm, NEMA 4X, flush type, Universal	Square D	9001SKR1U	1	
35	Sel. Sw., 30mm, NEMA 4X, 3 Pos. maintained, On-Off-On	Square D	9001SKS43B	2	
36	Elapse Time Meter, Round, 6 Digit, 120VAC	ENM	70000792 (T50B2)	2	
37	Snap Switch, Plunger Style Panel Mounting	Square D	9007AP221	1	
38	Alarm Horn, Silver, 4", 120VAC	Edwards	876-N5	1	
39	Weatherproof Back Box, Silver	Wheelock	WBB-S	1	
40	Ground Fault Circuit Interrupter, Snap - Connect, 15A 120VAC	Leviton	MN759-W	1	
41	Power Distr. Block, 600VAC, 175A, 2 pole	Square D	9080LBA262104	1	
42	Power Distr. Block, 600VAC, 350A, 3 pole	Square D	9080LBA363206	1	
43	Terminal, 600VAC, 60A, 1 pole	Square D	9080GR6	21	
44	Equipment Ground Bar Kit, 5pt., (1) #14-#4 or (2) #14 or #12	Square D	PK5GTA	1	
45	Ground Lug, 2/0-14 AWG	Panduit	LAMA2/0-14-Q Y	2	
46	Ground Lug, Two Barrel 1/0-14 AWG	Thomas & Betts	ADR11-21	2	

BILL OF MATERIALS (SHIPPED LOOSE)					
47	Fusible Disconnect Switch, 240VAC, 3 Pole, 200A	Square D	H324DS	1	
48	Control Power Transformer, 2000VA, 240/480-120/240VAC	Square D	2S1FSS	1	
49	Class RK1, 250VAC, 100 A, Dual Element, Time Delay Fuse (3 Spares)	Bussmann	LPN-RK-100SPI	6	3
50	Equipment Ground Bar Kit, 200 Amp	Square D	PKOGTA2	1	
51	Nuetral Assembly Insulated, 200 Amp	Square D	SN20A	1	
52	Red Strobe, 120 Volt AC, 1/2" NPT Female	Ingram	CT015F-R	1	1
53	Submersible Pressure Transducer, 4-20mA, 15 PSI, 50' cable, Breather	Contegra	SLX 130-M-10-50-B	1	
54	Spare Fuse, Slo-Blo, Time Delay, 250VAC, 5A	Bussmann	FNM-5	1	1
55	Spare Fuse, Slo-Blo, Time Delay, 250VAC, 20A	Bussmann	FNM-20	1	1
56	Spare Fuse, Slo-Blo, Time Delay, 500VAC, 1A (Rejection Type)	Bussmann	FNQ-R-1	2	1
57	Spare Fuse, Slo-Blo, Time Delay, 500VAC, 1A (Rejection Type)	Bussmann	FNQ-R-2	1	1

CITY OF ST. AUGUSTINE LIFT STATION DETAILS ELECTRICAL PANEL	REVISION DATE:	JAN 2019
	NOT TO SCALE	LS-3

C.O.S.A.

CITY OF ST. AUGUSTINE LIFT STATION DETAILS
SINGLE LINE DIAGRAM

ELECTRICAL LEGEND

MCP 80	CIRCUIT BREAKER (FRAME/TRIP RATING – "MCP" MOTOR CIRCUIT PROTECTOR)
FVNR SIZE 2	MAGNETIC TYPE COMBINATION MOTOR STARTER, NEMA SIZE AS INDICATED ("FV" FULL VOLTAGE, "RV" REDUCED VOLTAGE, "NR" NON–REVERSING, "SS" SOLID STATE SOFT START)
30	MOTOR (NUMERAL INDICATES HORSEPOWER)
H	ELAPSED TIME METER (HOURS OF OPERATION)
H O A	HAND OFF AUTO SELECTOR SWITCH
CR	CONTROL RELAY
PM	THREE PHASE POWER MONITOR
AA	AUTOMATIC ALTERNATOR
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR

NOTES:

1. DESIGN DRAWINGS ARE DIAGRAMMATIC AND INTENDED TO SHOW THE GENERAL REQUIREMENTS. ALL EQUIPMENT AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE CITY OF ST. AUGUSTINE DESIGN STANDARDS AND SPECIFICATIONS.

2. ALL MATERIAL SHALL BE NEW AND SHALL CONFORM WITH THE STANDARDS OF THE UNDERWRITERS' LABORATORIES, INC., AMERICAN NATIONAL STANDARDS INSTITUTE, NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION, INSULATED POWER CABLE ENGINEERS ASSOCIATION, AND INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS, IN EVERY CASE WHERE SUCH A STANDARD HAS BEEN ESTABLISHED FOR THE PARTICULAR TYPE OF MATERIALS IN QUESTION.

3. THE INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE REGULATIONS OF THE LATEST EDITIONS OF THE NATIONAL ELECTRICAL CODE, NATIONAL ELECTRICAL SAFETY CODE, APPLICABLE CITY, STATE, AND LOCAL CODES AND REGULATIONS AND OTHER APPLICABLE CODES, INCLUDING UTILITY COMPANY CODES.

4. ALL PERMITS REQUIRED BY STATE OR LOCAL ORDINANCES SHALL BE OBTAINED AND AFTER COMPLETION OF THE WORK, A CERTIFICATE OF FINAL INSPECTION AND APPROVAL FROM THE ELECTRICAL INSPECTOR SHALL BE FURNISHED TO THE OWNER. ALL PERMITS FOR INSTALLATION, INSPECTIONS, CONNECTIONS, ETC., SHALL BE TAKEN OUT AND PAID FOR AS PART OF THE WORK UNDER THIS SECTION.

5. ALL MATERIALS AND WORKMANSHIP SHALL BE GUARANTEED TO BE FREE FROM DEFECTS. ANY PART OF THE SYSTEM CONSIDERED DEFECTIVE BY THE ENGINEER WITHIN THE GUARANTEE PERIOD SHALL BE IMMEDIATELY REPLACED OR CORRECTED TO THE ENGINEER'S SATISFACTION WITHOUT FURTHER EXPENSE TO THE OWNER.

6. THE PROJECTS GROUNDING SYSTEM SHALL CONSIST OF A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH NEC SPECIFICATIONS, BONDED TO A MAIN GROUND BUS INTERCONNECTING ALL POWER DISTRIBUTION EQUIPMENT. GROUND ROD SECTIONS SHALL BE COUPLED AND DRIVEN TO ESTABLISH A MAXIMUM RESISTANCE TO GROUND OF 10 OHMS THROUGHOUT THE GROUNDING SYSTEM.

7. UNLESS OTHERWISE INDICATED, ELECTRICAL EQUIPMENT ENCLOSURES SHALL BE NEMA 4X STAINLESS STEEL; CONDUCTORS SHALL BE STRANDED AWG TYPE THWN COPPER; UNDERGROUND CONDUIT SHALL BE PER CODE NEC; EXPOSED CONDUIT SHALL BE RIGID ALUMINUM; INCLUDING LOCATIONS BETWEEN CONTROL PANELS AND EXPLOSION PROOF SEALS SUPPORT CHANNEL AND MOUNTING STRUT SHALL BE MINIMUM 1.5" x 1.5" 316 S.S.

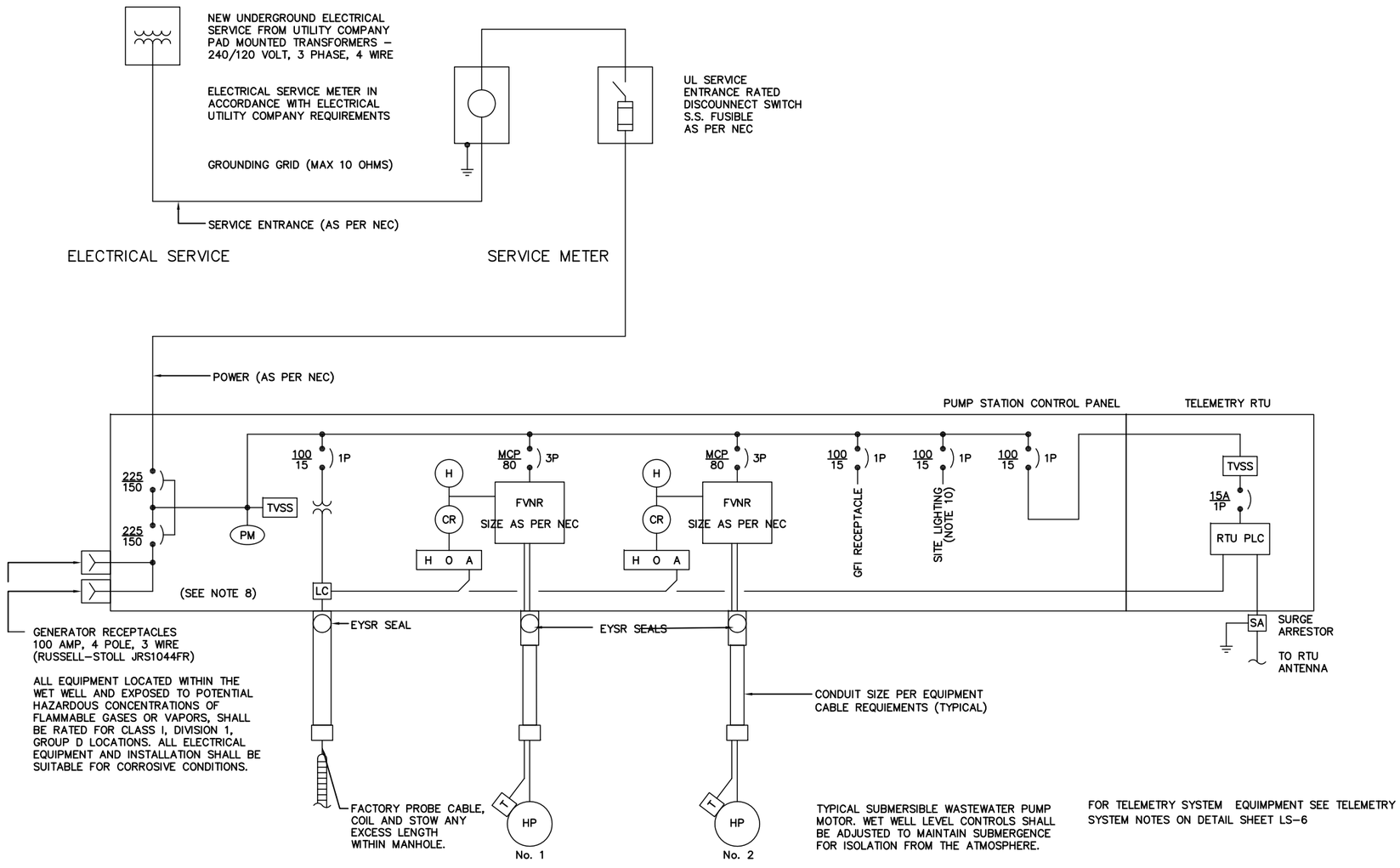
8. THE PUMP STATION CONTROL PANEL WET WELL LEVEL CONTROL SYSTEM SHALL INCLUDE DUPLEX PUMP CONTROLLER AND INTRINSICALLY SAFE SUBMERSIBLE WET WELL LEVEL SENSING PROBE FOR AUTOMATIC LEAD/LAG PUMP CONTROL AND ALTERNATION.

9. DUCT SEAL IS REQUIRED AT ALL CONDUIT CONNECTIONS IN AND OUT OF THE EQUIPMENT CABLE TERMINAL BOXES. ADDITIONALLY, DUCT SEAL IS REQUIRED AT THE CONDUIT ENTRANCES INTO THE PUMP CONTROL PANEL. DUCT SEAL SHALL BE OUTDOOR SERVICE SILICON RTV.

10. PROVIDE SITE LIGHT AND POLE TO MATCH THE STREET LIGHTS. PROVIDE POWER TO THE SITE LIGHT FROM THE PUMP CONTROL PANEL (3#12, 3/4"C). PROVIDE WP LIGHT SWITCH MOUNTED ON THE LIGHT POLE.

11. FOR COORDINATION WITH LATEST CITY OF ST. AUGUSTINE PUMP STATION CONTROL PANEL STANDARDS AND REQUIREMENTS, CONTACT THE CITY OF ST. AUGUSTINE PUBLIC WORKS DEPARTMENT 904–825–1040.

12. FOR COORDINATION WITH LATEST CITY OF ST. AUGUSTINE TELEMETRY SYSTEM RTU STANDARDS AND REQUIREMENTS, CONTACT THE CITY OF ST. AUGUSTINE PUMP MAINTENANCE DEPARTMENT 904–825–1042.



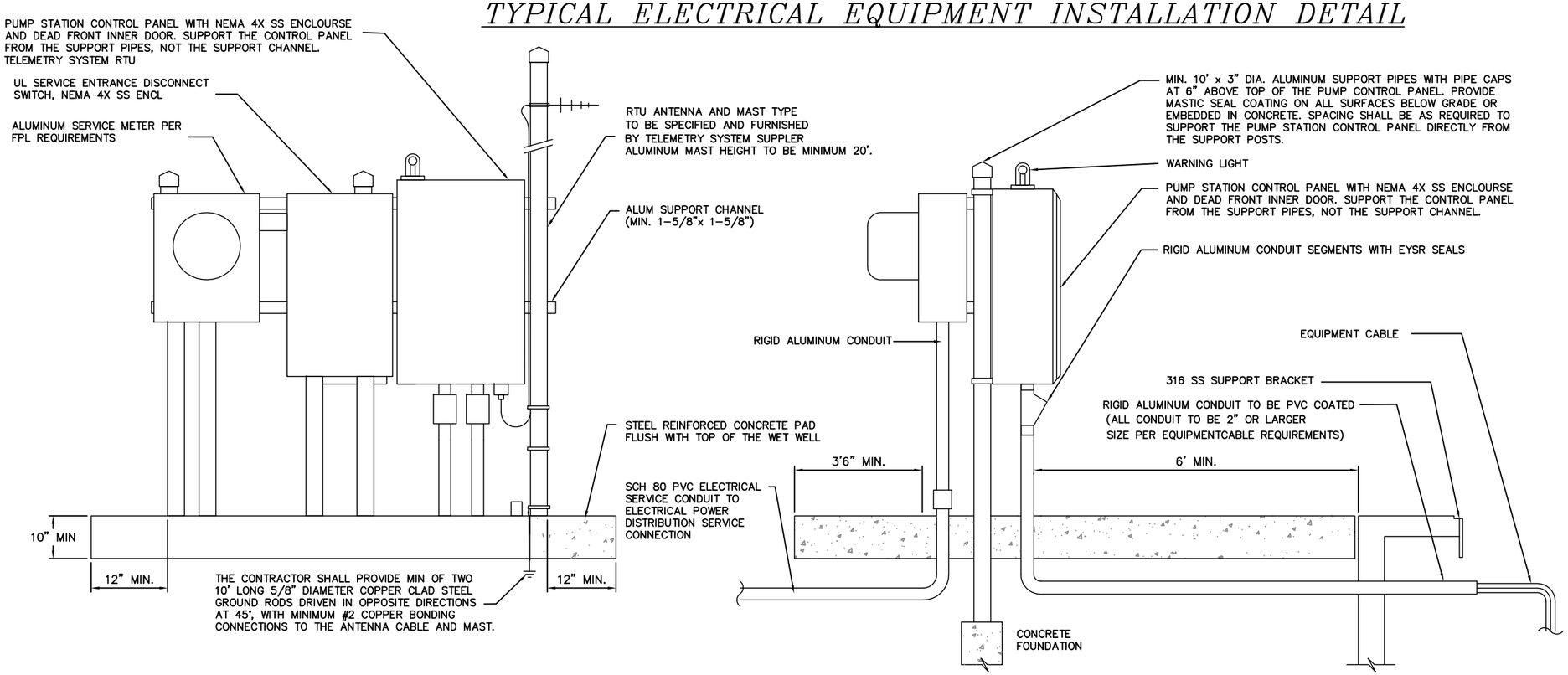
PUMPING STATION PUMPS

NOTE:
THE CITY OF ST. AUGUSTINE IS NOT RESPONSIBLE FOR THE ACCURACY AND CONTENTS OF THIS DRAWINGS. IT IS THE RESPONSIBILITY OF THE USER TO USE THE SERVICE OF A PROFESSIONAL ELECTRICAL / I&C ENGINEER TO DESIGN THE ELECTRICAL / I&C SYSTEMS FOR A SPECIFIC PROJECT

CITY OF ST. AUGUSTINE LIFT STATION DETAILS SINGLE LINE DIAGRAM	REVISION DATE:	FEB 2017
	NOT TO SCALE	LS–4

C.O.S.A.

CITY OF ST. AUGUSTINE LIFT STATION DETAILS
TYPICAL ELECTRICAL EQUIPMENT INSTALLATION DETAIL



TYPICAL PUMP STATION ELECTRICAL EQUIPMENT INSTALLATION DETAIL
NOT TO SCALE

TELEMETRY SYSTEM NOTES:

1. PROVIDE NEW TELEMETRY SYSTEM REMOTE TERMINAL UNIT (RTU) FOR REMOTE MONITORING AND CONTROL OF ALL PUMPING STATION EQUIPMENT.

   A. THE EXISTING CITY OF ST. AUGUSTINE PUMP STATION TELEMETRY SYSTEM SHALL BE EXPANDED BY THE TELEMETRY SYSTEM SUPPLIER WHO SHALL PROVIDE ALL THE EQUIPMENT AND APPURTENANCES AND SHALL BE RESPONSIBLE FOR THE SATISFACTORY OPERATION OF THE ENTIRE SYSTEM.

   B. THE ADDITIONS AND MODIFICATIONS TO THE EXISTING TELEMETRY SYSTEM SHALL INCLUDE RADIO COMMUNICATIONS SYSTEM, PLC INTERFACE, AND SOFTWARE CONFIGURATION AS INDICATED OR REQUIRED FOR COMPLETE SYSTEM OPERATION.

   C. THE TELEMETRY SYSTEM SUPPLIER SHALL BE: CONTROL SYSTEMS AUTOMATION, ELKTON, FL., ATTN: ROBERT SPITZ, 904-669-7665

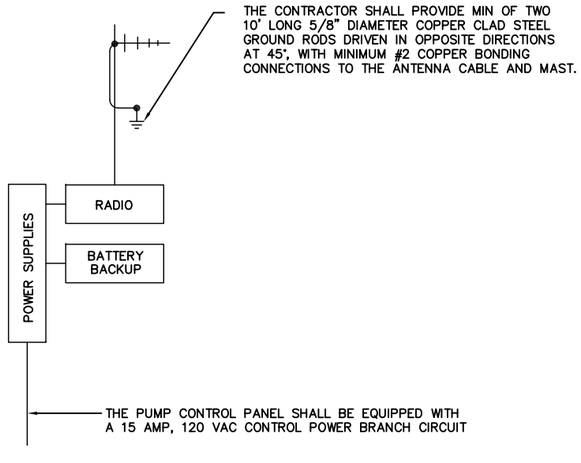
   D. TELEMETRY SHALL BE FULLY FUNCTIONAL PRIOR TO CITY ACCEPTANCE.

2. THE PUMP CONTROLER SHALL BE AN ALLEN-BRADLEY MICROLOGIX 1400 SERIES ANALOG PLC BASED UNIT MOUNTED WITHIN THE PUMP STATION CONTROL PANEL. SEE LIFT STATION CONTROL PANEL DETAIL LS-3.

3. ANTENNA MAST AS INDICATED SHALL BE PROVIDED BY THE TELEMETRY SYSTEM PROVIDER. ANTENNA, ANTENNA CABLE AND SURGE PROTECTION SHALL BE PROVIDED BY THE TELEMETRY SYSTEM SUPPLIER. THE ANTENNA SHALL BE AIMED BY THE TELEMETRY SYSTEM SUPPLIER DURING STARTUP AND TESTING.

4. THE TELEMETRY SYSTEM SUPPLIER SHALL BE RESPONSIBLE FOR OBTAINING FOR THE OWNER ALL REQUIRED FCC LICENSING REVISIONS, ETC. NECESSARY FOR THE OPERATION OF THE RADIO COMMUNICATIONS SYSTEM.

5. A FACTORY-TRAINED QUALIFIED SERVICE REPRESENTATIVE OF THE TELEMETRY SYSTEM SUPPLIER SHALL PROVIDE ALL SYSTEM INTEGRATION, INITIALIZATION, CUSTOMIZATION, STARTUP, AND TRAINING TO PROVIDE A COMPLETE AND OPERATING SYSTEM.



TYPICAL TELEMETRY SYSTEM RTU SCHEMATIC DIAGRAM
SEE PUMP CONTROL PANEL DETAIL LS-3
NOT TO SCALE

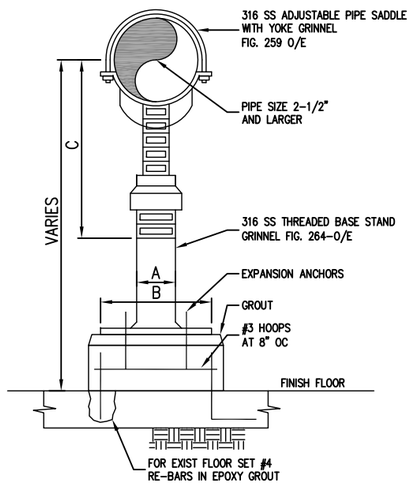
ALL FITTINGS AND COMPONENTS TO MEET CURRENT NEC REQUIREMENTS

NOTE:
THE CITY OF ST. AUGUSTINE IS NOT RESPONSIBLE FOR THE ACCURACY AND CONTENTS OF THIS DRAWINGS. IT IS THE RESPONSIBILITY OF THE USER TO USE THE SERVICE OF A PROFESSIONAL ELECTRICAL / I&C ENGINEER TO DESIGN THE ELECTRICAL / I&C SYSTEMS FOR A SPECIFIC PROJECT

CITY OF ST. AUGUSTINE LIFT STATION DETAILS ELECTRICAL EQUIPMENT	REVISION DATE:	FEB 2017
	NOT TO SCALE	LS-5

C.O.S.A.

CITY OF ST. AUGUSTINE LIFT STATION DETAILS – SUPPLEMENTARY DETAILS



NOTES: STANCHION PIPE SUPPORT

1. PROVIDE HALF ROUND RIGID INSULATION AND ISULATION SHEILD, SIMILAR TO GRINNELL FIG. 167 OR ELCEN FIG. 219 WHEN PIPING IS INSULATED.

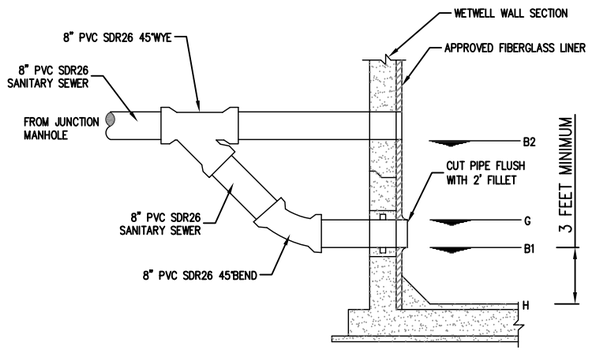
2. PROVIDE NEOPRENE WAFFLE ISOLATION PAD SIMILAR TO MASON TYPE "W" OR KORFUND KORPAD 40, UNDER SUPPORT FOOT WHEN PIPING IS ISOLATED OR SUPPORT IS ADJACENT TO MECHANICAL EQUIPMENT.

3. FOR BASE, HEIGHT, AND FLANGE DIMENSIONS, SEE TABLE.

4. ALL DIMENSIONS IN TABLE ARE IN INCHES.

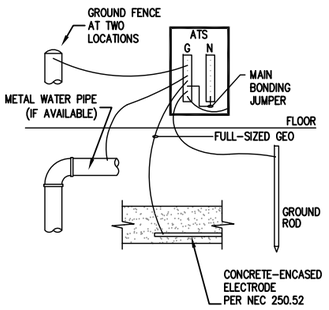
PIPE SIZE	A	B	C	
			MIN.	MAX.
2-1/2	2-1/2	9	8	13
3	2-1/2	9	8-1/4	13-1/4
3-1/2	2-1/2	9	8-1/2	13-1/2
4	3	9	9-1/4	14
5	3	9	10	14-3/4
6	3	9	10-1/2	15-1/4
8	3	9	11-3/4	16-1/2

PIPE SUPPORT
NOT TO SCALE



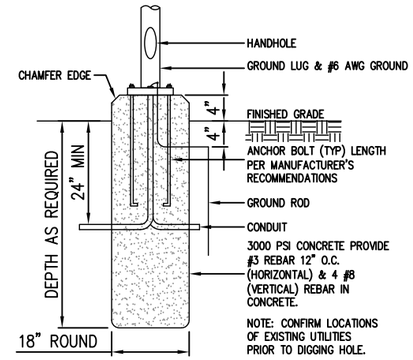
GRAVITY DROP CONNECTION DETAIL
NOT TO SCALE REQUIRED FOR ALL PUMPING STATIONS

NOTE: IF DIMENSION BETWEEN B2 & B1 IS 2 FEET OR LESS, GRAVITY DROP CONNECTION IS NOT REQUIRED.

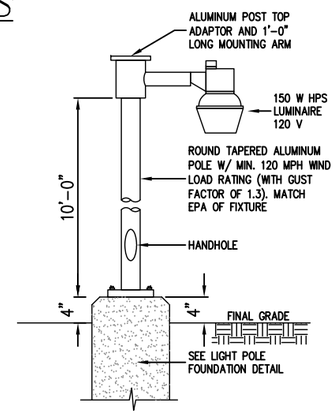


NOTE: BOND & GROUND ELECTRICAL SYSTEM PER NEC SECTION 250 AND ALL LOCAL CODES AND STATUTES. TEST GROUND 16060 TO ENSURE A MAXIMUM RESISTANCE TO GROUND OF 10 OHMS. ADD ADDITIONAL GROUND RODS AS NECESSARY TO MEET THIS REQUIREMENT. CONTRACTOR TO SUBMIT GROUND TEST RESULTS TO THE CITY.

GENERAL GROUNDING DETAIL
NOT TO SCALE

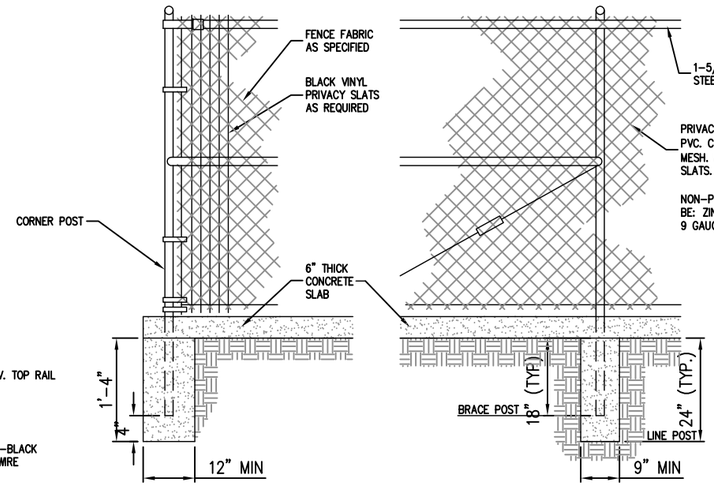


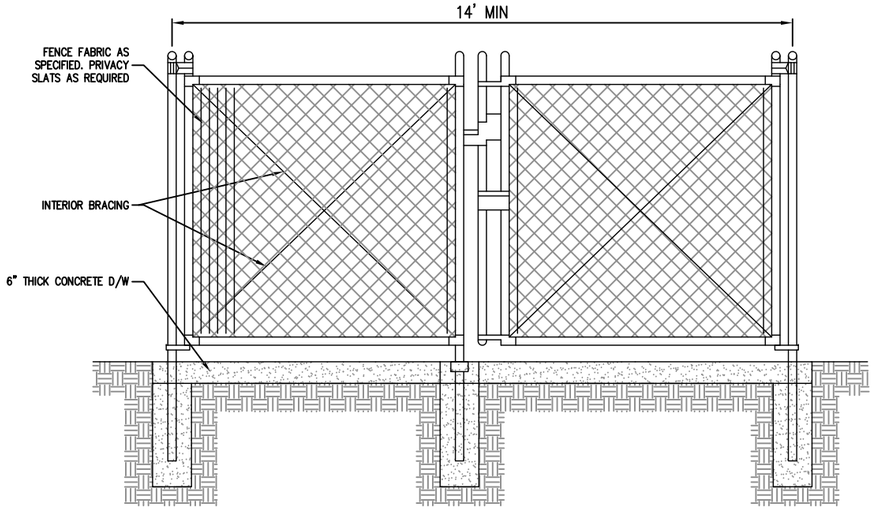
LIGHT POLE FOUNDATION
NOT TO SCALE



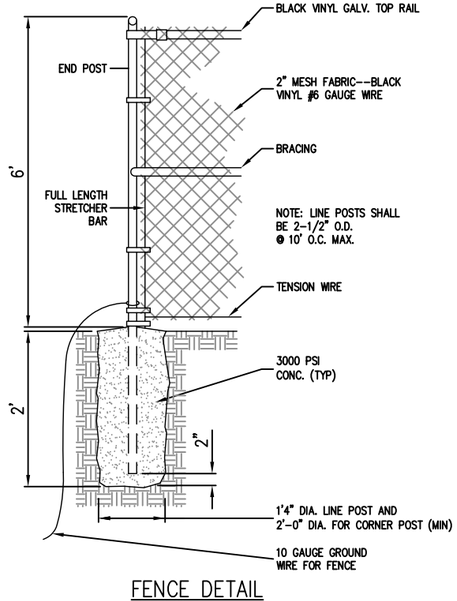
LIGHT POLE DETAIL
NOT TO SCALE

1. LUMINAIRE SHALL BE AS MANUFACTURED BY DAYBRITE OR APPROVED EQUAL (CAT No. VHP-150-S-XX-PE-12L-P)

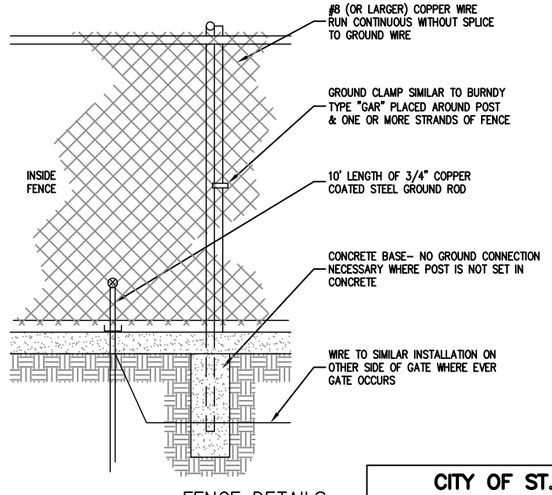




DOUBLE GATE DETAILS
NOT TO SCALE



FENCE DETAIL
NOT TO SCALE

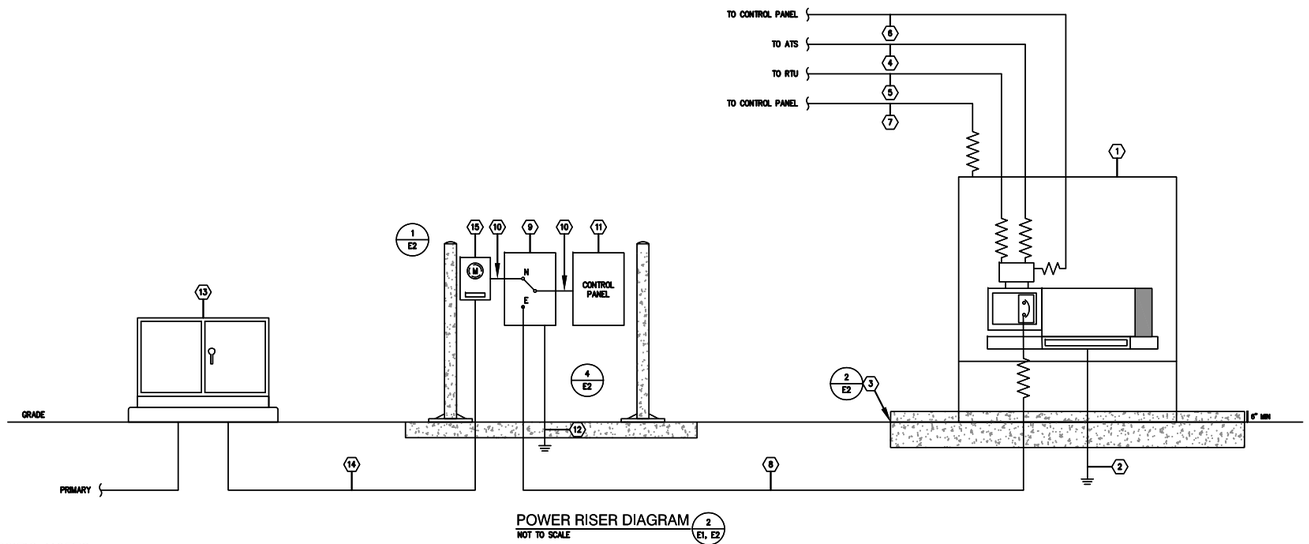


FENCE DETAILS
NOT TO SCALE

CITY OF ST. AUGUSTINE LIFT STATION DETAILS SUPPLEMENTARY DETAILS	REVISION DATE:	FEB 2017
	NOT TO SCALE	LS-6

C.O.S.A.

CITY OF ST. AUGUSTINE LIFT STATION DETAILS
EMERGENCY GENERATOR SPECIFICATIONS AND DETAILS



POWER RISER DIAGRAM (2 E1, E2)
NOT TO SCALE

NOTE: THIS DRAWING IS ISSUED BY THE CITY OF ST. AUGUSTINE FOR GENERAL INFORMATION ONLY. THE USER OF THIS DRAWING SHALL ENGAGE THE SERVICES OF LICENSED PROFFESIONAL ENGINEERS TO DESIGN THE ELECTRICAL AND STRUCTURE FEATURES SHOWN ON THIS DRAWING.

LIGHTING FIXTURE SCHEDULE

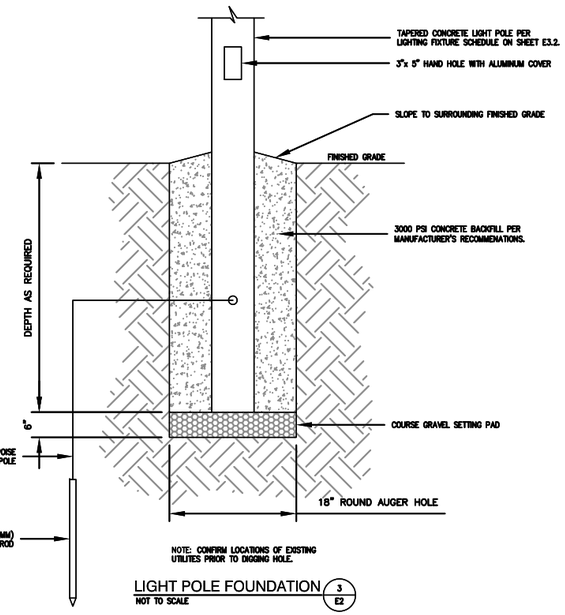
MARK	MANUF.	CATALOG NO.	LAMPS NO.	LAMPS TYPE	VOLT	MOUNTING	NOTES	DESCRIPTION / INSTALLATION
A	DAYBRITE	VHP 150 S XX-12L A	1	150W HPS	120	POLE		POLE MOUNTED AREA LIGHT, ALUMINUM, WET LOCATION. WITH BUILT-IN PHOTOCELL. PROVIDE POLE TOP ADAPTER TO ACCOMODATE FIXTURE. MOUNT AT 10' ABOVE GRADE. PROVIDE TYPE 1, 14' TAPERED CONCRETE POLE WITH HANDHOLE, AND TENON. PROVIDE 1 1/4" ADAPTER AT TOP OF POLE TO MATCH FIXTURE.

SPECIFIC NOTES:

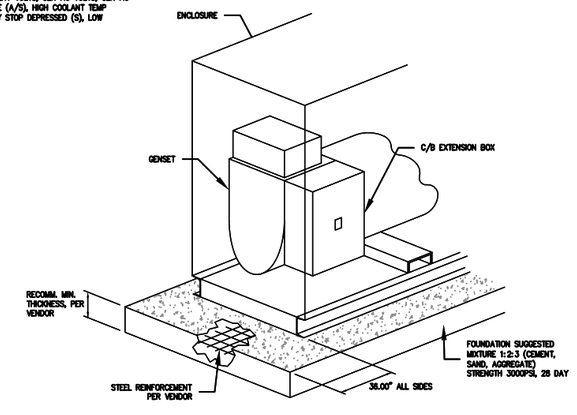
1. PROVIDE (@ 80% POWER FACTOR). 240/120V, THREE PHASE, 4 WIRE DIESEL GENERATOR WITH SOUND ATTENUATED ALUMINUM ENCLOSURE, MUFFLER AND 545 GALLON SUBBASE TANK, PER SPECIFICATIONS. GENERATOR SHALL BE MANUFACTURED BY CATERPILLAR/OLYMPIAN. PROVIDE 100% RATED, 175A, 240V, 3 POLE GENERATOR CIRCUIT BREAKER, RATED 10KAIC. CIRCUIT BREAKER SHALL BE UL LISTED FOR USE WITH THE AUTOMATIC TRANSFER SWITCH (DESCRIBED BELOW).
2. GROUND GENERATOR FRAME PER MANUFACTURER'S RECOMMENDATIONS (DO NOT CONNECT GENERATOR GROUND TO NEUTRAL AT GENERATOR). TEST GROUND TO ENSURE A MAXIMUM RESISTANCE TO GROUND OF 10 OHMS. ALSO, GROUND TANK AT OPPOSITE CORNERS WITH 10' GROUND RODS PER NEC. PROVIDE BOLTED CONNECTIONS AT TANK AND EXOTHERMIC WELDS AT GROUND RODS.
3. PROVIDE CONCRETE PAD FOR GENERATOR WITH STEEL REBAR ON BOTH DIRECTIONS. CONFIRM THICKNESS AND REINFORCEMENT REQUIRED FOR CONCRETE WITH A STRUCTURAL ENGINEER. CONFIRM LOCATION FOR CONDUIT STUB-UPS IN PAD AND TANK WITH GENERATOR VENDOR. COORDINATE LOCATION WITH GENERAL CONTRACTOR. SEE DETAIL 2, THIS SHEET FOR MORE INFORMATION.
4. PROVIDE 2 STRANDED #14 AWG THHN CONTROL WIRES (FOR STARTING) AND 2 SPARES IN 1" CONDUIT FROM GENERATOR CONTROL PANEL TO AUTOMATIC TRANSFER SWITCH. ALSO, PROVIDE 1 SPARE 1 1/4" CONDUIT AND PULLWIRE FROM GENERATOR TO TRANSFER SWITCH FOR FUTURE USE. CAP AT BOTH ENDS. CONFIRM REQUIREMENTS, NUMBER AND SIZE OF CONTROL WIRES WITH GENERATOR VENDOR.
5. PROVIDE 2 STRANDED #14 AWG THHN CONTROL WIRES IN 3/4" CONDUIT FROM THE GENERATOR COMMON ALARM DRY CONTACTS TO THE RTU TERMINAL STRIP TO ANNUNCIATE GENERATOR ALARMS (INCLUDING FUEL TANK) THROUGH THE RTU. COORDINATE REQUIREMENTS WITH RTU VENDOR.
6. PROVIDE 2 STRANDED #14 AWG THHN SIGNAL WIRES IN 3/4" CONDUIT FROM THE GENERATOR CONTROL PANEL TO THE LIFT STATION CONTROL PANEL, WHICH SHALL INDICATE "GENERATOR RUN" CONDITION AT THE LIST STATION CONTROL PANEL. SECOND PUMP IS LOCKED OUT WHILE ON EMERGENCY POWER.
7. PROVIDE 2 STRANDED #12 AWG CONDUCTORS AND #12 GROUND IN 3/4" CONDUIT FOR GENERATOR ACCESSORIES (WATER JACKET AND BATTERY CHARGER) FROM GENERATOR TO THE LIFT STATION CONTROL PANEL. COORDINATE WITH LIFT STATION CONTROL PANEL PROVIDER TO PROVIDE 20A, 120V, SINGLE POLE BREAKER FOR THIS CIRCUIT.
8. PROVIDE 4-#2/0 AWG CONDUCTORS AND STRANDED #6 GROUND, IN 2" CONDUIT. BURY CONDUIT AT LEAST 24" BELOW GROUND.
9. PROVIDE SERVICE RATED, 250A, 240/120V, 3 PHASE, 3 POLE AUTOMATIC TRANSFER SWITCH (ASCO MODEL 300 OR ONAN EXUAL) IN NEMA 4X ENCLOSURE WITH A SHORT CIRCUIT WITHSTAND RATING OF 35K SYMMETRICAL AMPS, PER SPECIFICATIONS. PROVIDE 225A, 240V, 3 POLE MAIN CIRCUIT BREAKER, RATED 42KAIC, IN TRANSFER SWITCH. PROVIDE TVSS PROTECTION FOR AUTOMATIC TRANSFER SWITCH.
10. PROVIDE 4-#4/0 AWG CONDUCTORS AND #4 GROUND, IN 2 1/2" CONDUIT (TYP.)
11. LIFT STATION CONTROL PANEL. PROVIDE ALL ELECTRICAL CONNECTIONS TO PANEL, PUMPS, AND ACCESSORIES. COORDINATE WITH LIFT STATION CONTROL PANEL PROVIDER TO ENSURE THAT PANEL COMES WITH 15A, 120V WEATHERPROOF GFI RECEPTANCE AND DEDICATED CIRCUITS FOR THE RTU AND SITE LIGHTING. SEE CIVIL DRAWINGS FOR MORE INFORMATION ON PANEL.
12. PROVIDE #1/0 AWG COPPER GROUND ELECTRODE CONDUCTOR. CONNECT TO GROUND ROD AND ANY OTHER AVAILABLE ELECTRODES PER ARTICLE 250 AND 250.50(C). SEE DETAIL 4, THIS SHEET, FOR MORE INFORMATION.
13. FP&L TRANSFORMER, ON A CONCRETE PAD (COORDINATE WITH FPL)
14. PROVIDE 225A, 240/120V, THREE PHASE, FOUR WIRE SERVICE LATERAL FROM TRANSFORMER. CONTACT FP&L FOR MORE INFORMATION.
15. PROVIDE FP&L APPROVED 400A, 3 PHASE, 4 WIRE METER SOCKET IN NEMA 3R ENCLOSURE. PROPERLY GROUND METER SOCKET PER NEC SECTION 250 AND LOCAL STANDARDS.
16. THE VOLTAGE OF EACH PHASE OF THE NORMAL SOURCE SHALL BE MONITORED WITH PICKUP ADJUSTABLE TO 95% OF NOMINAL AND DROPOUT ADJUSTABLE FROM 70% TO 90% OF PICKUP SETTING.
17. SINGLE-PHASE VOLTAGE AND FREQUENCY SENSING OF THE EMERGENCY SOURCE SHALL BE PROVIDED.
18. AN ADJUSTABLE TIME DELAY SHALL BE PROVIDED TO OVERRIDE MOMENTARY NORMAL SOURCE OUTAGES AND DELAY ALL TRANSFER AND ENGINE STARTING SIGNALS.
19. AN ADJUSTABLE TIME DELAY SHALL BE PROVIDED ON TRANSFER TO EMERGENCY, ADJUSTABLE FROM 0 TO 5 MINUTES FOR CONTROLLED TIMING OF TRANSFER OF LOADS TO EMERGENCY.
20. AN ADJUSTABLE TIME DELAY SHALL BE PROVIDED ON RETRANSFER TO NORMAL, ADJUSTABLE TO 30 MINUTES. TIME DELAY SHALL BE AUTOMATICALLY BYPASSED IF EMERGENCY SOURCE FAILS AND NORMAL SOURCE IS ACCEPTABLE.
21. A 5-MINUTE COOLDOWN TIME DELAY SHALL BE PROVIDED ON SHUTDOWN OF ENGINE GENERATOR.
22. ALL ADJUSTABLE TIME DELAYS SHALL BE FIELD ADJUSTABLE WITHOUT THE USE OF TOOLS.
23. A SET OF GOLD-FLASHED CONTACTS RATED 10 AMPS, 32 VDC SHALL BE PROVIDED FOR A LOW-VOLTAGE ENGINE START SIGNAL. THE START SIGNAL SHALL PREVENT DRY CRANKING OF THE ENGINE BY REQUIRING THE GENERATOR SET TO REACH PROPER OUTPUT, AND RUN FOR THE DURATION OF THE COOL DOWN SETTING, REGARDLESS OF WHETHER THE NORMAL SOURCE RESTORES BEFORE THE LOAD IS TRANSFERRED.
24. A PUSH-BUTTON TYPE TEST SWITCH SHALL BE PROVIDED TO SIMULATE A NORMAL SOURCE FAILURE.
25. A PUSH-BUTTON TYPE SWITCH TO BYPASS THE TIME DELAY ON TRANSFER TO EMERGENCY, THE ENGINE EXERCISER PERIOD ON THE RESTRANSFER TO NORMAL TIME DELAY WHICHEVER DELAY IS ACTIVE AT THE TIME THE PUSH-BUTTON IS ACTIVATED.
26. AUXILIARY CONTACTS, RATED 10 AMPS, 250 VAC SHALL BE PROVIDED CONSISTING OF ONE CONTACT, CLOSED WHEN THE ATS IS CONNECTED TO THE NORMAL SOURCE AND ONE CONTACT, CLOSED, WHEN THE ATS IS CONNECTED TO THE EMERGENCY SOURCE.
27. INDICATING LIGHTS SHALL BE PROVIDED, ONE TO INDICATE WHEN THE ATS IS CONNECTED TO THE NORMAL SOURCE (GREEN) AND ONE TO INDICATE WHEN THE ATS IS CONNECTED TO THE EMERGENCY SOURCE (RED). ALSO PROVIDE INDICATING LIGHTS FOR BOTH NORMAL AND EMERGENCY SOURCE AVAILABILITY.
28. TERMINALS SHALL BE PROVIDED TO INDICATE ACTUAL AVAILABILITY OF THE NORMAL AND EMERGENCY SOURCES, AS DETERMINED BY THE VOLTAGE SENSING PICKUP AND DROPOUT SETTINGS FOR EACH SOURCE.
29. ENGINE EXERCISER - AN ENGINE GENERATOR EXERCISING TIMER SHALL BE PROVIDED, INCLUDING A SELECTOR SWITCH TO SELECT EXERCISE WITH OR WITHOUT LOAD TRANSFER.
30. INPHASE MONITOR - AN INPHASE MONITOR SHALL BE INHERENTLY BUILT INTO THE CONTROLS. THE MONITOR SHALL CONTROL TRANSFER SO THAT MOTOR LOAD INRUSH CURRENTS DO NOT EXCEED NORMAL STARTING CURRENTS, AND SHALL NOT REQUIRE EXTERNAL CONTROL OF POWER SOURCES. THE INPHASE MONITOR SHALL BE SPECIFICALLY DESIGNED FOR AND BY THE PRODUCT OF THE ATS MANUFACTURER.
31. REMOTE ALARM: COORDINATE WITH OWNER EQUIPMENT TO PROVIDE ALARMS FOR REMOTE MONITORING OF THE FOLLOWING ITEMS. 1. RUN 2. STOP 3. FAILURE

GENERAL NOTES:

1. ROUTE ALL CONDUIT BETWEEN ELECTRICAL EQUIPMENT UNDERGROUND. UNDERGROUND CONDUIT MAY BE SCHEDULE 80 PVC (VERSUS RGS). WITH THE EXCEPTION OF CONDUIT WHICH ENTERS THE WET WELL, TRANSITIONS TO ABOVEGROUND SHALL BE MADE WITH PVC COATED RIGID STEEL OR WITH RIGID STEEL CONDUIT COATED WITH 2 COATS OF ASPHALTIC MATIC. CONDUIT WHICH ENTER THE WET WELL SHALL BE PVC COATED ALUMINUM AND SHALL CONTAIN EXPLOSION PROOF SEALS AND JUCTION BOXES AS SHOWN IN DETAIL 1, THIS SHEET.
2. SHORT CIRCUIT RATING SHOWN FOR EQUIPMENT IS BASED ON PRELIMINARY DATA. RECONFIRM AVAILABLE FAULT CURRENT AT THE SECONDARY OF THE TRANSFORMER WITH THE UTILITY AND RATE ALL EQUIPMENT ACCORDINGLY. (ADD 600A FOR MOTOR CONTRIBUTION).
3. ALL ABOVE CONDUIT SHALL BE ALUMINUM.
4. GENERATOR SHALL BE SIZED TO PROVIDE POWER TO THE ENTIRE DUPLEX PUMPING STATION IN THE EVENT OF POWER FAILURE.
5. THE EMERGENCY POWER SUPPLY SYSTEM SHALL CONSIST OF A DIESEL GENERATOR SET, WHICH UPON INTERRUPTION OF NORMAL POWER FROM TRANSFORMER, WILL START AUTOMATICALLY AND, BY AN AUTOMATIC TRANSFER SWITCH, WILL DISCONNECT LOAD FROM NORMAL SUPPLY AND CONNECT LOAD TO THE GENERATOR. THE GENERATOR SET SHALL BE SUPPLIED WITH RELATED COMPONENTS ACCESSORIES.
6. THE GENERATOR SHALL BE PROVIDED WITH A DOUBLE WALL SUB-BASE TANK CONSTRUCTED TO MEET ALL LOCAL CODES AND REQUIREMENTS. A FUEL TANK BASE OF FIVE (5) DAY CAPACITY SHALL BE PROVIDED AS AN INTEGRAL PART OF THE ENCLOSURE. IT SHALL BE CONTAINED IN A RUPTURE BASIN WITH 110% CAPACITY.
7. THE GENERATOR SET SHALL BE PROVIDED WITH A FULL TANK OF DIESEL FUEL FOR THE COMPLETION OF ALL TESTING.
8. THE COMPLETE DIESEL ENGINE GENERATOR SET, INCLUDING GENERATOR CONTROL PANEL, ENGINE STARTING BATTERIES AND DIESEL FUEL TANK, SHALL BE ENCLOSED IN A FACTORY ASSEMBLED, SOUND ATTENUATED ENCLOSURE MOUNTED ON THE FUEL TANK BASE. THE ENCLOSURE SHALL BE MADE FROM 12 GAUGE STEEL WITH ELECROSTATICALLY APPLIED POWDER COATED BAKED POLYESTER PAINT.
9. THE ENCLOSURE SHALL HAVE A RESULTING SOUND LEVEL THAT WILL MEET CITY CODE WITH THE GENERATOR SET RUNNING UNDER FULL LOAD.
10. ACOUSTICAL FOAM SHALL BE PROVIDED BETWEEN ALL SUPPORTS AND INSIDE DOORS AND SOUND BAFFLES ON AIR INTAKE AND AIR DISCHARGE.
11. A RESIDENTIAL GRADE SILENCER, COMPANION FLANGES, AND FLEXIBLE STAINLESS STEEL EXHAUST FITTING PROPERLY SIZED SHALL BE FURNISHED AND INSTALLED ACCORDING TO THE MANUFACTURES RECOMMENDATIONS.
12. THE GENERATOR SET SHALL BE INSTALLED ON A REINFORCED CONCRETE SLAB STRUCTURALLY DESIGN TO WITHSTAND THE LOAD OF THE GENERATOR AND THE FUEL TANK COMPLETELY FULL WITH DIESEL FUEL.
13. THE ENGINE SHALL BE DIESEL FUELED, FOUR (4) CYCLE, WATER COOLED. THE ENGINE SHALL UTILIZE IN-CYLINDER COMBUSTION TECHNOLOGY, TO MEET EPA EMISSION REGULATIONS. ADDITIONALLY, THE ENGINE SHALL COMPLY WITH THE STATE EMISSION REGULATIONS.
14. THE GENERATOR SHALL BE SUPPLIED WITH: AUTOMATIC VOLTAGE REGULATOR, LOCKED ROTOR MOTOR STATING, CIRCUIT BREAKER, FULLY SOLID-STATE, MICROPROCESSOR BASED, GENERATOR SET CONTROL, DIGITAL MONITORING CAPABILITY(ENGINE OIL PRESSURE, ENGINE COOLANT TEMP, ENGINE RPM, BATTERY VOLTS, GEN AC VOLTS, GEN AC CURRENT, GEN AC FREQUENCY), ALARMS AND SHUTDOWNS (LOW OIL PRESSURE (A/S), HIGH COOLANT TEMP (A/S), LOSS OF COOLANT (S), OVER SPEED (S), OVER CRANK (S), EMERGENCY STOP DEPRESSED (S), LOW COOLANT TEMP (A)
15. THE GENERATOR SET SHALL BE EQUIPED WITH A RAIL MOUNTED, ENGINE-DRIVEN RADIATOR WITH BLOWER FAN AND ALL ACCESSORIES.
16. A DC ELECTRIC STARTING SYSTEM WITH POSITIVE ENGAGEMENT SHALL BE FURNISHED.
17. JACKET WATER HEATER SHALL BE PROVIDED.
18. A LEAK-ACID STORAGE BATTERY SET OF THE HEAVY DUTY DIESEL STARTING TYPE SHALL BE PROVIDED. BATTERY VOLTAGE SHALL BE COMPATIBLE WITH THE STARTING SYSTEM.
19. A CURRENT LIMITING BATTERY CHARGER SHALL BE FURNISHED TO AUTOMATICALLY RECHARGE BATTERIES.
20. THE GENERATOR SHALL BE SUPPLIED WITH AN AUTOMATIC TRANSFER SWITCH AND CONTROL PANEL.
21. TWO YEAR WARRANTY FROM THE DATE OF INITIAL START UP OF THE SYSTEM IS REQUIRED.
22. PRIOR TO ACCEPTANCE OF THE INSTALLATION, THE EQUIPMENT SHALL BE SUBJECTED TO FULL LOAD TEST BY USING PORTABLE LOAD BANKS. FULL LOAD TEST SHALL BE CONDUCTED FOR A MINIMUM OF FOUR HOURS.
23. THREE COPIES OF THE O & M MANUALS FOR THE GENERATOR AND ITS COMPONENTS SHALL BE FURNISHED TO THE CITY PRIOR TO ACCEPTANCE OF THE PUMPING STATION.



LIGHT POLE FOUNDATION (3 E2)
NOT TO SCALE



NOTE: CONFIRM CONCRETE STRENGTH, REINFORCEMENT AND PAD THICKNESS WITH GENERATOR VENDOR. ALL SIZES ARE SHOWN IN INCHES.

PAD REINFORCEMENT DETAIL
NOT TO SCALE

CITY OF ST. AUGUSTINE LIFT STATION DETAILS EMERGENCY GENERATOR	REVISION DATE:	FEB 2017
	NOT TO SCALE	LS-7

C.O.S.A.

CITY OF ST. AUGUSTINE (C.O.S.A.) WATER AND SEWER GENERAL NOTES

GENERAL NOTES

1. THE CITY OF ST. AUGUSTINE (C.O.S.A.) STANDARDS AND SPECIFICATIONS DESIGN MANUAL AND DETAILS, LATEST EDITION, SHALL PRESIDE; THESE NOTES AND THIS PLAN SET ARE NOT INTENDED TO BE ALL INCLUSIVE WITH REGARD TO ALL POSSIBLE CONSTRUCTION REQUIREMENTS FOR THIS PROJECT.

2. THE C.O.S.A. STANDARDS MANUAL, DETAILS, AND "UTILITY CONSTRUCTION AND DEDICATION REQUIREMENTS" (LATEST EDITIONS) ARE AVAILABLE ONLINE. LINKS TO THESE ITEMS CAN BE FOUND ON THE "Public Works Documents, Forms and Reports" PAGE OF THE CITY'S WEBSITE. GO TO: www.staugustinegovernment.com --> Forms, Applications & Docs --> Public Works Requests and Documents.

3. A PRE-CONSTRUCTION MEETING IS REQUIRED WITH THE DEVELOPER AND/OR OWNER'S REPRESENTATIVE, THE ENGINEER OF RECORD, THE GENERAL CONTRACTOR, THE UNDERGROUND UTILITY CONTRACTOR, AND THE C.O.S.A. PRIOR TO THE START OF ANY CONSTRUCTION. A PRE-CONSTRUCTION MEETING WITH THE C.O.S.A. IS REQUIRED REGARDLESS OF OTHER AGENCIES REQUIREMENTS.

4. FOR PRE-CONSTRUCTION MEETING REQUIREMENTS, REFER TO THE C.O.S.A.'S "UTILITY CONSTRUCTION AND DEDICATION REQUIREMENTS", LATEST EDITION. PLAN AHEAD – C.O.S.A. APPROVAL OF PRE-CON SUBMITTAL ITEMS IS REQUIRED PRIOR TO SCHEDULING THE PRE-CON MEETING.

5. ALL WATER, SEWER, AND/OR REUSE CONSTRUCTION SHALL BE PERFORMED BY A CONTRACTOR LICENSED UNDER THE PROVISIONS OF CHAPTER 489, FLORIDA STATUTES. A COPY OF THE CONTRACTOR'S GENERAL LICENSE AND/OR UNDERGROUND UTILITY LICENSE SHALL BE PROVIDED PRIOR TO THE PRE-CONSTRUCTION MEETING.

6. PLAN AHEAD FOR C.O.S.A. DEDICATION AND ACCEPTANCE REQUIREMENTS FOR UTILITIES. THE CITY MUST OFFICIALLY ACCEPT ALL UTILITIES TO BE DEDICATED TO THE CITY PRIOR TO INSTALLING ANY WATER METERS, AND PRIOR TO SIGNING OFF ON ANY USE PERMIT OR CERTIFICATE OF OCCUPANCY. REFER TO THE C.O.S.A.'S "UTILITY CONSTRUCTION AND DEDICATION REQUIREMENTS", LATEST EDITION, FOR SUBMITTAL REQUIREMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE ALL REQUIRED DOCUMENTS ACCURATELY, DILIGENTLY AND IN A TIMELY MANNER. THE C.O.S.A. WILL NOT BE RESPONSIBLE FOR REQUESTING OR MANAGING SUBMITTAL OF THESE DOCUMENTS.

7. THE CONTRACTOR IS RESPONSIBLE FOR INSPECTING THE SITE PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF ALL LOCATIONS AND ELEVATIONS, PROPERTY LINES AND EASEMENTS PRIOR TO COMMENCEMENT OF CONSTRUCTION.

8. CONTRACTOR SHALL LOCATE, VERIFY, AND IDENTIFY ALL EXISTING UTILITIES AND UNDERGROUND UTILITIES SHOWN OR NOT SHOWN ON THE PLANS PRIOR TO ANY EXCAVATING ACTIVITIES AND TAKE ALL MEASURES NECESSARY TO PROTECT ALL UTILITIES DURING CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER OR C.O.S.A. (INCLUDING MEASURES SPECIFIED BY C.O.S.A. INSPECTOR SUCH AS MECHANICAL JOINT RESTRAINTS). SHOULD ANY UTILITY LINE OR COMPONENT BECOME DAMAGED OR REQUIRE RELOCATION, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE AFFECTED UTILITY COMPANY, ENGINEER OF RECORD, AND C.O.S.A. AT A MINIMUM, CONTRACTOR SHALL ENSURE PROTECTION OF ALL EXISTING UTILITIES BY FOLLOWING THE COMMON GROUND ALLIANCE BEST PRACTICES, LATEST VERSION, UNLESS EXCEPTIONS ARE SPECIFICALLY AGREED TO IN ADVANCE BY THE CITY. CONTRACTOR SHALL COORDINATE UTILITIES LOCATES WITH SUNSHINE STATE ONE-CALL OF FLORIDA. ONCE THE LOCATE SERVICE HAS FIELD MARKED ALL UTILITIES, CONTRACTOR SHALL VERIFY EACH UTILITY (INCLUDING ANY SERVICE LATERALS, I.E. WATER, SEWER, CABLE, GAS, ELECTRIC, PHONE, ETC.) AND THOSE WITHIN EACH PAVED AREA. VERIFICATION MAY BE PERFORMED UTILIZING GROUND PENETRATING RADAR, HAND DIG, OR VACUUM EXCAVATION. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL RECORD ON THE DRAWINGS BOTH THE HORIZONTAL AND VERTICAL LOCATION OF THE UTILITIES OFF OF A PREDETERMINED BASELINE.

9. THE CONTRACTOR SHALL PERFORM ALL WORK NECESSARY TO LOCATE, EXCAVATE AND PREPARE FOR CONNECTIONS TO THE TERMINUS OF THE C.O.S.A.'S EXISTING WATER OR SEWER SYSTEMS AT THOSE POINTS SHOWN ON THE DRAWINGS OR WHERE DIRECTED BY THE C.O.S.A. OR THE ENGINEER. ALL COSTS ASSOCIATED WITH THIS WORK AND FOR THE ACTUAL CONNECTION OF THE EXISTING MAINS SHALL BE INCLUDED IN THE BID FOR THE PROJECT AND SHALL NOT RESULT IN ANY ADDITIONAL COST TO THE C.O.S.A.

10. THE CONTRACTOR SHALL FIELD VERIFY THE CONNECTION POINTS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. ALL DISCREPANCIES SHALL BE REPORTED TO THE ENGINEER OF RECORD AND THE C.O.S.A. IMMEDIATELY.

11. THE WATER AND/OR SEWER SYSTEM SHALL BE CONSTRUCTED IN STRICT ACCORDANCE WITH THE C.O.S.A. APPROVED CONSTRUCTION DRAWINGS, DETAILS AND SPECIFICATIONS. IF THERE IS ANY DEVIATION FROM THE APPROVED CONSTRUCTION DRAWINGS, DETAILS OR SPECIFICATIONS, WITHOUT PRIOR AUTHORIZATION AND CONSENT FROM THE C.O.S.A., THE CONTRACTOR SHALL REMOVE THE DEVIATION AND RESTORE IT TO THE APPROVED CONSTRUCTION DRAWING CONFIGURATION AT NO EXPENSE TO THE C.O.S.A. FAILURE TO CONSTRUCT UTILITIES ACCORDINGLY WILL RESULT IN DELAYS IN OBTAINING SERVICE, C.O.S.A. REFUSAL TO ACCEPT THE UTILITIES, AND UNANTICIPATED COSTS AND CONSTRUCTION TIME WHILE CORRECTIONS ARE MADE. SUCH DELAYS AND COSTS WILL NOT BE THE RESPONSIBILITY OF THE C.O.S.A. THE C.O.S.A. WILL NOT ACCEPT UTILITIES WHICH ARE NOT CONSTRUCTED TO C.O.S.A. STANDARDS AND SPECIFICATIONS.

12. EXISTING UTILITIES SHOWN ON THESE PLANS HAVE BEEN LOCATED USING AVAILABLE MEANS. THE C.O.S.A. WILL NOT BE RESPONSIBLE FOR INACCURATE OR INCOMPLETE SURVEY INFORMATION, AND ANY RESULTANT DELAYS AND COSTS.

13. VERTICAL LOCATIONS OF ALL UTILITIES SHOWN ON THE PLANS HAVE BEEN REFERENCED TO A BENCH MARK NOTED ON THE PLANS. CONTRACTOR SHALL EXERCISE CAUTION DURING EXCAVATION NEAR EXISTING UTILITIES SHOWN ON THE PLANS AND SHALL NOTIFY THE ENGINEER IF LOCATION DIFFERS FROM THAT SHOWN ON THE PLANS BEFORE CONTINUING WITH CONSTRUCTION.

14. SHOULD CONDITIONS VARY FROM THOSE SHOWN ON THESE PLANS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND THE C.O.S.A. PRIOR TO CONTINUING CONSTRUCTION.

15. THE CONTRACTOR SHALL PROTECT SURVEY MARKERS, MONUMENTS, ETC. DURING CONSTRUCTION. THE CONTRACTOR SHALL RESTORE/REPLACE, AT NO ADDITIONAL EXPENSE TO THE OWNER, ANY DAMAGE DONE BY CONSTRUCTION ACTIVITIES.

16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING UTILITIES CAUSED BY HIS OR HER OPERATIONS. ANY DAMAGE SHALL BE REPLACED/REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER OR THE C.O.S.A.

17. THE CONTRACTOR SHALL COORDINATE ALL CONSTRUCTION AND BUILDING PLACEMENT WITH ALL OTHER UTILITIES CONSTRUCTION.

18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL AND DISPOSAL OF ANY UNSUITABLE MATERIAL FROM THE OPERATION. FURNISHING AND COMPACTING SUITABLE REPLACEMENT BACKFILL MATERIAL SHALL BE IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS.

19. UNSUITABLE MATERIALS UNDER WATER AND/OR SEWER MAINS SHALL BE REMOVED AND REPLACED WITH SELECTED BACKFILL PROPERLY COMPACTED TO 95% OF MAXIMUM DENSITY. BACKFILL SHALL BE COMPACTED IN A MAXIMUM OF ONE-FOOT (1) LIFTS. DENSITY TESTS SHALL BE TAKEN AFTER COMPACTION OF EVERY LIFT.

20. THE CONTRACTOR(S) SHALL NOTIFY ALL APPLICABLE UTILITIES COMPANIES, THE ENGINEER OF RECORD, THE PROPERTY OWNER, AND THE C.O.S.A. 72 HOURS PRIOR TO INITIATING ANY EXCAVATION ACTIVITIES, OR AS SPECIFIED BY THE UTILITY COMPANIES AND THE PERMITS OBTAINED FOR THE WORK.

21. THE ENGINEER OF RECORD AND THE C.O.S.A. SHALL BE GIVEN FORTY-EIGHT HOURS (48-HR) NOTICE OF ALL REQUESTED MEETINGS AND/OR TESTING MEASURES RELATED TO THE PROJECT.

22. ALL WORK, MATERIALS, AND EQUIPMENT SHALL BE IN COMPLETE ACCORDANCE WITH ALL RELEVANT C.O.S.A. STANDARDS AND REQUIREMENTS AS WELL AS STATE AND LOCAL REGULATIONS.

23. ALL UNDERGROUND UTILITY EQUIPMENT, MATERIALS AND INSTALLATION SHALL BE IN ACCORDANCE WITH THE CITY OF ST. AUGUSTINE (C.O.S.A.) STANDARDS AND SPECIFICATIONS DESIGN MANUAL AND DETAILS, AND ALL INTERIM STANDARDS UPDATES, LATEST EDITION, AND ALL APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS, AND THE APPROVED PLANS.

24. ALL UTILITY CROSSINGS SHALL COMPLY WITH F.D.E.P. REGULATIONS (CHAPTER 62-555.314, F.A.C.)

25. DURING ALL EXCAVATION ACTIVITIES NEAR EXISTING C.O.S.A. UTILITIES, CONTRACTOR SHALL PROTECT EXISTING PIPE FROM DAMAGE AND SUPPORT PIPE AS NECESSARY. CONTRACTOR SHALL RESTRAIN EXISTING PIPE AS NECESSARY AND/OR AS DIRECTED BY THE PLANS OR C.O.S.A. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE, AND THE EXISTING UTILITIES SHALL BE REPLACED/REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER OR THE C.O.S.A.

26. LANDSCAPING TREES SHALL HAVE A MINIMUM OF 7.5 FEET SEPARATION FROM THE EDGE OF PIPELINE TO THE EDGE OF THE TREE CANOPY.

GENERAL NOTES (CONTINUED)

27. ALL ROCK AND UNSUITABLY SIZED STONES (AS DESCRIBED IN APPLICABLE AWWA AND C.O.S.A. STANDARDS AND/OR PIPE MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES) FOUND IN TRENCHES FOR NEW AND RELOCATED PIPE SHALL BE REMOVED TO A DEPTH OF AT LEAST SIX (6) INCHES BELOW THE BOTTOM OF THE PIPE. CONTINUOUS AND UNIFORM BEDDING SHALL BE PROVIDED FOR NEW AND RELOCATED PIPES. THE BACKFILL MATERIAL SHALL BE TAMPED IN LAYERS AROUND THE NEW AND RELOCATED PIPES AND TO A SUFFICIENT HEIGHT ABOVE SUCH PIPE TO ADEQUATELY SUPPORT AND PROTECT THE PIPE.

28. DEWATERING SHALL BE PROVIDED TO KEEP GROUNDWATER ELEVATION A MINIMUM OF SIX INCHES BELOW UTILITIES BEING LAID. CONTRACTOR SHALL SECURE ALL REQUIRED FEDERAL, STATE AND LOCAL PERMITS FOR DEWATERING.

29. FOR WATER AND WASTEWATER MAINS SMALLER THAN 12 INCHES, THE MINIMUM AND MAXIMUM COVER SHALL BE 30 INCHES AND 36 INCHES, RESPECTIVELY, IN UNPAVED AREAS, AND 36 INCHES AND 42 INCHES, RESPECTIVELY, IN PAVED AREAS, OR AS REQUIRED WITHIN F.D.O.T. OR RAILROAD RIGHTS-OF-WAY. FOR MAINS GREATER THAN 12 INCHES, THE MINIMUM AND MAXIMUM COVER SHALL BE 42 INCHES AND 54 INCHES, RESPECTIVELY. EXCEPTIONS MAY BE MADE FOR CONFLICTS.

30. INSTALLATION OF FORCE MAINS OR WATER MAINS USING PIPE DEFLECTION WITHOUT FITTINGS SHALL ONLY BE ALLOWED AS APPROVED IN ADVANCE BY THE CITY. CONTRACTOR SHALL USE FITTINGS AS NECESSARY TO INSTALL PIPE WITHOUT JOINT DEFLECTION AT NO ADDITIONAL COST TO THE CITY. WHERE FORCE MAINS OR WATER MAINS ARE DEFLECTED WITHOUT FITTINGS, THE MAXIMUM JOINT DEFLECTION SHALL BE 80% OF THAT RECOMMENDED BY THE MANUFACTURER.

31. FITTINGS SHALL BE USED AT LOCATIONS INDICATED ON THE PLANS, UNLESS OTHERWISE APPROVED BY THE ENGINEER. ALL FITTINGS SHALL BE RESTRAINED PER THE RESTRAINED JOINT TABLE IN THE APPROVED PLAN SET.

32. ALL UNDERGROUND VALVES SHALL BE INSTALLED WITH AN ADJUSTABLE CAST IRON VALVE BOX WITH TOP SET TO FINAL GRADE IN ACCORDANCE WITH THE C.O.S.A. DETAILS AND SPECIFICATIONS. ALL VALVES SHALL HAVE PEG LOCATORS (145.7 KILOHERTZ).

33. ALL UNDERGROUND VALVES SHALL BE INSTALLED SO THAT THE OPERATING NUT IS ACCESSIBLE USING A STANDARD VALVE KEY. VALVE EXTENSIONS SHALL BE INSTALLED AS NECESSARY SO THAT THE OPERATING NUT IS A MAXIMUM OF 36" BELOW FINAL GRADE.

34. LOCATE WIRE AND LOCATOR PEGS SHALL BE INSTALLED ACCORDING TO C.O.S.A. STANDARDS, LATEST EDITION. IN GENERAL, LOCATE WIRE SHALL BE 10 GAUGE, SINGLE STRAND, UF RATED (DIRECT BURIAL), COPPER WIRE WITH 30 MIL (MIN.) INSULATION WITH EITHER WHITE OR YELLOW COLOR. LOCATOR PEGS SHALL BE ZIP-TIED TO BOTTOM SECTION OF ALL VALVE BOXES. THE ENTIRE LOCATING SYSTEM SHALL BE INSPECTED BY THE C.O.S.A. PRIOR TO BACKFILLING. AFTER BACKFILLING, ENTIRE LOCATING SYSTEM SHALL BE TESTED BY A CERTIFIED UTILITY LOCATOR OR BY A LICENSED ELECTRICAL CONTRACTOR, WITH THE TEST REPORT SUBMITTED TO C.O.S.A. THE C.O.S.A. SHALL BE NOTIFIED 72 HOURS IN ADVANCE OF ANY LOCATE SYSTEM TESTING. WHERE INSTALLED UNDER PAVEMENT AREAS, TESTING SHALL BE DONE PRIOR TO THE PLACEMENT OF PAVEMENT. IF ANY LOCATION IS IDENTIFIED WHERE THE TRACER WIRE IS NOT CONTINUOUS OR WHERE THE LOCATOR PEG DOES NOT DETECT, THE CONTRACTOR, AT NO ADDITIONAL COST TO THE OWNER OR C.O.S.A., SHALL MAKE NECESSARY REPAIRS AND RE-TEST. SUCCESSFUL LOCATE SYSTEM TEST REPORT IS REQUIRED PRIOR TO INSTALLATION OF WATER METERS.

35. CONTRACTOR IS RESPONSIBLE FOR PROPER NOTIFICATION TO INSPECTING AUTHORITIES BEFORE AND DURING CONSTRUCTION.

36. CONTRACTOR SHALL PROVIDE A MINIMUM OF SEVEN (7) CALENDAR DAYS NOTICE TO THE C.O.S.A. PRIOR TO SCHEDULING THE FINAL INSPECTION.

37. NO WORK REQUIRING CITY INSPECTION SHALL BE DONE AFTER 4:00 P.M. OR BEFORE 8:30 A.M. MONDAY THROUGH THURSDAY. NO WORK REQUIRING CITY INSPECTION SHALL BE DONE ON FRIDAYS, SATURDAYS, SUNDAYS, OR CITY RECOGNIZED HOLIDAYS UNLESS THE PROPER AND EFFICIENT PROSECUTION OF THE WORK REQUIRES OPERATIONS DURING THESE HOURS. IN THE EVENT THAT SUCH WORK HOURS ARE NECESSARY, THE CONTRACTOR SHALL REIMBURSE THE CITY FOR ALL COSTS ASSOCIATED WITH INSPECTION STAFF OVERTIME. WRITTEN NOTIFICATION FOR THE WORK SHALL BE PROVIDED TO THE CITY A MINIMUM OF 48 HOURS BEFORE STARTING WORK WITHIN THE ABOVE RESTRICTED HOURS AND SHALL BE SUBJECT TO THE AVAILABILITY OF THE INSPECTION STAFF. NO WORK THAT DOES NOT REQUIRE CITY INSPECTION SHALL BE DONE AFTER 7:00 P.M. OR BEFORE 7:00 A.M., OR ON SATURDAYS AND SUNDAYS, UNLESS THE PROPER AND EFFICIENT PROSECUTION OF THE WORK REQUIRES OPERATIONS DURING THESE TIMES. WRITTEN NOTIFICATION FOR THE WORK DURING THESE TIMES SHALL BE PROVIDED TO THE CITY A MINIMUM OF 48 HOURS BEFORE STARTING THE WORK. THE CITY SHALL HAVE 24 HOURS TO REVIEW AND APPROVE THE NOTIFICATION BEFORE THE WORK MAY BE STARTED.

38. THE C.O.S.A. RESERVES THE RIGHT TO KEEP ALL C.O.S.A. UTILITIES REMOVED DURING CONSTRUCTION.

39. ALL SPOOL PIECES TO BE MINIMUM 30-INCHES. CONTRACTOR SHALL PLAN AHEAD ACCORDINGLY TO ALLOW FOR THIS REQUIREMENT, AND SHALL NOTIFY CITY IMMEDIATELY SHOULD CONDITIONS DISCOVERED DURING CONSTRUCTION NECESSITATE ALTERNATE SOLUTIONS WHERE MINIMUM 30-INCH SPOOL PIECES CANNOT BE MET. ALL ALTERNATE FITTINGS, SUCH AS ?FOSTER ADAPTERS? FOR EXAMPLE, SHALL BE CONSIDERED INCIDENTAL AND SHALL BE INSTALLED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE CITY.

40. ALL OF THE STANDARD C.O.S.A. CONSTRUCTION DETAILS SHALL APPLY TO THIS PROJECT, REGARDLESS OF DETAILS SHOWN OR NOT SHOWN ON THE PLANS.

41. ADHERENCE TO THE PLANS AND SPECIFICATIONS CONTAINED HEREIN, OR THE CITY REPRESENTATIVE'S APPROVAL ON ANY ASPECT OF ANY CONSTRUCTION OPERATION COVERED BY THESE PLANS AND SPECIFICATIONS, SHALL IN NO WAY RELIEVE THE CONTRACTOR OF THEIR ULTIMATE RESPONSIBILITY FOR THE SATISFACTORY COMPLETION OF THE WORK.

42. CITY VALVES, FIRE HYDRANTS, LIFT STATIONS, FLUSHING HYDRANTS, AND SEWER MANHOLE COVERS ARE TO BE EXERCISED BY CITY STAFF OR OTHERS UNDER THE DIRECT SUPERVISION OF THE CITY INSPECTOR.

43. IN CASE OF ACCIDENTAL IMPACTS TO ANY CITY UTILITY SYSTEM IMMEDIATELY CONTACT THE CITY PUBLIC WORKS DEPARTMENT AT 904-825-1040 OR AFTER HOURS, CONTACT THE CITY WATER TREATMENT PLANT 904-825-1044.

NOTICE OF PROCEDURE

1. ALL BUILDING PERMITS AND WATER METERS PROCESSED THROUGH THE C.O.S.A. PLANNING & BUILDING DEPARTMENT, OR THE C.O.S.A. CUSTOMER SERVICE DEPARTMENT SHALL BE ACCOMPANIED BY A SET OF CIVIL SITE DESIGN AND CONSTRUCTION PLANS STAMPED APPROVED BY THE C.O.S.A. PUBLIC WORKS DEPARTMENT.
2. C.O.S.A. PUBLIC WORKS DEPARTMENT SITE PLAN APPROVAL IS REQUIRED PRIOR TO OBTAINING A BUILDING PERMIT.
3. ALL CONNECTIONS TO THE WATER AND/OR SEWER SYSTEM, FLUSHING, AND PRESSURE TESTS TO BE PERFORMED BY THE UTILITY CONTRACTOR OR LICENSED MASTER PLUMBER MUST BE SCHEDULED AT LEAST FIVE (5) WORKING DAYS IN ADVANCE WITH THE C.O.S.A. THE C.O.S.A. INSPECTOR MUST BE PRESENT PRIOR TO THE CONNECTION BEING MADE OR TESTING.
4. IT IS THE ENGINEER OF RECORD'S RESPONSIBILITY TO SECURE APPLICABLE PERMITS PRIOR TO CONSTRUCTION.
5. THE OWNER SHALL PURCHASE ALL WATER METERS THROUGH THE C.O.S.A.
6. WATER AND/OR SEWER UTILITY CONNECTION FEES SHALL BE PAID PRIOR TO ISSUANCE OF A SITE AND/OR BUILDING PERMIT.
7. ALL ON-SITE PRIVATE WATER AND/OR SEWER CONSTRUCTION BETWEEN THE METER OR CLEANOUT AND BUILDING MAY BE INSPECTED BY THE C.O.S.A. TO ENSURE STANDARDS ARE MET.
8. ALL REQUIREMENTS BY THE C.O.S.A. (I.E. FINAL INSPECTION, CORRECTION OF PUNCH LIST ITEMS, "AS-BUILTS", F.D.E.P. CERTIFICATION OF COMPLETION, BILL OF SALE, RECORDED EASEMENTS, ETC.) MUST BE SATISFIED PRIOR OF ISSUANCE OF CERTIFICATES OF OCCUPANCY.

AS-BUILT NOTES

1. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PRODUCE, SUBMIT AND OBTAIN APPROVAL OF REPRODUCIBLE "AS-BUILT" DRAWINGS FROM JURISDICTIONAL AGENCIES AS MAY BE REQUIRED.
2. "AS-BUILT" INFORMATION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR SHALL EMPLOY THE SERVICES OF A SURVEYOR REGISTERED IN THE STATE OF FLORIDA TO DETERMINE ALL "AS-BUILT" INFORMATION.
3. REFER TO C.O.S.A.'S "UTILITY CONSTRUCTION AND DEDICATION REQUIREMENTS" AND SECTION 30 OF THE CITY'S MANUAL, LATEST EDITIONS, FOR A COMPLETE DESCRIPTION AND LISTING OF THE CITY'S AS-BUILT REQUIREMENTS.
4. ALL C.O.S.A. AS-BUILT REQUIREMENTS ARE REQUIRED TO BE MET PRIOR TO C.O.S.A. ACCEPTANCE OF UTILITIES, INSTALLATION OF WATER METERS, OR FINAL PAYMENT.
5. ALL AS-BUILT PLANS AND CAD DRAWINGS MUST BE PROVIDED ON THE NAD 83 STATE PLANE FLORIDA EAST COORDINATE SYSTEM (US FEET), AND CONTAIN A MINIMUM OF FOUR (4) GPS ACQUIRED LOCATION POINTS. THE C.O.S.A. WILL NOT ACCEPT AS-BUILT PLANS OR CAD DRAWINGS NOT REFERENCED TO S.P.C.
6. A MINIMUM OF FIVE WORKING DAYS PRIOR TO THE PRELIMINARY FIELD INSPECTION, TWO (2) SETS OF PRELIMINARY BLACKLINE "AS-BUILTS" SHOWING THE REQUIRED INFORMATION, SHALL BE SUBMITTED TO THE ENGINEER OF RECORD AND THE C.O.S.A.
7. THE RECORD OR "AS-BUILT" DRAWINGS TO BE PREPARED BY THE CONTRACTOR AND SUBMITTED AT THE TIME OF THE REQUEST FOR A LETTER OF RELEASE TO PLACE THE CONSTRUCTION INTO SERVICE WILL CLEARLY DEPICT THE VERTICAL CLEARANCES BETWEEN WATER, SEWER (INCLUDING STORM) AND REUSE LINES AT ALL CROSSINGS AND PARALLEL RUNS WHERE THE HORIZONTAL SEPARATION IS LESS THAN 10 FEET. IN ADDITION, THE CENTERING OF UNCUT LENGTHS OF PIPE (USUALLY 20 FEET) AT POINTS OF CROSSINGS WILL BE DOCUMENTED ON THE DRAWINGS AND ALL MITIGATING CONSTRUCTION MEASURES CLEARLY DEPICTED IN CASES WHERE A MINIMUM OF 18 INCHES OF VERTICAL CLEARANCE BETWEEN THE WATER AND SEWER (INCLUDING STORM) LINES IS NOT POSSIBLE.

POTABLE WATER SYSTEM NOTES

1. ALL WATER MAINS 4" THROUGH 12" DIAMETER SHALL BE PVC C-900, DR-18, COLOR "BLUE" WITH PUSH-ON GASKETED JOINTS OR C-906 HDPE DR 11 COLOR "BLUE" OR DIP CLASS 350.
2. ALL WATER MAINS 16" THROUGH 20" DIAMETER SHALL BE PVC C-905, DR-25, COLOR "BLUE" WITH PUSH-ON GASKETED JOINTS OR C-906 HDPE DR 11 COLOR "BLUE" OR DIP CLASS 250.
3. ALL WATER MAINS 24" AND LARGER DIAMETER SHALL BE DUCTILE IRON PIPE.
4. ALL WATER LINES 2" DIAMETER OR LESS SHALL BE HDPE CTS DR 9 COLOR "BLUE".
5. ALL CURB STOPS ARE TO BE FORD BALL-TYPE OR EQUAL WITH LOCKING CAPACITY AND LARGE NUT. 1" MINIMUM. SEE C.O.S.A. APPROVED MATERIALS AND MANUFACTURER'S LIST, LATEST EDITION.
6. THE SEPARATION REQUIREMENT BETWEEN POTABLE WATER MAINS AND OTHER UTILITIES SHALL BE PER CHAPTER 62-555, F.A.C.
7. A FULL UNCUT LENGTH OF WATER MAIN PIPE (USUALLY 20 FEET) SHALL BE CENTERED AT THE POINT OF CROSSING OF ALL WATER AND SEWER (INCLUDING STORM) LINES AT THE POINT OF CROSSINGS REGARDLESS OF THE VERTICAL SEPARATIONS.
8. WHERE SOLVENT CONTAMINATION IS FOUND IN THE TRENCH, WORK WILL BE STOPPED AND THE PROPER AUTHORITIES NOTIFIED. WITH THE APPROVAL OF THE C.O.S.A. AND THE HEALTH DEPARTMENT, DUCTILE IRON PIPE, FITTINGS AND APPROVED SOLVENT RESISTANT GASKET MATERIAL SHALL BE USED IN THE CONTAMINATED AREA. THE DUCTILE IRON PIPE WILL EXTEND AT LEAST 100 FEET BEYOND ANY DISCOVERED CONTAMINATION.
9. NO CONNECTION TO EXISTING POTABLE WATER SYSTEM SHALL BE ALLOWED UNTIL ALL PROPOSED WATER LINES HAVE BEEN PRESSURE TESTED, DISINFECTED, CLEARED FOR SERVICE AND ACCEPTED FOR MAINTENANCE BY THE C.O.S.A. AND F.D.E.P.
10. JUMPER CONNECTIONS WITH BACKFLOW PREVENTION DEVICE SHALL BE USED TO FILL OR FLUSH WATER MAINS.
11. ALL NEW AND RELOCATED WATER MAIN PIPE, FITTINGS, VALVES, AND FIRE HYDRANTS SHALL BE IN CONFORMANCE WITH APPLICABLE AMERICAN WATER WORKS ASSOCIATION (AWWA) AND THE C.O.S.A. STANDARDS.
12. ALL NEW AND RELOCATED WATER MAIN PIPE AND FITTINGS WILL COMPLY WITH THE LATEST F.D.E.P. AND AWWA STANDARDS FOR LEAD CONTENT.
13. ALL NEW AND RELOCATED WATER MAINS SHALL BE PRESSURE TESTED AND LEAKAGE TESTED IN ACCORDANCE WITH AWWA STANDARD C605, LATEST EDITION.
14. ALL NEW AND RELOCATED WATER MAINS SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA STANDARD C651 AND RULE 62-555.340, F.A.C.
15. ALL NEW AND RELOCATED WATER SERVICES SHALL BE IN CONFORMANCE WITH THE STATE PLUMBING CODE AND THE C.O.S.A. STANDARDS.
16. THE BACTERIOLOGICAL SAMPLE POINTS SHALL BE INDICATED ON THE ASBUILT DRAWINGS. THE SAMPLE POINT NUMBERING AND STATIONING SHALL CORRESPOND TO THOSE ON THE BACTERIOLOGICAL SAMPLE CHAIN OF CUSTODY FORMS.
17. ALL METER BOX ASSEMBLIES ARE TO BE INSTALLED OUTSIDE PAVED AREAS UNLESS CONDITIONS NECESSITATE OTHERWISE AND ALTERNATE LOCATIONS ARE APPROVED IN ADVANCE BY THE CITY. ALL METER BOX ASSEMBLIES ARE TO BE INSTALLED 1-FOOT INSIDE RIGHT-OF-WAY LINES UNLESS CONDITIONS NECESSITATE OTHERWISE AND ALTERNATE LOCATIONS ARE APPROVED IN ADVANCE BY THE CITY.

WASTEWATER SYSTEM NOTES

1. INTERIOR LINERS ARE REQUIRED ON JUNCTION MANHOLES WITH THREE OR MORE INVERTS, AND/OR MANHOLES RECEIVING FORCE MAIN FLOW. LINERS SHALL BE SPECTRASHIELD, SEWPERCOAT, OR EQUAL AS APPROVED BY THE C.O.S.A.
2. SANITARY SEWER LINE TO DEPTHS OF 10' SHALL BE SDR-35 PVC PIPE CONFORMING TO ASTM D-3034 COLORED GREEN. SANITARY SEWER LINE OF DEPTHS 10' TO 15' SHALL BE SDR-26 PVC. ALL SANITARY SEWER LINES SHALL BE GREEN AND CLEARLY MARKED ON THE PIPE.
3. SANITARY SEWER FORCE MAIN 4" AND LARGER SHALL BE C900 DR25 PVC PIPE CONFORMING TO ASTM D-1784, D-1785, AND D-2241. DUCTILE IRON PIPE SHALL ONLY BE USED WITH PRIOR APPROVAL BY THE THE C.O.S.A.. SANITARY FORCE MAIN SHALL BE COLOR CODED GREEN AND CLEARLY MARKED.
4. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER OF RECORD AND THE C.O.S.A. ALL VIDEO LOGS, WRITTEN REPORTS, AND DEFLECTION TEST RESULTS FOR REVIEW AND APPROVAL.
5. THE CONTRACTOR SHALL CONTACT THE C.O.S.A. FOR INSPECTION AFTER INSTALLATION OF GREASE TRAPS, INTERCEPTORS, AND/OR OIL-WATER SEPARATORS.

HYDROSTATIC TESTING NOTES

1. AFTER ALL PRESSURE PIPES ARE INSTALLED, THE JOINTS COMPLETED, AND THE TRENCH BACKFILLED, THE NEWLY LAID PIPE AND APPURTENANCES SHALL BE SUBJECTED TO A HYDROSTATIC TEST FOR A PERIOD OF AT LEAST TWO (2) HOURS. THE ENGINEER AND THE C.O.S.A. MUST BE NOTIFIED AT LEAST 48 HOURS BEFORE A TEST IS TO BE PERFORMED. TEST SHALL BE AS SET FORTH IN AWWA STANDARD C605. ANY LEAKS DETECTED SHALL BE CORRECTED AND THE SECTION OF PIPELINE RETESTED. THE TWO HOUR TEST PERIOD SHALL BEGIN WHEN ALL JOINTS HAVE BEEN DETERMINED TO BE WATER TIGHT. LEAKAGE SHALL BE LIMITED TO THAT ALLOWANCE SET FORTH IN SECTION 4 OF AWWA STANDARD C600 LATEST EDITION. HYDROSTATIC AND LEAKAGE TEST AND BLOW-DOWN (ZEROING OF GAUGE) MUST OCCUR BEFORE SAMPLING FOR BACTERIOLOGICAL TEST. THE MAXIMUM ALLOWABLE PRESSURE LOSS IS 5 PSI.

UTILITY ABANDONMENT

1. ALL EXISTING WATER AND SEWER UTILITY SERVICES THAT WILL NO LONGER BE UTILIZED MUST BE PROPERLY ABANDONED BY CONTRACTOR BY CUTTING, CAPPING, AND REPAIRING SERVICE CONNECTIONS AT THE UTILITY MAIN LOCATIONS BY METHODS DIRECTED BY THE CITY INSPECTOR AND UNDER CITY INSPECTOR'S OBSERVATION. EXCAVATION MAY BE REQUIRED IN ORDER TO DETERMINE PROPER ABANDONMENT METHODS.
2. ALL EXISTING WATER AND SEWER UTILITY SERVICES INTENDED TO BE REUSED MUST BE INVESTIGATED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRS AND/OR REPLACEMENT TO RENEW EXISTING POTABLE WATER SERVICES, AND SEWER SERVICE LATERALS. ALL UTILITIES MUST BE RETURNED TO GOOD WORKING ORDER. ALL INVESTIGATIVE AND REPAIR/REPLACEMENT METHODS WILL BE AS DIRECTED BY THE CITY INSPECTOR AND UNDER CITY INSPECTOR'S OBSERVATION. EXCAVATION AND OTHER PROCEDURES SUCH AS CLOSED-CIRCUIT TV MAY BE REQUIRED IN ORDER TO DETERMINE CONDITION.

STANDARD WATER/SEWER/RECLAIMED WATER SEPARATION REQUIREMENTS

THE CONTRACTOR SHALL INSTALL ALL MAINS IN ACCORDANCE WITH THE REQUIREMENTS OF RULE 62-555.314, FAC, BELOW. THE CONTRACTOR SHALL NOTIFY THE C.O.S.A. IN ANY INSTANCE WHERE THE BELOW REQUIREMENTS CANNOT BE MET PRIOR TO INSTALLATION OF PIPE.

"62-555.314 LOCATION OF PUBLIC WATER SYSTEM MAINS.

FOR THE PURPOSE OF THIS SECTION, THE PHRASE "WATER MAINS" SHALL MEAN MAINS, INCLUDING TREATMENT PLANT PROCESS PIPING, CONVEYING EITHER RAW, PARTIALLY TREATED, OR FINISHED DRINKING WATER; FIRE HYDRANT LEADS; AND SERVICE LINES THAT ARE UNDER THE CONTROL OF A PUBLIC WATER SYSTEM AND THAT HAVE AN INSIDE DIAMETER OF THREE INCHES OR GREATER.

(1) HORIZONTAL SEPARATION BETWEEN UNDERGROUND WATER MAINS AND SANITARY OR STORM SEWERS, WASTEWATER OR STORMWATER FORCE MAINS, RECLAIMED WATER PIPELINES, AND ON-SITE SEWAGE TREATMENT AND DISPOSAL SYSTEMS.

(A) NEW OR RELOCATED, UNDERGROUND WATER MAINS SHALL BE LAID TO PROVIDE A HORIZONTAL DISTANCE OF AT LEAST THREE FEET BETWEEN THE OUTSIDE OF THE WATER MAIN AND THE OUTSIDE OF ANY EXISTING OR PROPOSED STORM SEWER, STORMWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER REGULATED UNDER PART OF CHAPTER 62-610, F.A.C.

STANDARD WATER/SEWER/RECLAIMED WATER SEPARATION REQUIREMENTS (CONTINUED)

(B) NEW OR RELOCATED, UNDERGROUND WATER MAINS SHALL BE LAID TO PROVIDE A HORIZONTAL DISTANCE OF AT LEAST THREE FEET, AND PREFERABLY TEN FEET, BETWEEN THE OUTSIDE OF THE WATER MAIN AND THE OUTSIDE OF ANY EXISTING OR PROPOSED VACUUM-TYPE SANITARY SEWER.

(C) NEW OR RELOCATED, UNDERGROUND WATER MAINS SHALL BE LAID TO PROVIDE A HORIZONTAL DISTANCE OF AT LEAST SIX FEET, AND PREFERABLY TEN FEET, BETWEEN THE OUTSIDE OF THE WATER MAIN AND THE OUTSIDE OF ANY EXISTING OR PROPOSED GRAVITY- OR PRESSURE-TYPE SANITARY SEWER, WASTEWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER NOT REGULATED UNDER PART OF CHAPTER 62-610, F.A.C. THE MINIMUM HORIZONTAL SEPARATION DISTANCE BETWEEN WATER MAINS AND GRAVITY-TYPE SANITARY SEWERS SHALL BE REDUCED TO THREE FEET WHERE THE BOTTOM OF THE WATER MAIN IS LAID AT LEAST SIX INCHES ABOVE THE TOP OF THE SEWER.

(D) NEW OR RELOCATED, UNDERGROUND WATER MAINS SHALL BE LAID TO PROVIDE A HORIZONTAL DISTANCE OF AT LEAST TEN FEET BETWEEN THE OUTSIDE OF THE WATER MAIN AND ALL PARTS OF ANY EXISTING OR PROPOSED .ON-SITE SEWAGE TREATMENT AND DISPOSAL SYSTEM. AS DEFINED IN SECTION 381.0065(2), F.S.,AND RULE 64E-6.002, F.A.C.

(2) VERTICAL SEPARATION BETWEEN UNDERGROUND WATER MAINS AND SANITARY OR STORM SEWERS, WASTEWATER OR STORMWATER FORCE MAINS, AND RECLAIMED WATER PIPELINES.

(A) NEW OR RELOCATED, UNDERGROUND WATER MAINS CROSSING ANY EXISTING OR PROPOSED GRAVITY- OR VACUUM-TYPE SANITARY SEWER OR STORM SEWER SHALL BE LAID SO THE OUTSIDE OF THE WATER MAIN IS AT LEAST SIX INCHES, AND PREFERABLY 12 INCHES, ABOVE OR AT LEAST 12 INCHES BELOW THE OUTSIDE OF THE OTHER PIPELINE. HOWEVER, IT IS PREFERABLE TO LAY THE WATER MAIN ABOVE THE OTHER PIPELINE.

(B) NEW OR RELOCATED, UNDERGROUND WATER MAINS CROSSING ANY EXISTING OR PROPOSED PRESSURE-TYPE SANITARY SEWER, WASTEWATER OR STORMWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER SHALL BE LAID SO THE OUTSIDE OF THE WATER MAIN IS AT LEAST 12 INCHES ABOVE OR BELOW THE OUTSIDE OF THE OTHER PIPELINE. HOWEVER, IT IS PREFERABLE TO LAY THE WATER MAIN ABOVE THE OTHER PIPELINE.

(C) AT THE UTILITY CROSSINGS DESCRIBED IN PARAGRAPHS (A) AND (B) ABOVE, ONE FULL LENGTH OF WATER MAIN PIPE SHALL BE CENTERED ABOVE OR BELOW THE OTHER PIPELINE SO THE WATER MAIN JOINTS WILL BE AS FAR AS POSSIBLE FROM THE OTHER PIPELINE. F.A.C. ALTERNATIVELY, AT SUCH CROSSINGS, THE PIPES SHALL BE ARRANGED SO THAT ALL WATER MAIN JOINTS ARE AT LEAST THREE FEET FROM ALL JOINTS IN VACUUM-TYPE SANITARY SEWERS, STORM SEWERS, STORMWATER FORCE MAINS, OR PIPELINES CONVEYING RECLAIMED WATER REGULATED UNDER PART OF CHAPTER 62-610, F.A.C., AND AT LEAST SIX FEET FROM ALL JOINTS IN GRAVITY- OR PRESSURE-TYPE SANITARY SEWERS, WASTEWATER FORCE MAINS, OR PIPELINES CONVEYING RECLAIMED WATER NOT REGULATED UNDER PART OF CHAPTER 62-610, SANITARY SEWER MANHOLE.

(3.) SEPARATION BETWEEN WATER MAINS AND SANITARY OR STORM SEWER MANHOLES.

(A) NO WATER MAIN SHALL PASS THROUGH, OR COME INTO CONTACT WITH, ANY PART OF A

(B) EFFECTIVE AUGUST 28, 2003, WATER MAINS SHALL NOT BE CONSTRUCTED OR ALTERED TO PASS THROUGH, OR COME INTO CONTACT WITH, ANY PART OF A STORM SEWER MANHOLE OR INLET STRUCTURE. WHERE IT IS NOT TECHNICALLY FEASIBLE OR ECONOMICALLY SENSIBLE TO COMPLY WITH THIS REQUIREMENT (I.E., WHERE THERE IS A CONFLICT IN THE ROUTING OF A WATER MAIN AND A STORM SEWER AND WHERE ALTERNATIVE ROUTING OF THE WATER MAIN OR THE STORM SEWER IS NOT TECHNICALLY FEASIBLE OR IS NOT ECONOMICALLY SENSIBLE), THE DEPARTMENT SHALL ALLOW EXCEPTIONS TO THIS REQUIREMENT (I.E., THE DEPARTMENT SHALL ALLOW CONSTRUCTION OF CONFLICT MANHOLES), BUT SUPPLIERS OF WATER OR PERSONS PROPOSING TO CONSTRUCT CONFLICT MANHOLES MUST FIRST OBTAIN A SPECIFIC PERMIT FROM THE DEPARTMENT IN ACCORDANCE WITH PART V OF THIS CHAPTER AND MUST PROVIDE IN THE MANHOLE. PRELIMINARY DESIGN REPORT OR DRAWINGS, SPECIFICATIONS, AND DESIGN DATA ACCOMPANYING THEIR PERMIT APPLICATION THE FOLLOWING INFORMATION:

1. TECHNICAL OR ECONOMIC JUSTIFICATION FOR EACH CONFLICT MANHOLE.

2. A STATEMENT IDENTIFYING THE PARTY RESPONSIBLE FOR MAINTAINING EACH CONFLICT

3. ASSURANCE OF COMPLIANCE WITH THE DESIGN AND CONSTRUCTION REQUIREMENTS IN SUB-SUBPARAGRAPHS A. THROUGH D. BELOW.

A. EACH WATER MAIN PASSING THROUGH A CONFLICT MANHOLE SHALL HAVE A FLEXIBLE, WATERTIGHT JOINT ON EACH SIDE OF THE MANHOLE TO ACCOMMODATE DIFFERENTIAL SETTLING BETWEEN THE MAIN AND THE MANHOLE.

B. WITHIN EACH CONFLICT MANHOLE, THE WATER MAIN PASSING THROUGH THE MANHOLE SHALL BE INSTALLED IN A WATERTIGHT CASING PIPE HAVING HIGH IMPACT STRENGTH (I.E., HAVING AN IMPACT STRENGTH AT LEAST EQUAL TO THAT OF 0.25-INCH-THICK DUCTILE IRON PIPE).

C. EACH CONFLICT MANHOLE SHALL HAVE AN ACCESS OPENING, AND SHALL BE SIZED, TO ALLOW FOR EASY CLEANING OF THE MANHOLE.

D. GRATINGS SHALL BE INSTALLED AT ALL STORM SEWER INLETS UPSTREAM OF EACH CONFLICT MANHOLE TO PREVENT LARGE OBJECTS FROM ENTERING THE MANHOLE.

(4) SEPARATION BETWEEN FIRE HYDRANT DRAINS AND SANITARY OR STORM SEWERS, WASTEWATER OR STORMWATER FORCE MAINS, RECLAIMED WATER PIPELINES, AND ON-SITE SEWAGE TREATMENT AND DISPOSAL SYSTEMS. NEW OR RELOCATED FIRE HYDRANTS WITH UNDERGROUND DRAINS SHALL BE LOCATED SO THAT THE DRAINS ARE AT LEAST THREE FEET FROM ANY EXISTING OR PROPOSED STORM SEWER, STORMWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER REGULATED UNDER PART OF CHAPTER 62-610, F.A.C.; AT LEAST 64E-6.002, F.A.C. THREE FEET, AND PREFERABLY TEN FEET, FROM ANY EXISTING OR PROPOSED VACUUMTYPE SANITARY SEWER; AT LEAST SIX FEET, AND PREFERABLY TEN FEET, FROM ANY EXISTING OR PROPOSED GRAVITY- OR PRESSURE-TYPE SANITARY SEWER, WASTEWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER NOT REGULATED UNDER PART III OF CHAPTER 62-610, F.A.C.; AND AT LEAST TEN FEET FROM ANY EXISTING OR PROPOSED "ON-SITE SEWAGE TREATMENT AND DISPOSAL SYSTEM" AS DEFINED IN SECTION 381.0065(2), F.S., AND RULE

(5) EXCEPTIONS. WHERE IT IS NOT TECHNICALLY FEASIBLE OR ECONOMICALLY SENSIBLE TO COMPLY WITH THE REQUIREMENTS IN SUBSECTION (1) OR (2) ABOVE, THE DEPARTMENT SHALL ALLOW EXCEPTIONS TO THESE REQUIREMENTS IF SUPPLIERS OF WATER OR CONSTRUCTION PERMIT APPLICANTS PROVIDE TECHNICAL OR ECONOMIC JUSTIFICATION FOR EACH EXCEPTION AND PROVIDE ALTERNATIVE CONSTRUCTION FEATURES THAT AFFORD A SIMILAR LEVEL OF RELIABILITY AND PUBLIC HEALTH PROTECTION. ACCEPTABLE ALTERNATIVE CONSTRUCTION FEATURES INCLUDE THE FOLLOWING:

(A) WHERE AN UNDERGROUND WATER MAIN IS BEING LAID LESS THAN THE REQUIRED MINIMUM HORIZONTAL DISTANCE FROM ANOTHER PIPELINE AND WHERE AN UNDERGROUND WATER MAIN IS CROSSING ANOTHER PIPELINE AND JOINTS IN THE WATER MAIN ARE BEING LOCATED LESS THAN THE REQUIRED MINIMUM DISTANCE FROM JOINTS IN THE OTHER PIPELINE:
OR THE OTHER PIPELINE; OR
1. USE OF PRESSURE-RATED PIPE CONFORMING TO THE AMERICAN WATER WORKS ASSOCIATION STANDARDS INCORPORATED INTO RULE 62-555.330, F.A.C., FOR THE OTHER PIPELINE IF IT IS A GRAVITY- OR VACUUM-TYPE PIPELINE;

2. USE OF WELDED, FUSED, OR OTHERWISE RESTRAINED JOINTS FOR EITHER THE WATER MAIN

3. USE OF WATERTIGHT CASING PIPE OR CONCRETE ENCASEMENT AT LEAST FOUR INCHES THICK FOR EITHER THE WATER MAIN OR THE OTHER PIPELINE.

(B) WHERE AN UNDERGROUND WATER MAIN IS BEING LAID LESS THAN THREE FEET HORIZONTALLY FROM ANOTHER PIPELINE AND WHERE AN UNDERGROUND WATER MAIN IS CROSSING ANOTHER PIPELINE AND IS BEING LAID LESS THAN THE REQUIRED MINIMUM VERTICAL DISTANCE FROM THE OTHER PIPELINE:

1. USE OF PIPE, OR CASING PIPE, HAVING HIGH IMPACT STRENGTH (I.E., HAVING AN IMPACT STRENGTH AT LEAST EQUAL TO THAT OF 0.25-INCH-THICK DUCTILE IRON PIPE) OR CONCRETE ENCASEMENT AT LEAST FOUR INCHES THICK FOR THE WATER MAIN; AND

2. USE OF PIPE, OR CASING PIPE, HAVING HIGH IMPACT STRENGTH (I.E., HAVING AN IMPACT STRENGTH AT LEAST EQUAL TO THAT OF 0.25-INCH-THICK DUCTILE IRON PIPE) OR CONCRETE ENCASEMENT AT LEAST FOUR INCHES THICK FOR THE OTHER PIPELINE IF IT IS NEW AND IS CONVEYING WASTEWATER OR RECLAIMED WATER."

CITY OF ST. AUGUSTINE
WATER AND SEWER
GENERAL NOTES

REVISION DATE: **FEB 2017**

NOT TO SCALE **N-1**

C.O.S.A.

STORM WATER POLLUTION PREVENTION PLAN

GENERAL NOTES

THE CONTRACTOR SHALL AT A MINIMUM IMPLEMENT THE CONTRACTOR'S REQUIREMENTS OUTLINED BELOW AND THOSE MEASURES SHOWN ON THE CLEARING AND EROSION CONTROL PLAN. IN ADDITION THE CONTRACTOR SHALL UNDERTAKE ADDITIONAL MEASURES REQUIRED TO BE IN COMPLIANCE WITH APPLICABLE PERMIT CONDITIONS AND STATE WATER QUALITY STANDARDS.

SEQUENCE OF MAJOR ACTIVITIES

THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

1. INSTALL STABILIZED CONSTRUCTION ENTRANCE.
2. INSTALL SILT FENCES, SYNTHETIC BALES AND OTHER EROSION/SEDIMENTATION CONTROLS AS REQUIRED.
3. CLEAR AND GRUB FOR DIVERSION SWALES/DIKES AND SEDIMENT BASIN IF REQUIRED.
4. CONSTRUCT SEDIMENTATION BASIN IF REQUIRED.
5. CONTINUE CLEARING AND GRUBBING.
6. STOCK PILE TOP SOIL IF REQUIRED.
7. PERFORM PRELIMINARY GRADING ON SITE AS REQUIRED.
8. STABILIZE DENUDED AREAS AND STOCKPILES AS SOON AS PRACTICABLE.
9. INSTALL STORM SEWER, WATER, SEWER AND IRRIGATION.
10. COMPLETE GRADING AND INSTALL PERMANENT SEEDING/SOD AND PLANTING.
11. REMOVE ACCUMULATED SEDIMENT FROM BASIN.
12. WHEN ALL CONSTRUCTION ACTIVITY IS COMPLETE AND THE SITE IS STABILIZED, REMOVE ANY TEMPORARY DIVERSION SWALES/DIKES AND RESEED/SOD AS REQUIRED.

TIMING OF CONTROLS / MEASURES

AS INDICATED IN THE SEQUENCE OF MAJOR ACTIVITIES, THE SILT FENCES AND SYNTHETIC BALES, STABILIZED CONSTRUCTION ENTRANCE AND SEDIMENT BASIN WILL BE CONSTRUCTED PRIOR TO CLEARING OR GRADING OF ANY OTHER PORTIONS OF THE SITE. STABILIZATION MEASURES SHALL BE INITIATED AS SOON AS PRACTICAL IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. ONCE CONSTRUCTION ACTIVITY CEASES PERMANENTLY IN AN AREA, THAT AREA WILL BE STABILIZED PERMANENTLY IN ACCORDANCE WITH THE PLANS. AFTER THE ENTIRE SITE IS STABILIZED, THE ACCUMULATED SEDIMENT WILL BE REMOVED FROM THE SEDIMENT TRAPS AND THE EARTH DIKE/SWALES WILL BE REGRADED/REMOVED AND STABILIZED IN ACCORDANCE WITH THE CLEARING AND EROSION CONTROL PLAN.

CONTROLS

IT IS THE CONTRACTORS RESPONSIBILITY TO IMPLEMENT THE EROSION AND TURBIDITY CONTROLS AS SHOWN ON THE PLANS. IT IS ALSO THE CONTRACTORS RESPONSIBILITY TO ENSURE THESE CONTROLS ARE PROPERLY INSTALLED, MAINTAINED AND FUNCTIONING PROPERLY TO PREVENT TURBID OR POLLUTED WATER FROM LEAVING THE PROJECT SITE. THE CONTRACTOR WILL ADJUST THE EROSION AND TURBIDITY CONTROLS SHOWN ON THE PLANS AND ADD ADDITIONAL CONTROL MEASURES, AS REQUIRED, TO ENSURE THE SITE MEETS ALL FEDERAL, STATE AND LOCAL EROSION AND TURBIDITY CONTROL REQUIREMENTS. THE FOLLOWING BEST MANAGEMENT PRACTICES WILL BE IMPLEMENTED BY THE CONTRACTOR AS REQUIRED BY THE PLANS AND AS REQUIRED TO MEET THE EROSION AND TURBIDITY REQUIREMENTS IMPOSED ON THE PROJECT SITE BY THE REGULATORY AGENCIES.

STABILIZED CONSTRUCTION ENTRANCE:

1. CONTRACTOR SHALL INSTALL AND MAINTAIN FOR THE DURATION OF THE CONSTRUCTION A STONE STABILIZED PAD LOCATED AT POINTS OF VEHICULAR INGRESS AND EGRESS TO THE CONSTRUCTION SITE. AGGREGATE SHALL BE FDOT SIZE NO. 1 COARSE AGGREGATE.

EROSION AND SEDIMENT CONTROLS STABILIZATION PRACTICES:

1. SYNTHETIC BALE BARRIER: SYNTHETIC BALE BARRIERS CAN BE USED BELOW DISTURBED AREAS SUBJECT TO SHEET AND RILL EROSION WITH THE FOLLOWING LIMITATIONS:
   - A. WHERE THE MAXIMUM SLOPE BEHIND THE BARRIER IS 33 PERCENT.
   - B. IN MINOR SWALES OR DITCH LINES WHERE THE MAXIMUM CONTRIBUTING DRAINAGE AREA IS NO GREATER THAN 2 ACRES.
   - C. WHERE EFFECTIVENESS IS REQUIRED FOR LESS THAN 3 MONTHS.
   - D. EVERY EFFORT SHOULD BE MADE TO LIMIT THE USE OF SYNTHETIC BALE BARRIERS CONSTRUCTED IN LIVE STREAMS OR IN SWALES WHERE THERE IS THE POSSIBILITY OF A WASHOUT. IF NECESSARY, MEASURES SHALL BE TAKEN TO PROPERLY ANCHOR BALES TO INSURE AGAINST WASHOUT.
   - E. REFER TO THE DETAILS FOR CONSTRUCTING THE SYNTHETIC BALE BARRIER. ALSO, REFER TO THE DETAILS FOR PROPER LOCATION, MATERIAL AND USAGE.
2. FILTER FABRIC BARRIER: FILTER FABRIC BARRIERS CAN BE USED BELOW DISTURBED AREAS SUBJECT TO SHEET AND RILL EROSION WITH THE FOLLOWING LIMITATIONS:
   - F. WHERE THE MAXIMUM SLOPE BEHIND THE BARRIER IS 33 PERCENT.
   - G. IN MINOR SWALES OR DITCH LINES WHERE THE MAXIMUM CONTRIBUTING DRAINAGE AREA IS NO GREATER THAN 2 ACRES.
   - H. REFER TO THE DETAILS FOR PROPER CONSTRUCTION OF THE FILTER FABRIC BARRIER.
3. BRUSH BARRIER WITH FILTER FABRIC: BRUSH BARRIER MAY BE USED BELOW DISTURBED AREAS SUBJECT TO SHEET AND RILL EROSION WHERE ENOUGH RESIDUE MATERIAL IS AVAILABLE ON SITE.
4. LEVEL SPREADER: A LEVEL SPREADER MAY BE USED WHERE SEDIMENT-FREE STORM RUNOFF IS INTERCEPTED AND DIVERTED AWAY FROM THE GRADED AREAS ONTO UNDISTURBED STABILIZED AREAS. THIS PRACTICE APPLIES ONLY IN THOSE SITUATIONS WHERE THE SPREADER CAN BE CONSTRUCTED ON UNDISTURBED SOIL AND THE AREA BELOW THE LEVEL LIP IS STABILIZED. THE WATER SHOULD NOT BE ALLOWED TO RECONCENTRATE AFTER RELEASE. LEVEL SPREADER SHALL BE CONSTRUCTED IN ACCORDANCE TO THE DETAILS.
5. STOCKPILING MATERIAL: NO EXCAVATED MATERIAL SHALL BE STOCKPILED IN SUCH A MANNER AS TO DIRECT RUNOFF DIRECTLY OFF THE PROJECT SITE INTO ANY ADJACENT WATER BODY OR STORM WATER COLLECTION FACILITY.
6. EXPOSED AREA LIMITATION: THE SURFACE AREA OF OPEN RAW ERODIBLE SOIL EXPOSED BY CLEARING AND GRUBBING OPERATIONS OR EXCAVATION AND FILLING OPERATIONS SHALL NOT EXCEED 10 ACRES. THIS REQUIREMENT MAY BE WAIVED FOR LARGE PROJECTS WITH AN EROSION CONTROL PLAN WHICH DEMONSTRATES THAT OPENING OF ADDITIONAL AREAS WILL NOT SIGNIFICANTLY AFFECT OFF-SITE DEPOSIT OF SEDIMENTS.
7. INLET PROTECTION: INLETS AND CATCH BASINS WHICH DISCHARGE DIRECTLY OFF-SITE SHALL BE PROTECTED FROM SEDIMENT-LADEN STORM RUNOFF UNTIL THE COMPLETION OF ALL CONSTRUCTION OPERATIONS THAT MAY CONTRIBUTE SEDIMENT TO THE INLET.
8. TEMPORARY SEEDING: AREAS OPENED BY CONSTRUCTION OPERATIONS AND THAT ARE NOT ANTICIPATED TO BE RE-EXCAVATED OR DRESSED AND RECEIVE FINAL GRASSING TREATMENT WITHIN 7 DAYS SHALL BE SEEDED WITH A QUICK GROWING GRASS SPECIES WHICH WILL PROVIDE AN EARLY COVER DURING THE SEASON IN WHICH IT IS PLANTED AND WILL NOT LATER COMPETE WITH THE PERMANENT GRASSING.
9. TEMPORARY SEEDING AND MULCHING: SLOPES STEEPER THAN 6:1 THAT FALL WITHIN THE CATEGORY ESTABLISHED IN PARAGRAPH 8 ABOVE SHALL ADDITIONALLY RECEIVE MULCHING OF APPROXIMATELY 2 INCHES LOOSE MEASURE OF MULCH MATERIAL CUT INTO THE SOIL OF THE SEEDED AREA ADEQUATE TO PREVENT MOVEMENT OF SEED AND MULCH.
10. TEMPORARY GRASSING: THE SEEDED OR SEEDED AND MULCHED AREA(S) SHALL BE ROLLED AND WATERED OR HYDRO MULCHED OR OTHER SUITABLE METHODS IF REQUIRED TO ASSURE OPTIMUM GROWING CONDITIONS FOR THE ESTABLISHMENT OF A GOOD GRASS COVER. TEMPORARY GRASSING SHALL BE THE SAME MIX AND AMOUNT REQUIRED FOR PERMANENT GRASSING IN THE CONTRACT SPECIFICATIONS.
11. TEMPORARY REGRASSING: IF AFTER 14 DAYS FROM SEEDING, THE TEMPORARY GRASSED AREAS HAVE NOT ATTAINED A MINIMUM OF 75 PERCENT GOOD GRASS COVER, THE AREA WILL BE REWORKED AND ADDITIONAL SEED APPLIED SUFFICIENT TO ESTABLISH THE DESIRED VEGETATIVE COVER.
12. MAINTENANCE: ALL FEATURES OF THE PROJECT DESIGNED AND CONSTRUCTED TO PREVENT EROSION AND SEDIMENT SHALL BE MAINTAINED DURING THE LIFE OF THE CONSTRUCTION SO AS TO FUNCTION AS THEY WERE ORIGINALLY DESIGNED AND CONSTRUCTED.
13. PERMANENT EROSION CONTROL: THE EROSION CONTROL FACILITIES OF THE PROJECT SHOULD BE DESIGNED TO MINIMIZE THE IMPACT ON THE OFFSITE FACILITIES.
14. PERMANENT SEEDING: ALL AREAS WHICH HAVE BEEN DISTURBED BY CONSTRUCTION WILL, AS A MINIMUM, BE SEEDED. THE SEEDING MIX MUST PROVIDE BOTH LONG-TERM VEGETATION AND RAPID GROWTH SEASONAL VEGETATION. SLOPES STEEPER THAN 4:1 SHALL BE SEEDED AND MULCHED OR SODDED.

CONTROLS *(CONTINUED)*

STRUCTURAL PRACTICES:

1. TEMPORARY DIVERSION DIKE: TEMPORARY DIVERSION DIKES MAY BE USED TO DIVERT RUNOFF THROUGH A SEDIMENT-TRAPPING FACILITY AND IT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAILS.
2. TEMPORARY SEDIMENT TRAP: A SEDIMENT TRAP SHALL BE INSTALLED IN A DRAINAGE WAY AT A STORM DRAIN INLET OR AT OTHER POINTS OF DISCHARGE FROM A DISTURBED AREA. THE FOLLOWING SEDIMENT TRAPS MAY BE CONSTRUCTED EITHER INDEPENDENTLY OR IN CONJUNCTION WITH A TEMPORARY DIVERSION DIKE:
   - A. BLOCK AND GRAVEL SEDIMENT FILTER – THIS PROTECTION IS APPLICABLE WHERE HEAVY FLOWS AND/OR WHERE AN OVERFLOW CAPACITY IS NECESSARY TO PREVENT EXCESSIVE PONDING AROUND THE STRUCTURE. REFER TO THE DETAILS FOR CONSTRUCTION OF A CURB INLET SEDIMENT FILTER, AND FOR CONSTRUCTION OF A DROP INLET SEDIMENT FILTER.
   - B. GRAVEL SEDIMENT TRAP – THIS PROTECTION IS APPLICABLE WHERE HEAVY CONCENTRATED FLOWS ARE EXPECTED, BUT NOT WHERE PONDING AROUND THE STRUCTURE MIGHT CAUSE EXCESSIVE INCONVENIENCE OR DAMAGE TO ADJACENT STRUCTURES AND UNPROTECTED SEDIMENT TRAP.
   - C. DROP INLET SEDIMENT TRAP – THIS PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (S < 5%) AND WHERE SHEET OR OVERLAND FLOWS (Q < 0.5 CFS) ARE TYPICAL. THIS METHOD SHALL NOT APPLY TO INLETS RECEIVING CONCENTRATED FLOWS SUCH AS IN STREET OR HIGHWAY MEDIANS. REFER TO THE DETAILS FOR CONSTRUCTION OF SYNTHETIC BALE AND FABRIC SEDIMENT FILTER.
3. OUTLET PROTECTION: APPLICABLE TO THE OUTLETS OF ALL PIPES AND PAVED CHANNEL SECTIONS WHERE THE FLOW COULD CAUSE EROSION AND SEDIMENT PROBLEM TO THE RECEIVING WATER BODY. SILT FENCES AND SYNTHETIC BALES ARE TO BE INSTALLED IMMEDIATELY DOWNSTREAM OF THE DISCHARGING STRUCTURE AS SHOWN ON THE OUTLET PROTECTION DETAIL.
4. SEDIMENT BASIN: WILL BE CONSTRUCTED AT THE COMMON DRAINAGE LOCATIONS THAT SERVE AN AREA WITH 10 OR MORE DISTURBED ACRES AT ONE TIME, THE PROPOSED STORM WATER PONDS (OR TEMPORARY PONDS) WILL BE CONSTRUCTED FOR USE AS SEDIMENT BASINS. THESE SEDIMENT BASINS MUST PROVIDE A MINIMUM OF 3,600 CUBIC FEET OF STORAGE PER ACRE DRAINED UNTIL FINAL STABILIZATION OF THE SITE. THE 3,600 CUBIC FEET OF STORAGE PER ACRE DRAINED DOES NOT APPLY TO FLOWS FROM OFFSITE AREAS AND FLOWS FROM ONSITE AREAS THAT ARE EITHER UNDISTURBED OR HAVE UNDERGONE FINAL STABILIZATION WHERE SUCH FLOWS ARE DIVERTED AROUND BOTH THE DISTURBED AREA AND THE SEDIMENT BASIN. ANY TEMPORARY SEDIMENT BASINS CONSTRUCTED MUST BE BACKFILLED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATIONS FOR STRUCTURAL FILL. ALL SEDIMENT COLLECTED IN PERMANENT OR TEMPORARY SEDIMENT TRAPS MUST BE REMOVED UPON FINAL STABILIZATION.

OTHER CONTROLS

WASTE DISPOSAL:

WASTE MATERIALS:
ALL WASTE MATERIALS EXCEPT LAND CLEARING DEBRIS SHALL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL MEET ALL LOCAL AND STATE SOLID WASTE MANAGEMENT REGULATIONS. THE DUMPSTER WILL BE EMPTIED AS NEEDED AND THE TRASH WILL BE HAULED TO A STATE APPROVED LANDFILL. ALL PERSONNEL WILL BE INSTRUCTED REGARDING THE CORRECT PROCEDURE FOR WASTE DISPOSAL. NOTICES STATING THESE PRACTICES WILL BE POSTED AT THE CONSTRUCTION SITE BY THE CONSTRUCTION SUPERINTENDENT. THE INDIVIDUAL WHO MANAGES THE DAY-TO-DAY SITE OPERATIONS WILL BE RESPONSIBLE FOR SEEING THAT THESE PROCEDURES ARE FOLLOWED.

HAZARDOUS WASTE:
ALL HAZARDOUS WASTE MATERIALS WILL BE DISPOSED OF IN THE MANNER SPECIFIED BY LOCAL OR STATE REGULATION OR BY THE MANUFACTURER. SITE PERSONNEL WILL BE INSTRUCTED IN THESE PRACTICES AND THE SITE SUPERINTENDENT. THE INDIVIDUAL WHO MANAGES DAY-TO-DAY OPERATIONS WILL BE RESPONSIBLE FOR SEEING THAT THESE PRACTICES ARE FOLLOWED.

SANITARY WASTE:
ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NEEDED TO PREVENT POSSIBLE SPILLAGE. THE WASTE WILL BE COLLECTED AND DEPOSED OF IN ACCORDANCE WITH STATE AND LOCAL WASTE DISPOSAL REGULATIONS FOR SANITARY SEWER OR SEPTIC SYSTEMS.

OFFSITE VEHICLE TRACKING:
A STABILIZED CONSTRUCTION ENTRANCE WILL BE PROVIDED TO HELP REDUCE VEHICLE TRACKING OF SEDIMENTS. THE PAVED STREET ADJACENT TO THE SITE ENTRANCE WILL BE SWEPT DAILY TO REMOVE ANY EXCESS MUD, DIRT OR ROCK TRACKED FROM THE SITE. DUMP TRUCKS HAULING MATERIAL FROM THE CONSTRUCTION SITE WILL BE COVERED WITH A TARPAULIN.

MAINTENANCE / INSPECTION PROCEDURES

EROSION AND SEDIMENT CONTROL INSPECTIONS AND MAINTENANCE PRACTICES:

THE FOLLOWING ARE INSPECTION AND MAINTENANCE PRACTICES THAT WILL BE USED TO MAINTAIN EROSION AND SEDIMENT CONTROLS.

- NO MORE THAN 10 ACRES OF THE SITE WILL BE DENUDED AT ONE TIME WITHOUT WRITTEN PERMISSION FROM THE ENGINEER.
- ALL CONTROL MEASURES WILL BE INSPECTED BY THE SUPERINTENDENT, THE PERSON RESPONSIBLE FOR THE DAY-TO-DAY SITE OPERATION OR SOMEONE APPOINTED BY THE SUPERINTENDENT, AT LEAST ONCE A WEEK AND FOLLOWING ANY STORM EVENT OF 0.25 INCHES OR GREATER.
- ALL TURBIDITY CONTROL MEASURES WILL BE MAINTAINED IN GOOD WORKING ORDER; IF A REPAIR IS NECESSARY, IT WILL BE INITIATED WITHIN 24 HOURS OF REPORT.
- BUILT UP SEDIMENT WILL BE REMOVED FROM SILT FENCE WHEN IT HAS REACHED ONE-THIRD THE HEIGHT OF THE FENCE.
- SILT FENCE WILL BE INSPECTED FOR DEPTH OF SEDIMENT, TEARS, TO SEE IF THE FABRIC IS SECURELY ATTACHED TO THE FENCE POSTS, AND TO SEE THAT THE FENCE POSTS ARE FIRMLY IN THE GROUND.
- THE SEDIMENT BASINS WILL BE INSPECTED FOR THE DEPTH OF SEDIMENT, AND BUILT UP SEDIMENT WILL BE REMOVED WHEN IT REACHES 10 PERCENT OF THE DESIGN CAPACITY OR AT THE END OF THE JOB, WHICHEVER COMES FIRST.
- DIVERSION DIKES/SWALES WILL BE INSPECTED AND ANY BREACHES PROMPTLY REPAIRED.
- TEMPORARY AND PERMANENT SEEDING AND PLANTING WILL BE INSPECTED FOR BARE SPOTS, WASHOUTS, AND HEALTHY GROWTH.
- A MAINTENANCE INSPECTION REPORT WILL BE MADE AFTER EACH INSPECTION.
- THE REPORTS WILL BE KEPT ON SITE DURING CONSTRUCTION AND AVAILABLE UPON REQUEST TO THE OWNER, ENGINEER OR ANY FEDERAL, STATE OR LOCAL AGENCY APPROVING SEDIMENT AND EROSION PLANS, OR STORM WATER MANAGEMENT PLANS. THE REPORTS SHALL BE MADE AND RETAINED AS PART OF THE STORM WATER POLLUTION PREVENTION PLAN FOR AT LEAST THREE YEARS FROM THE DATE THAT THE SITE IS FINALLY STABILIZED AND THE NOTICE OF TERMINATION IS SUBMITTED THE REPORTS SHALL IDENTIFY ANY INCIDENTS OF NON-COMPLIANCE.
- THE SITE SUPERINTENDENT WILL SELECT UP TO THREE INDIVIDUALS WHO WILL BE RESPONSIBLE FOR INSPECTIONS, MAINTENANCE AND REPAIR ACTIVITIES, AND FILLING OUT THE INSPECTION AND MAINTENANCE REPORT.
- PERSONNEL SELECTED FOR INSPECTION AND MAINTENANCE RESPONSIBILITIES WILL RECEIVE TRAINING FROM THE SITE SUPERINTENDENT. THEY WILL BE TRAINED IN ALL THE INSPECTION AND MAINTENANCE PRACTICES NECESSARY FOR KEEPING THE EROSION AND SEDIMENT CONTROLS USED ONSITE IN GOOD WORKING ORDER.

NON-STORM WATER DISCHARGES:

IT IS EXPECTED THAT THE FOLLOWING NON-STORM WATER DISCHARGES WILL OCCUR FROM THE SITE DURING THE CONSTRUCTION PERIOD:

- WATER FROM WATER LINE FLUSHING.
- PAVEMENT WASH WATERS (WHERE NO SPILLS OR LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAVE OCCURRED).
- UNCONTAMINATED GROUNDWATER (FROM DEWATERING EXCAVATION).

ALL NON-STORM WATER DISCHARGES WILL BE DIRECTED TO THE SEDIMENT BASIN PRIOR TO DISCHARGE. ALL SUCH DISCHARGES SHALL MEET STATE WATER QUALITY STANDARDS AND ALL NECESSARY PERMITS SHALL BE OBTAINED.

SPILL PREVENTION

MATERIAL MANAGEMENT PRACTICES:

THE FOLLOWING ARE THE MATERIAL MANAGEMENT PRACTICES THAT WILL BE USED TO REDUCE THE RISK OF SPILLS OR OTHER ACCIDENTAL EXPOSURE OF MATERIALS AND SUBSTANCES TO STORM WATER RUNOFF.

GENERAL:

- AN EFFORT WILL BE MADE TO STORE ONLY ENOUGH PRODUCT REQUIRED TO DO THE JOB.
- ALL MATERIALS STORED ONSITE WILL BE STORED IN A NEAT, ORDERLY MANNER IN THEIR APPROPRIATE CONTAINERS AND, IF POSSIBLE, UNDER A ROOF OR OTHER ENCLOSURE.
- PRODUCTS WILL BE KEPT IN THEIR ORIGINAL CONTAINERS WITH THE ORIGINAL MANUFACTURER'S LABEL.
- SUBSTANCES WILL NOT BE MIXED WITH ONE ANOTHER UNLESS RECOMMENDED BY THE MANUFACTURER..
- WHENEVER POSSIBLE, ALL OF A PRODUCT WILL BE USED UP BEFORE DISPOSING OF THE CONTAINER.
- MANUFACTURER'S RECOMMENDATIONS FOR PROPER USE AND DISPOSAL WILL BE FOLLOWED.
- THE SITE SUPERINTENDENT WILL INSPECT DAILY TO ENSURE MATERIALS ONSITE RECEIVE PROPER USE AND DISPOSAL.

HAZARDOUS PRODUCTS:

THESE PRACTICES ARE USED TO REDUCE THE RISKS ASSOCIATED WITH HAZARDOUS MATERIALS:

- PRODUCTS WILL BE KEPT IN ORIGINAL CONTAINERS UNLESS THEY ARE NOT RESEALABLE.
- ORIGINAL LABELS AND MATERIAL SAFETY DATA WILL BE RETAINED; THEY CONTAIN IMPORTANT PRODUCT INFORMATION.
- IF SURPLUS PRODUCT MUST BE DISPOSED OF, MANUFACTURER'S OR LOCAL AND STATE RECOMMENDED METHODS FOR PROPER DISPOSAL WILL BE FOLLOWED.

PRODUCT SPECIFIC PRACTICES:

THE FOLLOWING PRODUCT SPECIFIC PRACTICES WILL BE FOLLOWED ONSITE:

PETROLEUM PRODUCTS:
ALL ONSITE VEHICLES WILL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTATIVE MAINTENANCE TO REDUCE THE CHANCE OF LEAKAGE. PETROLEUM PRODUCTS WILL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. ANY ASPHALT SUBSTANCES USED ONSITE WILL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

FERTILIZERS:
FERTILIZERS USED WILL BE APPLIED ONLY IN THE MINIMUM AMOUNTS RECOMMENDED BY THE MANUFACTURER. ONCE APPLIED, FERTILIZER WILL BE WORKED INTO THE SOIL TO LIMIT EXPOSURE TO STORM WATER. STORAGE WILL BE IN A COVERED AREA. THE CONTENTS OF ANY PARTIALLY USED BAGS OF FERTILIZER WILL BE TRANSFERRED TO A SEALABLE PLASTIC BIN TO AVOID SPILLS.

PAINTS:
ALL CONTAINERS WILL BE TIGHTLY SEALED AND STORED WHEN NOT REQUIRED FOR USE. EXCESS PAINT WILL NOT BE DISCHARGED TO THE STORM SEWER SYSTEM BUT WILL BE PROPERLY DISPOSED OF ACCORDING TO MANUFACTURER'S INSTRUCTIONS OR STATE AND LOCAL REGULATIONS.

CONCRETE TRUCKS:
CONCRETE TRUCKS SHALL BE ALLOWED TO WASH OUT OR DISCHARGE SURPLUS CONCRETE OR DRUM WASH WATER ONLY AT DISCHARGE POINT PROVIDED. NO OFFSITE DISCHARGE WILL BE PERMITTED.

SPILL CONTROL PRACTICES:

IN ADDITION TO GOOD HOUSEKEEPING AND MATERIAL MANAGEMENT PRACTICES DISCUSSED IN THE PREVIOUS SECTIONS OF THIS PLAN, THE FOLLOWING PRACTICES WILL BE FOLLOWED FOR SPILL PREVENTION AND CLEANUP:

MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEANUP WILL BE CLEARLY POSTED ON SITE AND SITE PERSONNEL WILL BE MADE AWARE OF THE PROCEDURES AND THE LOCATION OF THE INFORMATION AND CLEANUP SUPPLIES.

MATERIALS AND EQUIPMENT NECESSARY FOR SPILL CLEANUP WILL BE KEPT IN THE MATERIAL STORAGE AREA ONSITE. EQUIPMENT AND MATERIALS INCLUDE BUT ARE NOT LIMITED TO BROOMS, DUST PANS, MOPS, RAGS, GLOVES, GOGGLES, LIQUID ABSORBENT (I.E. KITTY LITTER OR EQUAL), SAND, SAWDUST, AND PLASTIC AND METAL TRASH CONTAINERS SPECIFICALLY FOR THIS PURPOSE.

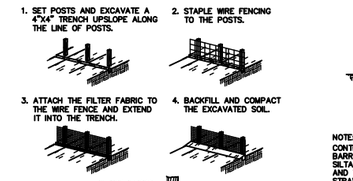
ALL SPILLS WILL BE CLEANED UP IMMEDIATELY AFTER DISCOVERY.

THE SPILL AREA WILL BE KEPT WELL VENTILATED AND PERSONNEL WILL WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT INJURY FROM CONTACT WITH A HAZARDOUS SUBSTANCE.

SPILL OF TOXIC OR HAZARDOUS MATERIAL WILL BE REPORTED TO THE APPROPRIATE STATE OR LOCAL GOVERNMENT AGENCY, REGARDLESS OF THE SIZE OF THE SPILL.

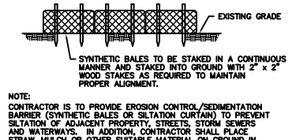
THE SPILL PREVENTION PLAN WILL BE ADJUSTED TO INCLUDE MEASURES TO PREVENT THIS TYPE OF SPILL FROM REOCCURRING AND HOW TO CLEAN UP THE SPILL IF THERE IS ANOTHER ONE. A DESCRIPTION OF THE SPILL, WHAT CAUSED IT, AND THE CLEANUP MEASURES WILL ALSO BE INCLUDED.

THE SITE SUPERINTENDENT RESPONSIBLE FOR THE DAY-TO-DAY SITE OPERATIONS, WILL BE THE SPILL PREVENTION AND CLEANUP COORDINATOR. HE/SHE WILL DESIGNATE AT LEAST ONE OTHER SITE PERSONNEL WHO WILL RECEIVE SPILL PREVENTION AND CLEANUP TRAINING. THESE INDIVIDUALS WILL EACH BECOME RESPONSIBLE FOR A PARTICULAR PHASE OF PREVENTION AND CLEANUP. THE NAMES OF RESPONSIBLE SPILL PERSONNEL WILL BE POSTED IN THE MATERIAL STORAGE AREA AND IF APPLICABLE, IN THE OFFICE TRAILER ONSITE.



SILT FENCE CONSTRUCTION

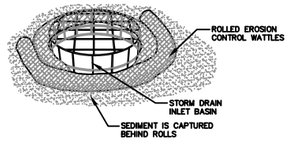
N.T.S.

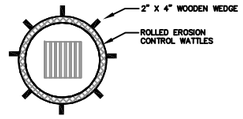


NOTE:
CONTRACTOR IS TO PROVIDE EROSION CONTROL/SEDIMENTATION BARRIER (SYNTHETIC BALES OR SILTATION CURTAIN) TO PREVENT SILTATION OF ADJACENT PROPERTY, STREETS, STORM SEWERS AND WATERWAYS. IN ADDITION, CONTRACTOR SHALL PLACE STRAW, MULCH OR OTHER SUITABLE MATERIAL ON GROUND IN AREAS WHERE CONSTRUCTION RELATED TRAFFIC IS TO ENTER AND EXIT SITE. IF, IN THE OPINION OF THE ENGINEER AND/OR LOCAL AUTHORITIES, EXCESSIVE QUANTITIES OF EARTH ARE TRANSPORTED OFF-SITE EITHER BY NATURAL DRAINAGE OR BY VEHICULAR TRAFFIC, THE CONTRACTOR IS TO REMOVE AND CLEAN SAID EARTH TO THE SATISFACTION OF THE ENGINEER AND/OR LOCAL AUTHORITIES.

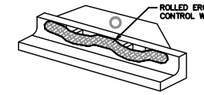
SEDIMENT BARRIER

N.T.S.

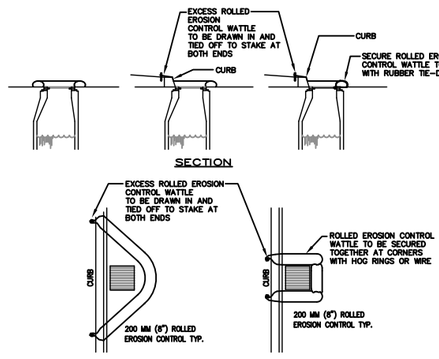




INLET PROTECTION FOR DROP INLETS OR MANHOLES



SEDIMENT BARRIER FOR CURB SIDE INLET



CATCHBASIN OPTION "A"
(TO BE USED UNLESS OPTION "B" IS NECESSARY DUE TO CONDITIONS)

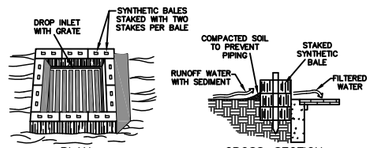
CATCHBASIN OPTION "B"
(FOR USE IN TIGHTER AREAS, NARROW ROADS, ETC.)

PLAN

NOTES
1. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
2. SECURE ROLLED EROSION CONTROL PRODUCT TO GROUND AT EACH END.
3. ROLLS SHOULD BE INSPECTED AFTER EVERY SIGNIFICANT STORM EVENT TO CLEAR AND DISPOSE OF SEDIMENT AND DEBRIS.
4. USE 12" DIAMETER, 20' LONG WATTLE ROLLS FOR STANDARD CIRCULAR DRAINAGE STRUCTURES. PLACE THE ROLL AROUND THE STRUCTURE AND JOIN THE ENDS TOGETHER WITH HOG RINGS OR WIRE. USE 2"x2"x24" WOODEN WEDGES TO HOLD DOWN WATTLE ROLLS.

ROLLED EROSION AND SEDIMENTATION CONTROL PRODUCTS

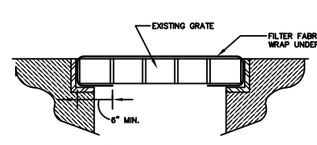
N.T.S.



SPECIFIC APPLICATION
THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (SLOPES NO GREATER THAN 5 PERCENT) WHERE SHEET OR OVERLAND FLOWS ARE TYPICAL.

SYNTHETIC BALE DROP INLET SEDIMENT FILTER

N.T.S.



CATCH BASIN SEDIMENT PROTECTION DETAIL

N.T.S.

CITY OF ST. AUGUSTINE STORM WATER POLLUTION PREVENTION PLAN	REVISION DATE:	FEB 2017
	NOT TO SCALE	N-2

C.O.S.A.

CITY OF ST. AUGUSTINE (C.O.S.A.) HORIZONTAL DIRECTIONAL DRILLING (HDD) CONSTRUCTION REQUIREMENTS

GENERAL:

1. THE CITY OF ST. AUGUSTINE (C.O.S.A.) STANDARDS AND SPECIFICATIONS DESIGN MANUAL AND DETAILS, AND ALL INTERIM STANDARDS UPDATES, LATEST EDITION, SHALL PRESIDE; THESE NOTES ARE NOT INTENDED TO BE ALL INCLUSIVE.

2. THE CONTRACTOR SHALL PERFORM ALL WORK NECESSARY TO LOCATE, EXCAVATE AND PREPARE FOR CONNECTIONS TO THE TERMINUS OF THE CITY'S EXISTING WATER OR SEWER SYSTEMS AT THOSE POINTS SHOWN ON THE DRAWINGS OR WHERE DIRECTED BY THE CITY OR THE ENGINEER. ALL COSTS ASSOCIATED WITH THIS WORK AND FOR THE ACTUAL CONNECTION OF THE EXISTING MAINS SHALL BE INCLUDED IN THE BID FOR THE PROJECT AND SHALL NOT RESULT IN ANY ADDITIONAL COST TO THE CITY.

3. THE CONTRACTOR'S WORK SHALL INCLUDE ALL SERVICES, EQUIPMENT, MATERIALS, AND LABOR FOR COMPLETE AND PROPER INSTALLATION, TESTING, RESTORATION OF UNDERGROUND UTILITIES AND ENVIRONMENTAL PROTECTION AND RESTORATION.

4. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL INSTALLATION PROCESSES INCLUDING DRILLING, BACK-REAMING, MANAGEMENT AND DISPOSAL OF ALL DRILLING FLUID, DEWATERING, AND LEAK TESTING THE PIPE AND FITTINGS.

5. FOR THE SUPPLY OF DOMESTIC WATER DURING CONSTRUCTION, THE CONTRACTOR SHALL UTILIZE A CITY METER ASSEMBLY (METER & BACKFLOW DEVICE) AND PAY FOR ALL WATER CONSUMED, EXCEPT IN THE CASE WHERE A NEW WATER MAIN IS CONNECTED DIRECTLY INTO THE ACTIVE WATER SYSTEM FOR LINE FILLING AND FLUSHING OPERATION. UN-ACCOUNTABLE DOMESTIC WATER QUANTITIES SHALL BE MINIMIZED.

6. DIRECTIONAL DRILLING OPERATIONS SHALL BE PERFORMED COMPLETELY WITHIN THE RIGHT-OF-WAY AND/OR EASEMENTS SHOWN ON THE DRAWINGS.

7. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR BEING FAMILIAR WITH THE CONDITIONS WHICH MAY BE ENCOUNTERED DURING THE HDD, AND FOR COMPETENTLY HANDLING THOSE CONDITIONS AS THEY ARISE.

8. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ANY GEOTECHNICAL INVESTIGATIONS THEY DEEM NECESSARY AND ANY OTHER DATA NECESSARY TO ENSURE A SUCCESSFUL PROJECT.

9. ADHERENCE TO THE PLANS AND SPECIFICATIONS CONTAINED HEREIN, OR THE CITY REPRESENTATIVE'S APPROVAL ON ANY ASPECT OF ANY DIRECTIONAL BORE OPERATION COVERED BY THESE PLANS AND SPECIFICATIONS, SHALL IN NO WAY RELIEVE THE CONTRACTOR OF THEIR ULTIMATE RESPONSIBILITY FOR THE SATISFACTORY COMPLETION OF THE WORK.

10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OF ALL DAMAGE TO PRIVATE AND/OR PUBLIC PROPERTY (AT NO EXPENSE TO THE CITY). REPAIR WORK SHALL MEET ALL LOCAL AND STATE RULES AND REQUIREMENTS.

11. PERMITS FOR ALL WORK WITHIN FDOT, COUNTY, CITY, AND SUBMERGED LAND OF THE STATE OF FLORIDA RIGHTS-OF-WAY SHALL BE OBTAINED BY THE OWNER. THE CONTRACTOR SHALL VERIFY THE EXISTENCE OF ALL PERMITS BEFORE COMMENCING ANY WORK ON THE PROJECT.

12. INDIVIDUAL PIPE LENGTHS SHALL BE ASSEMBLED BY BUTT-FUSION UNLESS OTHERWISE SPECIFIED. CONNECTED FITTINGS SHALL BE FUSED OR MECHANICALLY JOINED TO THE PIPING AS SPECIFIED.

HDD SUBMITTALS REQUIRED FROM CONTRACTOR:

BORE PLAN:

CONTRACTOR SHALL SUBMIT THE FOLLOWING REQUIRED INFORMATION FOR ALL INDIVIDUAL HDD SEGMENTS. ACCEPTABLE RESPONSES TO THE EVALUATION CRITERIA LISTED BELOW SHALL BE REQUIRED PRIOR TO BEGINNING ANY HDD WORK.

1. CONTRACTOR SHALL PROVIDE A BORE PLAN OF EACH HDD SEGMENT FOR THE PROJECT THAT IS COMPATIBLE WITH THE PIPE CHARACTERISTICS, SITE CONDITIONS, AND HDD EQUIPMENT.
2. CONTRACTOR SHALL PROVIDE CALCULATIONS (IN ACCORDANCE WITH ASTM F 1962 OR EQUAL) FOR PULL BACK FORCE REQUIRED AND THE RESULTING RIG SIZE PROPOSED FOR THE PROJECT.
3. CONTRACTOR SHALL PROVIDE CALCULATIONS (IN ACCORDANCE WITH INDUSTRY STANDARDS) PREDICTING THE EXPECTED ANNULAR PRESSURE AND IDENTIFY AREAS SUBJECT TO HYDROFRACTURE.
4. CONTRACTOR SHALL PROVIDE CALCULATIONS DEMONSTRATING THAT THE PIPE WILL NOT BE OVERSTRESSED.
5. CONTRACTOR SHALL VERIFY THAT THE INFORMATION AND CALCULATIONS PRESENTED IN THE BORE PLAN WILL BE FULLY INCORPORATED INTO THE WORK PLAN.
6. CONTRACTOR SHALL IDENTIFY WHICH, IF ANY, ITEMS OF THE BASIS OF DESIGN THAT THE CONTRACTOR PROPOSES TO CHANGE (ENTRY/EXIT ANGLES, DEPTH, RADIUS, ETC.). THESE CHANGES SHALL BE REFLECTED IN THE CALCULATIONS AND INFORMATION REQUIRED IN THESE EVALUATION CRITERIA.

WORK PLAN:

PRIOR TO BEGINNING WORK, THE CONTRACTOR MUST SUBMIT TO THE CITY FOR APPROVAL A WORK PLAN DETAILING PROCEDURE AND SCHEDULE TO EXECUTE THE PROJECT. WORK PLAN SHALL INCLUDE A DESCRIPTION OF ALL EQUIPMENT TO BE USED, DOWN-HOLE TOOLS, LIST OF PERSONNEL AND THEIR QUALIFICATIONS/EXPERIENCE (INCLUDING BACK-UP PERSONNEL IN THE EVENT THAT AN INDIVIDUAL IS UNAVAILABLE), LIST OF SUB-CONTRACTORS, SCHEDULE OF WORK ACTIVITY, SAFETY PLAN (INCLUDING MSDS OF ANY POTENTIALLY HAZARDOUS SUBSTANCES), TRAFFIC CONTROL PLAN (IF APPLICABLE), ENVIRONMENTAL PROTECTION PLAN AND CONTINGENCY PLANS FOR POSSIBLE PROBLEMS INCLUDING A FRAC-OUT AND SURFACE SPILL CONTINGENCY PLAN. WORK PLAN SHOULD BE COMPREHENSIVE, REALISTIC AND BASED ON ACTUAL WORKING CONDITIONS FOR THE PARTICULAR PROJECT. WORK PLAN SHOULD DOCUMENT THOUGHTFUL PLANNING REQUIRED TO SUCCESSFULLY COMPLETE PROJECT. CONTRACTOR SHALL SUBMIT AND OBTAIN CITY'S APPROVAL OF A PRE-CONSTRUCTION BORE-LOG DEPICTING A PLAN AND PROFILE (HORIZONTAL AND VERTICAL ALIGNMENT) OF THE PROPOSED BORE PATH. BORE-LOG SHALL SHOW ALL UTILITY CROSSINGS AND EXISTING STRUCTURES. ALL PROPOSED DEVIATIONS FROM THE DRAWINGS INCLUDED IN THE CONTRACT DOCUMENTS SHALL BE CLEARLY IDENTIFIED.

THE WORK PLAN SHALL SPECIFICALLY ADDRESS THE FOLLOWING POTENTIAL PROBLEMS:
1. A FRAC-OUT AND SURFACE SPILL CONTINGENCY PLAN AS COMPLETED BY THE CITY AS PART OF THE PERMIT.
2. LOSS OF RETURNS.
3. OBSTRUCTIONS ALONG BORE PATH DURING REAMING OR PULLBACK.
4. DRILL PIPE OR PRODUCT PIPE CANNOT BE ADVANCED.
5. DEVIATIONS FROM DESIGN LINE AND GRADE EXCEED ALLOWABLE TOLERANCES.
6. DRILL PIPE OR PRODUCT PIPE BROKEN OFF IN BOREHOLE.
7. COLLAPSE OF PRODUCT PIPE OR EXCESSIVE DEFORMATION.
8. DAMAGE TO A UTILITY.
9. EXCESSIVE SUBSIDENCE OR HEAVE.

THE WORK PLAN SHALL SPECIFICALLY ADDRESS THE FOLLOWING PROCEDURES:
1. METHODS:
   THE CONTRACTOR SHALL PROVIDE COMPLETE DESCRIPTIONS OF PROPOSED PLANS, PROCEDURES, AND PERSONNEL, AS WELL AS SUPPORTING CALCULATIONS, FOR THE FOLLOWING:
   a. DRILLING OPERATIONS, ADDRESSING: PROCEDURES FOR PILOT HOLE DRILLING AND REAMING. PROCEDURES FOR TRACKING AND CONTROLLING THE DRILLING HEAD LOCATION. PROCEDURES FOR DOCUMENTING AND PREPARING AS-BUILTS.
   b. DRILLING FLUID MANAGEMENT PLAN.
   c. SPOILS HANDLING AND DISPOSAL PLAN.
   d. PIPE STORAGE AND HANDLING, ADDRESSING: THE MEANS AND METHODS FOR PROTECTING PIPE AND ENSURING TEMPERATURE CONTROL IN ACCORDANCE WITH THE CONTRACTOR'S INSTALLATION CALCULATIONS.
   e. PIPELINE ASSEMBLY AND INSTALLATION, ADDRESSING: PROCEDURES FOR PIPE JOINING, PIPELINE PULLBACK, AND PULLBACK MONITORING.
   f. PREVENTION OF INADVERTENT FLUID LOSSES AND SPILLS, AND CONTINGENCIES FOR RAPID CONTAINMENT AND CLEANUP, ADDRESSING: MEASURES TO MITIGATE RISK OF INADVERTENT FLUID RETURNS TO SURFACE. PROCEDURES FOR MONITORING AND CONTROLLING DRILLING FLUID FLOWS AND PRESSURES. EQUIPMENT, RESOURCES, AND PROCEDURES FOR IDENTIFYING, CONTAINING, AND CLEANING UP FLUID LOSSES AND SPILLS.
   g. QUALITY CONTROL AND TESTING PROCEDURES.
   h. SAFETY PLAN.
   i. TIE-IN/CONNECTION(S) TO EXISTING SYSTEM.

2. EQUIPMENT:
   THE CONTRACTOR SHALL PROVIDE THE MAKE, MODEL, AND TECHNICAL SPECIFICATIONS FOR EACH OF THE FOLLOWING:
   a. HORIZONTAL DIRECTIONAL DRILL RIG.
   b. DRILLING SYSTEM COMPONENTS.
   c. DOWNHOLE DRILLING ASSEMBLY AND REAMING EQUIPMENT.
   d. DOWNHOLE PRESSURE SUB.
   e. GUIDANCE AND CONTROL SYSTEM.
   f. PULLING HEAD.
   g. SWIVEL.
   h. ROLLERS.
   i. SOLIDS SEPARATION AND DRILL FLUID RECIRCULATION SYSTEMS.
   j. PIPE FUSION EQUIPMENT.
   k. PIPE FUSION DATA LOGGER.
   l. PIPE HANDLING EQUIPMENT.
   m. PIGS AND PIGGING EQUIPMENT.

THE CONTRACTOR SHALL PROVIDE THE FOLLOWING SPECIFIC EQUIPMENT INFORMATION: CALIBRATION CERTIFICATION FOR THE PILOT BORE GUIDANCE AND CONTROL SYSTEM; CALIBRATION CERTIFICATION FOR THE HEAT FUSION DATA LOGGER.

CALCULATIONS:

THE FOLLOWING CALCULATIONS SHALL BE SIGN AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF FLORIDA AND SUBMITTED PRIOR TO BEGINNING ANY HDD WORK:
1. PULLBACK LOAD CALCULATION.
2. PIPE STRESS CALCULATION.
3. RATE OF PENETRATION.
4. MAXIMUM ALLOWABLE DRILLING FLUID PRESSURE CALCULATION.
5. CONTRACTOR SHALL CONFIRM THAT THE DESIGN PARAMETERS DO NOT RESULT IN INSTALLATION STRESSES THAT EXCEED ALLOWABLE PIPE STRESSES.

SHOP DRAWING SUBMITTALS:

ACTUAL CATALOG DATA, BROCHURES AND DESCRIPTIVE LITERATURE WILL NOT BE REQUIRED FOR ITEMS OF STANDARD USAGE WHICH MEET THE REQUIREMENTS OF THIS MANUAL. ANY SPECIALTY ITEM NOT LISTED AS A PART OF THIS MANUAL WILL REQUIRE A COMPLETE SHOP DRAWING SUBMITTAL FOR ANY MATERIAL WHICH MAY, IN THE ENGINEER'S OR THE CITY'S OPINION, NOT BE IN COMPLIANCE WITH THIS MANUAL.

THE FOLLOWING DATA SHALL BE PROVIDED FOR ITEMS WHICH ARE NOT INCLUDED IN THIS MANUAL:
1. THE CONTRACTOR SHALL PROVIDE DETAILED SUBMITTALS OF THE PROPOSED PIPE AND FITTING PRODUCTS. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR PRODUCTS DELIVERED TO THE SITE WITHIN THREE (3) DAYS OF DELIVERY TO THE SITE. HORIZONTAL DIRECTIONAL DRILLING SHALL NOT COMMENCE UNTIL THE CONTRACTOR HAS RECEIVED WRITTEN CITY APPROVAL OF ALL PROPOSED PRODUCT SUBMITTALS.
2. THE FOLLOWING INFORMATION SHALL BE SUBMITTED FOR ALL PROPOSED PIPES, FITTINGS, FLANGES, AND SPECIALS:
   a. CATALOG SHEETS AND/OR SPECIFICATIONS, VERIFYING COMPLIANCE WITH THE REQUIREMENTS OF THIS SECTION.
   b. SHOP DRAWINGS.
   c. MANUFACTURING QUALITY CONTROL AND QUALITY ASSURANCE PROCEDURES.
   d. MANUFACTURER'S RECOMMENDATIONS FOR TRANSPORTATION, HANDLING, AND STORAGE.
   e. MANUFACTURER'S RECOMMENDATIONS FOR FIELD JOINING AND JOINT QUALITY CONTROL.
   f. MANUFACTURER'S RECOMMENDATIONS FOR FIELD TESTING.
   g. PIPE AND FITTINGS MATERIAL QUALITY CONTROL AND ASSURANCE TEST RESULTS.
   h. PIPE MANUFACTURER'S RETESTS AND REJECTIONS TESTS.
   i. PRODUCT AND MATERIAL CERTIFICATIONS FOR COMPLIANCE WITH THE REFERENCED STANDARDS, FOR ALL PRODUCTS DELIVERED TO THE SITE.

DAILY REPORTS:

CONTRACTOR SHALL MAINTAIN DAILY ACTIVITY REPORTS THROUGHOUT ALL DRILLING OPERATIONS, INCLUDING PIPE INSTALLATION. A SAMPLE DAILY REPORT SHALL BE SUBMITTED TO THE CITY FOR APPROVAL PRIOR TO THE COMMENCEMENT OF DRILLING OPERATIONS.
DAILY REPORTS SHALL BE SUBMITTED WITHIN 24 HOURS OF COMPLETION, AND SHALL INCLUDE, FOR EACH DRILL ROD ADDED OR WITHDRAWN, OR EVERY 25 FEET DURING DRILLING, PRE-REAMING, AND PULLBACK:
1. DOWNHOLE TOOLS AND EQUIPMENT IN USE.
2. DESCRIPTION OF GROUND CONDITIONS ENCOUNTERED.
3. DESCRIPTION OF DRILLING FLUID.
4. DRILLING FLUID PUMPING RATE.
5. MAXIMUM AND MINIMUM DOWNHOLE FLUID PRESSURES.
6. DRILLING HEAD LOCATION – AT LEAST EVERY 10 FEET ALONG THE BORE PATH.
7. DRILL STEM TORQUE.
8. DETAILS AND PERCEIVED REASONS FOR DELAYS GREATER THAN ONE HOUR OTHER THAN NORMAL BREAKS AND SHIFT CHANGES.
9. DETAILS OF ANY UNUSUAL CONDITIONS OR EVENTS.

RECORD DRAWINGS:

SUBMIT FOR CITY'S APPROVAL AS-BUILT RECORDS WITHIN FIVE WORKING DAYS OF COMPLETING PULL BACK. RECORD DRAWINGS AND BORE LOG SHALL BE IN VERTICAL DATUM NAVD88 AND HORIZONTAL DATUM NAD83 STATE PLANE FLORIDA EAST COORDINATE SYSTEM (US FEET), AND CONTAIN MINIMUM FOUR COORDINATE POINTS OF PROPERTY CORNERS WITHIN OR ADJACENT TO PROJECT SITE. RECORD DRAWINGS SHALL BE SIGNED AND SEALED BY A FLORIDA LICENSED PROFESSIONAL LAND SURVEYOR AND THE ENGINEER OF RECORD. CONTRACTOR SHALL CERTIFY ACCURACY OF ALL AS-BUILTS. FOLLOWING THE CITY'S APPROVAL OF THE PRELIMINARY AS-BUILT SUBMITTAL, THE FINAL AS-BUILT RECORDS SHALL BE SUBMITTED.

THE PRELIMINARY AS-BUILT SUBMITTAL SHALL CONSIST OF:
1. TWO (2) COPIES OF THE BORE LOG.
2. TWO (2) 24? X 36? PAPER COPIES AT A SCALE NOT LARGER THAN 1:20 HORIZONTAL AND 1:2 VERTICAL, PROVIDING A PLAN AND PROFILE (DATA EVERY 25LF OF MAIN, MINIMUM), AND ALL INFORMATION RECORDED DURING WORK PROGRESS, INCLUDING ALL IDENTIFIED SUBSURFACE ANOMALIES.

THE FINAL AS-BUILT SUBMITTAL SHALL CONSIST OF:
1. ONE (1) ELECTRONIC (CD) IN AUTOCAD FORMAT "DWG" ON NAD83 STATE PLANE FLORIDA EAST COORDINATE SYSTEM (US FEET), AND ONE "PDF".
2. THREE (3) COPIES OF THE BORE LOG.
3. THREE (3) 24? X 36? SIGNED AND SEALED PAPER SETS.
4. ONE (1) 24? X 36? SIGNED AND SEALED REPRODUCIBLE MYLAR SET.

NOTIFICATION:

THE CITY MUST BE NOTIFIED 48 HOURS (MINIMUM) IN ADVANCE OF STARTING THE HDD WORK. THE HDD SHALL NOT BEGIN UNTIL ALL NECESSARY SUBMITTALS FOR THE OPERATION HAVE BEEN COMPLETED AND APPROVED BY THE CITY.

SITE PREPARATION:

1. IF REQUIRED BY THE CONTRACT DOCUMENTS, PRIOR TO ANY ALTERATIONS TO THE WORK-SITE, THE CONTRACTOR SHALL PROVIDE A DIGITAL VIDEO RECORDING OF THE ENTIRE WORK AREA. ONE (1) COPY OF WHICH SHALL BE GIVEN TO THE CITY AND ONE (1) COPY TO REMAIN WITH CONTRACTOR FOR A PERIOD OF TWO (2) YEARS FOLLOWING THE COMPLETION OF THE PROJECT.

2. AT A MINIMUM, CONTRACTOR SHALL ENSURE THE PROTECTION OF ALL EXISTING UTILITIES BY FOLLOWING THE COMMON GROUND ALLIANCE BEST PRACTICES VERSION 1.0 OR LATEST VERSION, UNLESS EXCEPTIONS ARE SPECIFICALLY AGREED TO BY THE CITY.

3. THE CONTRACTOR SHALL COORDINATE UTILITIES LOCATES WITH SUNSHINE STATE ONE-CALL OF FLORIDA, INC. (#800/432-4770 OR WEBSITE WWW.CALLSUNSHINE.COM).

4. ONCE THE LOCATE SERVICE HAS FIELD MARKED ALL UTILITIES, THE CONTRACTOR SHALL VERIFY EACH UTILITY (INCLUDING ANY SERVICE LATERALS, I.E. WATER, SEWER, CABLE, GAS, ELECTRIC, PHONE, ETC.) AND THOSE WITHIN EACH PAVED AREA. VERIFICATION MAY BE PERFORMED UTILIZING GROUND PENETRATING RADAR, HAND DIG, OR VACUUM EXCAVATION.

5. PRIOR TO INITIATING DRILLING, THE CONTRACTOR SHALL RECORD ON THE DRAWINGS BOTH THE HORIZONTAL AND VERTICAL LOCATION OF THE UTILITIES OFF OF A PREDETERMINED BASELINE.

6. THE CONTRACTOR SHALL MANAGE AND CONTROL DRILLING PRACTICES TO PREVENT DAMAGE TO EXISTING UTILITIES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LOSSES AND REPAIRS AS A RESULT OF DAMAGE TO UNDERGROUND UTILITIES RESULTING FROM DRILLING OPERATIONS.

7. THE CONTRACTOR SHALL MAKE A REASONABLE EFFORT TO LOCATE EVIDENCE OF ANY OTHER POTENTIAL SUBSURFACE OBSTRUCTIONS SUCH AS PILES OR PIERS.

8. THE WORK SITE SHALL BE GRADED AND FILLED TO PROVIDE A LEVEL WORKING AREA. NO ALTERATIONS BEYOND WHAT IS REQUIRED FOR OPERATIONS ARE TO BE MADE. CONTRACTOR SHALL CONFINE ALL ACTIVITIES TO DESIGNATED WORK AREAS.

9. FOLLOWING DRILLING OPERATIONS, CONTRACTOR WILL DE-MOBILIZE EQUIPMENT AND RESTORE THE WORK SITE TO ORIGINAL CONDITION. ALL EXCAVATIONS WILL BE BACKFILLED AND COMPACTED TO 95% OF ORIGINAL DENSITY (AT A MINIMUM), OR AS OTHERWISE SPECIFIED.

ENVIRONMENTAL PROTECTION:

1. CONTRACTOR SHALL INSTALL SILT FENCE BETWEEN ALL DRILLING OPERATIONS AND ANY DRAINAGE, WETLAND, WATERWAY OR OTHER AREA DESIGNATED FOR SUCH PROTECTION BY THE CITY OR OTHER STATE, FEDERAL AND LOCAL REGULATIONS.

2. CONTRACTOR SHALL FOLLOW ALL REQUIREMENTS OF THE CITY'S STORM WATER POLLUTION PREVENTION PLAN (SEE STANDARD DETAILS) AND THE DEWATERING SECTION OF THE CITY'S STANDARDS AND SPECIFICATIONS DESIGN MANUAL AND DETAILS, LATEST EDITION,

3. ADDITIONAL ENVIRONMENTAL PROTECTION NECESSARY TO CONTAIN ANY HYDRAULIC OR DRILLING FLUID SPILLS SHALL BE PUT IN PLACE, INCLUDING BERMS, LINERS, TURBIDITY CURTAINS AND OTHER MEASURES.

4. CONTRACTOR SHALL ADHERE TO ALL APPLICABLE ENVIRONMENTAL REGULATIONS STATED IN LOCAL, STATE AND FEDERAL PERMITS, LAWS, RULES AND REGULATIONS.

5. FUEL MAY NOT BE STORED IN BULK CONTAINERS (GREATER THAN 25 GALLONS) WITHIN 200 FEET OF ANY WATER BODY, WETLAND OR ENVIRONMENTALLY SENSITIVE AREA.

6. A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT SHALL BE OBTAINED BY THE CONTRACTOR.

7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING A "GENERIC PERMIT FOR DISCHARGE OF PRODUCED GROUND WATER FROM ANY NON-CONTAMINATED SITE ACTIVITY" FROM THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP) IN ACCORDANCE WITH THE DEWATERING SECTION OF THE CITY'S STANDARDS AND SPECIFICATIONS DESIGN MANUAL.

8. CONTRACTOR SHALL VERIFY THAT ALL ENVIRONMENTAL PERMITS ARE IN PLACE BEFORE COMMENCING ANY WORK ON THE PROJECT.

PERSONNEL QUALIFICATIONS CERTIFICATION:

1. DIRECTIONAL BORING:
   a. ALL PERSONNEL SHALL BE FULLY TRAINED IN THEIR RESPECTIVE DUTIES AS PART OF THE DIRECTIONAL DRILLING CREW AND IN SAFETY. EACH PERSON MUST HAVE BEEN FULLY TRAINED FOR OVER 1,000 HOURS ON ALL FACETS OF DIRECTIONAL DRILLING, INCLUDING, BUT NOT LIMITED TO MACHINE OPERATIONS, MUD MIXING, LOCATING, AND MATERIAL FUSION.
   b. A RESPONSIBLE REPRESENTATIVE WHO IS THOROUGHLY FAMILIAR WITH THE EQUIPMENT AND TYPE OF WORK TO BE PERFORMED, MUST BE IN DIRECT CHARGE AND CONTROL OF THE OPERATION AT ALL TIMES. IN ALL CASES THE SUPERVISOR MUST BE CONTINUALLY PRESENT AT THE JOB SITE DURING THE ACTUAL DIRECTIONAL BORE OPERATION.
   c. THE CONTRACTOR SHALL HAVE A SUFFICIENT NUMBER OF COMPETENT WORKERS ON THE JOB AT ALL TIMES TO ENSURE THE DIRECTIONAL BORE IS MADE IN A TIMELY AND SATISFACTORY MANNER.

2. PIPE ASSEMBLY:
   d. INDIVIDUAL PIPE LENGTHS SHALL BE ASSEMBLED BY BUTT-FUSION UNLESS OTHERWISE SPECIFIED. CONNECTED FITTINGS SHALL BE FUSED OR MECHANICALLY JOINED TO THE PIPING AS SPECIFIED. JOINTS BETWEEN PLAIN END PIPES AND PIPE FITTINGS SHALL BE MADE BY BUTT FUSION WHEN POSSIBLE.
   e. THE ON-SITE WELDER MAKING THE JOINTS SHALL HAVE RECEIVED SPECIFIC TRAINING FROM THE MANUFACTURER OF THE FITTINGS AND/OR PIPE BEING WELDED AND SHALL HAVE WRITTEN PROOF OF PROPER TRAINING/CERTIFICATION FROM THE ASSOCIATED MANUFACTURERS.
   f. ONLY CERTIFIED WELDERS WHO HAVE WRITTEN TRAINING CERTIFICATIONS FROM THE FITTING AND/OR PIPE MANUFACTURER WILL BE ALLOWED TO PERFORM THIS WORK. THAT IS, TO WELD A FITTING IN PLACE, THE ON-SITE WELDER (EMPLOYEE) MUST BE TRAINED AND CERTIFIED BY THE FITTING MANUFACTURER. TO BUTT WELD PIPE, THE ON-SITE WELDER (EMPLOYEE) MUST BE TRAINED AND CERTIFIED BY THE PIPE MANUFACTURER.
   g. THE FUSION WORK SHALL BE ACCOMPLISHED (WELDING AND COOL-DOWN/CLOSING TIMES) IN ACCORDANCE WITH THE FITTING AND PIPE MANUFACTURERS' RECOMMENDATIONS, AT A MINIMUM.
   h. EXTERNAL AND INTERNAL BEADS SHALL NOT BE REMOVED UNLESS APPROVED BY THE CITY.
   i. UPON REQUEST BY THE CITY OR CONTRACTOR, THE PIPE MANUFACTURER SHALL PROVIDE TRAINING AND TRAINING MATERIALS IN THE MANUFACTURER'S RECOMMENDED BUTT FUSION, SADDLE FUSION AND ELECTRO FUSION PROCEDURES TO THE CONTRACTOR'S INSTALLATION PERSONNEL, AND TO INSPECTORS REPRESENTING THE CITY, AT NO ADDITIONAL COST TO THE CITY.
   j. ONLY CERTIFIED (MANUFACTURER CERTIFICATION) EMPLOYEES WILL BE ALLOWED TO COMPLETE THIS FUSION WORK.

MATERIALS:

ALL HIGH DENSITY POLYETHYLENE (HDPE, PE) PIPE AND FITTINGS:

MATERIALS USED FOR THE MANUFACTURER OF POLYETHYLENE PIPE AND FITTINGS SHALL BE PE3408 HIGH DENSITY POLYETHYLENE MEETING CELL CLASSIFICATION 345464C PER ASTM D3350; AND MEETING TYPE III, CLASS B OR CLASS C, CATEGORY 5, GRADE P34 PER ASTM D1248; AND SHALL BE LISTED IN THE NAME OF THE PIPE AND FITTING MANUFACTURER IN PPI TR-4, RECOMMENDED HYDROSTATIC STRENGTHS AND DESIGN STRESSES FOR THERMOPLASTIC PIPE AND FITTINGS COMPOUNDS, WITH A STANDARD GRADE RATING OF 1600 PSI AT 730F PER ASTM D-2837. THE MANUFACTURER SHALL CERTIFY THAT THE MATERIALS USED TO MANUFACTURE PIPE AND FITTINGS MEET THESE REQUIREMENTS. NOTE THAT NOMINAL PIPE SIZES ONLY MAY BE INDICATED ON THE DRAWINGS AND/OR BID FORM. OUTSIDE DIAMETER OF PIPE IS GENERALLY 1 TO 2-INCHES GREATER THAN THE NOMINAL PIPE DIAMETER.

2" POLYETHYLENE TUBING LINES (LOW PRESSURE SEWER LINES ONLY):

TUBING SHALL BE MANUFACTURED OF PE 3408, HIGH DENSITY POLYETHYLENE (HDPE), IN ACCORDANCE WITH AWWA C901, ASTM D1248, ASTM D2239, ASTM D2737 AND ASTM D3350. THE TUBING SHALL HAVE A MINIMUM WORKING PRESSURE OF 200 PSI. POLYETHYLENE TUBING SHALL BE COPPER TUBE SIZE OR IPS SDR-9 AND SHALL BE COLORED BLACK OR GREEN. HDPE PIPE SHALL HAVE ULTRAVIOLET (UV) INHIBITORS FOR PROTECTION AGAINST DIRECT SUNLIGHT FOR ONE (1) YEAR. INSERTS FOR POLYETHYLENE TUBING MAY BE UTILIZED, AT CONTRACTOR'S OPTION, AND IF USED, SHALL BE 316 STAINLESS STEEL. THE CITY PREFERS STAINLESS STEEL FITTINGS BE UTILIZED WHEN AT ALL POSSIBLE. THE USE OF BRASS FITTINGS (INCLUDING COUPLINGS) IS NOT ACCEPTABLE, UNLESS A SUITABLE STAINLESS STEEL FITTING CANNOT BE FOUND. IN SUCH CASES, THE CITY MAY APPROVE BRASS FITTINGS IN ADVANCE ON A CASE-BY-CASE BASIS. TUBING SHALL BE APPROVED FOR USE WITH POTABLE WATER BY THE NATIONAL SANITATION FOUNDATION (NSF-14) AND SHALL BE CONTINUOUSLY MARKED AT INTERVALS OF NOT MORE THAN FOUR FEET WITH THE FOLLOWING:

1. NOMINAL SIZE
2. PRESSURE RATING
3. NSF SEAL
4. MANUFACTURER'S NAME OR TRADEMARK
5. STANDARD DIMENSION RATIO
6. ASTM SPECIFICATION

POLYETHYLENE PIPE (4 INCH AND LARGER):

HDPE PIPE SHALL CONFORM TO AWWA C906, DR-II, DUCTILE IRON PIPE (DIP) SIZE AND NSF 61 STANDARD. FOR PIPE SIZES 24-INCH AND LARGER, THE HDPE MAY BE IPS SIZE, DR 11. POLYETHYLENE PIPE SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM F714, POLYETHYLENE (PE) PLASTIC PIPE (SDR-PR) BASED ON CONTROLLED OUTSIDE DIAMETER AND SHALL BE SO MARKED. EACH PRODUCTION LOT OF PIPE SHALL BE TESTED FOR (FROM MATERIAL OR PIPE) MELT INDEX, DENSITY, % CARBON, DIMENSIONS AND EITHER QUICK BURST OR RING TENSILE STRENGTH (EQUIPMENT PERMITTING).

SERVICE IDENTIFICATION:

PERMANENT IDENTIFICATION OF PIPING SERVICE SHALL BE PROVIDED BY CO-EXTRUDING MULTIPLE EQUALLY SPACED COLOR STRIPES INTO THE PIPE OUTSIDE SURFACE OR BY SOLID COLORED PIPE SHELL. THE STRIPING MATERIAL SHALL BE THE SAME MATERIAL AS THE PIPE MATERIAL EXCEPT FOR COLOR. THE FOLLOWING COLORS SHALL BE USED TO IDENTIFY PIPING SERVICE (PRESSURE SERVICE):
BLUE – POTABLE WATER
GREEN – WASTEWATER OR FORCE MAIN
PURPLE – RECLAIMED WATER
BLACK – RAW WATER

POLYETHYLENE FITTINGS AND CUSTOM FABRICATION:

POLYETHYLENE FITTINGS AND CUSTOM FABRICATIONS SHALL BE MOLDED OR FABRICATED BY THE PIPE MANUFACTURER OR TRAINED PERSONNEL. BUTT FUSION OUTLETS SHALL BE MADE TO THE SAME OUTSIDE DIAMETER, WALL THICKNESS, AND TOLERANCES AS THE MATING PIPE. ALL FITTINGS AND CUSTOM FABRICATIONS SHALL BE FULLY RATED FOR THE SAME INTERNAL PRESSURE AS THE MATING PIPE. FABRICATED FITTINGS MUST HAVE THE SAME WORKING PRESSURE AS THE MATING PIPE.

MOLDED FITTINGS:

MOLDED FITTINGS SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM D3261, BUTT HEAT FUSION POLYETHYLENE (PE) PLASTIC FITTINGS FOR POLYETHYLENE (PE) PLASTIC PIPE AND TUBING, AND SHALL BE SO MARKED. EACH PRODUCTION LOT OF MOLDED FITTINGS SHALL BE SUBJECTED TO THE TEST REQUIRED UNDER ASTM D3261.

FABRICATED FITTINGS:

FABRICATED FITTINGS SHALL BE MADE BY HEAT FUSION JOINING SPECIALLY MACHINED SHAPES CUT FROM PIPE, POLYETHYLENE SHEET STOCK, OR MOLDED FITTINGS. FABRICATED FITTINGS SHALL BE RATED FOR INTERNAL PRESSURE SERVICE EQUIVALENT TO THE FULL SERVICE PRESSURE RATING OF THE MATING PIPE. DIRECTIONAL FITTINGS 16" AND LARGER SUCH AS ELBOWS, TEES, CROSSES, ETC., SHALL HAVE A PLAIN END INLET FOR BUTT FUSION AND FLANGED DIRECTIONAL OUTLETS.

ELECTRO FUSION BRANCH SADDLES:

SHALL MEET AWWA C-906, OUTLET SHALL COMPLY WITH ASTM-D3261, AND SHALL BE SPECIFICALLY MANUFACTURED FOR HDPE PIPE. THIS SADDLE MAY BE UTILIZED FOR WET-TAP APPLICATIONS. THESE ELECTRO FUSION FITTINGS SHALL BE DESIGNED AND MANUFACTURED IN ACCORDANCE WITH ASTM SPECIFICATIONS F-1055 FOR USE WITH HDPE (DIPS) PIPE.

POLYETHYLENE FLANGE ADAPTERS:

FLANGE ADAPTER SHALL BE MADE WITH SUFFICIENT THROUGHBORE LENGTH TO BE CLAMPED IN A BUTT FUSION JOINING MACHINE WITHOUT THE USE OF A STUB-END HOLDER. THE SEALING SURFACE OF THE FLANGE ADAPTER SHALL BE MACHINED WITH A SERIES OF SMALL V-SHAPED GROOVED TO PROVIDE GASKETLESS SEALING, OR TO RESTRAIN THE GASKET AGAINST BLOW-OUT. BELOW GROUND FLANGE ADAPTER MAY BE UTILIZED FOR 30" AND LARGER, DIP AND VALVES. ADAPTERS FOR 24 INCH AND SMALLER UTILIZE AN MJ ADAPTER (SEE BELOW).

BACK-UP RINGS AND FLANGE BOLTS:

FLANGE ADAPTERS SHALL BE FITTED WITH LAP JOINT FLANGES PRESSURE RATED EQUAL TO OR GREATER THAN THE MATING PIPE. CONVOLUTED STYLE BACKUP RINGS PREFERRED OVER THE FLAT STOCK RINGS. THE LAP JOINT FLANGE BORE SHALL BE CHAMFERED TO PROVIDE CLEARANCE TO THE FLANGE ADAPTER RADIUS. FLANGE BOLTS AND NUTS SHALL BE GRADE 2 OR HIGHER.

MANUFACTURER'S QUALITY CONTROL:

PIPE AND FITTING MANUFACTURER SHALL HAVE AN ESTABLISHED QUALITY CONTROL PROGRAM RESPONSIBLE FOR INSPECTING INCOMING AND OUTGOING MATERIALS. INCOMING POLYETHYLENE MATERIALS SHALL BE INSPECTED FOR DENSITY, MELT FLOW RATED, AND CONTAMINATION. THE CELL CLASSIFICATION PROPERTIES OF THE MATERIAL SHALL BE CERTIFIED BY THE SUPPLIER, AND VERIFIED BY MANUFACTURER'S QUALITY CONTROL.

POLYETHYLENE MECHANICAL JOINT (MJ) ADAPTERS:

MECHANICAL CONNECTIONS OF HDPE PIPE (4" THROUGH 24" DIAMETER) TO DUCTILE IRON OR PVC PIPING, MECHANICAL JOINT FITTINGS, OR VALVES SHALL BE THROUGH A SELF-RESTRAINING, FUSIBLE MECHANICAL JOINT ADAPTER WITH OR WITHOUT AN INTEGRAL, INTERNAL STAINLESS STEEL INSERT. MECHANICAL JOINT ADAPTER SHALL BE OF THE SAME SDR RATING AS THE PIPE. A SEPARATE, LOOSE STAINLESS STEEL TYPE INSERT WILL ONLY BE ALLOWED FOR PIPE SIZES 4 INCH THROUGH 8 INCHES. PROVIDE THE MECHANICAL JOINT ADAPTER, INCLUDING BUT NOT LIMITED TO LONGER TEE BOLTS OR ALL THREAD RODS WITH NUTS AT THE MECHANICAL JOINT BELL. NOTE THAT PE FLANGED ADAPTERS MAY BE UTILIZED FOR PIPE SIZES 30 INCHES AND LARGER.

CAST TRANSITION COUPLINGS:

HDPE TO MJ CAST TRANSITION COUPLING MAY ONLY BE UTILIZED FOR 8 INCH AND SMALLER PIPE SIZE. A STAINLESS STEEL STIFFENER IS REQUIRED SIZED AT PROPER ID OF HDPE PIPE. THE TRANSITION COUPLING MUST BE EPOXY LINED (3 MILS MINIMUM FOR WATER USE AND 12 MILS MINIMUM FOR SEWER USE). ACCEPTABLE IS A POWER SEAL MODEL 3520 OR APPROVED EQUAL.

MATERIALS (CONT'D):

ELECTRO FUSION COUPLINGS:

POLYETHYLENE PIPE AND FITTINGS MAY BE JOINED USING APPROVED ELECTRO FUSION COUPLINGS. FITTINGS SHALL BE PE3408 HDPE, CELL CLASS 345464C AS DETERMINED BY ASTM D3350-99. ELECTRO FUSION FITTINGS SHALL HAVE A MANUFACTURING STANDARD OF ASTM F1055. FITTINGS SHALL HAVE A PRESSURE RATING EQUAL TO THE PIPE. ALL ELECTRO FUSION FITTINGS SHALL BE SUITABLE FOR USE AS PRESSURE CONDUIT PER AWWA C906, AND HAVE NOMINAL BURST VALUE OF 3.5 TIMES THE WORKING PRESSURE OF THE FITTING. TO MINIMIZE "TOE-IN" PROBLEMS WHEN INSTALLING AN ELECTRO FUSION COUPLING LARGER THAN 12 INCH SIZE, THE CONTRACTOR SHALL REMOVE 12 INCHES (MINIMUM) FROM ALL ASSOCIATED "FACTORY ENDS" AND USE A RE-ROUNDING CLAMP ON THE ASSOCIATED PIPE. THE CONTRACTOR SHALL MARK PIPE INSERTION DEPTH PRIOR TO ASSEMBLY AND CONSTRUCT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

FUSIBLE PVC PIPE (4"–12" SIZE):

ONLY WITH SPECIFIC WRITTEN APPROVAL FROM THE CITY ENGINEER, FUSIBLE PVC MAY BE USED ON POTABLE WATER OR RECLAIMED WATER SYSTEMS (NOT ACCEPTABLE ON SEWER APPLICATIONS). FUSIBLE PVC MAY BE UTILIZED FOR DIRECTIONAL DRILLING AND DIRECT BURY APPLICATIONS. PIPE SHALL MEET C-900 PRESSURE CLASS, DR-18 WALL THICKNESS AND COLOR CODED. THE PIPE SHALL BE MARKED WITH THE NAME AND LOCATION OF THE MANUFACTURER, PRESSURE RATING AND SIZE. UNLESS APPROVED OTHERWISE BY THE CITY, THE BENDING RADIUS SHALL NOT EXCEED 50% OF THE MANUFACTURER'S RECOMMENDATION AND THE PULLING FORCE SHALL NOT EXCEED 80% OF THE MANUFACTURER'S RECOMMENDATION.

SERVICE CONNECTIONS:

POLYETHYLENE SERVICE LINE TUBING SHALL CONFORM TO SPECIFICATIONS IN THIS MANUAL, EXCEPT AS SPECIFIED HEREIN. SERVICES 2 INCHES AND SMALLER SHALL INCLUDE AN INTEGRAL SHUT-OFF VALVE AND BE PHILMAC FUSE-A-CORP FUSIBLE VALVE; OR CENTRAL PLASTICS ELECTRO FUSION SADDLE TAPPING TEE (USE SHELL CUTTER TO CUT THE HDPE OR CITY APPROVED EQUAL). THE CONTRACTOR SHALL SUPPLY ALL ADAPTERS, ELECTROFUSED COUPLINGS, AND SPECIAL CONNECTIONS NECESSARY TO TRANSITION FROM THE SERVICE CONNECTION TO THE CITY STANDARD POLYETHYLENE SERVICE TUBING AT BOTH ENDS. SERVICES ARE TO BE IN ACCORDANCE WITH ALL CITY STANDARDS.

DRILLING FLUIDS:

DRILLING FLUIDS SHALL BE A BENTONITE SLURRY.

DELIVERY, STORAGE AND HANDLING OF MATERIALS:

1. CONTRACTOR SHALL INSPECT MATERIALS DELIVERED TO THE SITE FOR DAMAGE. ALL MATERIALS FOUND DURING INSPECTION OR DURING THE PROGRESS OF WORK TO HAVE CRACKS, FLAWS, CRACKED LININGS, OR OTHER DEFECTS SHALL BE REJECTED AND REMOVED FROM THE JOB SITE WITHOUT DELAY.

2. CONTRACTOR SHALL UNLOAD AND STORE OPPOSITE OR NEAR THE PLACE WHERE THE WORK WILL PROCEED WITH MINIMUM HANDLING. STORE MATERIAL UNDER COVER OUT OF DIRECT SUN LIGHT. DO NOT STORE DIRECTLY ON THE GROUND. KEEP ALL MATERIALS FREE OF DIRT AND DEBRIS.

3. CONTRACTOR IS RESPONSIBLE FOR OBTAINING, TRANSPORTING AND SORTING ANY FLUIDS, INCLUDING WATER, TO THE WORK SITE.

4. DISPOSAL OF FLUIDS IS THE RESPONSIBILITY OF THE CONTRACTOR. DISPOSAL OF FLUIDS SHALL BE DONE IN A MANNER THAT IS IN COMPLIANCE WITH ALL PERMITS AND APPLICABLE FEDERAL, STATE, OR LOCAL ENVIRONMENTAL REGULATIONS. THE BENTONITE DRILLING SLURRY MAY BE RECYCLED FOR REUSE IN THE HOLE OPENING OPERATION, OR SHALL BE HAULED BY THE CONTRACTOR TO AN APPROVED LOCATION OR LANDFILL FOR PROPER DISPOSAL. CONTRACTOR SHALL THOROUGHLY CLEAN ENTIRE AREA OF ANY FLUID RESIDUE UPON COMPLETION OF INSTALLATION, AND REPLACE ANY AND ALL PLANTS AND SOD DAMAGED, DISCOLORED OR STAINED BY DRILLING FLUIDS.

EQUIPMENT REQUIREMENTS:

GENERAL:

THE DIRECTIONAL DRILLING EQUIPMENT SHALL CONSIST OF A DIRECTIONAL DRILLING RIG OF SUFFICIENT CAPACITY TO PERFORM THE BORE AND PULLBACK THE PIPE, A DRILLING FLUID MIXING, DELIVERY AND RECOVERY SYSTEM OF SUFFICIENT CAPACITY TO SUCCESSFULLY COMPLETE THE DRILL, A DRILLING FLUID RECYCLING SYSTEM TO REMOVE SOLIDS FROM THE DRILLING FLUID SO THAT THE FLUID CAN BE REUSED, A GUIDANCE SYSTEM TO ACCURATELY GUIDE BORING OPERATIONS, A VACUUM TRUCK OF SUFFICIENT CAPACITY TO HANDLE THE DRILLING FLUID VOLUME, TRAINED AND COMPETENT PERSONNEL TO OPERATE THE SYSTEM. ALL EQUIPMENT SHALL BE IN GOOD, SAFETY OPERATING CONDITION WITH SUFFICIENT SUPPLIES, MATERIALS AND SPARE PARTS ON HAND TO MAINTAIN THE SYSTEM IN GOOD WORKING ORDER FOR THE PROJECT DURATION.

DRILLING SYSTEM:

1. THE DIRECTIONAL DRILLING MACHINE SHALL CONSIST OF A POWER SYSTEM TO ROTATE, PUSH AND PULL HOLLOW DRILL PIPE INTO THE GROUND AT A VARIABLE ANGLE WHILE DELIVERING A PRESSURIZED FLUID MIXTURE TO A GUIDABLE DRILL (BORE) HEAD. THE POWER SYSTEM SHALL BE SELF CONTAINED WITH SUFFICIENT PRESSURE AND VOLUME TO POWER DRILLING OPERATIONS. HYDRAULIC SYSTEM SHALL BE FREE OF LEAKS. RIG SHALL HAVE A SYSTEM TO MONITOR AND RECORD MAXIMUM PULL-BACK PRESSURE DURING PULL-BACK OPERATIONS. THE RIG SHALL BE GROUNDED DURING DRILLING AND PULL-BACK OPERATIONS. THERE SHALL BE A SYSTEM TO DETECT ELECTRICAL CURRENT FROM THE DRILLING STRING AND AN AUDIBLE ALARM WHICH AUTOMATICALLY SOUNDS WHEN AN ELECTRICAL CURRENT IS DETECTED.

2. DRILLHEAD SHALL BE STEERABLE BY CHANGING ITS ROTATION AND SHALL PROVIDE NECESSARY CUTTING SURFACES AND DRILLING FLUID JETS.

3. MUD MOTORS (IF REQUIRED): MUD MOTORS SHALL BE OF ADEQUATE POWER TO TURN THE REQUIRED DRILLING TOOLS.

4. DRILL PIPE: SHALL BE CONSTRUCTED OF HIGH QUALITY 4130 SEAMLESS TUBING, GRADE D OR BETTER.

GUIDANCE SYSTEM:

1. GENERAL: A MAGNETIC GUIDANCE SYSTEM (MGS) OR PROVEN GYROSCOPIC SYSTEM SHALL BE USED TO PROVIDE A CONTINUOUS AND ACCURATE DETERMINATION OF THE LOCATION OF THE DRILL HEAD DURING THE DRILLING OPERATION. THE GUIDANCE SHALL BE CAPABLE OF TRACKING AT ALL DEPTHS UP TO EIGHTY (80) FEET AND IN ANY SOIL CONDITION, INCLUDING HARD ROCK. IT SHALL ENABLE THE DRILLER TO GUIDE THE DRILL HEAD BY PROVIDING IMMEDIATE INFORMATION ON THE TOOL FACE, AZIMUTH (HORIZONTAL DIRECTION), AND INCLINATION (VERTICAL DIRECTION). THE GUIDANCE SYSTEM SHALL BE ACCURATE TO +/-2% OF THE VERTICAL DEPTH OF THE BOREHOLE AT SENSING POSITION AT DEPTHS UP TO ONE EIGHTY (80) FEET AND ACCURATE WITHIN TWO (2) FEET HORIZONTALLY. THE GUIDANCE SYSTEM SHALL BE OF A PROVEN TYPE AND SHALL BE OPERATED BY PERSONNEL TRAINED AND EXPERIENCED WITH THIS SYSTEM. THE OPERATOR SHALL BE AWARE OF ANY MAGNETIC ANOMALIES ON THE SURFACE OF THE DRILL PATH AND SHALL CONSIDER SUCH INFLUENCES IN THE OPERATION OF THE GUIDANCE SYSTEM IF USING A MAGNETIC SYSTEM.

2. BORE TRACKING AND MONITORING: AT ALL TIMES DURING THE PILOT BORE THE CONTRACTOR SHALL PROVIDE AND MAINTAIN A BORE TRACKING SYSTEM THAT IS CAPABLE OF ACCURATELY LOCATING THE POSITION OF THE DRILL HEAD IN THE X, Y, AND Z AXES. THE CONTRACTOR SHALL RECORD THESE DATA AT LEAST ONCE PER DRILL PIPE LENGTH OR EVERY TWENTY-FIVE (25) FEET, WHICHEVER IS MOST FREQUENT, AND THE DATA LOGGED SHALL BE TIED TO THE SURFACE GRID TRACKING SYSTEM.

3. DOWNHOLE AND SURFACE GRID TRACKING SYSTEM: CONTRACTOR SHALL MONITOR AND RECORD X, Y, AND Z COORDINATES RELATIVE TO AN ESTABLISHED SURFACE SURVEY BENCH MARK AND BASELINE STATIONING THAT IS TIED TO EXISTING, FIXED AND VISIBLE SIGHT FEATURES. THE SURVEY BASELINE SHALL BE REFERENCED TO THE NAD 83 STATE PLANE FLORIDA EAST COORDINATE SYSTEM (US FEET). THE DATA SHALL BE CONTINUOUSLY MONITORED AND RECORDED AT LEAST ONCE PER DRILL PIPE-LENGTH OR AT TWENTY-FIVE (25) FEET, WHICHEVER IS MORE FREQUENT.

4. DEVIATIONS: ALL DEVIATIONS BETWEEN THE RECORDED AND DESIGN BORE PATH SHALL BE CALCULATED AND REPORTED ON THE DAILY LOG. IF THE DEVIATIONS EXCEED +/-2% OF THE VERTICAL DEPTH OF THE BOREHOLE AT SENSING POSITION AND/OR TWO (2) FEET HORIZONTALLY FROM THE DESIGN PATH, SUCH OCCURRENCES SHALL BE REPORTED IMMEDIATELY TO THE CITY. THE CONTRACTOR SHALL UNDERTAKE ALL NECESSARY MEASURES TO CORRECT DEVIATIONS AND RETURN TO DESIGN LINE AND GRADE.

5. DRILLING FLUID PRESSURES AND FLOW RATES: SHALL BE CONTINUOUSLY MONITORED AND RECORDED BY THE CONTRACTOR. THE PRESSURES SHALL BE MONITORED AT THE PUMP. THESE MEASUREMENTS SHALL BE MADE DURING PILOT BORE DRILLING, REAMING, AND PULLBACK OPERATIONS.

DRILLING FLUID (MUD) SYSTEM:

1. MIXING SYSTEM: A SELF-CONTAINED, CLOSED, DRILLING FLUID MIXING SYSTEM SHALL BE OF SUFFICIENT SIZE TO MIX AND DELIVER DRILLING FLUID. MIXING SYSTEM SHALL CONTINUALLY AGITATE THE DRILLING FLUID DURING OPERATIONS.

2. DRILLING FLUIDS: SHALL BE COMPOSED OF CLEAN WATER, APPROPRIATE ADDITIVES AND CLAY. WATER SHALL BE FROM AN AUTHORIZED SOURCE WITH A MINIMUM PH OF 6.0. WATER OF A LOWER PH OR WITH EXCESSIVE CALCIUM SHALL BE TREATED WITH THE APPROPRIATE AMOUNT OF SODIUM CARBONATE OR EQUAL. THE WATER AND ADDITIVES SHALL BE MIXED THOROUGHLY AND BE ABSENT OF ANY CLUMPS OR CLODS. NO POTENTIALLY HAZARDOUS MATERIAL MAY BE USED IN DRILLING FLUID.

3. DELIVERY SYSTEM: SHALL HAVE FILTERS IN-LINE TO PREVENT SOLIDS FROM BEING PUMPED INTO THE DRILL PIPE. CONNECTIONS BETWEEN THE PUMP AND DRILL PIPE SHALL BE RELATIVELY LEAK-FREE. USED DRILLING FLUID AND DRILLING FLUID SPILLED DURING DRILLING OPERATIONS SHALL BE CONTAINED AND CONVEYED TO THE DRILLING FLUID RECYCLING SYSTEM. A BERM, MINIMUM OF 12" HIGH, SHALL BE MAINTAINED AROUND DRILL RIGS, DRILLING FLUID MIXING SYSTEM, ENTRY AND EXIT PITS AND DRILLING FLUID CYCLING SYSTEM TO PREVENT SPILLS INTO THE SURROUNDING ENVIRONMENT. PUMPS AND OR VACUUM TRUCK(S) OF SUFFICIENT SIZE SHALL BE IN PLACE TO CONVEY EXCESS DRILLING FLUID FROM CONTAINMENT AREAS TO STORAGE AND RECYCLING FACILITIES.

4. DRILLING FLUID RECYCLING SYSTEM: SHALL SEPARATE SAND, DIRT AND OTHER SOLIDS FROM THE DRILLING FLUID TO RENDER THE DRILLING FLUID RE-USABLE. SPOILS SEPARATED FROM THE DRILLING FLUID WILL BE STOCKPILED FOR LATER USE OR DISPOSAL.

5. CONTROL OF DRILLING FLUIDS: THE CONTRACTOR SHALL FOLLOW ALL REQUIREMENTS OF THE FRAC-OUT AND SURFACE SPILL CONTINGENCY PLAN AS SUBMITTED AND APPROVED AND SHALL CONTROL OPERATIONAL PRESSURES, DRILLING MUD WEIGHTS, DRILLING SPEEDS, AND ANY OTHER OPERATIONAL FACTORS REQUIRED TO AVOID HYDRO-FRACTURE FLUID LOSSES TO FORMATIONS, AND CONTROL DRILLING FLUID SPILLAGE. THIS INCLUDES ANY SPILLAGES OR RETURNS AT ENTRY AND EXIT LOCATIONS OR AT ANY INTERMEDIATE POINT. ALL INADVERTENT RETURNS OR SPILLS SHALL BE PROMPTLY CONTAINED AND CLEANED UP. THE CONTRACTOR SHALL MAINTAIN ONSITE MOBILE SPOIL REMOVAL EQUIPMENT DURING ALL DRILLING, PRE-REAMING, REAMING AND PULLBACK OPERATIONS AND SHALL BE CAPABLE OF QUICKLY REMOVING SPOILS. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE CITY OF ANY INADVERTENT RETURNS OR SPILLS AND IMMEDIATELY CONTAIN AND CLEAN UP THE RETURN OR SPILL.

OTHER EQUIPMENT:

1. PIPE ROLLERS: IF UTILIZED, SHALL BE OF SUFFICIENT SIZE TO FULLY SUPPORT THE WEIGHT OF THE PIPE WHILE BEING HYDRO-TESTED AND DURING PULL-BACK OPERATIONS. SUFFICIENT NUMBER OF ROLLERS SHALL USED TO PREVENT EXCESS SAGGING OF PIPE.

2. HYDRAULIC OR PNEUMATIC PIPE RAMMERS MAY ONLY BE USED IF NECESSARY AND WITH THE AUTHORIZATION OF THE CITY REPRESENTATIVE.

3. RESTRICTIONS: OTHER DEVICES OR UTILITY PLACEMENT SYSTEMS FOR PROVIDING HORIZONTAL THRUST OTHER THAN THOSE DEFINED ABOVE IN THE PRECEDING SECTIONS SHALL NOT BE USED UNLESS APPROVED BY THE CITY PRIOR TO COMMENCEMENT OF THE WORK. CONSIDERATION FOR APPROVAL WILL BE MADE ON AN INDIVIDUAL BASIS FOR EACH SPECIFIED LOCATION. THE PROPOSED DEVICE OR SYSTEM WILL BE EVALUATED PRIOR TO APPROVAL OR REJECTION ON ITS POTENTIAL ABILITY TO COMPLETE THE UTILITY PLACEMENT SATISFACTORILY WITHOUT UNDUE STOPPAGE AND TO MAINTAIN LINE AND GRADE WITHIN THE TOLERANCES PRESCRIBED BY THE PARTICULAR CONDITIONS.

PIPE ASSEMBLY:

1. PIPE SHALL BE WELDED/FUSED TOGETHER IN ONE LENGTH, IF SPACE PERMITS. PIPE SHALL BE PLACED ON PIPE ROLLERS BEFORE PULLING INTO BORE HOLE. PIPES 16 INCH AND LARGER, A RE-ROUNDING CLAMP TOOL SHALL BE UTILIZED DURING ELECTRO-FUSION. PIPE SIZES LARGER THAN 12 INCH, MECHANICAL SCRAPPERS (PER THE FITTING MANUFACTURER'S RECOMMENDATION) SHALL BE UTILIZED DURING ELECTRO-FUSION. ALL ORIGINAL OXIDIZED PIPE SURFACES SHALL BE REMOVED IN ORDER FOR FUSION TO TAKE PLACE. SCRAPING PROCESS REQUIRES THAT APPROXIMATELY 0.10" OF THE OUTER "SKIN" BE REMOVED IN ORDER TO PENETRATE OXIDATION AND CONTAMINATION BARRIER. CUTS OR GOUGES THAT REDUCE WALL THICKNESS BY MORE THAN 10% ARE NOT ACCEPTABLE AND MUST BE CUT OUT AND DISCARDED.

2. BUTT FUSION TESTING WILL BE PERFORMED. THE TEST FUSION SHALL BE ALLOWED TO COOL COMPLETELY, AND THEN FUSION TEST STRAPS SHALL BE CUT OUT. THE TEST STRAP SHALL BE 12" (MIN) OR 30 TIMES THE WALL THICKNESS IN LENGTH WITH THE FUSION IN THE CENTER AND 1" (MIN) OR 1.5 TIMES THE WALL THICKNESS IN WIDTH. BEND THE TEST STRAP UNTIL THE ENDS OF THE STRAP TOUCH. IF THE FUSION FAILS AT THE JOINT, A NEW TEST FUSION SHALL BE MADE, COOLED COMPLETELY AND TESTED.

3. POLYETHYLENE PIPE AND FITTINGS MAY BE JOINED TOGETHER OR TO THE MATERIALS BY MEANS OF FLANGED CONNECTIONS (FLANGE ADAPTERS, ELECTROFUSED COUPLINGS, AND BACK-UP RINGS) OR MECHANICAL COUPLINGS DESIGNED FOR JOINING POLYETHYLENE PIPE OR FOR JOINING POLYETHYLENE PIPE TO ANOTHER MATERIAL. MECHANICAL COUPLINGS SHALL BE FULLY PRESSURE RATED AND FULLY THRUST RESTRAINED SUCH THAT WHEN INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, A LONGITUDINAL LOAD APPLIED TO THE MECHANICAL COUPLING WILL CAUSE THE PIPE TO YIELD BEFORE THE MECHANICAL COUPLING DISJOINS. EXTERNAL JOINT RESTRAINTS SHALL NOT BE USED IN LIEU OF FULLY RESTRAINED MECHANICAL COUPLINGS.

4. MECHANICAL JOINTS AND FLANGE CONNECTIONS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDED PROCEDURE. FLANGE FACES SHALL BE CENTERED AND ALIGNED TO EACH OTHER BEFORE ASSEMBLING AND TIGHTENING BOLTS. IN NO CASE SHALL THE FLANGE BOLTS BE USED TO DRAW THE FLANGES INTO ALIGNMENT. BOLT THREADS SHALL BE LUBRICATED, AND FLAT WASHERS SHALL BE FITTED UNDER THE FLANGE NUTS. BOLTS SHALL BE EVENLY TIGHTENED ACCORDING TO THE TIGHTENING PATTERN AND TORQUE STEP RECOMMENDATIONS OF THE MANUFACTURER. AT LEAST ONE (1) HOUR AFTER INITIAL ASSEMBLY, FLANGE CONNECTIONS SHALL BE RE-TIGHTENED FOLLOWING THE TIGHTENING PATTERN AND TORQUE STEP RECOMMENDATIONS OF THE MANUFACTURER. FINAL TIGHTENING TORQUE SHALL BE 100 FT-LBS OR LESS AS RECOMMENDED BY THE MANUFACTURER.

5. HDPE PIPE 24 INCH AND LARGER, UNLESS APPROVED OTHERWISE BY THE CITY, A FOUNDATION BED OF GRANULAR MATERIAL (#57 STONE) SHALL BE PLACED UNDER AND AROUND ALL D.I. FITTINGS AND VALVES FOR ADDITIONAL SUPPORT. FOUNDATION BED OF GRANULAR MATERIAL SHALL BE PROVIDED FOR ALL VALVES 20 SIZE AND LARGER. FOR GRANULAR MATERIALS, THE MINIMUM VERTICAL LIMIT IS 12 INCHES UNDER THE FITTING OR VALVE, UP TO 1/3 THE OVERALL HEIGHT OF THE FITTING OR VALVE. MINIMUM HORIZONTAL LIMITS OF THE GRANULAR MATERIAL SHALL BE 12 INCHES IN ALL DIRECTIONS BEYOND THE OUTER EDGES OF THE FITTING OR VALVE. COMPACTION OF SOILS BELOW THE GRANULAR MATERIAL SHALL BE AT 98% OF THE MAXIMUM DENSITY. ALL SPOOL PIECES BETWEEN 24 INCH AND LARGER D.I. FITTINGS AND VALVES SHALL BE AT LEAST 5 FEET LONG. NO JOINT DEFLECTION SHALL BE ALLOWED AT THE FITTINGS OR VALVES.

6. GENERAL REQUIREMENTS FOR OPEN-CUT CONSTRUCTION SHALL MEET ALL REQUIREMENTS IN THE CITY'S STANDARDS AND SPECIFICATIONS DESIGN MANUAL AND DETAILS, AND ALL INTERIM STANDARDS UPDATES, LATEST EDITION.

DRILLING PROCEDURES:

DRILL PATH:

PRIOR TO DRILLING CONTRACTOR SHALL UTILIZE ALL VERIFIED LOCATE INFORMATION TO DETERMINE DRILL PATHWAY. MARKED UP DRAWINGS SHALL BE ONSITE AT ALL TIMES, AND REFERRED TO DURING THE DRILL OPERATION.

GUIDANCE SYSTEM:

CONTRACTOR SHALL PROVIDE AND MAINTAIN INSTRUMENTATION NECESSARY TO ACCURATELY LOCATE THE PILOT HOLE (BOTH HORIZONTAL AND VERTICAL DISPLACEMENTS), MEASURE PILOT STRING TORSIONAL AND AXIAL AND MEASURE DRILLING FLUID DISCHARGE RATE AND PRESSURE. THE CITY REPRESENTATIVE SHALL HAVE ACCESS TO INSTRUMENTATION AND READINGS AT ALL TIMES DURING OPERATION.

PILOT HOLE:

THE PILOT HOLE SHALL BE DRILLED ALONG THE PATH SHOWN ON THE PLANS AND PROFILE DRAWINGS OR AS DIRECTED BY THE CITY REPRESENTATIVE IN THE FIELD. UNLESS APPROVED OTHERWISE BY THE CITY, THE PILOT-HOLE TOLERANCES SHALL BE AS FOLLOWS:

1. VERTICAL ALIGNMENT SHALL BE +/-2% OF THE VERTICAL DEPTH OF THE BOREHOLE AT SENSING POSITION AS SHOWN ON THE PLANS.

2. HORIZONTAL ALIGNMENT SHALL BE ± 2 FEET AND WITHIN 3 FEET OF RIGHT-OF-WAY OR EASEMENT BOUNDARY.

3. CURVE RADIUS: THE PILOT HOLE RADIUS SHALL BE NO LESS THAN 80% OF THE MAXIMUM BENDING RADIUS AS RECOMMENDED BY THE PIPE MANUFACTURER OF THE PIPE BEING INSTALLED. IN NO CASE SHALL THE BENDING RADIUS BE LESS THAN 30 PIPE DIAMETERS, UNLESS APPROVED OTHERWISE BY THE CITY.

4. THE EXACT PILOT HOLE ENTRY POINT SHALL BE WITHIN ± 2 FEET OF THE LOCATION SHOWN ON THE DRAWING OR AS DIRECTED BY THE CITY REPRESENTATIVE IN THE FIELD.

5. THE EXIT POINT LOCATION SHALL BE WITHIN ± 2 FEET OF THE LOCATION SHOWN ON THE DRAWING OR AS DIRECTED BY THE CITY REPRESENTATIVE IN THE FIELD.

6. LIMITATIONS ON DEPTH: IF NOT NOTED ON THE PLANS, 6" HDPE PIPE AND SMALLER SHALL BE INSTALLED WITH A DEPTH OF 3 TO 5 FEET AND 8" HDPE PIPE THRU 12" PIPE SHALL BE INSTALLED WITH A DEPTH OF 3 TO 6 FEET UNLESS IT IS REQUIRED TO INSTALL THE PIPE DEEPER DUE TO UTILITY CONFLICTS. HDPE PIPE LARGER THAN 12" SHALL BE SPECIFICALLY DESIGNED BY THE ENGINEER AND APPROVED BY THE CITY. WHERE UTILITIES CROSS UNDER FDOT, COUNTY, CITY, AND/OR SUBMERGED LAND OF THE STATE OF FLORIDA RIGHTS-OF-WAY, THE DEPTH OF COVER SHALL COMPLY WITH APPLICABLE PERMITS.

7. THE MINIMUM SEPARATION REQUIREMENTS BETWEEN HDPE WATER MAIN AND A NON-WATER MAIN SHALL BE AS OUTLINED IN THE CITY'S MANUAL, OR AS SHOWN ON THE PLANS AND APPROVED BY THE CITY, WHICHEVER IS MORE CONSERVATIVE.

PULL BACK:

1. AFTER SUCCESSFULLY REAMING THE BORE HOLE TO THE REQUIRED DIAMETER, CONTRACTOR WILL PULL THE PIPE THROUGH THE BORE HOLE. IN FRONT OF THE PIPE WILL BE A SWIVEL AND REAMER TO COMPACT BORE HOLE WALLS. ONCE PULL-BACK OPERATIONS HAVE COMMENCED, OPERATIONS MUST CONTINUE WITHOUT INTERRUPTION UNTIL PIPE IS COMPLETELY PULLED INTO BORE HOLE. DURING PULL-BACK OPERATIONS CONTRACTOR WILL NOT APPLY MORE THAN THE MAXIMUM SAFE PIPE PULL PRESSURE AT ANY TIME. MAXIMUM ALLOWABLE TENSILE FORCE IMPOSED ON THE PULL SECTION SHALL BE EQUAL TO 80% OF THE PIPE MANUFACTURER'S SAFETY PULL (OR TENSILE) STRENGTH.

2. TORSIONAL STRESS SHALL BE MINIMIZED BY USING A SWIVEL TO CONNECT A PULL SECTION TO THE REAMING ASSEMBLY.

3. THE PULLBACK SECTION OF THE PIPELINE SHALL BE SUPPORTED DURING PULLBACK OPERATIONS SO THAT IT MOVES FREELY AND THE PIPE IS NOT DAMAGED.

4. EXTERNAL PRESSURE SHALL BE MINIMIZED DURING INSTALLATION OF THE PULLBACK SECTION IN THE REAMED HOLE. DAMAGED PIPE RESULTING FROM EXTERNAL PRESSURE SHALL BE REPLACED AT NO COST TO THE CITY.

5. BUOYANCY MODIFICATION SHALL BE AT THE DISCRETION OF THE CONTRACTOR AND SHALL BE APPROVED BY THE CITY REPRESENTATIVE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO THE PULL SECTION RESULTING FROM SUCH MODIFICATIONS.

6. IN THE EVENT THAT THE PIPE BECOMES STUCK, CONTRACTOR WILL CEASE PULLING OPERATIONS TO ALLOW ANY POTENTIAL HYDRO-LOCK TO SUBSIDE AND WILL COMMENCE PULLING OPERATIONS. IF PIPE REMAINS STUCK, CONTRACTOR WILL NOTIFY THE CITY REPRESENTATIVE. THE CITY REPRESENTATIVE AND CONTRACTOR WILL DISCUSS OPTIONS AND THEN WORK WILL PROCEED ACCORDINGLY.

TESTING:

DISINFECTION TESTS:

1. ALL WATER PIPE AND FITTINGS SHALL BE THOROUGHLY DISINFECTED PRIOR TO BEING PLACED IN SERVICE. DISINFECTION SHALL FOLLOW THE APPLICABLE PROVISIONS OF THE PROCEDURE ESTABLISHED FOR THE DISINFECTION OF WATER MAINS AS SET FORTH IN AWWA – STANDARD C651 ENTITLED "AWWA STANDARD FOR DISINFECTING WATER MAINS" AND SHALL BE IN ACCORDANCE WITH CHAPTER III. 1.– SECTION 350. BACTERIOLOGICAL TESTING ON THE WATER MAIN SHALL BE SCHEDULED WITH THE CITY REPRESENTATIVE. CONTRACTOR WILL COLLECT THE WATER SAMPLES AND BE RESPONSIBLE FOR COMPLETING THE WATER ANALYSIS (LAB TESTING).

2. TEMPORARY BLOW-OFFS SHALL BE INSTALLED FOR THE PURPOSE OF CLEANING THE WATER MAIN. BLOW-OFFS INSTALLED ON WATER MAINS UP TO AND INCLUDING 12 INCHES SHALL BE THE SAME DIAMETER AS THE WATER MAIN. BLOW-OFFS INSTALLED ON 16 INCH WATER MAINS AND LARGER SHALL BE THE NEXT SMALLER SIZE, IN DIAMETER, THAN THE WATER MAIN BEING TESTED. TEMPORARY BLOW-OFFS SHALL BE REMOVED AND PLUGGED AFTER THE MAIN IS CLEARED. THE CITY REPRESENTATIVE SHALL BE PRESENT PRIOR TO AND DURING THE OPERATION OF BLOW-OFFS. THE MAIN SHALL BE FLUSHED PRIOR TO DISINFECTION.

3. THE NEW WATER MAIN SHALL BE CONNECTED TO THE EXISTING WATER MAIN AT ONE POINT ONLY FOR FLUSHING PURPOSES (NO LOOPING). THE NEW MAIN MUST HAVE A BLOW-OFF ON THE END AS REQUIRED PREVIOUSLY. AFTER THE NEW MAIN IS THOROUGHLY FLUSHED, THE OPEN END SHALL BE SEALED AND RESTRAINED AND THE MAIN SHALL BE THOROUGHLY DISINFECTED. ANYTIME THE NEW LINE IS REOPENED (TO REPAIR DEFECTIVE JOINTS OR PIPE, DEFECTIVE FITTINGS OR VALVES) THE COMPLETE DISINFECTION PROCESS SHALL BE REPEATED. ONCE BACTERIOLOGICAL CLEARANCE HAS BEEN RECEIVED FROM THE REGULATORY AUTHORITY, THE NEW MAIN MAY BE PRESSURE TESTED.

PRE-INSTALLATION PNEUMATIC PRESSURE TEST:

AFTER EACH HDPE PIPE SECTION HAS BEEN ASSEMBLED AND PRIOR TO PULLBACK, THE CONTRACTOR SHALL PERFORM AN AIR PRETEST. THE TEST PRESSURE SHALL BE 2 PSI AND THIS PRESSURE SHALL BE HELD FOR TWO (2) HOURS. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL EQUIPMENT FOR THIS TEST. PRESSURE AND TEMPERATURE SHALL BE MONITORED AND RECORDED WITH CALIBRATED INSTRUMENTS THROUGHOUT THE TEST. END CAPS, FITTINGS OR VALVE CONNECTED TO THE PRODUCT PIPE SECTION SHALL HAVE A PRESSURE RATING EQUAL TO OR GREATER THAN THE TEST PRESSURE. THE CONTRACTOR SHALL CONFIRM WITH THE PRODUCT PIPE'S MANUFACTURER THAT THE SPECIFIED TEST PROCEDURES ARE SUITABLE FOR THE SUPPLIED PIPE. ANY RECOMMENDED MODIFICATIONS TO THE PROCEDURES OUTLINED IN THIS SPECIFICATION SHALL BE SUBMITTED TO THE CITY FOR APPROVAL. IF LEAKAGE IS INDICATED, THE PIPE SHALL BE VISUALLY INSPECTED AND THE LEAKING JOINT(S) SHALL BE CUT OUT AND REPLACED AND THE SECTION RE-TESTED IN ACCORDANCE WITH THE SPECIFICATION REQUIREMENTS. ALL COSTS OF REPAIR AND RETESTING SHALL BE BORNE BY THE CONTRACTOR.

PRESSURE AND LEAKAGE TESTS:

1. CONTRACTOR SHALL TEST PIPELINES INSTALLED IN ACCORDANCE WITH THESE SPECIFICATIONS PRIOR TO ACCEPTANCE OF THE PIPELINE BY THE CITY. ALL FIELD TESTS SHALL BE MADE IN THE PRESENCE OF THE CITY REPRESENTATIVE. EXCEPT AS OTHERWISE DIRECTED, ALL PIPELINES SHALL BE TESTED. UNLESS APPROVED OTHERWISE BY THE CITY, ALL FUSIBLE OR BUTT WELD JOINTS SHALL BE TESTED, INCLUDING MJ ADAPTER FITTINGS ASSOCIATED WITH THE NEW CONSTRUCTION. ALL PIPING TO OPERATE UNDER LIQUID PRESSURE SHALL BE TESTED IN SECTIONS OF APPROVED LENGTH. THE PRESSURE TESTING OF AN HDPE LINE SECTION SHALL BE TESTED SEPARATELY FROM THE PVC AND DIP LINE SECTIONS. WHERE IMPRACTICAL, THE HDPE TEST SECTION SHALL INCLUDE ONLY A MINIMUM AMOUNT OF PVC AND DUCTILE IRON PIPE WITHIN THE TEST SECTION. IF AT ALL POSSIBLE, THE PVC AND DIP TEST SECTIONS SHALL BE LEFT EXPOSED DURING THE PRESSURE TEST FOR VISUAL LEAKAGE OBSERVATION. FOR THESE TESTS, THE CONTRACTOR SHALL FURNISH CLEAN WATER, SUITABLE TEMPORARY TESTING PLUGS OR CAPS, AND OTHER NECESSARY EQUIPMENT, AND ALL LABOR REQUIRED. IF THE CONTRACTOR CHOOSES TO PRESSURE TEST AGAINST AN EXISTING CITY WATER MAIN/VALVE, THE NEW WATER MAIN MUST BE DISINFECTED PRIOR TO CONNECTION TO THE CITY LINE. THE CITY WILL NOT BE RESPONSIBLE FOR FAILURE OF THE PRESSURE TEST DUE TO THE EXISTING VALVE LEAKING. THE CITY MAY ELECT TO FURNISH SUITABLE PRESSURE GAUGES FOR THESE TESTS. IF NOT, THE CONTRACTOR WILL FURNISH SUITABLE PRESSURE GAUGES, CALIBRATED BY AN APPROVED TESTING LABORATORY, WHICH INCREMENTS NO GREATER THAN 2 PSI. GAUGES USED SHALL BE OF SUCH SIZE THAT PRESSURES TESTED WILL NOT REGISTER LESS THAN 10% OR MORE THAN 90% OF THE GAUGE CAPACITY. ALL VALVED SECTIONS SHALL BE HYDROSTATIC TESTED TO ENSURE SEALING (LEAK ALLOWANCE) OF ALL LINE VALVES. ALL HDD OVER 100 LF SHALL BE AIR PRESSURE TESTED (ABOVE GROUND) ± 5 PSI FOR A PERIOD OF 15 MINUTES, PRIOR TO INSERTION. THERE SHALL BE NO PRESSURE LOSS ALLOWED.

2. UNLESS IT HAS ALREADY BEEN DONE, THE SECTION OF PIPE TO BE TESTED SHALL BE FILLED WITH POTABLE WATER AND AIR SHALL BE EXPELLED FROM THE PIPE. RECLAIMED WATER MAY BE UTILIZED FOR FILLING NEW RECLAIMED WATER OR SEWER FORCE MAIN INSTALLATIONS. IF BLOW-OFFS OR OTHER OUTLETS ARE NOT AVAILABLE AT HIGH POINTS FOR RELEASING AIR, THE CONTRACTOR SHALL PROVIDE 1 INCH (MINIMUM TAPS AND BLOW-OFF VALVES (AT THE 12:00 POSITION), AS NECESSARY. THE COST OF CONSTRUCTING BLOW-OFF VALVES AND PLUGGING THEM, AFTER A SUCCESSFUL PRESSURE TEST, SHALL BE INCLUDED IN THE UNIT PRICE BID AMOUNT FOR THE HDPE PIPE.

3. FOR MAINS LARGER THAN 20-INCH SIZE, IT IS HIGHLY RECOMMENDED THAT THE CONTRACTOR PROFILE (LINE AND GRADE) THE MAIN AFTER INSTALLATION AND PRIOR TO PRESSURE AND LEAKAGE TEST TO ACCURATELY LOCATE ALL HIGH POINTS. FIELD SURVEY INSTRUMENT (LEVEL EQUIPMENT) SHALL BE UTILIZED FOR THIS TASK. BLOW-OFF VALVES SHALL BE INSTALLED (AT A MINIMUM) AT ALL HIGH POINTS WHICH OFFSET VERTICALLY MORE THAN TWO PIPE DIAMETERS IN LENGTH (AT A MINIMUM). THE CONTRACTOR SHALL CONSULT THE ENGINEER ON ANY TECHNICAL QUESTIONS OR CONCERNS.
4. HYDROSTATIC TESTING SHALL CONSIST OF A 150 PSIG TEST PRESSURES, BASED ON THE ELEVATION OF THE HIGHEST POINT OF THE LINE OR SECTION UNDER TESTS. PRESSURE SHALL BE APPLIED BY MEANS OF A PUMP CONNECTED TO THE PIPE IN A MANNER SATISFACTORY TO THE CITY REPRESENTATIVE. THE PUMP, PIPE CONNECTION AND ALL NECESSARY APPARATUS SHALL BE FURNISHED BY THE CONTRACTOR AND SHALL BE SUBJECT TO THE APPROVAL OF THE CITY REPRESENTATIVE.

5. MAXIMUM DURATION FOR PRESSURE TEST, INCLUDING INITIAL AND FINAL PHASE OF THE TEST, SHALL NOT EXCEED EIGHT (8) HOURS. IF THE TEST IS NOT COMPLETED DUE TO LEAKAGE, EQUIPMENT FAILURE, ETC., DEPRESSURIZE THE TEST SECTION, AND THEN ALLOW IT TO "RELAX" FOR AT LEAST EIGHT (8) HOURS BEFORE BRINGING THE TEST SECTION UP TO TEST PRESSURE AGAIN.

INITIAL PHASE OF PRESSURE TESTING:

FIRST, ALL AIR MUST BE REMOVED FROM THE TEST SECTION. THE PRESSURE TEST SHALL BE COMPLETED AFTER THE LINE IS BACKFILLED. IF POSSIBLE, ALL FLANGED OR MECHANICAL JOINT VALVES AND FITTINGS SHALL BE LEFT EXPOSED FOR VISUAL LEAK INSPECTION. IF POSSIBLE ALL PVC AND DIP TEST SECTIONS SHALL BE LEFT EXPOSED FOR VISUAL LEAK INSPECTION. INITIALLY, THE PRESSURE WITHIN THE TEST SECTION SHOULD BE RAISED TO APPROXIMATELY 160 PSI AND THEN ALLOWED TO BE IDLE (NO ADDITIONAL MAKE-UP WATER/PRESSURE TO BE INJECTED), FOR APPROXIMATELY 3 HOURS. DURING THIS 3 HOUR PERIOD, THE TEST SECTION SHALL BE ALLOWED TO STABILIZE AND COME TO AN EQUILIBRIUM STAGE. NO ADDITIONAL MAKE-UP WATER/PRESSURE SHALL BE APPLIED TO THE TEST SECTION DURING THIS 3 HOUR STABILIZATION PERIOD UNLESS THE LINE PRESSURE DROPS BELOW 140 PSI. IN THIS CASE, MAKE-UP WATER/PRESSURE SHALL ONLY BE APPLIED TO THE TEST SECTION TO MAINTAIN A MINIMUM OF 140 PSI (DURING THE 3 HOUR STABILIZATION PERIOD).

FINAL PHASE OF PRESSURE TESTING:

1. THE FINAL PHASE OF THE PRESSURE TEST SHALL INVOLVE APPLYING MAKE-UP WATER/PRESSURE TO ACHIEVE AN "INITIAL TEST PRESSURE" OF 150 PSI (MINIMUM)/155 PSI (MAXIMUM). THE TEST SECTION IS THEN ALLOWED TO BE IDLE (NO MAKE-UP WATER/PRESSURE IS ADDED) FOR A PERIOD OF 2 HOURS. AFTER THIS 2 HOUR PERIOD, MAKE-UP WATER/PRESSURE IS APPLIED AND MEASURED TO RE-ESTABLISH THE "INITIAL TEST PRESSURE". THE QUANTITY OF WATER UTILIZED TO RE-PUMP THE LINE SHALL BE MEASURED AND COMPARED TO THE ALLOWABLE QUANTITIES AS DETERMINED BY THE TABLE IN SECTION 33.5 OF THE C.O.S.A. MANUAL. IF THE ACTUAL MAKE-UP WATER QUANTITY IS EQUAL OR LESS THAN THE ALLOWABLE AMOUNT, THE PRESSURE TEST PASSES. IF THE ACTUAL MAKE-UP WATER QUANTITIES ARE GREATER THAN THE ALLOWABLE AMOUNT, THE PRESSURE TEST FAILS.

2. IN THE EVENT A SECTION FAILS TO PASS THE TESTS, THE CONTRACTOR SHALL DO EVERYTHING NECESSARY TO LOCATE, UNCOVER (EVEN TO THE EXTENT OF UNCOVERING THE ENTIRE SECTION), AND REPLACE THE DEFECTIVE PIPE, VALVE, FITTING OR JOINT. VISIBLE LEAKS SHALL BE CORRECTED REGARDLESS OF TOTAL LEAKAGE. LINES WHICH FAIL TO MEET THESE TESTS SHALL BE RETESTED AS NECESSARY UNTIL TEST REQUIREMENTS ARE COMPLIED WITH. ALL TESTING SHALL BE PERFORMED AT THE CONTRACTOR'S EXPENSE.

3. IF, IN THE JUDGMENT OF THE CITY, IT IS IMPRACTICABLE TO FOLLOW THE FOREGOING PROCEDURES EXACTLY FOR ANY REASON, MODIFICATIONS IN THE PROCEDURE SHALL BE MADE WITH APPROVAL; BUT, IN ANY EVENT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE ULTIMATE TIGHTNESS OF THE PIPING WITHIN THE ABOVE REQUIREMENT. RE-DISINFECTION SHALL BE REQUIRED IF THE LINE IS DE-PRESSURIZED FOR REPAIRS PRIOR TO TYING.

LOCATE WIRE:

LOCATE WIRE SHALL BE PROVIDED ON ALL INSTALLATIONS. FOR HDD PROJECTS, LOCATE WIRE SHALL BE A MINIMUM 10AWG COPPER-CLAD CARBON STEEL WITH 30 MILS (MIN) INSULATION. FOR OPEN-CUT PROJECTS, THE LOCATE WIRE CONSTRUCTION AND TESTING SHALL MEET CITY LOCATE WIRE REQUIREMENTS. THE EXTERNAL COLOR SHALL BE EITHER WHITE OR YELLOW. LOCATE WIRE SHALL BE BROUGHT TO GRADE WITHIN A VALVE BOX OR LOCATE STATION BOX AT ALL "ENTRY POINT LOCATIONS" AND ALL "EXIT POINT LOCATIONS", REGARDLESS OF WHETHER SUCH BOXES ARE IDENTIFIED ON THE PLANS. FOR HDD PROJECTS, THERE IS NO MAXIMUM LENGTH OR INTERVAL BETWEEN LOCATE WIRE STATIONS. THE LOCATE WIRE TESTING AND REPORTING REQUIREMENTS SHALL BE AS PER CITY STANDARDS. IF THE LOCATE WIRE BREAKS OR IS NOT CONTINUOUS (FROM END TO END), THE CONTRACTOR SHALL, AT THE CONTRACTOR'S SOLE EXPENSE, PROVIDE SOFT-DIGS FOR THE PORTIONS OF THE MAIN WITH 12-FEET OR LESS COVER (EVERY 50 LF ALONG MAIN) TO CONFIRM AS-BUILT DATA. THIS SOFT-DIG DATA SHALL BE RECORDED ON THE AS-BUILT RECORD DRAWINGS.

CITY OF ST. AUGUSTINE HORIZONTAL DIRECTIONAL DRILLING (HDD) CONSTRUCTION REQUIREMENTS	REVISION DATE:	FEB 2017
	NOT TO SCALE	N-3

C.O.S.A.