

**MARCO ISLAND UTILITIES
TECHNICAL STANDARDS MANUAL**

REVISED 2015

**CITY OF MARCO ISLAND UTILITIES DEPARTMENT
MANUAL OF STANDARDS AND SPECIFICATIONS**

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GENERAL REQUIREMENTS

INTRODUCTION

The purpose of this document is to provide technical and procedural requirements for design and construction of service connections, mains, and other water and sewer facilities connecting to or extending MARCO ISLAND Utilities Department (MIU) facilities. This document provides requirements for Developers, Engineers, and Contractors. A deviation from these specifications requires specific approval from the MIU Engineering staff. A formal submittal is required for review by the MIU Engineering staff showing that the requested deviation will meet or exceed the requirements of the specifications and is "equal to" or exceeds the quality and serviceability of the specified product or methodology. All requests shall be submitted in writing, and shall not be approved for use in the MIU service area until approved in writing by MIU.

The intent of this manual is to provide for uniformity in utilities construction, and represent MINIMUM standards acceptable to MIU. This manual is also intended to maintain consistency with all local, state, and federal regulations and does not preclude compliance with SFWMD, FDEP, USACOE, Marco Island Land Development Code, and any other agency having jurisdiction. Any deviations with the technical specifications and details or conflicts with local codes and ordinances should be noted prior to submittal of plans.

Note: Go to www.cityofmarcoisland.com Marco Island Utilities tab for the latest revisions to the City of Marco Island Utilities Department Manual of Standards and Specifications.

SERVICE AVAILABILITY

Water and sewer service is available in areas where infrastructure is currently in place or where Developer agrees to install such infrastructure in accordance with a MIU approved master plan. Completed infrastructure shall be dedicated to MIU in accordance with procedures outlined elsewhere in this document. Sewer service is available for domestic quality sewage only. The MIU sewer system is a manifold system, and sewer service shall not be available to customers proposing to install and maintain localized lift stations, unless approved by MIU. Developer MAY ON A TEMPORARY BASIS be allowed or required to connect to the Sewer system utilizing a Developer maintained lift station (normally a grinder station). If approved, the Developer shall be required to abandon the temporary lift station, connect to central sewer system when available, and shall be responsible for their prorated share of central sewer system. Temporary private lift stations shall normally be considered for less than 2 years. Temporary septic systems in areas served by gravity sewer and/or force mains shall not be allowed.

PRELIMINARY PLANNING

Engineers and Developers are encouraged to submit a preliminary plan, and setup a meeting with MIU prior to submitting final construction plans. Preliminary planning can eliminate costly redesign of projects based on MIU comments. Master planning of large projects is required to determine the impact of those projects on MIU infrastructure, and for MIU infrastructure planning.

Project Engineer shall include in his submittal package:

1. Cover Letter
 - a. Request for preliminary review.
 - b. Type of units and number.
 - c. Projected water and wastewater demand.
 - d. Construction schedule.

2. Plans
 - a. Three sets of full-scale drawings (not less than 11 x 17 size).
 - b. "Preliminary Plan" shall be clearly marked on front page.
 - c. Materials of construction and technical specifications.

FINAL PLANS

Construction Plans shall show proposed lines (location, size, type of pipe, etc.). The plans shall also show the location of all existing and proposed appurtenances, including valves, fire hydrants, air release valves, manholes, and other appurtenances. Plans shall also include the location of other proposed utilities and location of other existing utilities including gas, storm drains, electric (including transformers), irrigation lines, telephone, and any other utility or other obstruction that may conflict with the proposed MIU facilities. Plans shall be at a maximum of 50 scale (40 scale or larger preferred). Plans shall show plan and profile of all water, reclaimed water, and wastewater lines.

Plan approvals expire one year from the date of approval. Revised plans conforming to current MIU requirements shall be submitted on all projects whose approval has expired. Any changes to MIU specifications since the expiration of the project approval shall be resubmitted. Fees shall also be applicable for resubmittals due to expiration of approval.

CONSTRUCTION

A preconstruction conference is required for all projects. A MIU representative shall attend the pre-construction conference. Five days notice is required to schedule a preconstruction conference.

In the event that project approvals were received more than one year prior to preconstruction, new submittals and reviews are required as noted above. Changes made subsequent to MIU approvals shall be appropriately indicated, and re-approval of

the changes is required prior to construction of those changes. A licensed underground utility contractor shall be utilized for all utility work to be dedicated to MIU.

SURVEY DATUM

Use North American Vertical Datum of 1988 (NAVD 88) for vertical survey control based on local National Geodetic Survey (NGS) Bench Marks. Horizontal survey control shall be based on North American Datum 1983 (NAD 83) State Plane Coordinate System, Florida East Zone FIPS 0901.

GLOBAL POSITIONING SYSTEM

The contractor shall hire a Professional Land Surveyor to provide As-Built coordinates, based on the Florida State Plane Coordinate System, East Zone for horizontal datum (2-foot accuracy) and NAVD 88 for vertical datum (0.1-foot accuracy). The contractor shall provide with every pay request, as-built coordinates for all underground utilities installed including, but not limited to, water, sanitary sewer and reclaimed water as follows: every 50 feet; at each thrust block; each change of direction; each service lateral tap and cleanout; each valve; each manhole; and at every junction structure (tee or wye).

DESIGN CONSIDERATIONS

The Engineer shall comply with the design and construction requirements as provided by MIU, Manual of Standards and Specifications, and the design shall be in accordance with Florida Department of Environmental Protection requirements. Conflicts between the FDEP requirements, specifications, and the standard details, shall be resolved in favor of the higher authority and clearly documented for MIU review and concurrence.

Hydraulic calculations shall be submitted for plan approval. Entry node(s) pressures and/or hydraulic model for water and force mains shall be provided by Engineer. Modeling software shall be WaterCad distributed by Haestad Methods or other software as approved by MIU.

Standard details included in this manual must be included in plan sets without alteration. If supplementary details are required they must be included on additional sheets. CAD files will not be provided to any outside firm or company.

Vertical and horizontal separation requirements of all mains and services shall be in accordance with FDEP requirements.

A. Flow Demands

Flow demands for design shall be calculated on the basis of full development as known or projected. Contact Customer Service for determining the current levels of service required per Equivalent Residential Connection (ERC) and to determine appropriate peaking demand factors. Flow demands for commercial, industrial, and special type developments shall be established utilizing the

current Ordinance. Approval of MIU is required for flow per unit from these types of projects.

B. Water Size Determination

1. Water distribution system shall be sized to provide ample capacity for the required peak flow rates. Design computations shall be provided for system design. All water mains shall be looped in a manor approved by MIU.
2. The minimum allowable size for any water main shall be 4-inches. The preferred minimum is 6" diameter (which is absolute minimum if there will be any fire hydrants connected to the main). The recommended size main for commercial and industrial developments shall be 12-inches.
3. Selection of pipe diameter and flow capacity shall consider minimum distribution system node pressures of 20 psi under peak hourly flow and maximum day plus fire flow conditions.

C. Water Main Design Considerations

1. Water mains shall be designed to have a minimum cover of 36 inches. Maximum allowable cover shall be 6-feet unless specifically approved by MIU.
2. Fire flow capacity used for sizing system components shall comply with the requirements of the fire department having jurisdiction. Documentation of the review and concurrence of the fire flow demand by the fire department having jurisdiction must be submitted prior to MIU review.
3. Wet taps shall be made with AISI Type 316 stainless steel tapping sleeves, and fusion bonded epoxy coated valves.
4. The location and spacing of fire hydrants shall comply with the requirements of the fire department having jurisdiction. The design fire flow demands, and the location and spacing of fire hydrants must be reviewed and approved by the fire department having jurisdiction prior to MIU review. Documentation of fire department review is required.
5. Valves shall be located at all intersecting mains (two per tee and three per cross), at the end of all lines to be extended, at all fire hydrants, on both sides of all water or wetland crossings, at both ends of all jack and bores and directional drills, at a minimum of 1000-feet along water mains, and at all other locations deemed appropriate by MIU.
6. Dead end lines shall be avoided wherever possible, and the use of dead end lines must have specific MIU approval if permitted. If allowed, an

automatic irrigation assembly (MIU Standard Detail W-6) shall be required at the end of dead end lines as directed by MIU. Automatic irrigation assembly shall be required at the end of all permanent dead end lines and lines that may not be extended for more than two years. A temporary irrigation assembly shall be provided at dead ends that will be extended within two years.

7. Air Release and Vacuum Valves.

Where the profile of the water mains larger than 8-inches is such that air pockets or entrapment could occur, provisions for air release shall be provided. Automatic air release assemblies shall be installed on all water mains larger than 8-inches where the deflection is 4 times the diameter of pipe or greater, and at a spacing along the water main of 1500-feet minimum. At all profile break points on water mains greater than 8-inches, such as localized high points, combined air release and vacuum valve assemblies shall be provided. If only one-way flow is expected in the main, the air release assembly shall be placed on the upstream side of conflict crossings. Air and vacuum valves and/or air release valves shall be suitably housed in pedestal mounts. Engineer shall provide computations to support location and size of air release valves with each submittal.

8. Service connections and other infrastructure shall be located with minimum off-set distances from power feeders and transformers as prescribed by the electric utility company. At no time shall the horizontal spacing from power feeders or transformers be less than 5-feet without prior approval from MIU.

D. Sanitary Sewer Size Computation

Sanitary sewer shall be sized to provide ample capacity for the required peak flow rates. The minimum allowable size for any gravity sewer main, other than lateral service connections, shall be 8-inches in diameter. The minimum size for laterals shall be 6-inches in diameter. All sewers shall be designed at slopes providing minimum velocities of not less than 2 feet per second when flowing full, based on Manning's formula.

The following minimum slopes shall be used as a design guideline:

<u>SANITARY SEWER PIPE DIAMETER (Inches)</u>	<u>MINIMUM SLOPE (Feet per 100 Feet)</u>
8"	0.40
10"	0.28
12"	0.22
15"	0.15
18"	0.12
21"	0.10
24"	0.08
30"	0.058
36"	0.046

Minimum slopes less than those indicated shall not be considered.

E. Sanitary Sewer Design Considerations

1. Sanitary gravity sewers shall be installed with straight alignment and grade between manholes with manhole spacing not to exceed 400 feet.
2. Manholes (see details) shall be constructed at all changes in size, direction, or termination of sanitary sewers. Sewer cleanouts shall be provided at the edge of the right-of-way or easement for all service connections. Laterals shall not exceed 150 feet in total length including cleanouts.
3. Flow direction changes greater than 90-degrees shall not be allowed without special approval. A line drop of 0.1-feet shall be provided across each manhole.
4. Sanitary gravity sewer line size changes shall occur only at manholes. Where different pipe sizes join in a manhole, the pipes are to be placed at elevations where the 0.8 depth points are equal, unless higher points are required.
5. Special attention shall be given to gravity lines or lift station wet wells that receive flow from sanitary sewer force mains. Care shall be taken in these areas to ensure excessive flow rates do not create surcharge conditions downstream. If the force main velocity is greater than 2.5 feet per second at the termination, the force main pipe size shall be increased one pipe size for the last two pipe joints to help dampen the velocity. Receiving manhole shall be IET coated for new structures, and for existing structures the receiving manhole shall be rehabilitated with Raven 405 or Spray Wall lining.

Force mains shall enter the terminal facility (gravity sewer manhole or lift station wet well) at a point equal to the operational water level of the receiving structure. Should an elevation drop be required to obtain the outlet connection, the prior downslope of the force main shall not exceed 45 degrees and adequate air venting shall be provided at the profile breakpoint. Discharge end shall be designed so pipe remains full at all times. Force mains into lift stations will be dropped to 6 inches above the floor. Detail shall be submitted to MIU for approval.

6. Where pipes are to extend into or through structures, flexible, watertight joints shall be provided at the wall face.
7. Gravity system overflows shall be installed from manhole to manhole, as directed by MIU. At least one overflow pipe shall be provided for each lift station area.
8. Service connections shall be a minimum of 6-inches in diameter. Service connections shall be located at center of lots, and shall be extended to the property line or easement limits. MIU may permit double services with specific prior written approval from MIU. Buildings two-stories and higher shall have a manhole at the property line or easement line (see details).
9. All connections to existing mains shall be made under the direction of MIU. Valves separating the mains being installed from existing mains shall be operated by or under the direction of MIU. The Contractor shall pay for the cost of the work in making the connections.
10. Any private wastewater system connecting to MIU's sanitary sewer shall be tested and inspected to assure compliance with the Manual of Standards and Specifications. In no case shall substandard private systems generating excessive inflow or infiltration be allowed to connect into the MIU system.
11. Wet taps shall be made with stainless steel tapping sleeves and valves.
12. Work on MIU lines or any other utilities resulting in MIU's customers being without water or sanitary sewer service shall submit service interruption form. MIU shall be notified 72 hours in advance so customer(s) can be notified.
13. Grease interceptors are not required for private residences. However, one or more grease interceptors are required where grease waste is produced in quantities that could otherwise cause line stoppage or hinder sewage disposal. The design of grease interceptors shall be based on standards found in (a) below. In addition, the following general requirements found in (b), (c), and (d), apply when determining the proper use and installation of a grease interceptor used as a component of an onsite sewage treatment and disposal system.

- a. Grease interceptors shall be capable of supporting HS-20 highway loading.
- b. The inlet invert of the grease interceptor shall discharge a minimum 2-1/2 inches above the liquid level line and the outlet pipe shall have a tee with a minimum diameter of 4 inches that extends to within 8 inches of the bottom of the tank. The inlet of a grease interceptor should discharge a minimum of 1/2 inch below and a maximum of 1 inch below the bottom of the inlet pipe and must have a tee as described for the outlet pipe.
- c. Grease interceptors shall be located so as to provide easy access for routine inspection, cleaning and maintenance. Manholes shall be provided over the inlet and outlet of each grease interceptor and be brought to finished grade.
- d. Where a grease interceptor is required or used; only kitchen wastewater from food preparation shall pass through the grease interceptor and then be discharged into the MIU system.
- e. Sizing of grease interceptors shall be based on the equations below. The minimum volume of any grease interceptor shall be 750 gallons and the maximum volume of a single grease interceptor shall be 1250 gallons. When the required effective capacity of the grease interceptor is greater than 1250 gallons, installation of grease interceptors in series is required. Engineer shall provide grease interceptor calculations with plan submittal.

Restaurants: $(S) \times (GS) \times (HR/12) \times (LF)$ = effective capacity of grease interceptor in gallons.

S = number of seats in the dining area.

GS = gallons of wastewater per seat: use 25 gallons for ordinary restaurant and use 10 gallons for single service article restaurants.

HR = number of hours establishment is open.

LF = loading factor: use 1.0 for north and south Collier Blvd. and 0.75 for all other roads.

Other type establishments with commercial kitchens:

$(M) \times (GM) \times (LF)$ = effective capacity of grease interceptor in 1gallons.

M = meals prepared per day.

GM = gallons of wastewater per meal: use 5 gallons.

LF = loading factor: use 1.00 with dishwashing and 0.75 without dishwashing.

- f. Grease Interceptor Cleaning Record is to be displayed so it is accessible to MIU Inspectors. See Appendix C for inspection sheet form used.

14. Sewage Force Mains

- a. Force main systems shall be of adequate size to efficiently transmit the total ultimate peak operational flow to the effluent point. Consideration shall be given to possible future connecting lift stations, and this probability shall be reviewed with MIU. Capacity computations shall be coordinated with the proposed pumping system and future flow requirements, if applicable. In order to provide adequate pipeline cleansing, force main flow velocity shall not be less than 2 feet per second nor greater than 6 feet per second at ultimate design minimum pumping capacity. However, with multiple lift station systems or phased development, this requirement may not be possible and the system design shall receive special attention regarding cleaning and maintenance.
- b. In addition to initial capital expenditure, long-term lift station operational costs shall also receive consideration when sizing force main systems. Should a pipe size option be available within the design limits, the cost of sewage pumps and motors, force main system and pump operating power (computed for design average daily flow rate for 10 years at existing electricity cost), shall be compared to like amounts for the alternate designs. The final force main size selection shall be directed towards the system with the least long range capital and operational cost. Said cost analysis shall be subject to review and approval by MIU.
- c. Valves shall be installed on all subsidiary force mains at the point of connection to the major main in order to isolate said pipeline for maintenance. Where force mains are to be extended, valves shall be placed at the future collection point to preclude line shutdown at the time of extension. At future connection branches or ends, the valves shall be restrained per the specifications in order to facilitate said connection without system shut-down. All mains shall have "inline" valves at a minimum of 1500-foot intervals.
- d. Force mains that are susceptible to sedimentation clogging created by depressed crossings or extended low flow and low velocity periods, shall be provided with suitable clean-out connections and pigging stations. Clean-out connections and pigging stations shall be located to facilitate maintenance operations, and shall be subject to review and approval by MIU.

- e. Force mains shall be designed to have 36-inch minimum cover. Maximum allowable cover shall be 5-feet unless specifically approved by MIU.

15. Air Release and Vacuum Valves

Where the pressure main profile is such that air pockets or entrapment could occur, provisions for air release shall be provided. Automatic air release assemblies shall be installed on all pressure mains where the deflection is 4 times the diameter of pipe or greater, and at a spacing along the pressure mains of 1500-feet minimum. At all profile break points on pressure mains, such as localized high points, where free flow will occur during operation or after pumping stops, combined air release and vacuum valve assemblies shall be provided. If only one-way flow is expected in the main, the air release assembly shall be provided at high points and on the upstream side of conflict crossings.

Engineer shall provide computations to support location of air release valves with each submittal.

16. Lift Stations

a. General

- i. Lift stations may not be permitted when an existing station is in hydraulic proximity. Developer may be required to update an existing station to facilitate the proposed flow. MIU shall solely determine the limit of hydraulic proximity.
- ii. For lift stations with a design maximum flow of 1500 GPM or less, a minimum of two pump units shall be provided. Where the peak design flow exceeds 1500 GPM, three or more units shall be provided, such that the design maximum flow can be pumped with the largest unit out of service. The selected sewage pump system shall be capable of pumping the design maximum flow at the maximum computed system total head requirements. Additionally, final selection shall be based upon optimum operational costs.
- iii. Odor control design shall be provided by the Engineer, required for the lift station by MIU.

b. Hydraulic Computations

Head capacity curves shall be prepared for the proposed pumping system in order to determine the various operational conditions.

Hydraulic computations shall be in accordance with standard engineering formulas with pipe friction loss calculated by the Hazen Williams Formula, using standard friction factors based on the material utilized. The system head capacity analysis shall provide the following and be subject to review by MIU:

- i. System operation under peak flow conditions with one pump or multiple parallel pumping as designed. Should the receiving force main systems be interconnected to additional lift stations; hydraulic design conditions shall also include said pumping systems operating at rated capacity.
 - ii. Pumping capability with one pump running, all units operating in parallel and other combinations, if applicable.
 - iii. For multiple lift station force main systems, the one pump maximum capacity under minimum flow contribution conditions from the other connected facilities shall be calculated.
- c. Wet Well Design
- i. The wet well structure shall have design capacity to allow a maximum of seven starts per hour under normal operating conditions. The minimum diameter of the wet well shall be 6-feet.
 - ii. Low water levels shall be set to provide adequate submergence for facilities to preclude inlet vortexing and air binding. In general, the normal operational water level shall provide positive suction head for the pumps. Maximum water levels shall not exceed the invert elevation of the lowest influent pipe with the high water alarm no higher than 0.8 feet below the invert of said pipe. There shall be a minimum distance of 3-feet from high water alarm (i.e. 0.8-feet below lowest influent invert) to the low level shutoff. Pump size may increase this distance.
- d. Types of Lift Station Construction
- i. Submersible Facilities
Submersible (package) sewage lift stations shall be provided where the peak design flow is less than 2000 gallons per minute unless otherwise required by MIU. These facilities shall be manufactured in accordance with all applicable provisions of this standard. The Contractor and manufacturer shall assume responsibility for the satisfactory installation and operation of the entire pumping system

including pumps, motors, hatch covers, and controls as specified. The minimum diameter of the wetwell for a package lift station shall be 6 ft. smaller wetwells if needed to address space limitations must be specifically approved by MIU.

ii. Built-In-Place Facilities

Structural built-in-place sewage lift stations may be required to be constructed where the peak design flow exceeds 2000 gallons per minute or as directed by MIU. Additionally, where the peak flow requirement is more than 1500 gallons per minute three pumping units shall be included. These facilities shall be constructed in accordance with all applicable provisions of this standard. Preliminary design submittals are required for facilities of this type.

e. Site Design Considerations

Lift Stations shall be installed off the right-of-way within readily accessible sites unless otherwise approved by MIU, and shall have adequate area provided for operation and maintenance of the facility. A site approximately 20-feet by 20-feet is generally adequate for normal size lift station facilities. The site shall be well drained and accessible for maintenance. The site shall meet current FDEP requirements for withstanding flood damage and interruption of service. As a minimum, pumping stations shall be design to remain fully operational and accessible during a 25-year flood. All non-immersible, mechanical equipment and electrical controls must be elevated or otherwise protected from damage during a 100-year flood. Site preparation shall include pavement and walkways for good all weather operations. Submit drawings of landscape and electrical plans, for approval if different from MIU standard details.

COMPLETION-DEDICATION

Completion-Dedication data to be submitted by the project engineer are included in Appendix E. Service shall not be provided until all items are complete. All infrastructure shall be designed for ultimate dedication to MIU. Gravity sewer lines will be cleaned and televised at the eleventh month following acceptance by MIU to determine if warranty repairs are required.

TECHNICAL SPECIFICATIONS

GENERAL

All materials must meet or exceed appropriate AWWA standards. For potable water systems, all material or equipment shall conform to the requirements of NSF 61.

The Contractor shall obtain from the pipe manufacturers, a certificate of inspection to the effect that the pipe and fittings supplied to the MIU service area have been inspected at the plant, and that they meet the requirements of these specifications. All pipe and fittings shall be subjected to visual inspection at time of delivery and also just before they are lowered into the trench to be laid, and pipe joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor. The entire product of any manufacturer may be rejected when, in the opinion of MIU, the methods of the manufacture fail to secure uniform results, or where the materials used are such as to produce inferior pipe or fittings.

Contractor's/Developer's Engineer shall provide copies of all submittals and shop drawings for all projects to MIU. Submittal or shop drawing data is recommended to be sent to MIU as approvals on the project are made by the City's Engineer, but shall be required to be included in the turnover documents submitted for project completion.

PRESSURE MAINS

Pressure mains shall be PVC meeting the requirements of AWWA C900. Pressure mains 14 inch diameter and greater shall meet the requirements of AWWA C905 with rubber gasketed pipe with bell and spigot ends or may be HDPE meeting the requirements of AWWA C906 with butt heat fusion joints. Minimum pressure main size shall be 4 inch diameter, and the minimum size of mains serving fire hydrants shall be 8 inch diameter when serving main is larger than 6 inch diameter. When the serving main is 6 inch diameter, the main serving fire hydrants may also be 6 inch diameter.

PVC fire mains shall be DR14 pipe, and HDPE fire mains shall be DR 11 pipe. Use of HDPE pipe shall be approved by MIU prior to construction. Equivalent PVC and HDPE are shown below:

PVC Standards	PVC Nomenclature	Equivalent HDPE AWWA C906 (PE 4710)
AWWA C900 DR 14	Pressure Class 200 psi	HDPE DR 11
AWWA C900 DR 18	Pressure Class 150 psi	HDPE DR 13.5
AWWA C905 DR 18	Pressure Class 235 psi	HDPE DR 9

PVC and HDPE pipe shall have ductile iron OD and shall be colored for water (blue or blue lined), sewer (green or green-lined), and irrigation (purple or purple lined).

Polywrap to designate pipe color shall be used only with specific approval from the MIU Engineering Department.

Directional drilling, if approved by MIU shall require the use of HDPE DR 11 pipe meeting AWWA C906 with butt heat fusion joints. If a casing pipe is required, both the casing and carrier pipe shall be DR 11 HDPE pipe.

PIPE FITTINGS

All polyvinyl chloride pipe and ductile iron pipe shall be installed with PVC or ductile iron fittings. The allowable coatings for ductile iron fittings are as follows:

Water	Sewage	Reuse
Fusion Bonded Epoxy	401 Epoxy	Fusion Bonded Epoxy
Cement Lined (if not available infusion bonded epoxy)		
Hymax for pipe transitions		

All HDPE pipe fittings shall be electrofusion or butt heat fusion joints conforming to specifications.

All PVC pipe fittings shall be ductile iron with Megalug restraint. Fittings shall conform to the requirements of AWWA C907. All C907 fittings shall be Multifittings, IPEX, or equivalent product approved by MIU. All fittings shall have a minimum pressure rating of 150 psi.

All ductile iron fittings shall be mechanical joint type with a minimum pressure rating of 250 psi and shall conform to the requirements of ANSI Standard A21.10. Ductile iron fittings shall be fusion bonded epoxy coated on the interior and outside in accordance with AWWA standard C116.

Fittings for HDPE pressure mains shall have electrofusion joints, or butt heat fusion joints. All electrofusion joint fittings shall have ISO 9001 certification, and shall be Central Plastics fittings. All butt heat fusion joint fittings shall conform to AWWA C906 and ASTM D 3261.

Electrofusion jointing shall be allowed only for those manufacturers approved by MIU. All electrofusion processors shall be equipped with bar code capability as well as manual operations. The processors shall be capable of printing out all fusion procedures made on the machine with complete information for total quality and installation control.

Each day the machine operator shall supply MIU with a complete printout of the day's activity along with a construction log of all the fusion conducted on fittings or taps. Only individuals trained and certified by FS/AWWA (Florida Section of AWWA) on fusion

procedures on HDPE shall be approved for installation of electrofusion fittings. Taps to electrofusion mains shall use 316 Stainless Steel service saddles.

GATE VALVES

Gate valves shall be installed in the vertical position only. Gate valves shall be resilient seat conforming to or exceeding the requirements of ANSI/AWWA C509 and C515. Gate valves for potable water service shall be certified to meet the requirements of ANSI/NSF 61. All external bolts, fasteners and hardware shall be Type 316 stainless steel. Ductile iron components shall be protected internally and externally by fusion bonded epoxy coatings meeting or exceeding the requirements of AWWA C550.

PIPE JOINTING

Materials and methods shall be in strict accordance with the recommendations of the respective pipe manufacturer.

All exposed piping shall be ductile iron pipe with an operating pressure of 250 psi, and shall be manufactured in accordance with ANSI/AWWA C110/A21.10-1992.

All buried joints for PVC pressure mains shall be mechanical joints, push-on, or restrained type and shall conform to ANSI/AWWA C111/A21.11-1990. All buried joints for HDPE pressure mains shall be butt heat fusion joints and shall conform to AWWA C906 and ASTM 03261.

Mechanical joints consisting of bell, socket, gland, gasket, bolts and nuts shall conform to ANSI Standard A21.11. Bolts shall be high strength annealed, COR-TEN steel T-head type having hexagonal nuts. Bolts and nuts shall be machined through and nuts shall be tapped at right angles to a smooth bearing surface.

Single sealed gasket push-on type joints shall conform to the requirements of ANSI A21.11 and shall be Tyton, Fastite, Superbelltite, Alltite, or approved equal.

Gaskets shall be elastomeric and conform to AWWA Standards and ASTM F477. Gaskets shall have clean tips unless otherwise specified.

PVC pipe shall have provisions for expansion and contraction provided in the joints. All joints except threaded joints shall be designed for push-on makeup connections. Push-on joint may be a coupling manufactured as an integral part of the pipe barrel consisting of a thickened section with an expanded bell with a groove to retain a rubber sealing ring of uniform cross section.

Threaded joints shall be used only with Schedule 80 pipe or better. At threaded joints between PVC and metal pipes, the metal shall contain a socket end in PVC side of spigot. A metal spigot shall not, under any circumstances, be screwed into a PVC socket.

RESTRAINTS

Fitting and joint restraints for all pipe types specified shall be Megalug restraints by EBAA Iron Sales Inc., Uniflange restraints by Ford Meter Box Company, Star Pipe Products restrainers or approved equal. Restraints on HDPE pipe joints and fittings are not required for butt heat fusion joints conforming to specifications. Restraints shall be stainless steel.

Where specified, mechanical restrained type joints for pipe shall be factory type and fabricated at the factory. Field welding for joint fabrication is not acceptable. Approved restrained type joints shall be as approved by MIU. Acceptable restrained joint types are T.R. Flex Joints as manufactured by US Pipe and LOK-Ring joints as manufactured by American Ductile Iron Pipe or MIU approved equal. One manufacturer shall supply all components of the restraining method and accessories.

Mechanical joint fittings are not allowed on HDPE piping.

COATING AND LININGS

This section includes materials and application of painting and coating systems for the following materials:

1. Submerged Metal
2. Exposed Metal
3. Buried Metal
4. Concrete and Masonry
5. Exposed Plastic Piping
6. Ductile Iron Piping (see below)

Coatings for water storage tanks and any water storage or conveyance systems not specifically identified herein shall be as recommend by the engineer and submitted for approval by MIU on an individual basis.

Coatings for concrete in contact with potable water will be project specific as recommend by the engineer and approved by MIU.

Coating systems for new or existing concrete structures will be project specific depending on the application and as recommended by the engineer and approved by MIU.

Ductile Iron Pipe

- A. All ductile iron pipe and fittings used in sewage and wastewater applications shall be bituminous coated on the exterior and P401 epoxy coated on interior.
- B. All ductile iron pipe used in potable water and reclaimed water applications shall be bituminous coated on the exterior and cement lined on the interior. All ductile

iron fittings shall be coated exterior and interior with fusion bonded epoxy.
Coatings used for potable water applications shall be ANSI/NSF 61 certified.

Thickness of all linings shall be uniform.

COATING SYSTEMS

The following table summarizes approved coating systems by application and type.

System No.	Application	Type
Ferrous Metal Submerged		
1.	Raw Water and Wastewater	Cycloaliphatic Epoxy
7.	Potable or Non-potable Clean Water	High Solids Epoxy Certified to ANSI/NSF 61
Ferrous Metal Exposed		
10.		Epoxy / Zinc / Polyurethane
Ferrous Metal Buried		
21.	Buried Metal Fabrication and Fittings	Fusion Bonded Epoxy (water) / CoalTar Epoxy (wastewater)
24.	Buried Metal Machined Parts and Fasteners	Corrosion resisting grease
Concrete and Masonry Corrosive Environments		
31.	Exposed Concrete and Masonry, Corrosive Environment	Acrylic Emulsion
33.	New Submerged Concrete, Raw Water or Wastewater; Concrete Repair, Renovation, Structural Restoration	Structural High Build Epoxy or Polyurethane Liner
Exposed PVC, CPVC, and FRP Piping		
41.	Coating for Ultraviolet Exposure or Color Coding	Polyamidoamine Epoxy / Aliphatic Acrylic Polyurethane

These systems are specified in the following paragraphs. For each coating, the required surface preparation, prime coat, intermediate coat (if required), topcoat, and coating thicknesses are described. Mil thicknesses shown are minimum dry-film thicknesses. No coatings are required on stainless steel or aluminum unless needed for color coding. Buried valves shall be supplied with a factory applied finish coating suitable for the intended application.

A. Submerged Metal

1. System No. 1:

Type: Polyamidoamine Epoxy (Epoxy / Epoxy / Epoxy)

Service Condition: For use with metal pipes, valves, supports and fabricated metal submerged in raw sewage or raw water or exposed to raw sewage and vapors in wet wells.

Surface Preparation: SSPC SP-10 / NACE 2 (near white metal sandblast).

Prime Coat: Tnemec Series N69 Hi-Build Epoxoline, DFT 3.0 to 5.0 mils.

Intermediate Coat: Tnemec Series 104 H.S. Epoxy, DFT 4.0 to 10.0 mils.

Finish Coat: Tnemec Series N69 Hi-Build Epoxoline II, DFT 4.0 to 6.0 mils; or, Series 104 H.S. Epoxy, DFT 4.0 to 10.0 mils.

Total Dry Film Thickness 11.0 to 25.0 mils.

Equivalent painting systems by Devoe, Ameron, and Carboline are acceptable subject to MIU approval.

2. System No. 7:

Type: Polyamidoamine Epoxy system certified in accordance with ANSI/NSF 61 for contact with potable water.

Service Condition: For use with metal pipes, valves, supports, steel tanks, and fabricated metal submerged in potable or non-potable clean water.

Surface Preparation: SSPC SP-10 / NACE 2 (near white metal sandblast).

Prime Coat: Tnemec Series N140 Pota-Pox Plus Hi-Build Epoxoline, DFT 4.0 to 6.0 mils.

Finish Coat: Tnemec Series N140 Pota-Pox Plus Hi-Build Epoxoline, DFT 4.0 to 6.0 mils.

Total Dry Film Thickness 10.0 to 12.0 mils.

Equivalent painting systems by Devoe, Ameron, and Carboline are acceptable subject to MIU approval.

B. Exposed Metal

1. System No. 10:

Type: Epoxy / Zinc / Polyurethane

Service Condition: For use with above grade and non-submerged metal structures, tanks, piping systems, and equipment.

Surface Preparation: SSPC SP- 6 / NACE 3 (commercial sandblast).

Prime Coat: Tnemec Series N69 Hi-Build Epoxoline, DFT 3.0 to 5.0 mils; or, Series 90-97 Tneme-Zinc, DFT 2.5 to 3.0 mils.

Intermediate Coat: Tnemec Series N69 Hi-Build Epoxoline or Series 27 Typoxy, DFT 2.5 to 3.0 mils.

Finish Coat: Tnemec Series 73, 1074, or 1075 Endura-Shield, DFT 2.0 to 5.0 mils.

Total Dry Film Thickness 7.0 to 13.0 mils for Epoxy / Polyurethane or 6.5 to 11.5 mils for Epoxy / Zinc/ Polyurethane.

Equivalent painting systems by Devoe, Ameron, and Carboline are acceptable subject to MIU approval.

C. Buried Metal

1. System No. 21:

Type: Polyamide Epoxy Coal-Tar

Service Condition: Direct bury metal products, wastewater fittings, and metal fabrication.

Surface Preparation: SSPC SP-10 / NACE 2 (near white metal sandblast).

Prime Coat: Tnemec Series N69 Hi-Build Epoxoline, DFT 3.0 to 5.0 mils.

Finish Coat: Tnemec Series 46H-413 Hi-Build Tneme-Tar, DFT 14.0 to 20.0 mils.

Total Dry Film Thickness 17.0 to 25.0 mils.

Equivalent painting systems by Devoe, Ameron, and Carboline are acceptable subject to MIU approval. Fittings for buried water mains shall have factory applied fusion bonded epoxy coatings.

2. System No. 24:

Type: Corrosion resisting anti-seize lubricant used to protect irregular fittings.

Service Condition: Buried metal parts and fasteners, such as bolts, bolt threads, tie rods, and nuts (including stainless steel unless furnished Teflon coated).

Surface Preparation: clean dry and free of foreign substances (power tool or commercial blast if needed SSPC SP-3 or SP-6).

Coating: NO-OX-ID GG-2 as manufactured by Sanchem, Inc. Apply a minimum thickness of 1/4 inch per manufacturer's directions.

D. Concrete and Masonry

1. System No. 31:

Hi-build, water based, Acrylic Emulsion

Service Conditions: Exposed concrete and masonry.

Surface Preparation: SSPC SP 13 / NACE 6 clean and dry

Prime Coat: Tnemec Series 180 or 181 (sand texture) Tnemecrete, DFT 4.0 to 8.0 mils.

Finish Coat: Tnemec Series 180 or 181 (sand texture) Tnemecrete, DFT 4.0 to 8.0 mils.

Total Dry Film Thickness 8.0 to 16.0 mils.

Equivalent painting systems by Devoe, Ameron, and Carboline are acceptable subject to MIU approval.

2. System No. 33:

Type: Solvent free 100% solids ultra high build epoxy or 100% VOC-free polyurethane. Approved systems are Raven Lining Systems 405, Sprayroq SprayWall® or equivalent product approved by MIU.

Service Conditions: Concrete wetted or submerged in raw water or raw sewage and structures exposed to moist hydrogen sulfide such as interiors of manholes and sewage pumping station wet wells. Also used for concrete repairs, rehabilitation, and structural restoration.

Surface Preparation: Provide a uniform, clean, neutralized surface as directed by the manufacturer's instructions. Concrete and masonry surfaces must have a surface profile equivalent to CSP3 to CSP5 in accordance with ICRI. Use abrasive blasting, low-pressure water cleaning may be used for debris removal but applied at a rate of no more than 2.5 gpm at a pressure of 3,000 psi.

Installation shall be by a certified installed authorized by the manufacturer. Installer shall follow the manufacturers' explicit recommendations for application.

Total minimum applied coating thickness will be 125 mils for new structures and 200 mils for rehabilitated structures.

E. Exposed or Color Coded PVC, CPVC, and FRP

1. System No. 41:

Type: Polyamidoamine Epoxy / Aliphatic Acrylic Polyurethane

Service Conditions: Color coding of PVC, CPVC or FRP or any non-metallic piping exposed to sunlight (except HDPE piping).

Surface Preparation: SSPC SP-1 (solvent clean). Lightly abrade the surface with medium-grain sandpaper.

Prime Coat: Tnemec Series N69 Hi-Build Epoxoline, International 7510, Ameron 385, ICI Devoe Devran 224 HS, Sherwin-Williams Macropoxy 646 B58 series, Carboline 888 or 890, PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 Series, or MIU approved equal. Apply to a minimum dry-film thickness of 2.0 mils.

Finish Coat: Tnemec Series 1075 Endura-Shield, International Interthane 990HS, Ameron 450 HS, ICI Devoe Devran 379, Carboline 134 HG, Sherwin-Williams Hi-Solids Polyurethane 865-300 series, PPG PITTHANE® Ultra Gloss Urethane Enamel 95-812 Series, or MIU approved equal. Apply to a minimum dry-film thickness of 2.0 mils.

Total Dry Film Thickness 4.0 to 6.0 mils.

REPRESENTATIVE COATING SCHEDULE (non inclusive)

Surface or Item	Coating System No.
Pumps (exposed components)	10
Pumps (submerged components)	1
Exposed ferrous piping	10
Submerged ferrous piping	1
Exposed ferrous valves	10
Submerged valves	1
Standard Concrete Manholes - Exterior surfaces	21
Standard Concrete Manholes - Interior surfaces	33
Concrete Wet Well - Exterior surfaces	21
Concrete Wet Well - Interior surfaces	33
Concrete Valve Vault - Exterior surfaces	21
Concrete Valve Vault - Interior surfaces	33

LOCATOR TAPE AND BALL MARKERS

A. General

Plastic locator tape, impregnated with metallic filings, shall be placed in the pipe trench in and labeled "water main", "force main", or "reuse main", as appropriate. Locator tape is to be placed approximately 18 inches above the pipe.

Locator balls shall be 3M™ ScotchMark 4-inch ball markers. Ball markers shall be model: 1423-XR/ID (blue) for water; 1424-XR/ID (green) for wastewater; 1428-XR/ID (purple) for reuse; 1422-XR/ID (red) for electric. For wastewater cleanouts, install LDL™ Clean-out Smart Plug assembly incorporating 3M™ EMS Near-Surface Marker color coded for wastewater (green). Ball markers are laid approximately 12 inches above the locator tape but no deeper than 5 feet below grade. Ball markers are placed at each change in direction, valve or fitting, service connections, and every 50 feet on straight runs.

B. Pressure Mains

Place locator tape and locator balls in accordance with MIU Standard Detail CB-14.

C. Gravity Sewer Mains

Place locator tape in accordance with MIU Standard Detail CB-14. Locator balls are not required above gravity sewer mains.

D. Gravity Sewer Laterals

Place locator tape in accordance with MIU Standard Detail CB-14. Place locator balls in accordance with MIU Standard Details SS-20 through SS-23.

VALVE BOXES

For 2-inch and larger valves, valve boxes shall be approved standard Buffalo type, cast iron, adjustable shaft valve boxes having a minimum shaft diameter of 5'1.-inches. The castings shall be coated with two coats of coal-tar pitch varnish. The lids of all boxes shall bear the word "WATER" or the letter "W", the word "FIRE" for fire hydrants and fire protection systems, the word "SEWER" for valves in wastewater system, and the word "REUSE" for valves in reclaimed water system. Lids for water shall be painted blue, for fire systems shall be painted red, for sewer systems shall be painted green, and for reuse systems shall be painted purple. Boxes shall be Tyler 6850 series. Extension sections shall be cast iron only. Every valve box shall be installed with a debris cap. Valve boxes are not to be installed in curb. All valve boxes shall be made in USA.

DEBRIS CAP

The debris cap shall be comprised of a hollow member having a cylindrical outer surface, a closure for one end and three point resilient contact pads projecting from the outer surface. One contact pad shall be movable by means of a cam having a low angle of advance whereby external forces applied to the cam via the movable contact pad do not cause rotation of said cam. The cap shall have a flexible skirt providing an outward seal preventing debris from getting past the cap. The cap must withstand, without slippage, a minimum vertical force of 50 pounds, at a loading rate of 1.0 inches/minute. The cap shall be molded using General Electric ABS #HIM 4500 or equal. The cap shall have retaining prongs to retain a standard locating coil. Caps shall be blue for water, green for wastewater, red for hydrants and fire mains, and purple for reclaimed water. Locator disk and locking device must be included with the debris cap.

CARRIER PIPE (for jack and bore)

Pressure main carrier pipes to be installed within the specified casings shall be restrained DR18 PVC Pipe. 14-inch and larger diameter pipe shall be restrained C905 DR18 PVC Pipe. Pipe and fittings shall comply with the applicable provisions of these Standards.

CASING PIPE AND SPACERS (for jack and bore and directional drilling)

Casing pipe shall be new prime steel pipe conforming to the requirements of ASTM Designation A-139. The minimum casing pipe size and wall thickness shall be as shown in the following table, for carrier pipe size indicated. For sizes not included, or for special design considerations, approval shall be obtained from MIU. The following table shows the requirements for steel casings:

Carrier Pipe Nominal Size (inches)	Casing Pipe Outside Diameter (inches)	Casing Pipe Wall Thickness (inches)
4	14	0.250
6	16	0.250
8	18	0.250
10	20	0.250
12	24	0.312
14	28	0.312
16	30	0.312
18	34	0.375
20	36	0.375
24	42	0.500

All casing spacers shall be made of stainless steel with a 10-mil to 16-mil factory applied fusion bonded polyvinyl chloride coating. All casing spacers shall be of the type manufactured by Pipeline Seal and Insulators, or Cascade Waterworks Mfg. All casing spacers larger than 36-inch shall be factory designed, taking in consideration the weight of the carrier pipe filled with water. All casing spacers shall have design compression

strength of not less than 18,000 psi, with full 2-inch wide runners. Wooden skids and polyethylene runners are unacceptable. All calculations and drawings shall be submitted to MIU for review and approval. Casing pipe end seals shall be Pipe Seal and Insulators Model "C" or "W" End Seals.

Casing pipe for HDPE directional drilling shall have a minimum 2-inch larger inside diameter than the outside diameter of the HDPE carrier pipe. Casing pipe ends for HDPE directional drilling shall be sealed per jack and bore requirements. Casing spacers are not required for directional drilling.

CORROSION PROTECTION

Corrosion protection is required for underground ductile iron pipe and fittings installed in corrosive soils. This shall be accomplished by the installation of polyethylene encasement. Polyethylene encasement shall be 4 mil high-density cross laminate meeting AWWA C105 and as approved by MIU. To determine the necessity for corrosion protection in suspect areas, a soil evaluation shall be performed as set forth in ANSI Standard A21.5. MIU reserves the authority to designate suspect areas requiring soil evaluation. Additionally, where other existing utilities are known to have cathodic protection, ductile iron pipes crossing protected utilities shall be protected for a distance of 20 feet to each side. If ductile iron pipe is to be installed parallel to and within 10 feet of cathodically protected pipe, then protection shall be provided for the entire length of the pipe. Steel pipe will not be allowed unless specifically approved by MIU. Steel pipe if used shall be cathodically protected.

ROAD CROSSINGS-PAVED AREAS

All pressure mains that are placed under a road or parking lot shall be PVC DR 14 C900 or HDPE DR11 C906. PVC DR18 or HDPE DR17 may be accepted in low traffic areas with prior approval with MIU. 14-inch and larger diameter pipe shall be C905 PVC DR18 or C906 HDPE DR11. Pipe crossing of roadways or under pavement shall be extended 5 feet off edge of roadway. MIU may require further extension in locations where future widening is anticipated.

AIR RELEASE VALVES

Air release valves shall be Valmatic Model 48SBWA, ARI-D-020, ARI S-020 or equal. Poly tubing shall be used for connection to the main, and shall be 2-inches minimum. Main line ARV's shall be isolated with a ball valve (2-inch shall be Ford Lead Free Brass Ball valve B11 - 777; larger sizes shall be approved by MIU). Air release valves shall be housed in WaterPlus Model ARV-H-30-B or ARV-H-40-B; blue for water, green for wastewater, and purple for reclaimed or irrigation water; with "Contact Marco Island Utilities in Emergency (239) 394-3168" imprinted on the side of the enclosure.

PIPE SUPPORTS

Pipe supports including all anchors and fasteners where used for bridge crossings shall be fabricated of Type 316 stainless steel. Material used for fabrication of the pipe supports shall not be less than 0.25 inches thick. The details shall be coordinated with and approved by MIU and FDOT if an FDOT bridge. The supports and the anchor system shall be designed by Florida registered professional engineer. Signed and sealed design calculations and anchor details shall be submitted to MIU. The design of pipe hanger system shall consider thermal expansion. Exposed piping shall be DI pipe or stainless steel pipe. Expansion joints shall be provided for exposed spans over 80 feet in length or as determined by the engineer. The maximum spacing of supports shall consider the weight of the pipe full of water and shall be determined by the engineer and shall be coordinated with the bridge structure and generally shall not be greater than 10 foot spacing except as specifically designed by the engineer and approved by MIU.

CONCRETE

General purpose cast-in-place concrete shall have a minimum compressive strength of 3,000 pounds per square inch unless otherwise noted.

POTABLE WATER SERVICE MATERIAL SPECIFICATIONS

Gate Valves

Gate valves shall be resilient wedge vertically oriented gate valves with a vertical operating system. Resilient wedge gate valves shall conform to ANSI/AWWA Standard C509 and C515. Valves for potable water service shall be certified for compliance with ANSI/NSF 61. Valves shall have 316 stainless steel external fasteners. Valves shall be manufactured by Mueller, M&H/Kennedy, American Darling, or CLOW. Valves must be installed not further than 3 feet from the tee which valve is serving, unless a deviation is specifically approved by MIU.

Automatic Flushing Assembly and Bacteriological Sample Valves

1. Automatic flushing assemblies shall be constructed in accordance with MIU Standard Detail W-6.
2. Temporary flushing assemblies shall be constructed in accordance with the standard details.
3. Bacteriological sample valves shall be constructed in accordance with the standard details. Connection shall be 1 1/2-inches in size, and shall be connected to the main with a 1 1/2-inch brass corporation stop, as shown on the details.

Backflow Preventers

Backflow preventers shall be provided as required by the FDEP. However, all Backflow Preventers must be Reduced Pressure Zone regardless of hazard. Backflow preventers shall generally be in compliance with standard details, and design shall be provided to MIU for approval prior to construction. Backflow preventers shall be Febco, Watts, Conbraco, or Wilkens.

Service Drops

Service drops shall be run to all lots. Drops should be to lot corners wherever possible.

Service drops for PVC, AC, and Ductile Iron pipe shall include full body stainless steel tapping sleeve, minimum 2-inch resilient seat gate valve or corporation stop (1-1/2 inch or 2 inch), service line, curb stop, and meter box. Tapping saddles are required for HDPE service connections. Contractor shall be responsible for relocation in the event of grade changes for meter and meter box. The minimum size service line shall be 1-1/2 inch-inch reducing to one 1 inch or two 1 inch services to each lot. No more than two 3/4 inch-inch meters may be served by a 1-1/2 inch service line. Components of the service drops shall be a combination of stainless steel and lead free brass.

All service lines that go under a road shall be placed inside of a PVC casing. The minimum size casing shall be 2-inch and shall be schedule 80 class 160 PVC pipe.

All services crossing under a 4-lane road or 2 lanes of a 4-lane road that are 1-1/2 inch or 2 inch shall be 4 inch pipe with 4 inch fusion bonded epoxy gate valve and stainless steel full body tapping sleeve that reduces to 1-1/2 inch or 2 inch once pipe has cleared the roadway by a minimum of 2 feet.

No services shall be in conflict with pad mount electric power transformers. In the case of services going under the roadway, at the point where casing comes past edge of pavement, the water service is to be a minimum of 5-feet off the corner of pad mounted electric transformers.

Service Tapping Sleeves

Tapping sleeves shall be full body 316 stainless steel for PVC, ductile iron and AC pipe as manufactured by Romac Industries Inc., or equal product if specifically approved by MIU.

Resilient seat gate valve assemblies for 1 inch and 1-1/2 inch services shall be 2-inch with a 2-inch operating nut. For services less than 1 inch (5/8 and 3/4 inch) use a 1-1/2 inch Ball Corporation Stop reduced to the meter size.

Corporate Stops

Ball Corporation Stops shall be 1-1/2 inch Ford model FB1100-6 with AWWA taper iron pipe thread on the inlet side and pack joint outlet for polyethylene tubing. Corporation Stops shall be placed downstream of wyes, but no more than 5 feet upstream of meters.

HDPE Electrofusion Bonded Service Taps

Tapping saddles for HDPE pipe shall be fabricated of Type 316 stainless steel with 316 stainless steel bolts incorporate a pressure activated gasket and shall be designed specifically for HDPE pipe applications.

Meters

Meters shall be model T-10 as manufactured by Neptune Technology Group, reading in gallons, with touch pad read, and main case of lead -free high-copper alloy. Water meters shall meet or exceed the latest AWWA Standard C700 standard and shall be ANSI/NSF 61 certified.

Brass Fittings

All brass fittings shall be as manufactured by the Ford Meter Box Company, Inc. and manufactured with lead free brass complying with AWWA Standard C800 for contact with potable water.

Service Tubing

Service tubing will be Performance Pipe DriscoPlex® 5100 Ultra-Line® PE 3408, DR-9 polyethylene with ultra-violet inhibitors and lifetime warranty, or approved equal.

Meter Boxes

Meter boxes shall be as follows:

Single Meter Box: Single Lid: DFW1200-1T-NH-LD
Single Box/Lid: DFW1200-12-1T-NH

Double Meter Box: Double Lid: DFW1500-1T-NH Lid
Double Box/Lid: DFW1500-12-T-NH

Fire Hydrants

Fire hydrants shall comply with AWWA C502. Fire hydrants shall be of the compression type, closing with the line pressure. Hydrants shall have internal cast flanges. The lower stem shall be located below the top of the lower barrel. The upper barrel will be fluted and ribbed above the safety flange. The seat ring shall be bronze and thread into a bronze bushing located between the lower barrel and the shoe. The lower barrel shall be designed so the barrel can be removed from hydrant while under pressure. Hose

and pumper nozzles shall be threaded with "O" ring seals and retained by stainless steel screws. Hydrants will be cast marked or outside design shall be such that visible identification can be made as to type and design.

Hydrants shall have 5-1/4-inch main valves. The Valve seat removal wrench shall be a short pattern design and fit all depth of buries.

Hydrants shall deliver a minimum of 750 gpm based on 5 feet bury with 6-inch diameter supply.

Depth of bury for hydrants shall be of the same as that specified for the pipe. Hydrants shall have a valve between the hydrant and the main. Two valves shall be required if distance from hydrant to main exceeds fifty feet. Hydrants are to be covered from the time of installation until the jumper assembly is removed and hydrant can be placed into service. Hydrant services will be subject to bacteriological testing. No hydrant will be turned on until bacteriological tests are satisfied.

The manufacturer shall provide certification of these fire hydrants standards to MIU.

Unless specifically approved by MIU all fire hydrants shall be CLOW 5-1/4 inch Medallion hydrant painted safely yellow.

Fire Lines

Fire lines shall be tapped directly into water main and a backflow preventer shall be installed (see backflow preventer details). There shall be no tap fee for fire lines, but MIU personnel are required to be present at time of tap. All fire lines will be bacteriologically tested from main valve on utility main to the backflow preventer. Fire line backflow preventers and valves must be tagged UL approved per the applicable fire district. Final inspections, plan review and acceptance, and pressure testing shall be monitored and approved by the applicable fire district. Separate main taps shall be required.

Water for Construction

Contractor shall install an in-line meter that is larger than 2" and MIU will install meter if 2" and smaller for metering water used during construction. The meter shall be furnished by MIU at a cost to be paid by the Contractor at the current rate established by Customer Services. Contractor shall contact customer service for connection fees, deposits, and water rates.

Construction meter may be utilized under the following circumstances:

1. Potable water exists, and water is needed for construction (sewer connection will not be made until construction is complete).
2. Potable waterline has been constructed; bacteriological testing has passed (no connection to sewer)

3. In extensive projects (Le. construction may take years to complete), at MIU's discretion, permanent meters may be placed, but classified as construction. Certain conditions may be required, including but not limited to: no water being introduced into the sewer system; or whether the sewer system is complete or not. Letter will be required from Developer/Owner and Contractor stating no water shall be introduced into the sewer system.

Tap for construction meter will be made by MIU up to 2" in size. Tap for construction meter will be made by Contractor for any meters larger than 2". Tap will be made by Contractor hired by Developer/Owner with the following conditions: Taps 2 inch and smaller that are under North and South Collier Blvd. will be placed by Contractor.

1. Tap will be size required for permanent meter (whether larger or smaller).
2. Tap will be done at location of permanent meter.
3. MIU inspector will witness tap.
4. Reduced pressure zone backflow prevention device is required, and shall be provided by the Contractor, for all construction and permanent meters.
5. Contractor to arrange and pay for a Florida licensed backflow tester/repairer to test or repair the reduced pressure zone backflow prevention device and provide test report to MIU,
6. No construction water is to be introduced into the sewer system, whether sewer is complete or not.

WASTEWATER SERVICE MATERIAL SPECIFICATIONS

Valves

All valves utilized on pressure mains for in-line installation shall be of the plug type, manufactured by DeZurik, or CLOW. All valves utilized on lift station sites shall be of the plug type, manufactured by DeZurik, or CLOW. All valves shall be internally epoxy lined. Hot taps may be permitted by MIU. If permitted, plug valves must be installed after tapping valve, and the tapping valve shall be buried in the open position with no access to the ground surface. Valves shall be tested and certified by the manufacturer at 100 psi in both flow directions.

All buried valves shall have 2-inch operating nut. Valves for buried service shall be equipped with extended actuator mounting, such that the hand wheel or lever operator is at a convenient height from grade for ease of operation. All valves and operators shall be designed for suitable operation at the pressure requirements dictated by the working pressure of the system, the pressure of the suspended solids, and other such considerations affecting its proper operation and normal life expectancy. The valves

shall be designed for not less than 150 psi working pressure. All external bolts, fasteners and hardware shall be Type 316 stainless steel.

Gravity Sewer Fittings

Gravity sewer fittings shall be PVC and shall conform to the requirements of ASTM D-3034 standard with minimum wall thickness of SDR26. Fittings 8-inch and smaller shall be molded in one piece with elastomeric joints with "locked in" design and minimum socket depths as specified in ASTM D-3034. Any molded fittings without the molded locked in design will be rejected. Fittings 10-inch and larger shall be molded or fabricated in accordance with ASTM D-3034, with manufacturers standard bells and gaskets. Gaskets shall have minimum cross sectional area of 0.20 sq. in. and conform to ASTM F-477 Standard. PVC material shall have a cell classification of 12454-8 as defined in ASTM D-1784. PVC sewer fittings and gaskets material shall conform to all ASTM standards stated in the *above* specification as well as ASTM D-3212.

Castings

Castings for manhole frames, covers and other items shall conform to the ASTM Designation A48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions 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 so the frames and covers do not shift under traffic conditions or permit entry of storm water from flooding. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. All manhole frames and covers shall be traffic bearing unless otherwise specified and shall include O-rings permanently mounted in covers. All manholes will have an inflow dish, Inflow Defender™ as manufactured by United Sealing Services, Inc. (USSI).

Frames and covers shall be fully bedded in mortar to the correct finish grade elevation with Ladtech adjustment rings installed in conformance with the standard drawings.

Manholes

Manholes shall conform to the requirements of ASTM Designation C478, with reinforcement of Grade 40 and the following modifications:

1. The minimum wall thickness shall be 8-inches.
2. All concrete shall be Type 2 Portland cement and shall attain a maximum compressive strength of 4000 psi in 28 days.
3. Reinforcing steel shall be intermediate grade new billet stock with deformations conforming to ASTM A305-53-7 and A15-54T. Reinforcing steel shall be clean and free from loose scale, rust, dirt, and oil. Reinforcing steel shall be placed in accordance with the ACI Manual of Detailing, and all bars shall be lapped 24 bar diameters unless otherwise noted. All reinforcing steel shall have a minimum of 3-inches of clearance

from edge of concrete. Spacing dimensions shown in details are from centerline of bars.

4. Joining Manhole Sections: Join precast sections using plastic joint sealing compound (Kent-Seal, manufactured by Hamilton Kent and RAM-Neck, manufactured by KT Snyder Company and trimmed prior to grouting. The first construction joint shall be not less than 2 feet above the base slab. Use tongue and groove joints suitable for the flexible gasket. Use non-shrink grout inside and outside for sealing between manhole precast sections then seal each outside section with EZ Wrap or Wrapid Seal.
5. All grout used for sealing around pipe openings and joints shall be Avanti or approved equal and designed for use in water.
6. Lifting holes through the structure are not permitted.
7. The design of the structure shall include a precast base of not less than 8 inches in thickness poured monolithically with the bottom section of the manhole walls. Bottom section shall be a minimum of 8-feet or appropriate height if total manhole is less than 8-feet.
8. Manhole tops shall terminate at such elevations as will permit laying up grade rings under the manhole frame to make allowances for future street grade adjustments. Adjustment to street grade shall be made with Ladtech HDPE riser rings or approved equal, with a maximum allowable adjustment with riser rings of 12-inches.
9. Drop connections, where required on precast manholes, shall be manufactured with the manhole elements at the casting yard. Drop manholes shall be constructed per the standard drawings. Field construction of drop manholes shall be allowed only with specific prior approval from MIU.
10. First manhole upstream of lift station shall be Integrated Environmental Technologies (IET) coated or approved equal on interior. IET coating shall be applied at a minimum thickness of 125 mils for new installations. The warranty for lining or coating on the lift station and entry manhole shall be 10 years. Surface for any coating shall be prepared by sand blasting prior to initial painting. Surface shall be clean and dry, and shall be inspected for leaks prior to painting.
11. All other new manholes shall be IET coated, or have three coats of epoxy tar finish on the interior with MIU approval. IET coating shall be applied at a minimum thickness of 125 mils. All rehabilitated manholes shall be coated on the interior with SprayWall® or Raven 405 at a thickness of 250 mils. Epoxy tar coating shall be Top-Coat Bitumastic No. 300M or approved equal. Each coat of epoxy tar shall be at a minimum thickness of 10 mils with a total coverage thickness of 30 mils, coats shall be colored

black, red, black to insure coverage, and shall have a minimum time of 48 hours between applications. Surface for any coating shall be prepared by sand blasting prior to initial painting. Surface shall be clean and dry, and shall be inspected for leaks prior to painting.

12. All flow line channels shall have a minimum of 2-inches thickness of poured concrete or 2-inch grouted finish. Filler in the bottom of the manhole shall be concrete. Gravel, sand or brick filler in the bottom of manholes shall not be allowed.
13. Contractor shall furnish flexible rubber sleeve with stainless steel clamp to provide a leak proof joint between the concrete manhole and all pipes entering the manhole.
14. All manholes in roadways and that are lined with IET, Raven 405, or SprayWall® will have Elastaseal™ internal waterproof, urethane coating on top 3 feet of manhole chimney. Apply Elastaseal™ in accordance with the manufacturer's specifications.

LIFT STATION MATERIAL SPECIFICATIONS

Sewage Pumps and Motors

1. General
 - a. Sewage pumping units shall be capable of handling raw, unscreened sewage and shall be capable of passing a sphere of at least 3 inches in diameter.
 - b. Pumps shall be electric motor driven and of a proven design that has been in sewage service under similar conditions for at least five years.
 - c. Pumps shall provide the required peak design performance requirements and be suitable for operation within the total hydraulic range of operation without overloading the motors.
 - d. Pump motors shall be 230/460 volts, 3-phase, 60 cycle electric motors. Pumps motors greater than 20 horsepower shall be 3-phase 480volt electric motors when 480V service voltage is available. Contractor shall verify local voltage prior to placement of order for pumps.
 - e. All lift stations shall be grounded with a minimum of two 10-FDOT copper ground rods no less than 6-feet apart, and shall have a measurement of 5 ohms or less.

2. Submersible Pumps

The pump units shall be non-clog, mechanical seal, submersible sewage pumps as manufactured by ABS. Certified pump curves shall be furnished with the pumps.

- a. Pumps shall be capable of handling raw, unscreened sewage. The design shall be such that pumping units will 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 other fastenings to be removed for this purpose and no need for personnel to enter pump well. Each pump shall be fitted with a 3/8-inch Series 316 stainless steel chain a minimum of 18-inches long attached to a 1/4-inch minimum Series 316 stainless steel wire rope which is to be hung on a rack at the top of the wet well.
- b. The stator casing, oil casing and impeller shall be of gray iron construction with all parts coming into contact with sewage protected by a coat of rubber asphalt paint. All external bolts and nuts shall be of stainless steel. A wear ring designed for abrasion resistance shall be installed at the inlet of the pump to provide protection against wear to the impeller. The impeller shall be of a single vane, non-clog design, capable of passing solids, fibrous material and heavy sludge, and constructed with a long throughway with no acute turns.
- c. A sliding guide bracket is to be an integral part of the pumping unit and the pump casing shall have a machined connecting flange to connect with the cast iron discharge connection, which shall be bolted to the floor of the sump and so designed as to receive the pump connecting flange without the need of any bolts or nuts.
- d. Sealing of the pumping unit 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 stainless steel 316, schedule 40 guide bars to and pressing tightly against the discharge connection; no portion of the pump shall bear directly on the floor of the sump and no rotary motion of the pump shall be required for sealing. Sealing at the discharge connection by means of a diaphragm, O-ring or similar method of sealing will not be accepted as an equal to a metal contact of the pump discharge and mating discharge connection specified and required.
- e. Pump motors shall be housed in an air-filled watertight casing and shall have Class F insulated windings, which shall be moisture resistant. The motor shall be NEMA Design B rated 155°C maximum. Pump motors should have cooling characteristics

suitable to permit continuous operation in a totally, partially or non-submerged condition. The pump shall be capable of running dry continuously in a totally dry condition. Cable junction box and motor shall be separated by a stator lead sealing gland or terminal board which shall isolate motor from any water or solids gaining access through pump top.

- f. Pump motor cable shall be suitable for submersible pump applications and this shall be permanently indicated on the cable.
- g. The pump manufacturer shall perform the following tests on each pump before shipment from the factory:
 - i. Megger the pump for insulation breaks or moisture.
 - ii. Prior to submergence, the pump shall be run dry and checked for correct rotation.
 - iii. Pump shall be run for 30 minutes in a submerged condition.
 - iv. Pump shall be removed from test tank, meggered immediately for moisture; oil plugs shall be removed for checking lower seal; inspection plug shall be removed for checking of upper seal and possible water intrusion of stator housing.
 - v. A written certified test report giving the above information shall be supplied with each pump at the time of shipment.
 - vi. All ends of pump cables will then be fitted with a rubber shrink fit boot to protect cable prior to electrical insulation.
- h. The pump manufacturer shall warrant the pumps being supplied to MIU against defects in workmanship and materials for a period of five years under normal use, operation and service. In addition, the manufacturer shall replace certain parts which shall become defective through normal use and wear on a progressive schedule of cost for a period of five years; parts included are the mechanical seal, impeller, pump housing, wear ring and ball bearings. The warranty shall be in published form and apply to all similar units.

Pump Controls

- 1. Each lift station control system shall include level floats, which shall sense the sewage level in the wet well and provide appropriate signals to the PLC circuits to produce the required mode of operation for the pumping facilities. Capability shall be provided for manual start-stop control for all pumping units as well as the normal automatic control from the liquid level

floats and PLC. An automatic alternator shall change the starting sequence on each pump cycle. A high water level alarm system shall be provided. Each sewage pump shall be provided with an elapsed time meter to indicate pump running time. Alternator relays shall be ATC Diversified Electronics.

2. Electric panel enclosures shall be Type 316 stainless steel with NEMA 4X rating, shall be UL rated and certified, and shall be equipped with all components recommended by the pump manufacturer and shall be compatible with the requirements of the pumping operation. All electrical panels shall be installed in the Margood telescopic enclosure if required to position above the 100-year flood elevation while being accessible. Electrical panels not required to be telescopic will be installed in an MIU non-telescopic Margood enclosure. Panel enclosures shall be mounted on a 6 ft by 6 ft by 24 inch thick steel reinforced concrete pad of 4,000 psi concrete.
3. Electric Panel shall include phase monitoring and TVSS Square D or APT D120VIP surge suppression.
4. Electric Panel shall include 100 or 200 ampere Russell Stowe generator receptacle with angle adapter.
5. Liquid Level float switches shall be Roto-Float Model S40 normally open. Each liquid level float switch shall be provided with 40-feet of electrical cable unless otherwise noted by MIU.

Variable Speed Pump Control Systems

The requirement for variable speed controlling of sewage pumps shall be considered for all large capacity pumps for major installations; when the hydraulic conditions indicate a necessity for variable speed control and when single phase conversion panels are used. The requirement for variable speed pump controls shall receive prior review with MIU. Should a variable speed control system be necessary, the facility shall be equal to existing variable speed control units, or as approved by MIU.

SCADA System

All sewage lift stations shall be required to be equipped for and connected with the master MIU remote SCADA system. The installation shall be compatible with the existing MIU SCADA system and must monitor pump on/off, communications failure, loss of power, and pump failure. Pump control by SCADA is required.

MIU shall provide and install the SCADA system components included by the lift station at the Developer/Owner's expense. The cost to the Developer/Owner shall be at cost, which shall be billed to the Developer/Owner by MIU upon receipt of Turnover Documents.

Emergency Bypass Pump Connections

All sewage lift stations whether equipped with stationary standby power generators or not, shall have connections provided for emergency auxiliary pumping through an additional bypass pipe and valve with Cam-Lok fittings housed in an in-ground enclosure

Emergency Generators

Portable emergency generators are required at sewage lift stations based on size, flow, and retention time and all re-pump stations. Said installation shall be an engine-generator, diesel operated of adequate size to automatically start and operate the pumps required for design flow conditions, lights, controls and other critical items. All alarm and control shall be provided with SCADA points. The engine-generator sizing for the application and the installation shall be in accordance with all applicable manufacturers' requirements. All lift stations shall be provided with emergency generator receptacles approved by MIU.

Odor Control

Re-pump stations and non-residential waste generators must provide pretreatment and appropriate odor control. Odor control may be required elsewhere by MIU. Odor control units shall be and shall be sized for the design flow and anticipated odor control requirements.

Access Hatches and Guides

The pump manufacturer, to insure unit responsibility, shall supply access hatches and guides. Access frames and covers as manufactured by U.S. Foundry of Miami, Florida or approved equal, shall have a 1/2-inch thick one-piece, mill finish, extruded aluminum frame, incorporating a continuous concrete anchor. Door panel shall be 1/4-inch aluminum diamond plate, reinforced to withstand a live load of 300 psf. Door shall open to 90° and automatically lock with a stainless steel hold open arm with aluminum release handle. Door shall close flush with the frame. Doors shall have MIU approved method to eliminate vibration of the doors when pumps activate. Lifting handle, hinges and all fastening hardware shall be stainless steel. Unit shall lock with a noncorrosive locking bar. Unit shall be guaranteed against defects in material and/or workmanship for a period of 10 years.

Wet Wells

1. The structure shall be circular and shall be constructed of poured-in-place concrete or precast concrete sections (ASTM C478) placed on a poured bottom foundation base. The top slab shall be suitable for AASHTO H20 traffic loading where needed and the wet well shall be designed to prevent floatation.

2. All joints shall have a "Ram-Neck" gasket. Joints shall be constructed with EZ wrap, Wrapid Seal or approved equal on exterior. All joints shall have non-shrink grout on interior and exterior.
3. Lift station shall be coated with a coating system as stated in these specifications or as approved by MIU. Coating shall be applied at a minimum thickness of 125 mils for new installations. Existing or rehabilitated wet wells must meet the specifications for SprayWall® or Raven 405 coatings, or equal approved by MIU. Coating shall be applied for a minimum thickness of 250 mils for existing and rehabilitated installations. The warranty for lining or coating on the lift station and entry manhole shall be 10 years. Surface for any coating shall be prepared by sand blasting prior to initial painting. Surface shall be clean and dry, and shall be inspected for leaks prior to painting. Spark testing of coatings shall be performed when required by MIU.
4. Lift station piping shall include a 4-inch (minimum) HDPE SDR 11 header pipe (see details for dimensions). Header pipe shall have a flange adapter to connect to the pump foot piece. Flange adapter shall be EBAA 2100, JCM 301 or Smith Blair, and shall be epoxy lined. The connection to the foot piece shall also have a JCM 230 stainless steel insert. The header pipe shall have an ARI -0-040 air release valve attached to the HDPE pipe with a Ford FS 303 stainless steel saddle.
5. Piping shall also include 4-inch iron body plug valve with non-lubricated nickel iron, neoprene coated plug, 100 percent opening (80 percent port), complete with wrench as manufactured by DeZurik; a 4-inch flanged lever and weight check valve as manufactured by Milliken, Mueller, Kennedy, or CLOW.

Lift Station Water System

1. All sewage lift stations shall be provided with a station water system with adequate capacity and pressure for wash-down utilization. The lift station water supply shall be completely separated from the potable supply by use of reduced pressure type back-flow preventers. Hose bibs and hose shall be provided at convenient locations to facilitate maintenance. Potable water with meter and RPZ backflow preventer shall be required.
2. Flow meters shall be required for developments with private water systems connected to the MIU sewer system. Meters shall be Magmeter or equal approved by MIU.

CONSTRUCTION SPECIFICATIONS

GENERAL

The term "local standards" as used in connection with the Construction Specifications, means the standards of Marco Island Utilities (MIU). Prior to any construction, the Contractor shall contact MIU and arrange a pre-construction meeting. A pre-construction meeting is mandatory for all line extensions within the MIU service area, or changes to existing lines.

EXISTING IMPROVEMENTS

The Contractor shall maintain in operating condition all active utilities, sewers, gutters and other drains encountered in the utility installation. The Contractor shall repair to the satisfaction of the owner, any surface or sub-surface improvement damaged during the course of the work (unless such improvement is shown to be abandoned or removed), whether or not such improvement is shown on the drawings.

CONNECTIONS TO EXISTING MAINS

1. Contractor shall make all required connections larger than 2 inch to existing pressure mains, arranging with MIU to have supervision during the connections. All such connections shall be pressure taps or mechanical joint tees for water mains.
2. All water main taps or tees shall be subject to sampling and testing.
3. CONNECTIONS WILL NOT BE MADE WITHOUT PROPER CERTIFICATIONS BY THE DESIGN ENGINEER.

EXCAVATION, TRENCHING, BACKFILLING, AND RESTORATION

General

The provisions set forth in this Section shall be applicable to all underground gravity sewers, force mains, and water piping installations regardless of location. Special design considerations will require approval from the MIU.

Sheeting and Bracing

In order to prevent damage to property, injury to persons, erosion, cave-in or excessive trench width, adequate sheeting and bracing shall be provided per regulations of the Federal Occupational Safety and Health Administration and/or as directed by the Owner or Engineer. Contractor shall comply with local regulations or, in the absence thereof, with the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc. This work shall be performed in

accordance with accepted standard practice when design consideration warrants due to *adverse* soil condition, proximity of existing utilities, maintenance and protection of traffic. Sheeting shall be removed when the trench has been backfilled to at least one-half its depth or when removal would not endanger the construction of adjacent structures. When required to eliminate excessive trench width or other damage, shoring or bracing shall be left in place and the top cut off at an elevation 2.5-feet below finished grade, unless otherwise directed.

Protection of Pipe Laid in Fill Areas

The underground utilities specified shall not be laid in areas of fill prior to the actual performance of the grading operation, unless the depth of the cover over such utilities below existing ground surface is at least 36-inches. Such depth of cover requirement may be reduced provided the pipe is protected by concrete cradling, encasement or other manner satisfactory to the MIU. Lines in excess of 6-feet deep upon completion of fill operation shall not be permitted.

Workmanship

1. Trench Dimensions
 - a. The minimum width of the trench shall be equal to the outside diameter of the pipe at the joint plus 8-inches for unsheeted trench or 12-inches for sheeted trench.
2. Trench Grade
 - a. Perform final grading of trench bottoms by hand tools, carry machine excavation only to such depth that soil bearing for pipes will not be disturbed. Grade the bottom of trenches evenly to insure uniform bearing for all pipes. Cut holes as necessary for joints and joint making.
 - b. As an alternate method, optional with the Contractor, excavate trenches to at least 4 inches below the required bottom levels and refill to the proper grade with gravel firmly compacted.
 - c. In rock, cemented gravel, old masonry or other hard noncushioning material, excavate to at least 4 inches below the pipe at all points and refill to grade with sand or gravel firmly compacted.
 - d. In fill containing refuse, organic matter or similar substances, remove such material to a depth of at least 6-inches below the pipe at all points and refill with #57 stone to spring line of pipe. Fill to grade with good clean dirt, sand, base rock, and asphalt, as

required. Nothing larger than #57 stone shall be used for pipe bedding.

- e. Soil unsuitable for a proper foundation encountered at or below trench grade, such as muck or other deleterious material, shall be removed for the full width of the trench and to the depth required to reach suitable foundation material, unless special design considerations receive prior approval from MIU. Backfilling below trench grade shall be in compliance with the applicable provisions. Unless otherwise specified or directed, backfill layers shall not exceed 6 inches in thickness for the full trench width and compaction shall equal 95% of maximum density, as determined by AASHTO Specification T-180. Compaction density tests shall be made at all such backfill areas with spacing not to exceed 50-feet apart.

Excavated Material

Excavated material to be used for backfill shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the Contractor shall be responsible for obtaining the sites to be used and shall maintain his operations to provide for natural drainage and not present an unsightly appearance.

Material Disposal

Excess, unsuitable, or cleared and grubbed material resulting from utility installation shall be immediately removed from the work site and disposed of at a location secured by the Contractor.

Fill Material

Should there be insufficient material from the excavations to meet the requirements for fill material. Fill Material shall be obtained from pits secured and tested by the Contractor and approved by MIU. Copies of all test results shall be submitted to MIU.

Rock Excavation

Rock excavation shall be defined as excavation of any hard natural substance, which requires the use of explosives and/or special impact tools such as jackhammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.

Dewatering

1. Water shall not be allowed in the trenching while the pipes are being laid and/or tested. The Contractor shall not open more trench than the available pumping facilities are able to dewater to the satisfaction of MIU. If surface water is encountered, the Contractor shall use approved means to dewater the excavation. A well point system or other approved equipment shall be installed if necessary to maintain the excavation in a dry condition for placing of concrete and setting pipe lines. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall the pipelines being installed be used as drains for such water and the ends of the pipe shall be kept properly and adequately blocked during construction by the use of approved stoppers, and not improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstruction matter into the pipelines. If on completion of the work any such material has entered the pipelines, they shall be cleaned so that the entire system will be left clean and unobstructed.
2. Contractor shall be responsible for all applicable state and local regulations regarding offsite discharge of water and turbidity control per Engineer's instructions.

Obstructions

1. It shall be the Contractor's responsibility to acquaint himself with all existing conditions and to locate all structures and utilities along the proposed utility alignment in order to avoid conflicts. Where actual conflicts are unavoidable, work shall be coordinated with the facility owner and performed so as to cause as little interference as possible with the service rendered by the facility to be disturbed. Facilities or structures damaged in the prosecution of the work shall be repaired and/or replaced immediately, in conformance with current standard practices of the industry, or according to the direction of the owner of such facility, at the Contractor's expense.
2. All water pipes, storm drains, force mains, gas or other pipe, telephone or power cables or conduits, curbs, sidewalks, all house services and all other obstructions, whether or not shown on drawings or marked by underground locating services, shall be temporarily removed from, or supported across utility line excavations.
3. Rules and Regulations governing the respective utilities shall be observed in executing all work. Active utilities if encountered shall be protected in accordance with written instructions of the Engineer. Inactive and abandoned utilities encountered in trenching operation shall be removed, plugged or capped. In absence of specific requirements, plug or cap such

utility lines at least 3 feet from utility line to be installed or as required by local regulations.

4. Underground sprinkler system piping encountered within the work area and interfering with swale grading or other work requirements, shall be capped-off and removed by the Contractor in such a manner as to not render the system unusable, if possible. Prior to sod placement, the system shall be repaired and/or replaced by the Contractor.
5. Existing materials in the work area are to remain the property of the affected property owner(s) and if removed, shall be surrendered that property owner.
6. Where it is necessary to temporarily interrupt house services, the Contractor shall notify the MIU Project Manager and submit the completed "Service Interruption Form" for scheduling a service interruption. 72 hours in advance of proposed work. Termination of services will be permitted during the week prior to holidays or City of Marco designated days off. The Contractor shall be responsible for any damage to any such pipes, conduits or cables, and shall restore them to service promptly.
7. Approximate locations of known water, sanitary, drainage, power, gas and telephone installations along the route of new pipelines or in the vicinity of new work are shown, but must be verified in the field by the Contractor. The Contractor shall uncover these pipes, ducts, cables, etc., carefully, by hand, prior to installing new utility lines. Any discrepancies or differences found shall be brought to the attention of the Owner in order that necessary changes may be made to permit installation of new pipe.
8. Where fences, walls, or other man made obstructions exist illegally in the public right-of-way or easement, the Owner shall have them removed upon adequate prior notice by the City of Marco Island.

Tree Protection

Exercise care to protect the roots of trees to remain. Within the branch spread of such trees, perform all trenching by hand. Open the trench only when the utility can be installed immediately. Prune injured roots cleanly and backfill as soon as possible. Perform all this work under direction of the Engineer.

Backfilling

1. General: Backfill material shall be clean earth fill composed of sand, clay and sand, sand and rock, crushed rock, or an approved combination thereof. Backfilling shall be accomplished under two specified requirements: First Lift, from trench grade to spring line of pipe; and, Second Lift, from the top of the First Lift to the ground surface. Where

structures, encasements, or other below grade concrete work have been installed, backfilling shall not proceed until the concrete has obtained sufficient strength to support the backfill load.

2. First Lift: #57 stone or approved material shall be carefully placed and tamped around the lower half of the utility. Backfilling shall be carefully continued in layers not exceeding 6-inches in thickness for the full trench width, until the fill is at spring line of pipe. The material for these first layers of backfill shall be lowered to within 2-feet above the top of pipes before it is allowed to fall, unless the material is placed with approved devices that protect the pipes from impact. The "First Lift" shall be thoroughly compacted and completed before the "Second Lift" is placed.
3. Second Lift. The remainder of the trench, above the "First Lift", shall be backfilled in layers not exceeding 9-inches. The maximum dimension of a stone, rock, or pavement fragment shall be 4 inches. When trenches are cut in pavements or areas to be paved, compaction, as determined by ASSHTO Specification T-180 shall be equal to 95% of maximum density, with compaction in other areas not less than 90% of maximum density. Under roadways the compaction shall be to not less than 98% of maximum density. The use of flowable fill maybe required to achieve required density.
4. Compaction Methods
 - a. The above specified compaction shall be accomplished using accepted standard methods (powered tampers, vibrators, etc.), with exception that the first two feet of backfilling over the pipe shall be compacted by hand-operated tamping devices.
 - b. Hydraulic compaction, i.e. flooding the trench with water, shall be allowed with project specific approval from MIU, with the exception of the first two feet of backfilling over the pipe as noted above. Density requirements for hydraulic compaction are the same as other compaction methods.
5. Density Tests

A testing Laboratory approved by MIU shall make density tests for determination of the above specified compaction, at the expense of the Contractor. Test locations will be determined by MIU, but in any case shall be spaced not more than 300 feet apart where the trench cut is continuous in pavements or areas to be paved. Tests shall also be made where a trench crosses a paved roadway or future paved roadway. If any test results are unsatisfactory, the Contractor shall re-excavate and re-compact the backfill at his expense until the desired compaction is obtained. Additional compaction tests shall be made to each side of an

unsatisfactory test, as directed, to determine the extent of re-excavation and re-compaction necessary.

Protective Concrete Slab

Protective concrete slabs shall be installed over the top of trenches; where required, to protect the installed utility against excessive loads, or when insufficient cover exists.

Restoration

1. Existing sidewalks and driveways removed, disturbed, or destroyed by construction, shall be replaced or repaired. The finished work shall be equal in all respects to the original and shall be approved by MIU.
2. Pavement or roadway surfaces cut or damaged shall be replaced by the Contractor in equal or better condition than the original, including stabilization, base course, surface course, curb and gutter or other appurtenances.
 - a. The Contractor shall obtain the necessary permits prior to any roadway work. Additionally, the Contractor shall provide advance notice to the appropriate authority, as required, prior to construction operations.
 - b. Roadway restoration (within Marco Island jurisdiction) Restoration shall be in accordance with the requirements set forth in the "Marco Island Development Standards" and these Standards. The materials of construction and method of installation, along with the proposed restoration design for items not referred or specified herein, shall receive prior approval from the City of Marco Island. Where existing pavement is to be removed, the surfacing shall be mechanical saw cut prior to trench excavation, leaving a uniform and straight edge parallel to the utility, with minimum disturbance to the remaining adjacent surfacing. The width of cut for this phase of existing pavement removal shall be minimal.
 - c. Immediately following the specified backfilling and compaction, a temporary sand seal coat surface shall be applied to the cut areas. This temporary surfacing shall provide a smooth traffic surface with the existing roadway and shall be maintained until final restoration. Said surfacing shall remain for ten (10) days in order to assure the stability of the backfill under normal traffic conditions. Following this period and prior to fifteen (15) days after application, the temporary surfacing shall be removed and final roadway surface restoration accomplished, unless otherwise directed by MIU.

- d. In advance of final restoration, the temporary surfacing shall be removed and the existing pavement mechanically sawed straight and clean, 12-inches outside of ditch line minimum. Following the above operation, the Contractor shall proceed immediately with final pavement restoration in accordance with the requirements set forth by City of Marco Island.
 - e. Roadway Restoration (outside Marco Island jurisdiction). Work within the rights-of-way of public thoroughfares which are not under jurisdiction of Marco Island, shall conform to the requirements of the Governmental agency having jurisdiction. Specifically, work within State Highway right-of-way shall be in full compliance with all requirements of the permit drawings, and to the satisfaction of the Florida Department of Transportation.
 - f. All drainage should be restored to its original conditions unless directed by the appropriate Regulatory Agency.
3. Protection and Restoration of Property
- a. During the course of construction, the Contractor shall take special care and provide adequate protection in order to minimize damage to vegetation, surfaced areas, and structures within the construction right-of-way, easement or site, and take full responsibility for the replacement or repair thereof.
 - b. The Contractor shall immediately repair any damage to private property created by encroachment thereon. Should the removal or trimming of valuable trees, shrubs, or grass be required to facilitate the installation within the designated construction area, this work shall be done in cooperation with the City of Marco Island and/or local communities which the work takes place. Valuable vegetation, removed or damaged, shall be replanted, if possible, or replaced by items of equal quality, and maintained until growth is re-established.
 - c. Topsoil damaged in the course of work shall be replaced with at least a 4-inch layer of suitable material. Following construction completion, the work area along the route of the installation shall be finish grade to elevations compatible with the adjacent surface, with grassing or hand raking required within developed areas.

4. Cleanup

Work site cleanup and property restoration shall follow behind construction operation without delay, In order to facilitate an acceptable construction site, debris and waste materials shall be removed from the site immediately and daily trenching length versus pipe laying shall be

coordinated to provide the minimum overnight trench opening. Construction site maintenance, along with on-going cleanup and final property restoration acceptance, shall be as directed by MIU.

PIPE INSTALLATION

Pipe Cleanliness

The interior of the pipes shall be thoroughly cleaned of all foreign matter before being gently lowered into the trench and shall be kept clean during laying operations by means of plugs or other approved methods. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

Pipe Gradient

Lines shall be laid straight and depth of cover shall be maintained uniform with respect to finish grade, whether grading is completed or proposed at the time of pipe installation.

Pipe Laying

Under no circumstances shall pipe or appurtenances be dropped or dumped into the trench. All pipes shall have a uniform bearing on the trench bottom. No trench water or dirt shall enter the pipe or joints space during pipe laying. A water-tight plug shall be inserted in the open end of the piping when pipe laying is not in progress. Pipe shall be cut as necessary to locate fittings and valves in the positions shown on the Drawings. The pipe shall be cut squarely and neatly and without damage to the pipe. Plugs shall be set in openings that are left for branches to be installed later.

Identification with Marking Tape

Marking tape shall be installed 12 inches above water/sewer mains during backfill operations per standards outlined in the FDEP rules and regulations, AWWA Standards, or Ten State Standards. Wire/tape shall be tied to provide continuity. Any previously installed tape damaged during excavation shall be re-tied and repaired or replaced. A double layer of marking tape shall be provided the first on the pipe and the second 18- inches below finish grade. Marking tape on pipe shall be covered with 12-inches or more of soil before top tape is installed. After backfill, detection tests will be conducted every 1000 feet.

Pipe Joint Deflection

Whenever it is desirable to deflect pipe, the amount of deflection shall not exceed the maximum limits as shown in AWWA Standard C600. Pipe joint deflection shall not be allowed without prior approval of MIU.

Rejects

Any pipe found defective shall be immediately removed and replaced with sound pipe at the Contractor's expense.

Polyvinyl Chloride Pipe and HDPE Pipe

Polyvinyl chloride pipe and HDPE may be damaged by prolonged exposure to direct sunlight and the Contractor shall take necessary precautions during storage and installation to avoid this damage. Pipe shall be stored under cover, and installed with sufficient backfill to shield it from the sun.

Joints

1. The particular joint used shall be approved by MIU prior to installation.
2. Where shown on plans or where, in the opinion of MIU, settlement or vibration is likely to occur, pressure main pipe joints shall be restrained. Approved restrainer glands will be permitted for restraint of ductile iron, PVC and HDPE pipe.
3. Mechanical Joints. All types of mechanical joint pipes shall be laid and jointed in full conformance with manufacturer's recommendations, which shall be submitted to MIU for review and approval before work is begun. Torque wrenches set as specified in AWWA Specifications C111 shall be used; or spanner type wrenches not longer than specified therein may be used with the permission of MIU.
4. Push-On Joints. Push on joints shall be made in strict, complete compliance with the manufacturer's recommendation. Lubricant, if required, shall be an inert, non-toxic, water soluble compound incapable of harboring, supporting, or culturing bacterial life. Manufacturer's recommendations shall be submitted to the Engineer for review and approval before work is begun, and the manufacturer shall ensure that the Contractor has been advised of his recommended methods of installation.
5. Polyvinyl Chloride Pipe Joints. The joints of all PVC pipelines shall be made in conformity with the recommendations of the pipe manufacturer. No sulfur base compound joints shall be used.

6. HDPE Pipe Joints. Heat fusion or electro fusion joints for HDPE pipe shall conform to the requirements AWWA C906.
7. Ductile iron pipe cutting for new installation or repair:
 - a. Grinding of ductile pipe will not be allowed.
 - b. Contractor will replace section of pipe if inspector finds ground ductile pipe.
 - c. Ductile pipe must be cut within 2' of the bell or spigot end. This will ensure all fittings (tees, 90°, 45, mechanical joints) fit together according to manufacture specifications.
 - d. When tees, elbows, and mechanical joints still do not fit properly, jacking of pipe end to receive fittings or mechanical joints will be allowed provided the manufactures recommendations are followed.

Cover

Pressure mains shall have an allowable minimum cover of 36-inches and a maximum allowable cover of 6-feet.

VALVE AND VALVE BOX INSTALLATION

Valves

1. Valves shall be carefully inspected, opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Where 316 stainless steel bolts and fasteners are specified confirm that 316 stainless steel bolts and fasteners are installed.
2. Valves, unless shown otherwise, shall be set with their stems vertically above the centerline of the pipe. Set valves and stops with stems plumb and at the exact locations shown.
3. Valve and service boxes shall be plumb, centered over valves, and with tops at finished grade.
4. Any valve that does not operate correctly shall be removed and replaced.
5. All valves shall be installed vertical. Side actuators if used must be specifically approved by MIU.

Valve Boxes

1. Valve boxes shall be set plumb and carefully centered over the operating nuts of the valves so as to permit a gate wrench to be fitted easily to the operating nut.
2. Care shall be taken to prevent earth and other material from entering the valve box.
3. Any valve box which is out of alignment or whose top does not conform to the finished ground surface shall be dug out and reset.
4. Every valve box shall be installed with a debris cap.
5. Valves boxes shall not be installed in curb.
6. Trench backfill shall be tamped thoroughly for a distance of 3-feet on each side of boxes.
7. Valve boxes shall be set to conform to the level of the finished surface and held in position by a square of concrete placed under the support flange as shown on the drawings. The valve box shall not transmit surface loads to the pipe or valve. Before final acceptance of the work, all valve boxes shall be adjusted to finish grade.

SERVICE CONNECTIONS, MANHOLES, ENCASEMENT

Service Connection

1. Service connections shall be installed at the locations shown on the approved drawings and per MIU standard details. Generally sewer service connections shall be at the center of the lot, and water service connections shall be on the property line between two adjoining lots. Owner shall be responsible for relocation in the event of grade changes. Locator balls are required at all services and taps, and for cleanouts with LDL cap and "Near Surface" locator.

Manholes

1. Manhole trench shall be excavated in accordance with EXCAVATION, TRENCHING, BACKFILLING, AND RESTORATION section of these specifications. Manhole base section shall be placed on compacted base of gravel or approved material.
2. Manhole sections will be placed and joined using ram-neck and trimmed prior to grouting. Non-shrink grout shall be inside and outside for sealing between manhole precast sections. Nonshrink grout shall be approved by MIU, and be designed for use in water.

3. Apply Wrapid Seal or EZ Wrap heat shrink seal on each outside manhole joint section, as shown on the MIU standard details.
4. Manhole tops shall terminate at such elevation to allow laying up grade rings under manhole frame and cover to make allowance for street grade or final ground elevation. Manhole frame and cover shall be installed above grade rings.
5. Channel shall be constructed and formed with concrete or grout in the bottom of manholes to direct flow in the manhole. Channels shall be sloped smoothly and evenly, and a concrete bench to a height of the crown of the highest pipe.
6. Pipes shall be cut flush with the inside wall of the manhole. Pipe shall extend through manhole wall 4" as a minimum and no more than 12" at a maximum.
7. Coat manholes in accordance with these specifications. Coatings shall be applied in strict conformance with the manufacturer's requirements. Manholes shall be sandblasted, cleaned and dried prior to installation of coatings. Coatings shall be applied by a company with a minimum of 10 years experience installing coatings in manholes. Entry manholes and lift station wet wells coatings shall have a warranty of ten years on all workmanship and products, and shall protect the structure for a minimum of ten years from all leaks or failure from exposure to corrosive gases.
8. Provide Inflow Defender manhole cover inserts as specified by USSI (Utility Sealing Service Inc.) or approved equal for each manhole to reduce stormwater inflow.
9. Manhole Testing
 - a. Manholes shall be visually inspected for leakage. Any leakage shall be sealed and resealed until leakage is eliminated.
 - b. Manholes shall be vacuum tested for water tightness in accordance with ASTM C1244. Vacuum testing shall be done in accordance with the following table:

Manhole Depth (Ft)	Min. Test Time (sec) (4 foot Dia. Manhole)
4	10
6	15
8	20
10	25
12	30
14	35

- c. Procedure: Induce a back pressure of 5.0 psi, equivalent to 10" Hg (Mercury). Allowable loss is less than 1" Hg for the length of the time specified.
- d. Spark testing of coatings shall be performed when required by MIU.

Concrete Encasement

1. Flowable Fill/Concrete encasement shall be constructed in accordance with details for the following instances; with MIU approval:
 - a. The waterline crosses under, or at a depth that provides less than 18 inches clear distance from sewer lines. Encasement shall extend a minimum of 10-feet on each side of the point of crossing. Either pipe may be encased.
 - b. The Engineer has ordered the line encased.
2. LCEC transmission line crossing a MIU line shall have a minimum 18-inch separation vertically and 5-foot (minor feed) to 10-foot (major feed) separation horizontally from the LCEC line, or flowable fill/concrete encasement shall be provided. Any LCEC lines crossing a pressure main or service connections shall be protected by concrete slab and brass information tag as approved by MIU.
3. The points of beginning and ending of pipe encasement shall be not more than 6-inches from a pipe joint, to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.
4. Encasement of any pipes will require special written permission from MIU.

JACK AND BORE

General

The provisions of this section shall represent the minimum standards for the installation of casing pipe by the jacking and boring method for water and sewer pressure mains.

Water and sewer pressure mains to be placed under MARCO ISLAND Department of Transportation and Florida State of Transportation roadways, and railroads shall be installed in a casing to be bored and jacked under the pavement. The steel casing and jacking procedures shall conform to the requirements of FDOT as outlined in "Utility Accommodation Guide Procedure 616-400" and any supplements thereto; all work and materials shall be subject to inspection by Marco Island,

FDOT or affected railroads. The Owner's property and surface conditions shall be restored to the original condition in keeping with the Owner's specifications and standards. Specific crossing requirements shall be obtained in advance from the authority having jurisdiction.

It shall be the responsibility of the Contractor to submit the necessary permit documents and data to the appropriate authority and receive approval thereof.

The Contractor shall maintain traffic on the roadway and shall keep all workmen and equipment clear of the pavement during the work. All safety regulations of the Department shall be complied with.

Casing Pipe Installation

Casing pipes crossing under roadways shall be located at suitable approved alignments in order to eliminate possible conflict with existing or future utilities and structures, with a minimum of 36 inches depth of cover between the top of the casing pipe and the surface of the roadway.

1. For casing pipe crossings under roadways, railroads, or other installations not within the jurisdiction of Marco Island, the Contractor shall comply with the regulations of said authority in regard to design, specifications and construction. State Highway casing installations shall be as specified in the FDOT, "Utility Accommodation Guide", and for railroads, the American Railway Engineering Association, Part 5, Section 5.2, "Specifications for pipelines Conveying Non-Flammable Substances", shall be applicable.
2. The boring and jacking operations shall be done simultaneously, with continuous installation until the casing pipe is in final position. Correct line and grade shall be carefully maintained. Add-on sections of casing pipe shall be full-ring welded to the preceding length, developing water-tight total pipe strength joints. The casing installation shall produce no upheaval, settlement, cracking, movement or distortion of the existing roadbed or other facilities.

Casings weld joints will beveled at a 45° angle with 1/16" land on the bevel face. The weld joint will be butted together with no gap. Weld joint to be tack welded at 12, 6, 3 and 9 o'clock positions (more if required), tack is to be ground free of flux and porosity to 1/16" below face of joint. A root pass shall be performed first to join two pipes together. Grind or wire brush to remove trapped flux and porosity. The cover pass is to properly seal and provide the proper strength needed to support pipe. Cover pass will extend 1½ times the diameter of the weld rod past the weld joint on each side. Weld height can be no more than 1/8" and no less than flush with weld joint. When weld joint is complete, remove all flux, wire brush weld, grind to remove any defects or areas that are not smooth such as

starts, stops, weld spatter, and arc strikes. Welding electrodes shall be compatible with the base metal.

3. Casing pipe holes shall be mechanically bored through the soil by a cutting head on a continuous auger mounted inside the pipe. The auger shall extend a minimum distance beyond the end of the casing pipe to preclude formation of voids outside of the pipe shell.
4. The casing pipe shall be adequately protected to prevent crushing or other damage under jacking pressures. Backstops shall be provided for adequately distributing the jack thrust without causing deformation of the soil or other damage. Should the casing pipe be damaged, such damaged portion, if not in the hole, shall be replaced; however, if inserted, the encasement pipe shall be abandoned in place, suitably plugged, grouted, and an alternate installation made, as directed by Marco Island and MIU.
5. Required boring or jacking pits or shafts shall be excavated and maintained to the minimum dimension. Said excavation shall be adequately barricaded, sheeted, braced and dewatered.

Carrier Pipe

Casing spacers shall provide support of the carrier pipe within the casing. Pipe shall be restrained and casing spacers attached prior to push carrier pipe through casing. One spacer shall be placed within 2-feet from each end of the casing. One spacer shall be placed on the spigot end of each segment of pipe at the line marking the limit of insert into the bell of the joint so that the spacer pushes the joint and relieves compression within the joint. Subsequent spacers shall be placed at 8-foot intervals, or spacers shall be placed in accordance with the manufacturers' specification, if less distance apart than the above spacing. Following placement of the carrier pipe within the steel casing, end seals are to be installed at the casing ends.

DIRECTIONAL DRILLING

General

All directional drilling shall require special approval by the MIU Engineering Department in writing. Directional drilling shall be performed by an experienced Contractor (10 years minimum experience shall be required). Directional drilling with HDPE casing and carrier pipe shall be allowed for road crossings with prior MIU, Marco Island, Collier County, and/or FDOT approval. Directional drilling shall also be considered on a case by case basis for gravity sewer and pressure mains to facilitate installation in areas where restoration would be difficult or in areas with limited space for construction equipment. Directional drilling will not be

permitted on holidays, Fridays or on days the City of Marco Island is closed.

FLUSHING, TESTING, AND STERILIZATION OF WATER MAINS

General

Flushing Mains Upon completion of the water distribution system, all valves shall be tested to insure their full opening, the system shall be flushed out progressively by opening blow-offs and building outlets, and before final acceptance of the work further tests shall be made from blowoffs and outlets to ascertain that the lines are clear. All mains 8-inches” and larger are required to be pigged and swabbed. All mains or service lines 6-inches or smaller shall be scheduled with MIU with 24 hours notice prior to flushing.

Hydrostatic (Pressure) Testing

1. The Contractor shall perform hydrostatic testing of the system as set forth herein, and shall conduct tests in the presence of representatives from MIU; at least 48 hours advance notice shall be provided to MIU.
2. Piping and appurtenances to be tested shall be within sections between valves unless alternate methods have received prior approval from MIU. Testing shall not proceed until restraining devices are installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.
3. Hydrostatic testing of force mains shall be performed at 100 pounds per square inch pressure unless otherwise approved by the MIU. Test period shall be not less than one (1) hour. Testing shall be in accordance with the applicable provisions as set forth in AWWA Standard C600. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formula:

$$L = (SD\sqrt{P}) / 133,200$$

Where:

L = Allowable leakage in gallons per hour

S = Length of section tested in feet

D = Nominal diameter of the pipe in inches

P = Average test pressure maintained during the leakage test in pounds per square inch.

4. The testing procedure shall include the continued application of the specified pressure to the test system, for the one-hour period, by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container.
5. Should the test fail, the Contractor shall accomplish necessary repairs, and the test repeated until results are within the established limits. The Contractor shall furnish the necessary labor, water, pumps, and gauges at specified location(s) and all other items required to conduct the required water distribution system testing and perform necessary repairs.

Sterilization of Mains

1. Sterilization of Water Distribution System: As soon as the water distribution system has been flushed out as above specified, it shall be sterilized in accordance with the requirements of FDEP. NO WATER IS TO BE USED DURING BACTERIOLOGICAL TESTING OR UNTIL BACTERIOLOGICAL TEST RESULTS HAVE BEEN RECEIVED BY MIU OR RE-CHLORINATION WILL BE NECESSARY.
2. Introduce chlorine or a solution of calcium or sodium hypochlorite, filling the lines slowly and applying the sterilizing agent at a rate of 50 parts per million of chlorine, as determined by residual chlorine tests at the ends of the lines. Open and close all valves and hydrants while the system is being chlorinated.
3. After the sterilizing agent has been applied for 24 hours, test for residual chlorine at the ends of the lines. If less than 5 ppm is indicated, repeat the sterilization process.
4. When tests show at least 5 ppm of residual chlorine, flush out the system until chlorine level is that of distribution system.
5. The Engineer reserves the right to test the water again at any time prior to final acceptance of the work and, if found unsafe bacteriologic ally, Engineer shall require the Contractor to re chlorinate the system until the water is proven equal to that supplied by the public system.
6. Re-chlorination of systems shall be done by adding 50 ppm of chlorine, not by flushing with MIU water.

FLUSHING AND TESTING OF GRAVITY SEWER & FORCE MAINS

General

MIU reserves the right to require Contractor to conduct any combination of the following procedures for gravity sewers and force mains.

Flushing

All mains shall be flushed to remove all sand and other foreign matter. The velocity of the flushing water shall be at least 4-feet per second. Flushing shall be terminated at the direction of the Engineer. The Contractor shall dispose of the flushing water without causing a nuisance or property damage. Pigs will be required where pipeline diameter is greater than 8-inches.

Hydrostatic (Pressure) Testing

1. The Contractor shall perform hydrostatic testing of the system as set forth in the following, and shall conduct said tests in the presence of representatives from MIU; 48 hours advance notice shall be provided to MIU.
2. Piping and appurtenances to be tested shall be within sections between valves unless alternate methods have received prior approval from MIU. Testing shall not proceed until restraining devices are installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.
3. Hydrostatic testing of force mains shall be performed at 100 pounds per square inch pressure unless otherwise approved by the MIU. Test period shall be not less than one (1) hour. Testing shall be in accordance with the applicable provisions as set forth in AWWA Standard C600. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formula:

$$L = (SD\sqrt{P}) / 133,200$$

Where:

L = Allowable leakage in gallons per hour

S = Length of section tested in feet

D = Nominal diameter of the pipe in inches

P = Average test pressure maintained during the leakage test in pounds per square inch

4. The testing procedure shall include the continued application of the specified pressure to the test system, for the one-hour period, by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container.
5. Should the test fail, the Contractor shall accomplish necessary repairs, and the test repeated until results are within the established limits. The Contractor shall furnish the necessary labor, water, pumps, and gauges at specified location(s) and all other items required to conduct the required water distribution system testing and perform necessary repairs.

Limits of Infiltration and Exfiltration for Gravity Sewers

1. General It is imperative that all sanitary sewers and associated service lines be constructed watertight to prevent infiltration and/or exfiltration. To that end, all new sanitary sewer mains will be subject to rigid testing. Lines shall be television inspected and copies of videotapes provided.
2. Exfiltration Each test section of sewer shall be tested between successive manholes by closing the lower end of the sewer to be tested, and the inlet sewer of the upper manhole with stoppers. The pipe and manhole shall be filled with water to a point 4 feet above the invert of the sewer at the center of the upper manhole; or if ground water is present, 4 feet above the average adjacent ground water level.
3. Infiltration If, in the opinion of the Engineer or the MIU, excessive ground water is encountered in the construction of a section of the sewer, the infiltration test for leakage shall be used. The end of the sewer at the upper structure shall be closed sufficiently to prevent the entrance of water, and pumping of ground water shall be discontinued for at least 3 days, after which the section shall be tested for infiltration. The infiltration into each individual reach of sewer between adjoining manholes shall not exceed that allowed by the formula shown. Unless otherwise specified, infiltration will be measured by the Engineer in the presence of MIU representative.
4. The allowable leakage will be computed by the formula:

$$E = 0.0001 L \times D H$$

Where:

L = length of sewer and house connections tested, in feet.

E = the allowable leakage in gallons per minute of sewer tested.

D = the internal diameter of the pipe in inches.

H (exfiltration) = the difference in elevation between the water surface in the upper manhole and the invert of the pipe at the lower manhole; or if

ground water is present above the invert of the pipe in the lower manhole, the difference in elevation between the water surface in the upper manhole and the ground water at the lower manhole.

H (infiltration) = the difference in the elevation between the ground water surface and the invert of the sewer at the downstream manhole.

5. The Contractor shall, at its expense, furnish all water, materials and labor for making the required test. All tests shall be made in the presence of the Engineer and a MIU representative. A period of one hour shall be allowed for absorption prior to the test.

Low Pressure Air Testing

1. MIU may require air testing of gravity sewer, in lieu of exfiltration testing for 24 inch diameter and smaller pipe.
2. Recommended practice can be found in Recommended Practice for Low Pressure Testing of Installed Sewer Lines (UNI-B-6-98) by Uni-Bell PVC Pipe Association. Gravity sewer pipes shall be air tested as follows:
 - a. The sewer main shall be flushed and cleaned prior to the air test.
 - b. The section of gravity main to be tested shall be isolated with air filled stoppers or plugs suitable for air testing.
 - c. The services shall be capped and weighted to preclude blowing off during the test.
 - d. Air shall be added slowly to the test section so that the test pressure equals 4.0 psig.
 - e. Test air pressure shall be maintained within 0.5 psig of the test pressure by regulating the air supply for a period of two (2) minutes to stabilize the temperature.
 - f. After two (2) minutes, the air supply shall be disconnected and the pressure in the pipe adjusted to 3.5 psig.
 - g. Measure the time required for a one (1) psig drop in pressure using a stop watch.
 - h. Compare the recorded time with the allowable time in the following table:

Length of Test Section (feet)	Test Time (minutes:seconds)	
	10" Dia. Pipe	8" Dia. Pipe
<150	7:34	9:26
150-175	7:34	9:26
176-200	7:34	9:26
201-225	7:34	9:53
226-250	7:34	9:53
251-275	7:35	11:52
276-300	7:35	11:52
Length > 325 < 500	8:50	13:50

- i. If the recorded time is less than allowable loss, replace the defective fittings and pipe and re-test until a satisfactory test is achieved.

Mandrel Testing

1. The mandrel shall be a rigid, nonadjustable, odd-numbering-leg (nine legs minimum) mandrel having an effective length not less than its nominal diameter.
2. The mandrel shall have a minimum diameter at any point along the full length as follows:

Pipe Material (inches)	Nominal Size (inches)	Minimum Mandrel Diameter (inches)
PVC-ASTM D 3034 (SDR 26)	6	5.33
	8	7.11
	10	8.87
	12	10.55
	15	12.90
PVC-ASTM D 3034 (SDR 35)	6	5.619
	8	7.524
	10	9.405
	12	11.191
	15	13.849
PVC-ASTM F 679 (T-1 Wall)	18	16.924
	21	19.952
	24	22.446
	27	25.297

3. The mandrel shall be fabricated of steel, be fitted with pulling rings at each end; be stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size, and mandrel outside diameter (e.g., PVC, 0 3034-8"-7.524"); and be furnished in a

carrying case labeled with the same data as stamped or engraved on the mandrel.

4. Following placement and compaction of backfill and prior to placing permanent pavement, ball and mandrel the pipe to measure for obstructions (excessive deflections, joint offsets, and lateral pipe intrusions).
5. Test installed pipe to ensure that vertical deflections for plastic pipe do not exceed the maximum allowable deflection. Maximum allowable deflections shall be governed by the mandrel requirements stated herein and shall nominally be:

Nominal Pipe Size	Percentage
Up to and including 12 inches	5.0
Over 12 inches	4.0

6. The maximum average inside diameter shall be equal to the average outside diameter per applicable ASTM standard minus two minimum wall thicknesses per applicable ASTM standards. Manufacturing and other tolerances shall not be considered for determining maximum allowable deflections.
7. Perform deflection tests not sooner than 30 days after completion of placement and compaction of backfill. Clean and inspect the pipe for offsets and obstructions prior to testing.
8. Pull a mandrel through the pipe by hand to verify that maximum allowable deflections have not been exceeded. Prior to use, the mandrel shall be certified by an independent testing laboratory. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate test. If the mandrel fails to pass, the pipe will be deemed to be over deflected.
9. Uncover any over deflected pipe and, if not damaged, reinstall. Remove damaged pipe from the site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any over deflection, shall be uncovered, removed from the site, and replaced with new pipe.
10. All costs incurred by the Contractor attributable to mandrel and deflection testing, including any delays, shall be borne by the Contractor at no cost to the Owner.

Televising

1. All sanitary sewer mains shall be televised at the Contractor's expense and a videotape of the subject mains provided prior to acceptance by MIU.
2. The Developer is required to pay MIU for warranty televising in the eleventh month after dedication for all gravity lines. This fee is to be paid at the time of construction application.

FINAL INSPECTION

General

At the time of final inspection of the work performed under the contract, the utilities to be dedicated to MIU shall be complete in every respect and in perfect operating condition. All surplus materials of every character resulting from the work shall be removed. Any defects discovered in the utilities subsequent to this inspection shall have been corrected. Final inspection will be done as a walk-through with MIU, Engineer and Contractor personnel present.

Record Drawings

Provide three sets of printed record drawings, and one CD containing the record drawing files. Record drawings showing location of all valves, hydrants, manholes, piping, lift stations and other appurtenances shall be sent to MIU before final approval. Record drawings shall include field surveyed elevations on all manholes, lift stations, and other appurtenances necessary to verify completion of construction, and to provide for future connections or extensions. Elevation data shall at a minimum include inverts and tops of manholes and lift stations including drop connection inverts. Record drawings shall also show final grades over the top of all gravity and pressure mains, including landscape berm elevations.

Warranty Inspection

Warranty inspection to be done eleven months after turnover, and corrections required at that time shall be made by the person or company that provided the turnover warranty to MIU.

OTHER INFORMATION

Traffic Control

All traffic control signs will be set up in accordance with state, City, or County DOT regulations, whichever one has jurisdiction of right-of-way being worked in.

Other Permits

Utilities approval does not obviate the need for obtaining applicable state, county, or health department permits.

Protections

Where LCEC lines cross the top of any pressurized main, a concrete slab, 4-inches thick and 3-feet wide shall be centered over the main or approved equal with brass tag mounted in concrete describing conflict.

APPENDIX A-1

PROJECT: _____

CHECKLIST FOR SANTIARY SEWER COLLECTION SYSTEM INSPECTIONS

GENERAL: All inspections are to be called for **24 hours in advance**. Contact MIU.

PEOPLE ATTENDING SPECTIONS: A) Contractor's Representative
 B) Engineer's Inspector
 C) MIU Inspector

DESCRIPTION	CONSTRUCTION STANDARDS		DATE	COMMENTS
	PAGE	SECTION		
Clearing				
Materials				
Subgrade				
Wet Trenches				
Pipe Laying				
Services				
WYE Record				
Anchorage				
LD. Taping				
Final Lamping				

APPENDIX A-2

PROJECT: _____

SANITARY SEWER COLLECTION SYSTEM AND SECONDARD SEWAGE STATION TESTING AND SUBMITTL CHECKLIST

GENERAL: All tests results and other submittals are specified in the Utility Standards for MIU shall be submitted to MIU within 5 days after Contractor receives results.

PEOPLE ATTENDING SPECTIONS: A) Contractor's Representative
 B) Engineer's Inspector
 C) MIU Inspector

DESCRIPTION	CONSTRUCTION STANDARDS		DATE	COMMENTS
	PAGE	SECTION		
Manholes				
Concrete				
WYE Record				
Infiltration				
Exfiltration				
Deflection				
WYE Record				
Backfill Compaction				
Transition Details				
Submittals				

APPENDIX A-3

PROJECT: _____

CHECKLIST FOR SECONDARY SEWAGE LIFT STATION INSPECTION

GENERAL: All inspections are to be called for **24 hours in advance**.

PEOPLE ATTENDING SPECTIONS: A) Contractor's Representative
 B) Engineer's Inspector
 C) MIU Inspector

DESCRIPTION	CONSTRUCTION STANDARDS		DATE	COMMENTS
	PAGE	SECTION		
Clearing				
Dewatering				
Wet Well				
Main Connection				
Control Center Location				
Lift Station Punchlist				

APPENDIX A-4

PROJECT: _____

CHECKLIST FOR SANTIARY SEWER COLLECTION SYSTEM INSPECTIONS

GENERAL: All inspections are to be called for **24 hours in advance**. Contact MIU.

PEOPLE ATTENDING SPECTIONS: A) Contractor's Representative
 B) Engineer's Inspector
 C) MIU Inspector

	YES	NO
I. Prior to Inspection Time		
A. Utility Site Inspection Checklist Complete		
B. Insure collection system flushed clean		
C. Insure well is pumped clean and all debris removed by means other than permanent pumps.		
D. Have water and power available to test pump(s) and controls		
E. Have factory representatives for all major equipment present (include installing electrician, if necessary)		
F. Have necessary equipment (hoist) on hand for raising and lowering pumps.		
G. Have O&M literature, spare parts, record drawings, etc. for transmittal to owner representative.		
II. Well		
A. Grouting		
1. At base – infiltration? Slope plug all influent lines, pump dry, check for amount of infiltration over 24-hour period, if possible.		
2. At joints –		
Leakage (staining)		
Trowelled smooth		
3. At cover		
Leakage		
Cover-to-well bond		
4. Painting		
B. Position		
1. Is base level?		
2. Walls plumb?		
3. Cover level – no ponding, above ground		

	YES	NO
III. Pumps – Are volutes clear?		
A. Run pump(s) individually on “Hand”		
1. Excessive vibration		
2. Discharge piping leakage		
3. Check electric “loading” on each pump circuit as tested		
4. Note indicator light operation and meters at panel		
B. Run pumps simultaneously on “hand”		
1. Excessive vibration		
2. Discharge piping leakage		
3. Check “loading” on circuits		
4. Note drawdown rate		
5. Allow pumps to run dry		
6. Note indicator light and meter operation at panel		
C. Raise pumps up and out of well (Manu. rep.)		
1. Are chains/cables of sufficient strength?		
2. Release pumps at discharge connection		
3. Smooth operation on guide rails		
4. Rails secure		
5. Pumps clear valves, etc., when raised and removed, cables free		
D. Pumps out of well		
1. Rotation correct		
2. Check/record plat information		
a. Serial Number		
b. G.P.M.		
c. Head		
d. H.P.		
E. Lower pumps into well		
1. Travel on rails		
2. Connection to discharge		
3. Seal at discharge		
4. Cables clean		
Raise floats from well, while testing, refill well		
IV. Equipment check-off list		
A. Pumps		
B. Rails		
C. Valves		
1. Shut-off		
2. Check		

	YES	NO
D. Control Panel		
1. Mount (concrete post)		
2. Enclosure		
3. Auxiliary power		
a. Receptacle		
b. Alternator		
4. Alarm		
a. Audio		
b. Visual (Flasher)		
5. Conduit Seal		
a. Pump Cables		
b. Control wires		
6. Power		
a. Overhead		
b. Underground		
E. Access Hatch		
1. Cover		
a. Fit		
b. Operation		
c. Lock		
d. Paint		
2. Frame		
a. Fit		
b. Grout		
c. Paint		
F. Rack for float controls cable.		
1. Excess cable stored neatly		
G. Hook for chain/cable at top		
H. Chain/cables for raising		
I. Conduit seal at well cover		
1. Pump cables		
2. Control cables		
J. Vent pipe through cover-goose-necked		
K. If valve box:		
1. Gravel in bottom		
2. Return to well		

	YES	NO
L. Telemetry		
1. Radio Signal		
2. Software interface		
V. BILLING		
1. Notify Customer Services of connection so they can begin billing process.		

APPENDIX B1

**PRESSURE TEST REPORT
MARCO ISLAND UTILITIES**

Project: _____

Date: _____

Witnessed by: _____

Type of Line: _____ Water Main _____ Force Main

Diameter _____ inches (D)

Length _____ feet (S)

Test Pressure _____ PSI

TEST

Start _____ PSI @ _____ (time in minutes, or time zero) P1 @ T1

Stop _____ PSI @ _____ (time in minutes) P2 @ T2

Average Test Pressure (P) _____ PSI, $P = (P1 + P2) / 2$ (must be greater than 100 psi)

Test Time (T) = T2 – T1 (must be greater than 60 minutes)

Record water consumed during test (leakage) _____ gal (G)

Recorded leakage = $60 (G / T)$ = gallons per hour

Calculate Allowable Leakage per AWWA C600 (L)

$$L = (SD\sqrt{P}) / 133,200$$

= _____ gallons per hour

Passed ____ YES ____ NO (Pass if Recorded Leakage is less than Allowable Leakage)

APPENDIX B2

**LOW PRESSURE AIR TEST REPORT
MARCO ISLAND UTILITIES**

Project: _____

Date: _____

Witnessed by: _____

Pipe Material: _____

Diameter _____ inches

Length of Test Section _____ feet

Recorded Time _____ minutes

Allowable Time _____ minutes (see table)

Length of Test Section (feet)	Test Time (minutes:seconds)	
	10" Dia. Pipe	8" Dia. Pipe
<150	7:34	9:26
150-175	7:34	9:26
176-200	7:34	9:26
201-225	7:34	9:53
226-250	7:34	9:53
251-275	7:35	11:52
276-300	7:35	11:52
Length > 325 < 500	8:50	13:50

Passed _____ YES _____ NO

APPENDIX D

LIST OF APPROVED MATERIALS AND MANUFACTURERS

Item	Manufacturer	Style/Part/Model No.
I. Wastewater Force Main		
Air Release Valves	1. Apco SS	450
Casing Spacers	1. Cascade 2. PSI	CCS-12" Width Min. C12G-2
Check Values (4" & Larger)	1. ITT Kennedy 2. Mueller 3. Clow	106 A-2600-6 F-5382
Couplings	Hymax	Hymax - 2000
Expansion Joints	1. Mercer 2. Metraflex 3. EBAA Iron, Inc.	
Fittings	1. McWane 2. U.S. Pipe 3. NAAPCO 4. American 5. Tyler	
Manhole Frame and Cover	1. U.S. Foundry (Refer to MIU Standard Detail SS-7)	1.USF #227-AS-ORS (built-up) 2.USF #1295-AS-ORS (slab-type)
Manhole Jointing Material	1. K.T. Snyder Co., Inc. 2. Conseal	1. Ram-Nek 2. CS102
Pipe (DI)	1. American 2. McWane 3. U.S. Pipe	
Pipe (PVC) Force Main and Gravity Main	1. Certain Teed 2. Can-Tex 3. North Star 4. J-M 5. Capco 6. H & W Industries	
Plug Valves	1. Mueller 2. Dezurik 3. Clow	Series 100 F-5370, F5365
Repair Clamps	1. Hymax	EZ-MAX PLUS – 4000

Item	Manufacturer	Style/Part/Model No.
Restrained Joints	1. EBAY Iron, Inc.	Megalug
Tapping Sleeve, Fabricated Steel	1. Smith Blair 2. JCM 3. Baker 4. Ford 5. Water Works 6. Mueller	622 412 428 FTSC CT-790 H-624
Tapping Sleeve, MJ	1. U.S. Pipe 2. Mueller 3. Tyler 4. Waterous 5. M & H 6. Clow 7. American Flow Control	1. T-9 2. H-615, H-619 3. S-149 4. A-212 5. 1574 6. F-2505 7. Series 2800
Tapping Valves	1. Kennedy 2. M & H 3. American Flow Control 4. Waterous 5. U.S. Pipe 6. Clow 7. Mueller	1. 950-X 2. 4751 3. Series 2500 4. Series 800 5. Metroseal 250 6. F-5093 7. T-2360
Valve Boxes	1. Tyler	
II. Wastewater Pump Station		
Generator Circuit Breaker	1. Square D	
Generator Systems	1. Onon (Cummins)	
Motor Automatic Megger	1. Automeg	
Pressure Gauges	1. Ashcroft	
Submersible Pumps	1. ABS	
Wetwell Access Frames and Covers	1. Halliday Products Inc. 2. Bilco	
Control Panels (CP)	1. Best Controls	
Alarm Horn (AH)	1. Federal Signal	1. 350-120-30-WB
Alarm Light (AL)	1. Federal Signal	1. 141ST-120R

Item	Manufacturer	Style/Part/Model No.
Control Circuit Breaker	1. Westinghouse	
Control Circuit Transformer	1. Square D	
Duplex Receptacle/GFI (DR)	1. Redington 2. Hubbel (alternate)	710-0016
Elapse Time Meter (ETM)		
Emergency Circuit Breaker (ECB)	1. Square D	
Enclosure	1. Hoffman	
Fuses	1. Bussman 2. Gould-Shawmut	
Flasher (FL)	1. SSAC	
Float Regulator	1. Roto-Float	
Generator Receptacles (GR) 1. 230V, 100A, 3P, 4W 2. 230V/460V, 100A, 3P, 4W	1. Russell Stoll	
Hand-Auto-Off (HOA) Selector	1. Square D	
Horn Silence Switch (HSS)	1. Square D	
Main Circuit Breaker (MCB)	1. Square D	
Main Circuit Transformer (MCT)	1. Square D	
Moisture and Temperature Failure Light (MT)	1. Littelfuse	
Motor Circuit Breaker (MB)	1. Square D	
Motor Starter (MS)	1. Square D	
Overload Heater (OL)	1. Square D	
Phase Monitor	1. Diversified	
Pilot Light	1. Littelfuse	
Pump Automatic Alternator (PAA)	1. Diversified	
Relay (R)	1. Potter Brumfield 2. Eagle Signal	
Resistor (RE) 5 watt, 2500 ohm	1. Rockwood	

Item	Manufacturer	Style/Part/Model No.
Run Indicator (RL)	1. Littelfuse	
Surge Protector (LA)	1. GE 2. EDCO	
Terminal Strip (TS)	1. Square D	
III. Water Main		
Air Release Valves	1. Val-Matic 2. Apco	VM-38 200
Backflow Prevention Devices	1. Febco 2. Watts 3. Conbraco 4. Wilkens	
Corporation Stops	1. Ford EBAA	F-1000, FB-1000
Couplings	1. Hymax	Hymax – 2000
Curb Stops – Single Service	1. Ford	Single Service: B43-342W
Curb Stops – Double Service	1. Ford	Double Service/Branch: BA13-232W/U48-43
Fire Hydrants (5¼")	1. Clow	Medallion F-2545
Fittings	1. McWane 2. U.S. Pipe 3. NAAPCO 4. American 5. Tyler	
Gate Valves Resilient Seat Only (Angle valves require written permission from MIU)	1. Clow 2. Mueller 3. U.S. Pipe 4. Waterous 5. American Flow Control 6. M & H	
Metallic Locating Tape	1. Terratape 2. Magnatec	
Locating Markers	1. 3M 1400 Series EMS ID Ball Markers	1. 1423-XR/iD (blue for water) 2. 1424-XR/iD (green for wastewater) 3. 1428-XR/iD (purple for reclaimed water)
Meters (5/8" and Larger)	1. Sensus	AMR Touch Read

Item	Manufacturer	Style/Part/Model No.
Pipe (DI)	<ol style="list-style-type: none"> 1. American 2. McWane 3. U.S. Pipe 	
Pipe (PVC)	<ol style="list-style-type: none"> 1. Certain Teed 2. Can-Tex 3. North Star 4. J-M 5. Capco 6. H & W Industries 	
Polyethylene Tubing	<ol style="list-style-type: none"> 1. Performance Pipe 	DriscoPlex® 5100-Ultra-Line® PE 3408
Repair Clamps	<ol style="list-style-type: none"> 1. Hymax 	EZ-MAX PLUS- 4000
Restrained Joints	<ol style="list-style-type: none"> 1. EBAA Iron, Inc. 	Megalug
Service Saddles	<ol style="list-style-type: none"> 1. JCM 2. Mueller 	402 Series 10500
Tapping Sleeves, Fabricated Steel	<ol style="list-style-type: none"> 1. JCM 2. Ford 3. Mueller 	412 FTSC H-624
Tapping Sleeves, MJ	<ol style="list-style-type: none"> 1. Mueller 2. Tyler 3. Waterous 4. Clow 5. M & H 6. American Flow Control 	H-615, H-619 S-149 800 F-5205 1574 Series 2800
Tapping Valves	<ol style="list-style-type: none"> 1. Kennedy 2. M & H 3. American Flow Control 4. Waterous 5. U.S. Pine 6. Clow 7. Mueller 	950-X 4751 Series 2500 Series 800 Metroseal 250 F-5093 T-2360
Valve Boxes	<ol style="list-style-type: none"> 1. Tyler 	
Single Meter Boxes	<ol style="list-style-type: none"> 1. Brooks 	Automatic Read Type, Polyethylene
Double Meter Boxes	<ol style="list-style-type: none"> 1. Brooks 	Automatic Read Type, Polyethylene

APPENDIX E

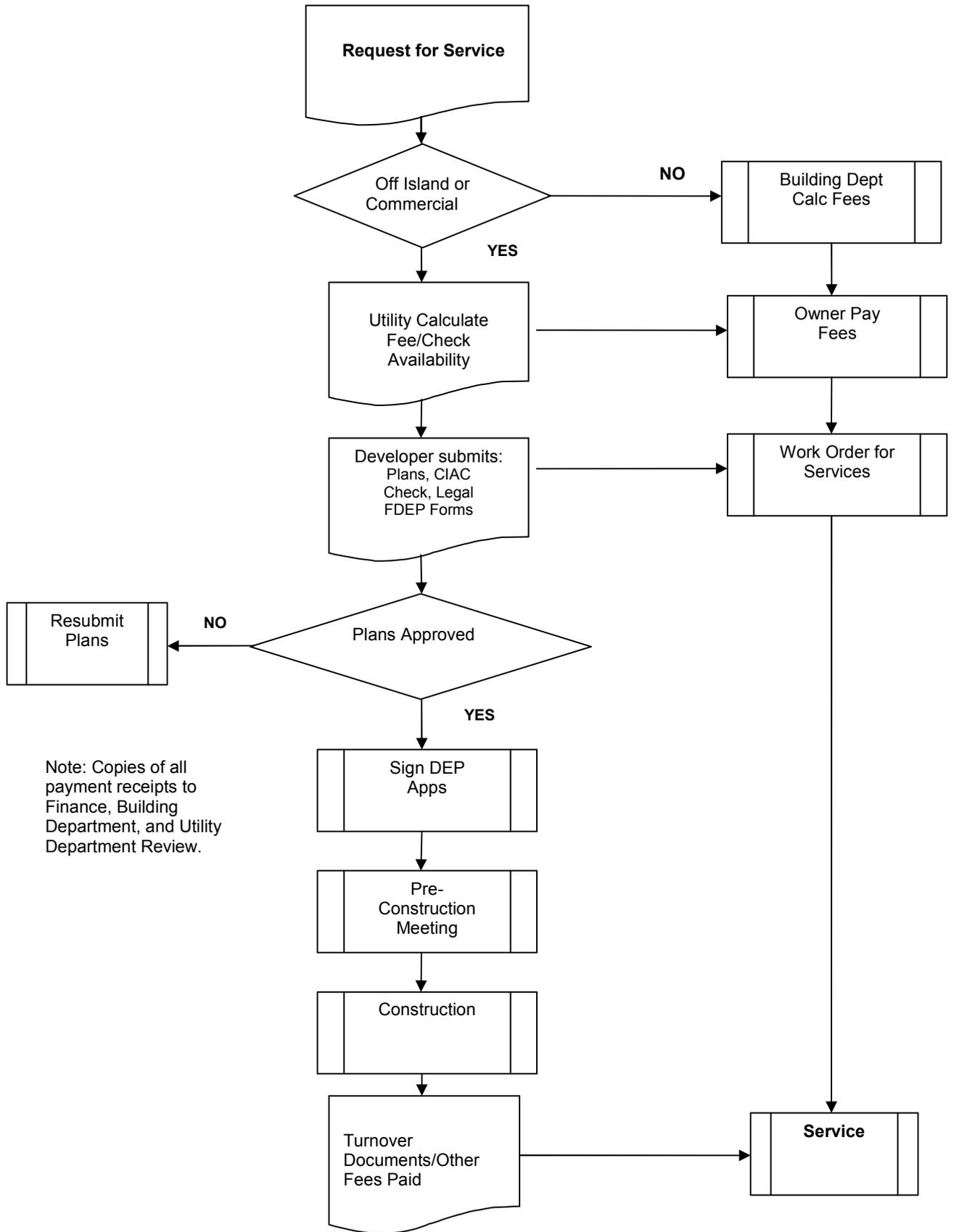
TURNOVER DOCUMENTS CHECKLIST MARCO ISLAND UTILITIES

Item	Description	Check-Off
1	Electronic Record Drawings in AutoCAD 2010 or later edition (confirm with MIU), and three (3) hard copy sets of Record Drawings. Utilities shown in all proposed, final, and record plan sets are to be color coded, with existing utilities shown in black. Provide files in DWG and PDF format.	
2	Final plat on disk in AutoCAD 2006 minimum.	
3	Water: bacteriological, pressure and leakage test results as well as any other tests deemed necessary by City of Marco Island.	
4	Gravity Sewer: Leakage tests, TV report and results of mandrel test.	
5	Force Main: pressure and leakage test results.	
6	Easement(s) dedicated to City of Marco Island (notarized and recorded with the county).	
7	Contractor's Letter of Warranty for a period of one year after acceptance by City of Marco Island (signed and sealed by professional engineer or notarized).	
8	Contractor's Waiver & Release of Lien (recorded with the county).	
9	Developer's Engineer Letter of Certification (signed, sealed and dated).	
10	Bill of Sale for water and wastewater contributed property with accurate cost records establishing the construction cost of the completed additions (a copy of related construction contracts duly certified by a notary of the State of Florida as true and correct copies of the originals required).	
11	As-Built Inspection Records: Contractor is responsible for scheduling field inspection/site visits by Marco Island Utilities.	
12	Backflow Prevention Inspection Report and Testing: Contractor is responsible for scheduling field inspection by Marco Island Utilities.	
13	Start-up Report and O&M Manual on Pump/Lift Station: Contractor is responsible for scheduling field inspection b Marco Island Utilities.	

APPENDIX F

NEW SERVICE PROCEDURES MARCO ISLAND UTILITIES

1. New residential customers on the Island should complete the Application for Services and pay fees at the Building Department. If main extensions or laterals are required, procedures for commercial customers apply.
2. All non-resident customers and “off Island customers” should complete the application for services and return to the Department Review Section at the Utility Department (MIU). You will be notified by letter of availability and fees due.
3. All required new infrastructure shall be designed and constructed in accordance with the Marco Island Technical Standards Manual (Standards) dated July 2006. The improvements will be dedicated to Marco Island Utilities unless otherwise noted in the approved plans.
4. After receipt of Availability Notification, submit three sets of plans and FDEP applications signed and sealed by a registered professional engineer, and a check for fees due. Plans will not be reviewed nor FDEP application executed until fees are paid.
5. When approved plans are received, please schedule a pre-construction meeting with the Utility Department.
6. Marco Island Utilities will conduct periodic inspections and must be notified two days in advance of specific milestones as specified in the Standards.
7. Turnover documents and final payment of fees must be submitted before service connections are made. Mains are not to be tapped without MIU representative present. FDEP approval letter is mandatory for final connections.
8. Water meters up to 2 inches will be supplied by MIU for residential services. Developer is responsible for all commercial meters, and meter boxes, which are to be supplied in accordance with the Standards.
9. All backflow devices will be furnished, maintained and tested annually by a TRIO or FWPCOA licensed State tester in accordance with the Standards. Test results shall be reported to MIU within 10 working days of installation, and repairs completed with 10 working days of annual inspection date to prevent termination of water service.
10. In the unlikely event that Standards conflict with regulations of higher authority such as FDEP or Health department or Fire Departments, please notify MIU. Regulations by higher authority supercede Standards and procedures referenced in this document.



Note: Copies of all payment receipts to Finance, Building Department, and Utility Department Review.

APPENDIX F-1

**MARCO ISLAND UTILITIES
APPLICATION FOR SERVICES**

1. Name and address of person or entity making application for service.

2. Application for:
 ___ Single Family ___ Multi-Family ___ Commercial ___ New Development

3. Service requested:
 ___ Water ___ Wastewater ___ Effluent

4. Project name, phases, and estimated date(s) service is required:

5. Engineers estimate of average daily flows in gallons per day (GPD):

 Water: _____ GPD Wastewater: _____ GPD
 Effluent: _____ GPD Meter size: _____

6. Legal description of property:

Signed: _____ Date: _____
Name: _____ Telephone: _____
Title: _____

1. Wastewater service is required where available and for all commercial and new developments.
2. Main extensions required by owner/developer at his expense. Improvements shall be dedicated to MIU.
3. Water – 450 gallons per day for equivalent residential connection (ERC).
4. Wastewater – 275 gallons per day per ERC.
5. Charges per existing tariff.
6. Improvements per Florida Water Service Standards and Specifications dated April, 2002.

APPENDIX G

MARCO ISLAND UTILITIES

REQUEST FOR TEMPORARY INTERRUPTION OF SERVICES

Date of Request: _____

Company Name: _____

Person's Name Making Request: _____ Title: _____

Date of Proposed Event: _____

Describe why Temporary Interruption of Services is being requested in detail:

Requested Time Frame of Temporary Interruption of Service: Date: _____ to _____
Time: _____ AM to _____ PM

Type of service Interruption: Water main, Water Service, Force Main, Gravity Main, Left Station, Reuse, Raw Water, Power, Other: _____

Size of Pipe: _____ Depth of Pipe: _____ ‘ _____ “

Pipe Material: Asbestos Concrete, PVC, Clay, Ductile, Other: _____

Outside Diameter of Existing Pipe at Connection Points:

Have the correct pipe fittings been purchased? _____ List all fittings and diameter range of proposed fitting: _____

Are pumper trucks and/or portable generators required to perform job task? _____

Requests for Temporary Interruption Services will require a site visit by Marco Island Utility's Collections and Distribution Manager, Field Supervisor, and Project Manager. Please submit a written alternative/ emergency plan with the "Request for Temporary Interruption of Services" to ensure that service(s) will be restored within the time frame specified above. Contractors are subject to any expenses incurred by Marco Island Utilities beyond our control. MIU reserves the right to terminate project at any time, at contractor's expense. At anytime work extends beyond scheduled time because of inadequate planning or preventable acts with contractor's control, contractor will be assessed MIU expenses incurred as a result of the delay. By signing this document the contractor and MIU are in agreement with terms as listed in the document.

Collections and Distribution Manager _____ Date: _____

Field Supervisor _____ Date: _____

Project Manager _____ Date: _____

Contractor's Project Manager _____ Date: _____

Contractor's Job Foreman _____ Date: _____

APPENDIX H

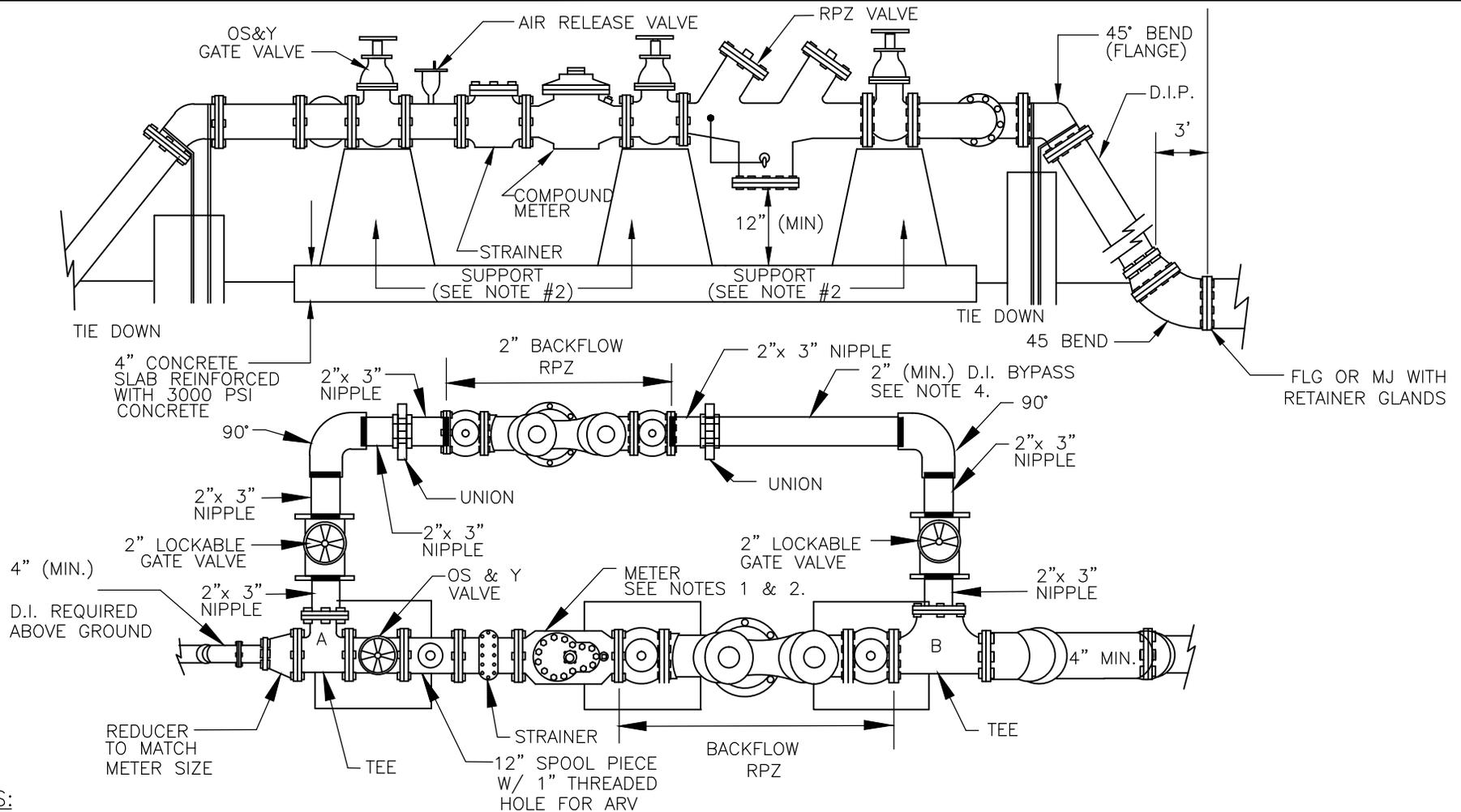
STANDARD DETAILS INDEX

Combination Details		Backflow Assembly Details	
CB-1	RESTRAINT TABLE	BF-1	STANDARD METER/BACKFLOW ASSEMBLY
CB-2	THRUST RESTRAINING		
CB-3	TYPICAL THRUST BLOCKS	BF-3	¾" TO 2" BACKFLOW ASSEMBLY
CB-4	DEAD END THRUST RESTRAINING FOR AC PIPE	BF-4	DEDICATED FIRE FLOW BACKFLOW ASSEMBLY
CB-5	OFFSET AIR RELEASE VALVE		
CB-6	DUCTILE IRON TRANSITION COUPLING		
CB-7	PVC PRESSURE LINE CONFLICT ADJUSTMENT FITTINGS		
CB-8	CONFLICT ADJUSTMENT MJ		
CB-9	AC AND CLAY PIPE REPLACEMENT/REPAIR		
CB-10	TRENCH AND PAVING RESTORATION		
CB-11	DUAL PIPELINE TRENCH AND PAVING RESTORATION		
CB-12	TRENCH AND PAVING RESTORATION FOR HIGH VOLUME ROADWAYS (FLOWABLE FILL)		
CB-13	ASPHALT OVERLAY		
CB-14	LOCATOR TAPE AND BALL MARKERS FOR PRESSURE MAINS		
CB-15	JACK AND BORE		
CB-16	VALVE PAD		
CB-17	GUARD POST		
CB-18	HORIZONTAL DIRECTIONAL DRILL		

APPENDIX H

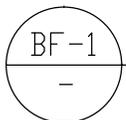
STANDARD DETAILS INDEX

Water Details		Sanitary Sewer Details	
W-1	CONSTRUCTION JUMPER ASSEMBLY	SS-1	PRECAST MANHOLE – CONCENTRIC
W-2	FIRE HYDRANT ASSEMBLY	SS-2	PRECAST MANHOLE – ECCENTRIC
W-3	FIRE HYDRANT ASSEMBLY WITH GRADE-LOC ADAPTOR	SS-3	DROP MANHOLE
W-4	FIRE HYDRANT LOCATIONS/CLEARANCE	SS-4	MANHOLE AND DROP MANHOLE SCHEDULE AND GENERAL NOTES
W-5	TYPICAL FIRE HYDRANT INSTALLATION WITH BOLLARDS	SS-5	SHALLOW MANHOLE
W-6	AUTOMATIC FLUSHING ASSEMBLY (SPRINKLER TYPE)	SS-6	OFFSET MANHOLE RECONSTRUCTION
W-7	TEMPORARY FLUSHING ASSEMBLY	SS-7	FLOW LINE CHANNELS
W-8	BACTERIOLOGICAL SAMPLE VALVE	SS-8	FORCE MAIN CONNECTION TO MANHOLE WITHY INSIDE DROP
W-9	WATER MAIN FLUSHING ASSEMBLY	SS-9	MANHOLE RING AND COVER
W-10	VALVE INSTALLATION	SS-10	CLEANOUT ASSEMBLY
W-11	16” AND LARGER VALVE INSTALLATION	SS-11	SEWER CONNECTION FOR DEPTHS OVER 8 FEET
W-12	1” TO 30” TAPPING SLEEVE AND VALVE FOR 1” TO 30” SERVICES	SS-12	CUSTOMER SANITARY LATERAL TRENCH RESTORATION
W-13	METER BOX ASSEMBLY (ASSEMBLY PROVIDED BY MIU)	SS-13	GREASE INTERCEPTOR
W-14	MINIMUM LCEC TRANSFORMER SEPARATION FOR WATER SYSTEM CONNECTION	SS-14	LIFT STATION WET WELL ACCESS DOOR
W-15	VALVE OPERATOR EXTENSION	SS-15	LIFT STATION VALVE VAULT ACCESS DOOR
W-16	AUTOMATIC FLUSHING ASSEMBLY (WHERE CANNOT USE SPRINKLER TYPE)	SS-16	LIFT STATION HOSE BIB AND VENT MOUNTING
		SS-17	LIFT STATION HOSE BIB
		SS-18	3” AND LARGER NON-POTABLE WATER METER ASSEMBLY
		SS-19	NON-POTABLE WATER SIGN
		SS-20	SINGLE SEWER SERVICE CONNECTION
		SS-24	VALVE VAULT FLOOR DRAIN



NOTES:

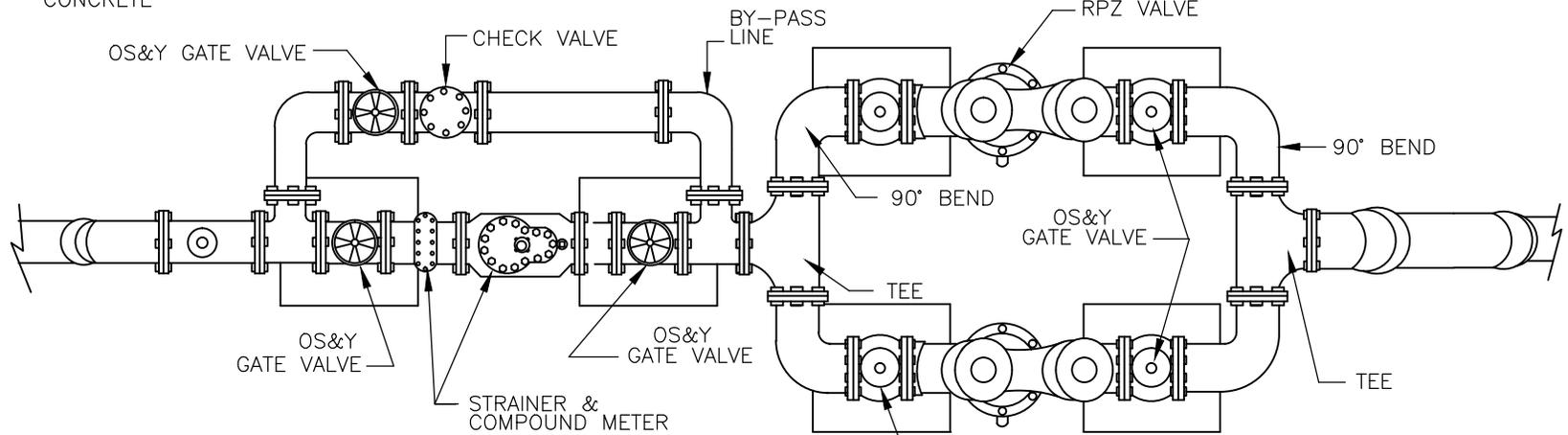
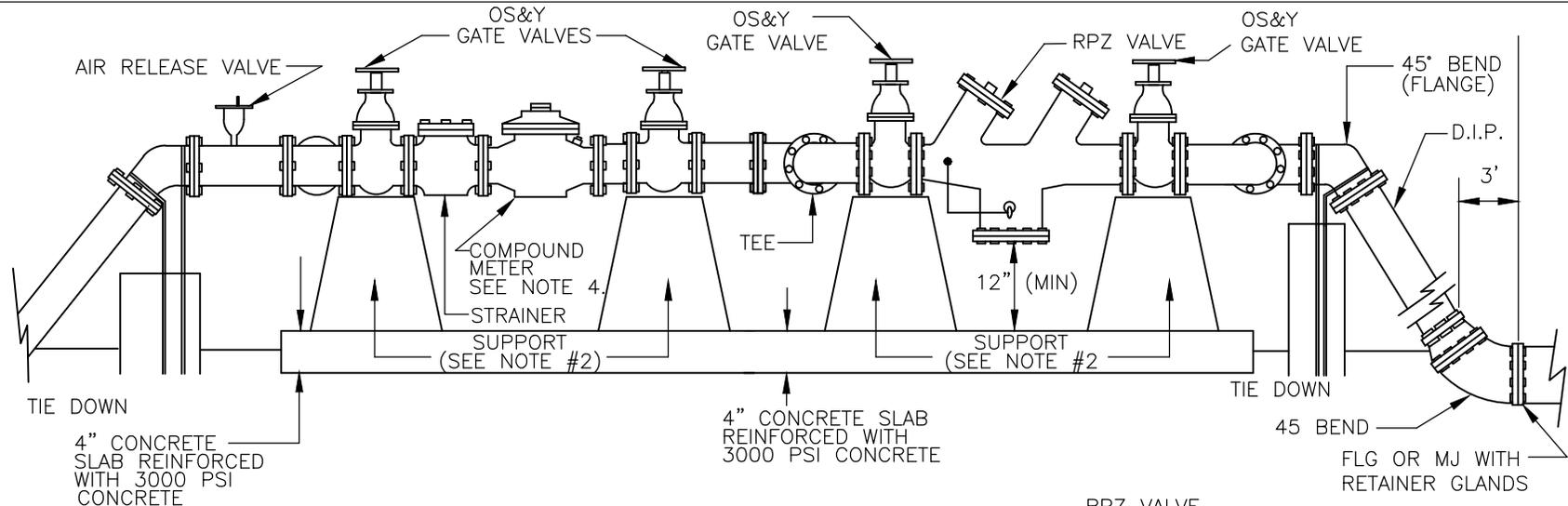
1. METER SIZE DETERMINES CONFIGURATION SIZE BETWEEN TEE "A" & "B".
2. METER TO BE SENSUS TOUCH PAD READ REGISTER ONLY.
3. ENTIRE APPARATUS TO BE PAINTED WITH UV RATED PAINT. (EXCEPT METER), RED FOR FIRE SERVICE AND BLUE FOR POTABLE SERVICE.
4. BYPASS TO BE A MAXIMUM OF ONE PIPE DIAMETER SMALLER THAN MAIN LINE.
5. NO. 1 VALVE ON MAIN LINE TO BE CHAIN LOCKED IN OPEN POSITION THROUGH YOKE AND HANDWHEEL. NO. 1 VALVE ON BYPASS TO BE CHAIN LOCKED IN CLOSED POSITION THROUGH YOKE AND HANDWHEEL. LOCKS TO BE FURNISHED BY MIU.
6. SUPPORTS TO BE 316 SS, ADJUSTABLE.
7. ALL ABOVE GRADE GATE VALVES SHALL BE RESILIENT SEAT, HAND WHEEL, OUTSIDE STEM & YOKE (OS&Y) TYPE.
8. ALL BRASS FITTINGS TO BE LEAD FREE OR NO LEAD.



STANDARD METER BACKFLOW ASSEMBLY
 NOT TO SCALE (REVISED 08/26/15)

MARCO ISLAND UTILITIES
 960 North Collier Blvd.
 MARCO ISLAND, FL 34145

SCALE:	NOT TO SCALE
DATE:	APRIL 2007
DWG #:	BF-1.DWG



NOTE:

1. IF CONTINUOUS SERVICE IS NOT REQUIRED, A SINGLE BACKFLOW PREVENTER MAY BE INSTALLED, AND TEES AND BENDS ELIMINATED.
2. SUPPORTS TO BE 316 SS, ADJUSTABLE.
3. METER TO BE NEPTUNE OR SENSUS TOUCH PAD READ ONLY. USE COMPOUND METER IF ASSEMBLY IS FOR POTABLE WATER ONLY.
4. NO. 1 VALVE ON MAIN LINE TO BE CHAIN LOCKED IN OPEN POSITION THROUGH YOKE AND HANDWHEEL. NO. 1 VALVE ON BYPASS TO BE CHAIN LOCKED IN CLOSED POSITION THROUGH YOKE AND HANDWHEEL. LOCKS TO BE FURNISHED BY MIU.
5. METER SIZE DETERMINES CONFIGURATION SIZE BETWEEN TEE "A" & "B".
6. ALL ABOVE GRADE GATE VALVES SHALL BE RESILIENT SEAT, HAND WHEEL, OUTSIDE STEM & YOKE (OS&Y) TYPE.
7. ENTIRE APPARATUS TO BE PAINTED WITH UV RATED PAINT. (EXCEPT METER), RED FOR FIRE SERVICE AND BLUE FOR POTABLE SERVICE.
8. ALL BRASS WILL BE LEAD FREE OR NO LEAD.

BF-2 CONTINUOUS SERVICE BACKFLOW ASSEMBLY (ONLY WITH MIU PRIOR APPROVAL)

- NOT TO SCALE (REVISED 08/26/15)

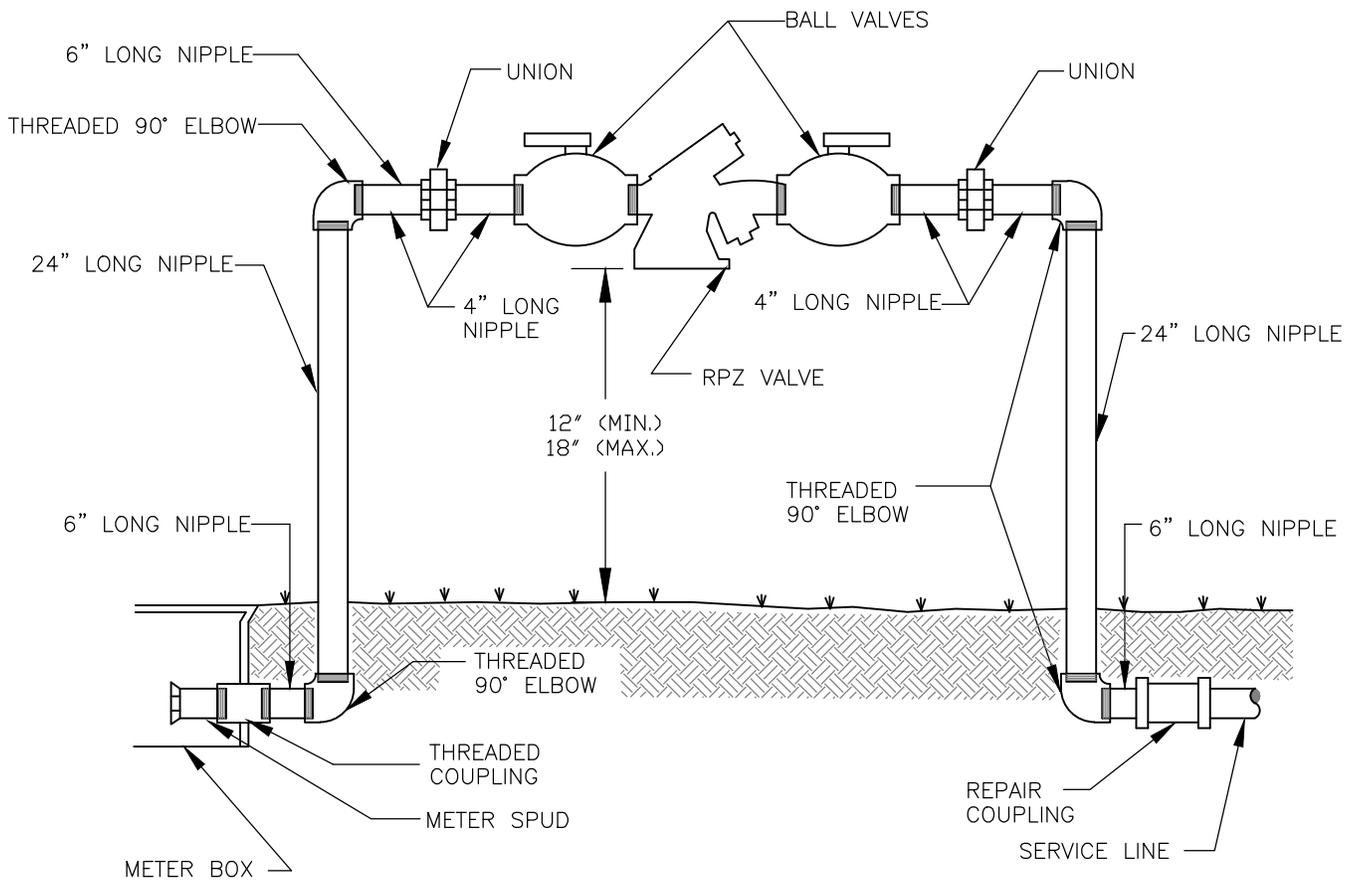
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: BF-2.DWG



NOTES:

1. FITTINGS ARE TO BE LEAD FREE OR NO LEAD BRASS.
2. STRAIGHT PIPE RUNS ARE TO BE TYPE "K" COPPER.

BF-3
—

3/4" - 2" BACKFLOW ASSEMBLY

NEW INSTALLATIONS (EXCEPT FOR BACKFLOWS ON FIRELINES)
NOT TO SCALE (REVISED 08/26/15)

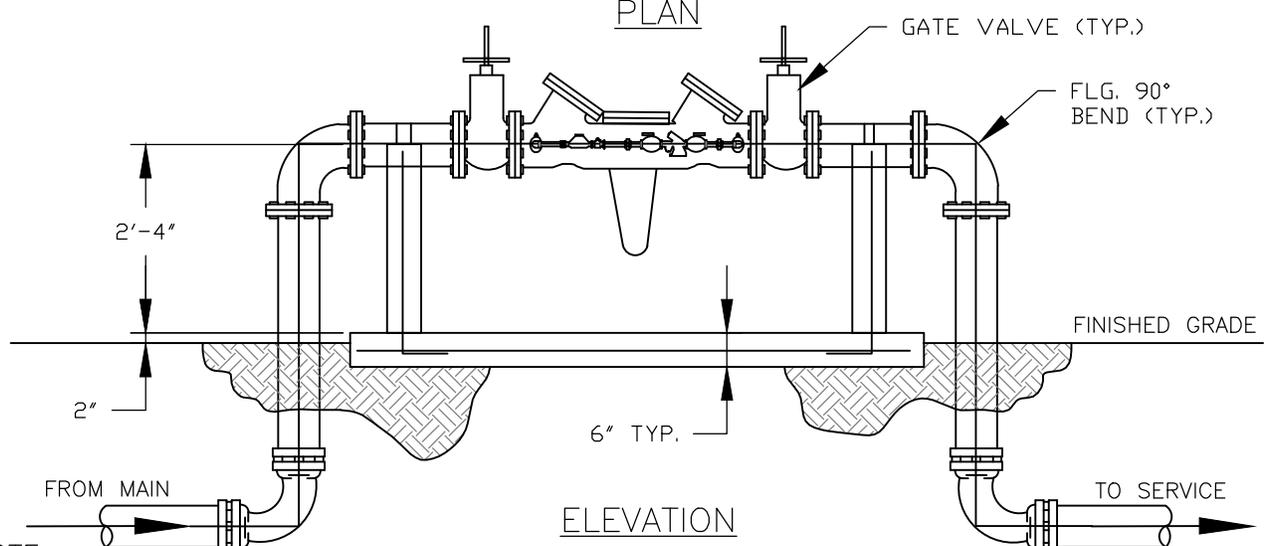
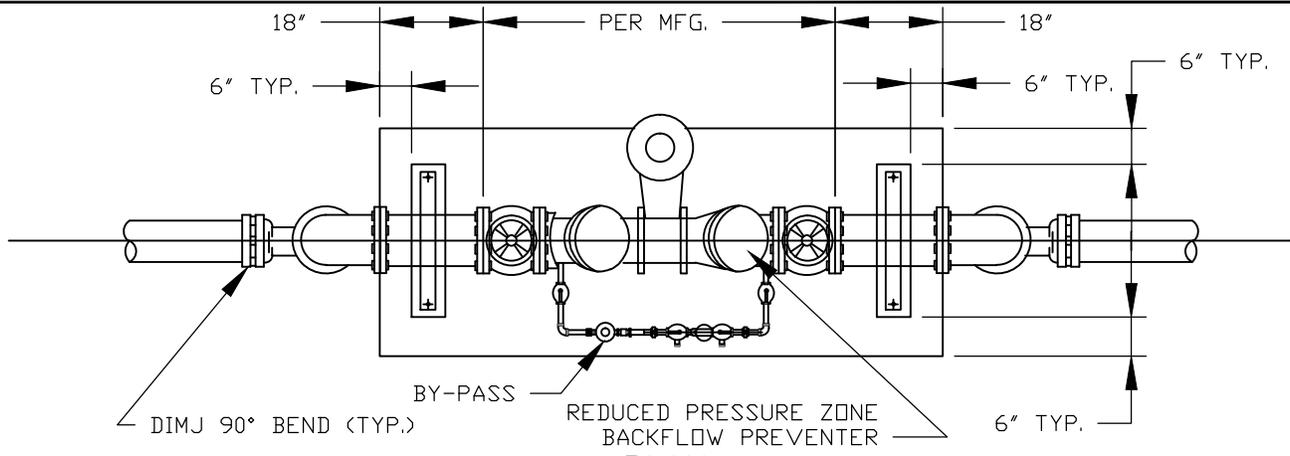
**MARCO ISLAND
UTILITIES**

960 N. COLLIER BLVD.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: BF-3.DWG



NOTE:

1. ALL ABOVE GRADE GATE VALVES SHALL BE RESILIENT SEAT, HAND WHEEL, OUTSIDE STEM & YOKE (OS&Y) TYPE.
2. ALL ABOVE GRADE PIPING 3 INCHES IN DIA. & LARGER SHALL BE DUCTILE IRON WITH FLANGED ENDS, CLASS 53. ALL BELOW GRADE PIPING SHALL BE DIMJ W/ RESTRAINING TYPE DEVICES, MEGA-LUG OR APPROVED EQUAL. PIPING SMALLER THAN 3 INCHES SHALL BE LEAD FREE OR NO LEAD BRASS.
3. ALL ASSEMBLIES SHALL BE 30 INCHES ABOVE FINISHED GRADE LEVEL, AND HAVE A 6" (MINIMUM) THICK CONCRETE SLAB REINFORCED W/ #5 @ 12' E.W. THE OVERALL SLAB DIMENSIONS SHALL BE DETERMINED BY THE ASSEMBLY SIZE.
4. BY-PASS LINE SHALL CONSIST OF A TOTALIZING SENSUS TOUCH PAD REGISTER ONLY METER (REGISTERING IN GALLONS) AND REDUCED PRESSURE ZONE BACKFLOW ASSEMBLY. METER & PIPING SHALL BE BRASS AND BYPASS VALVES MUST HAVE A LOCKING MECHANISM.
5. DEPENDING ON LOCATION, A FENCE MAY BE REQUIRED AROUND ASSEMBLY FOR SAFETY.
6. FIRE MAIN SHALL BE IN ADDITION TO CUSTOMER SERVICE/SUPPLY MAIN.
7. OWNER SHALL TEST ASSEMBLY AND SUBMIT TEST REPORTS TO MIU ANNUALLY.
8. SUPPORTS TO BE 316 SS, ADJUSTABLE.
9. NO. 1 VALVE ON MAIN LINE TO BE CHAIN LOCKED IN OPEN POSITION THROUGH YOKE AND HANDWHEEL. NO. 1 VALVE ON BYPASS TO BE CHAIN LOCKED IN CLOSED POSITION THROUGH YOKE AND HANDWHEEL. LOCKS TO BE FURNISHED BY MIU.
10. ENTIRE APPARATUS TO BE PAINTED WITH RED UV RATED PAINT. (EXCEPT METER).

BF-4
—

DEDICATED FIRE FLOW BACKFLOW ASSEMBLY

NOT TO SCALE
(REVISED 08/26/15)

MARCO ISLAND UTILITIES
960 N. COLLIER BLVD.
MARCO ISLAND, FL 34145

SCALE:	NOT TO SCALE
DATE:	APRIL 2007
DWG #:	BF-4.DWG

RESTRAINT TABLE

PIPE SIZE	HORIZONTAL BENDS				VERTICAL OFFSETS		DEAD ENDS Lr (FT.)	REDUCERS (SEE NOTES)			TEES						
	90° BENDS Lr (FT.)	45° BENDS Lr (FT.)	22.5° BENDS Lr (FT.)	11.25° BENDS Lr (FT.)	45° BENDS (SEE NOTE 2)			SIZE	L(A) (FT.)	L(B) (FT.)	RUN SIZE	BRANCH SIZE	Lrn (FT.)	Lbr (FT.)			
					Lhs (FT.)	Lis (FT.)											
4"	27	11	5	3	31	8	60	6 x 4	64	43	4"	4"	10	11			
6"	37	15	7	4	43	11	84	8 x 6	60	46	6"	6"	10	34			
8"	48	20	10	5	57	15	110	8 x 4	153	79	8"	4" OR LESS	10	FITTING ONLY			
								10 x 8	55	44							
10"	57	24	11	6	68	17	131	10 x 6	133	81	10"	6" OR LESS	10	FITTING ONLY			
12"	57	24	11	6	68	19	131	12 x 10	46	38							
16"	58	24	12	6	55	19	106	12 x 8	104	69	10"	6" OR LESS	10	FITTING ONLY			
20"	70	29	14	7	67	23	129	16 x 12	61	45							
24"	81	33	16	8	78	27	150	16 x 10	103	63	12"	6" OR LESS	10	FITTING ONLY			
								20 x 16	58	45							
								20 x 12	139	81	16"	8" OR LESS	10	FITTING ONLY			
								24 x 20	55	45							
24 x 16	128	82	16"	8" OR LESS	10	FITTING ONLY											
16"	16"	10					73										
16"	12"	10	38														
16"	10"	10	16														
20"	20"	10	95														
20"	16"	10	63														
20"	12"	10	24														
20"	10" OR LESS	10	FITTING ONLY														
24"	24"	20"	10	116	87	53	10	10"	10" OR LESS	10	10"	10" OR LESS	10	FITTING ONLY			
															20"	10	87
															16"	10	53
															12"	10	10

NOTES:

1. LENGTHS SHOWN ON THIS TABLE ARE TO BE INTERPRETED AS FOLLOWS:

Lhs = RESTRAINED LENGTH FROM HIGH SIDE FITTING OF A VERT. BEND

Lis = RESTRAINED LENGTH FROM LOW SIDE FITTING OF A VERT. BEND

Lr = RESTRAINED LENGTH ON BOTH SIDES FROM FITTING

Lrn = MINIMUM LENGTH TO FIRST JOINT OF RUN ON BOTH SIDES

Lbr = RESTRAINED LENGTH REQUIRED ON BRANCH FROM FITTING

L(A) = LENGTH OF PIPE ON SMALL SIDE FREE OF FITTING

L(B) = RESTRAINED LENGTH ON LARGE SIDE OF REDUCER

2. A SAFETY FACTOR = 2.5 IS USED FOR VERTICAL OFFSETS TO COMPENSATE FOR SATURATED SOIL CONDITIONS.

A SAFETY FACTOR = 2.0 IS USED FOR ALL OTHER CASES.

3. L(A) AND L(B) ABOVE ARE TWO OPTIONS FOR PROVIDING THE REQUIRED THRUST RESTRAINT FOR THE FITTING. EITHER L(A) LENGTH OF PIPE FREE OF FITTINGS (BENDS, TEES, REDUCERS OR VALVES) ON THE SMALL SIDE OF THE REDUCER WILL PROVIDE THE REQUIRED RESTRAINT OR L(B) LENGTH CAN BE RESTRAINED ON THE LARGE SIDE OF THE FITTING.

4. THE FOLLOWING ARE ASSUMED :

4" - 10" PIPE HAS 30" MIN. COVER

12" - 24" PIPE HAS 36" MIN. COVER

4" - 24" PIPE IS PVC

5. VALVES SHALL BE RESTRAINED ON EITHER SIDE OF THE FITTING AS A MINIMUM. IN LINE VALVES SHALL HAVE NO FITTINGS WITHIN THE LENGTHS SHOWN ON THIS TABLE FOR THE SAME SIZE DEAD END. IN CASES WHERE THIS LENGTH CAN NOT BE PROVIDED FREE OF FITTINGS, ADDITIONAL RESTRAINT SHALL BE REQUIRED AS APPROVED BY ENGINEER.

6. ALL DEAD END LINES, PERMANENT OR TEMPORARY, SHALL BE RESTRAINED PER THE ABOVE RESTRAINT TABLE.



NOT TO SCALE

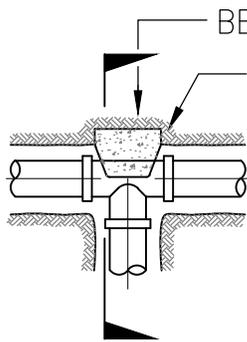
MARCO ISLAND UTILITIES

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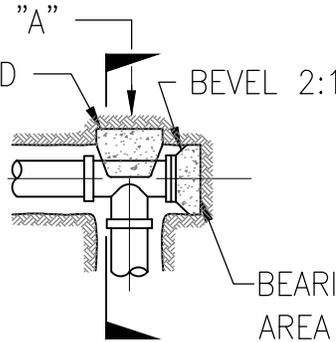
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DATE: APRIL 2007

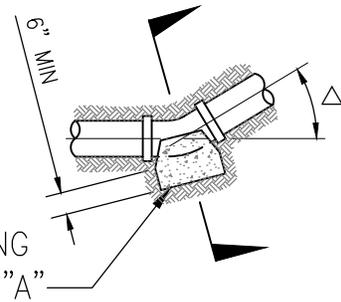
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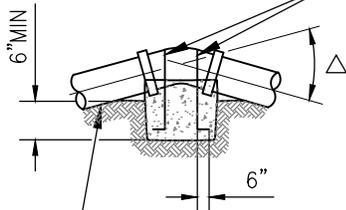
PLAN (TYPE-1)



PLAN (TYPE-2)



PLAN (TYPE-3, HORIZ BEND)

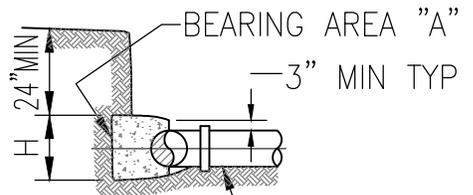


BOTTOM OF TRENCH

ELEV (TYPE-4, VERT BEND)

REBAR SIZES		
PIPE SIZE (IN)	Δ	REBAR
6-12	0-90°	#4
20-42	0-22.5°	#4
20-36	45°	#5
20-30	90°	#6
36-42	45°-90°	#7

COAT REBAR WITH SYSTEM NO 23 PER SECTION 099000



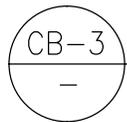
SECTION

BOTTOM OF TRENCH TYPES-1,2,3

NOTES:

1. BASED ON OD OF PIPE AT GASKET
2. CHECK SIZE OF FITTING TO VERIFY AVAILABLE AREA FOR BEARING ON CONCRETE
3. DO NOT USE THIS DETAIL WITH VERTICAL THRUST BLOCKS FOR PIPE SIZES AND BENDS NOT SHOWN IN THE TABLES
4. TEST PRESS = 100 PSI
SOIL BRG PRESS = 2000 LB/SF
5. FOR RESTRAINING EXISTING UNRESTRAINED PIPE ONLY.

PIPE DIA (IN)	TEE OR DEAD-END	BEARING AREA "A" (SF)				VERTICAL THRUST BLOCK VOL OF CONCRETE (CY)			
		$\bar{I}=11.25'$	$\bar{I}=22.5'$	$\bar{I}=45'$	$\bar{I}=90'$	$\bar{I}=11.25'$	$\bar{I}=22.5'$	$\bar{I}=45'$	$\bar{I}=90'$
6	1.9	1.0	1.0	1.4	2.7	0.2	0.4	0.7	1.3
8	3.3	1.0	1.3	2.5	4.6	0.3	0.6	1.2	2.3
10	5.4	1.1	2.1	4.1	7.6	0.5	1.0	2.0	3.8
12	7.6	1.5	3.0	5.8	10.7	0.7	1.5	2.9	5.3
14	10.3	2.0	4.0	7.9	14.6	1.0	2.0	3.9	7.2
16	13.4	2.6	5.2	10.3	19.0	1.3	2.6	5.1	9.4
18	17.2	3.4	6.7	13.1	24.3	1.7	3.3	6.5	12.0
20	21.3	4.2	8.3	16.3	30.2	2.1	4.1	8.1	—
24	30.8	6.0	12.0	23.6	43.5	3.0	5.9	11.6	—



TYPICAL THRUST BLOCKS

NOT TO SCALE

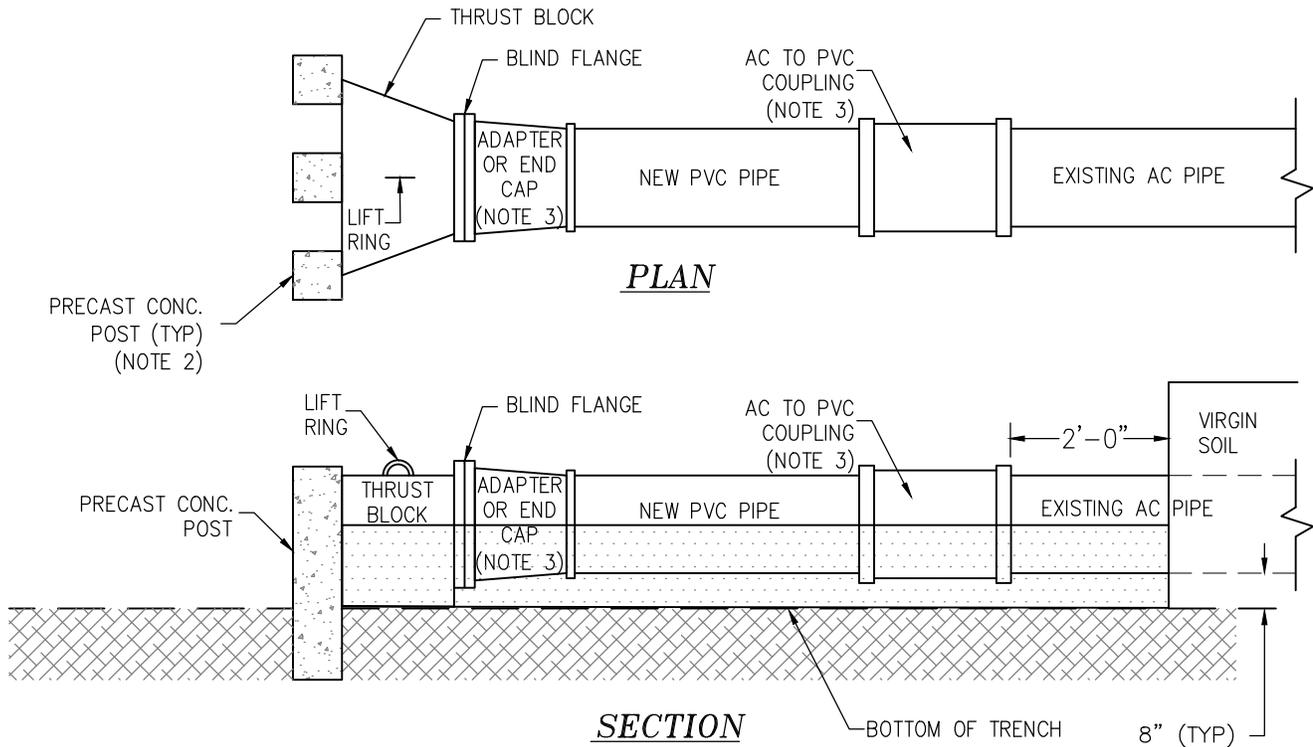
MARCO ISLAND UTILITIES

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SCALE: NOT TO SCALE

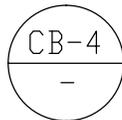
DATE: APRIL 2007

DWG #: CB-3.DWG



NOTE:

1. THRUST RESTRAINING SHOWN IS TO BE USED IN EXCAVATIONS WHERE PIPE CAN NOT BE RESTRAINED AGAINST FIRM NATIVE MATERIAL.
2. SIZE AND DEPTH OF PILINGS TO BE DESIGNED BY ENGINEER OF RECORD ACCORDING TO TYPE OF UTILITY AND SIZE.
3. ALL NEW BURIED COUPLINGS AND EXISTING DUCTILE IRON FITTINGS AND VALVES EXPOSED DURING CONSTRUCTION TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.
4. BACKFILL UP TO THE SPRING LINE OF THE PIPE IS TO BE FDOT 57 STONE HAUNCHED OR SLICED, ROCK SUPPORTS UNDERSIDE OF PIPE AND VOIDS ARE FILLED. BACKFILL UP TO THE SPRING LINE OF REPAIR COUPLINGS IS TO BE EXCAVATABLE FLOWABLE FILL PER FDOT SECTION 121 EXTENDING TO EXCAVATION VIRGIN SOIL AND 2 FEET BEYOND COUPLING IN EACH DIRECTION.
5. TRENCH RESTORATION ABOVE THE SPRING LINE OF THE PIPE IS TO BE IN ACCORDANCE WITH MIU STANDARD DETAIL CB-11.



DEAD END THRUST RESTRAINING FOR AC PIPE

NOT TO SCALE

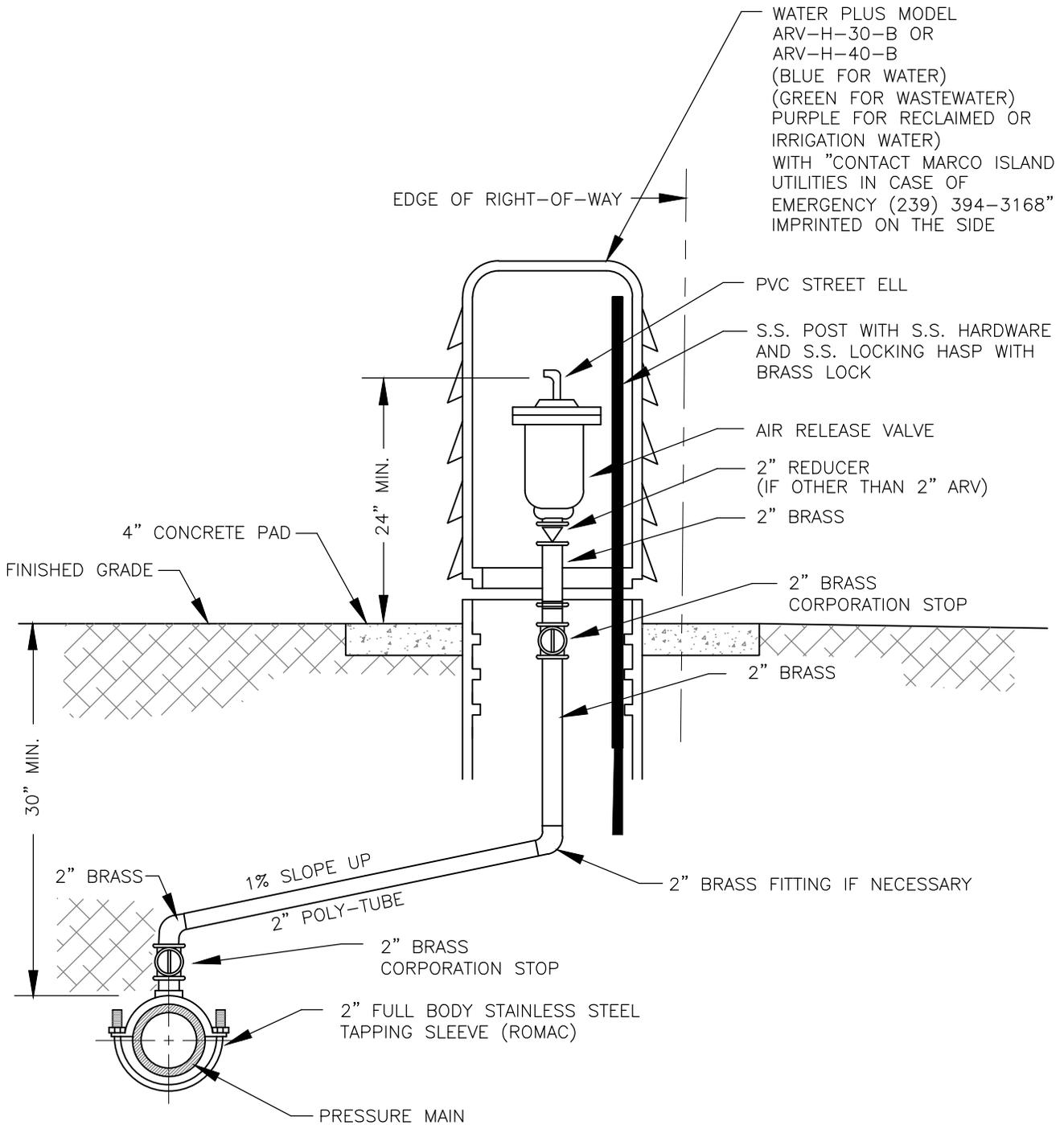
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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: CB-4.DWG



CB-5 OFFSET AIR RELEASE VALVE
NOT TO SCALE (REVISED 08/26/15)

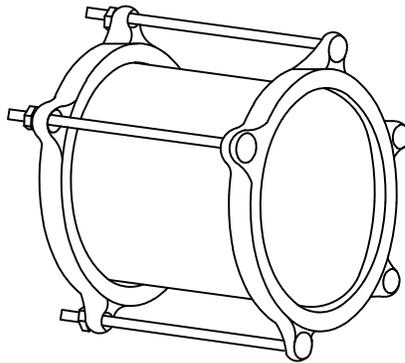
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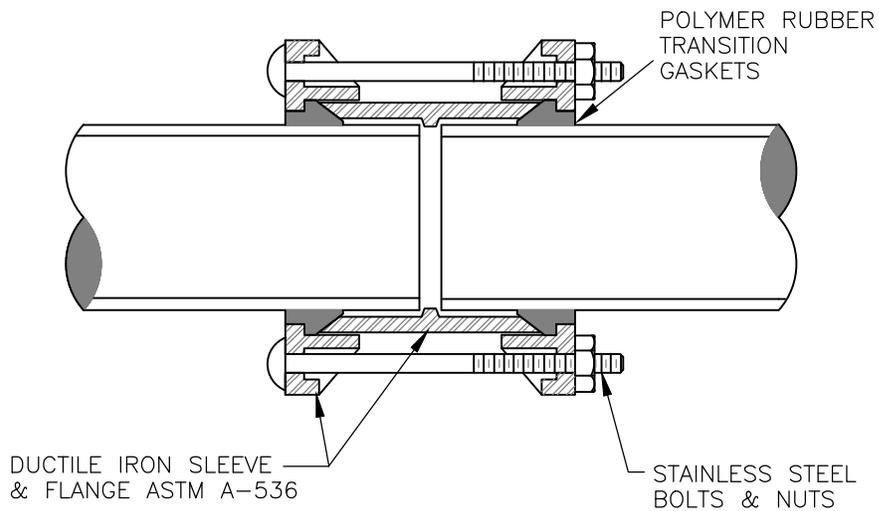
SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: CB-5.DWG



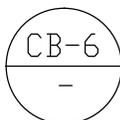
DUCTILE IRON TRANSITION
COUPLING OR APPROVED EQUAL



JOINS CAST IRON, DUCTILE IRON, ASBESTOS-CEMENT, C-900
BY MECHANICAL JOINT COMPRESSION PRINCIPAL

NOTES:

1. NON RESTRAINED COUPLING CAN ONLY BE USED IN STRAIGHT RUNS OF PIPE, A MINIMUM OF 60' FROM ANY FITTING THAT HAS A CHANGE OF DIRECTION MUST BE MAINTAINED.
2. DUCTILE IRON COUPLING WILL BE EPOXY 401 LINED FOR SEWER AND CEMENT LINED FOR POTABLE WATER.
3. HYMAX COUPLING ARE APPROVED FOR WATER AND SEWER BUT MUST HAVE STAINLESS STEEL NUTS AND BOLTS.



DUCTILE IRON TRANSITION COUPLING

NOT TO SCALE (REVISED 08/26/15)

**MARCO ISLAND
UTILITIES**

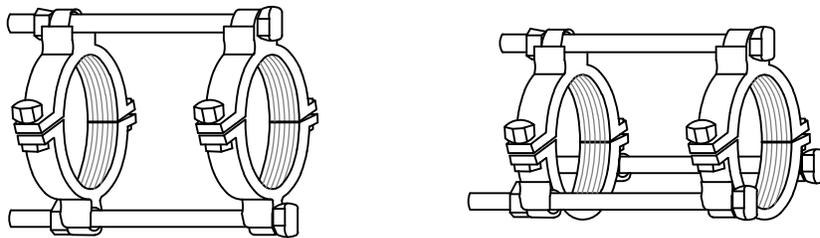
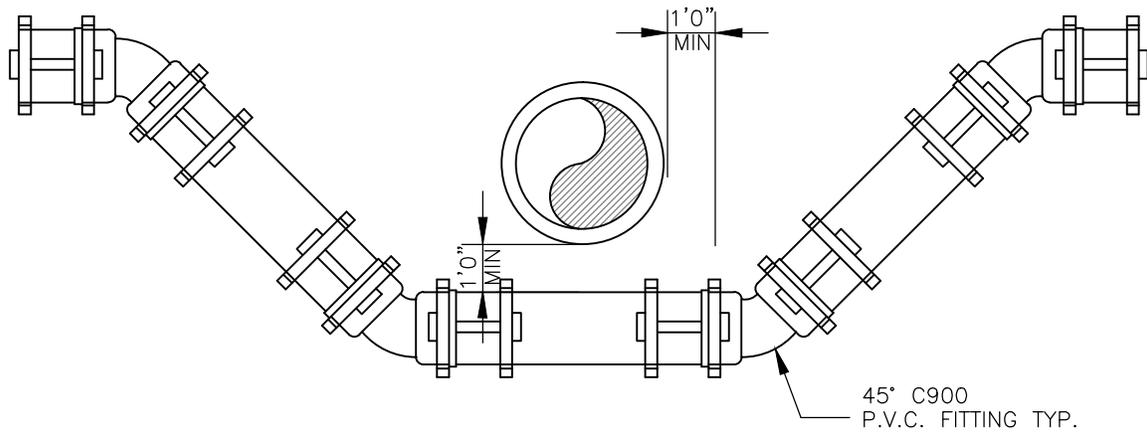
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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: CB-6.DWG

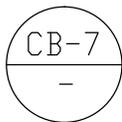
RESTRAINT SYSTEM FOR PUSH ON
P.V.C. FITTINGS & PIPING
SIZE AND TYPE AS SPECIFIED ON PLAN



RESTRAINT DETAIL FOR ADJUSTING
PVC PRESSURE LINE DUE TO CONFLICTS

NOTE:

1. ALL NUTS, BOLTS AND ALL THREAD MUST BE STAINLESS STEEL.



PVC PRESSURE LINE CONFLICT ADJUSTMENT FITTINGS

NOT TO SCALE (REVISED 08/26/15)

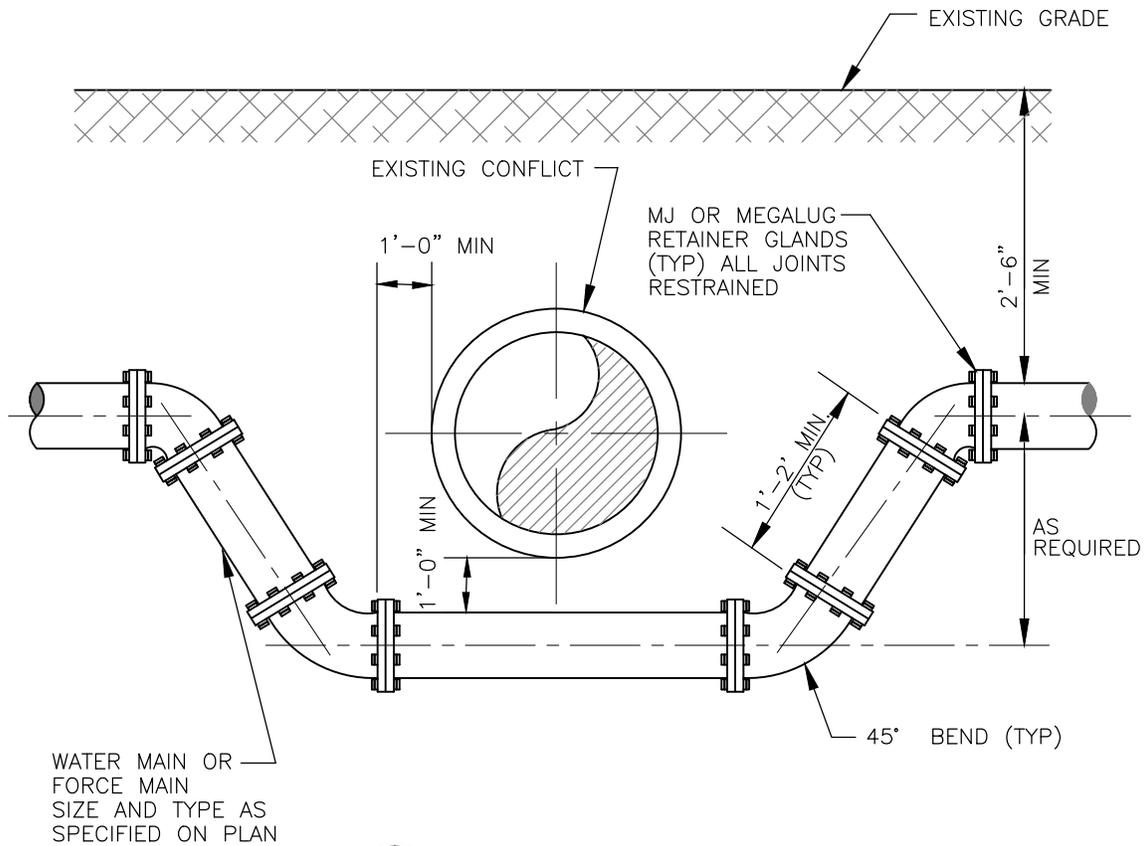
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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: CB-7.DWG



CB-8
CONFLICT ADJUSTMENT MJ
-
NOT TO SCALE

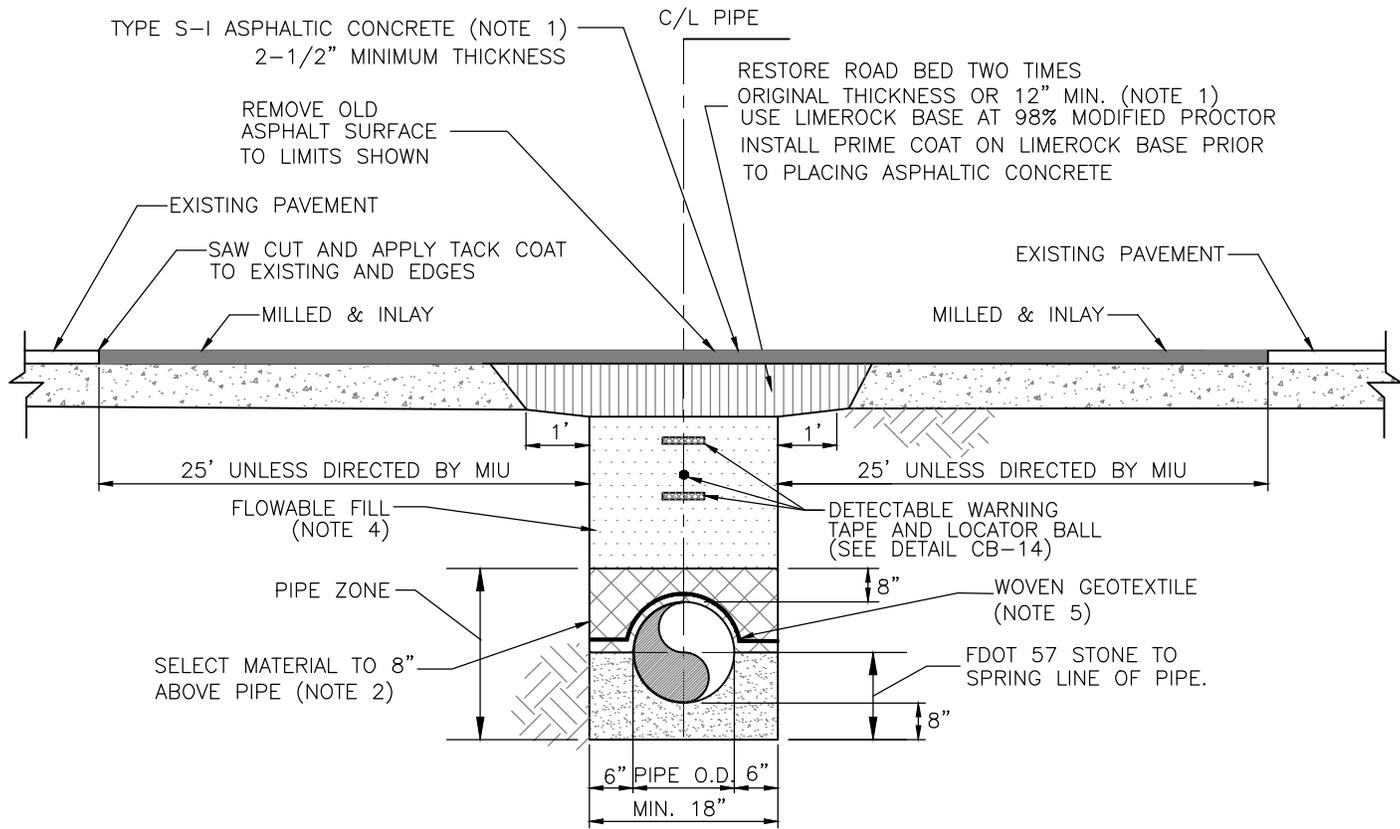
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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: CB-8.DWG



NOTES:

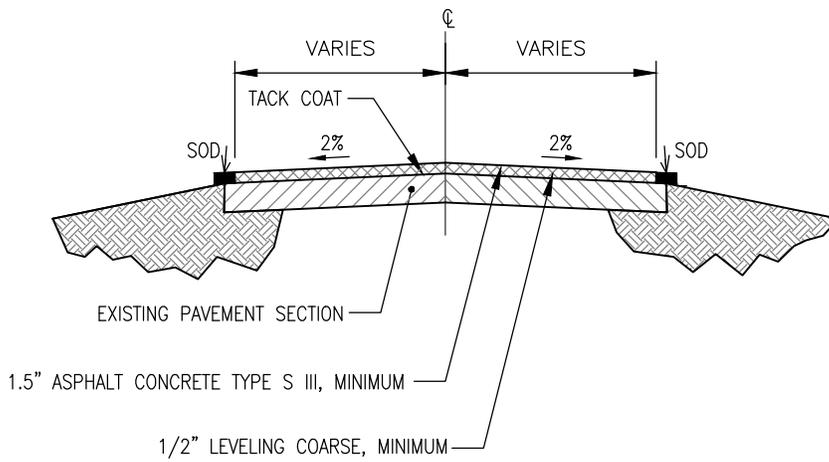
1. IN LIEU OF LIMEROCK FOR TRENCH BASE RESTORATION, ONE OF THE FOLLOWING TWO OPTIONS MAY BE SELECTED: (1) PROVIDE 12 INCHES MINIMUM THICKNESS OF EXCAVATABLE FLOWABLE FILL PER FDOT SECTION 121 OR (2) PROVIDE 6 INCHES MINIMUM OF TYPE ABC-3, BASE COURSE ASPHALT CONCRETE, PER FDOT SECTION 331. SELECT ONE OF THE THREE OPTIONS FOR USE THROUGHOUT THE ENTIRE PROJECT.
2. BACKFILL ABOVE THE SPRING LINE OF THE PIPE SHALL BE GRANULAR SELECT MATERIAL. SELECT MATERIAL IN THIS AREA MAY BE NATIVE MATERIAL AS LONG AS THE MATERIAL WILL PASS THROUGH A 3/8-INCH SIEVE, AND BE FREE OF ROCKS, CLAY AND ORGANIC MATERIAL.
3. IN UNPAVED AREAS, CONSTRUCT BACKFILL TO BOTTOM OF SOD. INSTALL SOD IN AREAS DISTURBED BY CONSTRUCTION. MATCH EXISTING GRADE.
4. MATERIAL ABOVE THE PIPE ZONE TO THE BOTTOM OF THE PAVEMENT ZONE SHALL BE EXCAVATABLE FLOWABLE FILL PER FDOT SECTION 121.
5. INSTALL GEOTEXTILE ALONG ENTIRE LENGTH AND WIDTH OF TRENCH, MIRAFI FW402 OR PRE-APPROVED EQUAL.

CB-12
 -

 TRENCH AND PAVING RESTORATION WITH FLOWABLE FILL
 NOT TO SCALE (REVISED 08/26/15)

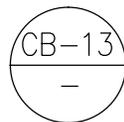
(FOR USE AS DIRECTED BY MIU)

MARCO ISLAND UTILITIES 960 North Collier Blvd. MARCO ISLAND, FL 34145	SCALE: NOT TO SCALE
	DATE: NOVEMBER 2007
	DWG #: CB-12.DWG



NOTES:

1. TOP OF SOD MUST MATCH EXISTING GRADE AND BE BELOW EDGE OF PAVEMENT.
2. CONSTRUCT BACKFILL TO BOTTOM OF SOD, INSTALL SOD IN AREAS DISTURBED BY CONSTRUCTION.



ASPHALT OVERLAY

NOT TO SCALE (REVISED 08/26/15)

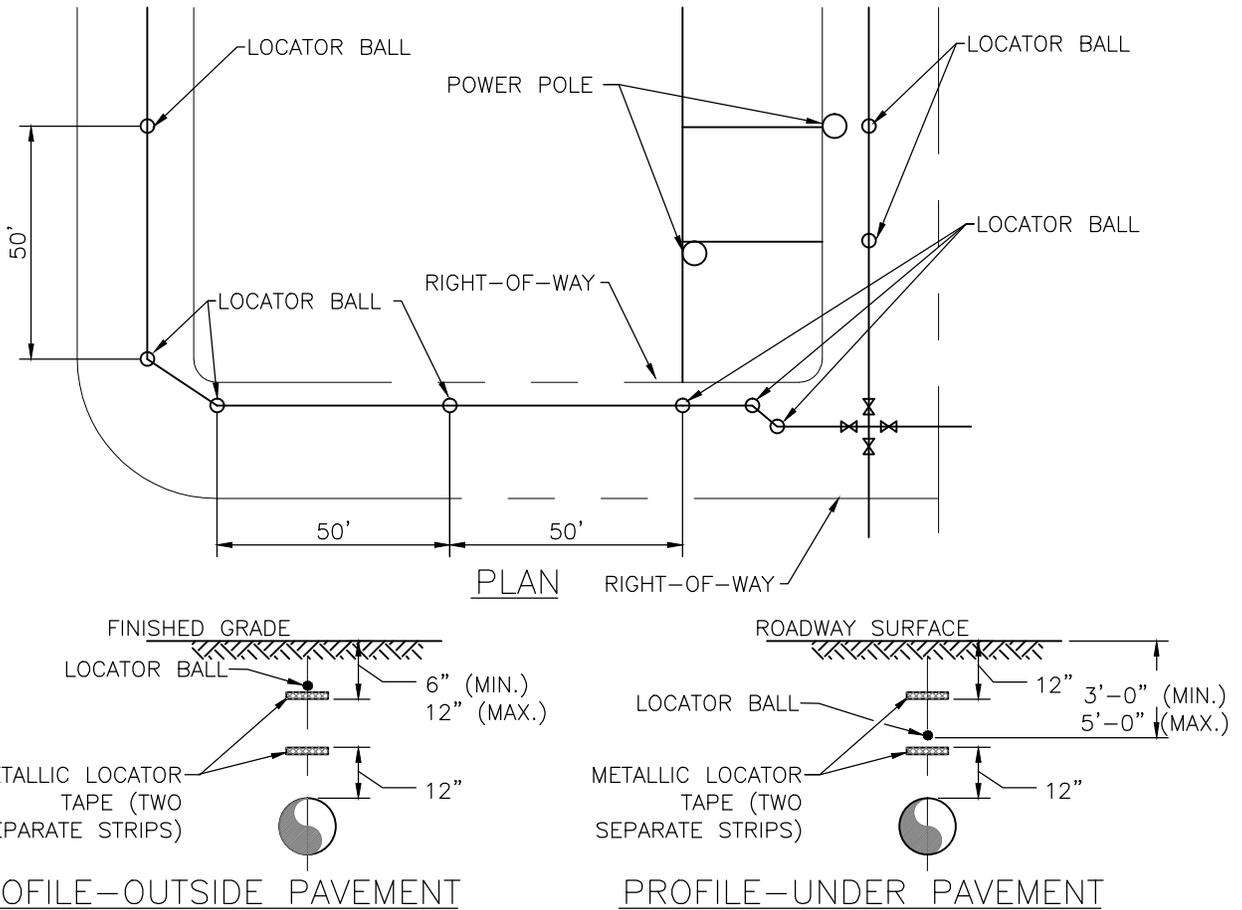
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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: CB-13.DWG



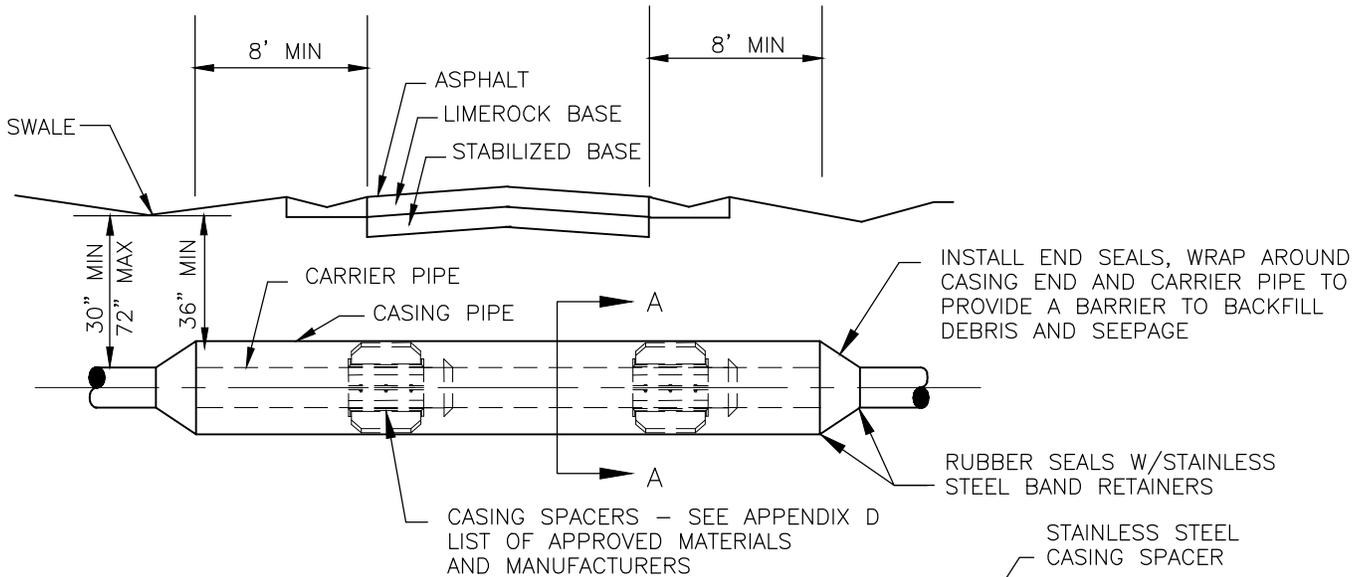
NOTES:

1. LOCATOR MARKERS ARE TO BE 4" BALL MARKER AS MANUFACTURED BY 3M, MODEL 1423-XR/10 FOR WATER (BLUE), 1424-XR/10 FOR WASTEWATER (GREEN) AND 1424-XR/10 FOR REUSE WATER (PINK).
2. PRESSURE MAINS CROSSING ROAD: LOCATE BALLS TO BE PLACED NO MORE THEN 2'-0" FROM OUTSIDE EDGE OF PAVEMENT.
3. MARKERS ARE TO BE INSTALLED AT ALL CHANGE OF DIRECTIONS AND FITTINGS ABSENT OF ANY VALVE. ON STRAIGHT RUNS, MARKERS ARE TO BE INSTALLED EVERY 50'.
4. PROVIDE CONSTRUCTION RECORD DRAWINGS SHOWING THE LOCATION OF PRESSURE MAIN LOCATOR BALLS AND THE BAR CODE FOR EACH BALL.
5. METALLIC LOCATOR TAPE IS REQUIRED ABOVE GRAVITY SEWER MAINS. LOCATOR BALLS ARE NOT REQUIRED ABOVE GRAVITY SEWER MAINS, BUT IS REQUIRED FOR SEWER LATERALS. LDL PLUGS WITH 3M LOCATOR REQUIRED FOR CLEANOUTS. (SEE DETAIL SS-10)
6. TRACE WIRE: CONTINUOUS, SINGLE-STRAND COPPER WIRE, INSULATED, 12 AWG. CLEAR PLASTIC COVERING, IMPRINTED WITH INSCRIPTION DESCRIBING SPECIFIC UTILITY IN LARGE LETTERS. INSTALL TRACE WIRE AT TOP CENTER; PULL WIRE TAUT TO REMOVE ANY SLACK. EXTEND TRACE WIRE TO UTILITY BOXES, MANHOLES AND JUNCTIONS TO ALLOW FOR CONNECTION TO SUBSURFACE LOCATION EQUIPMENT.

CB-14
 -

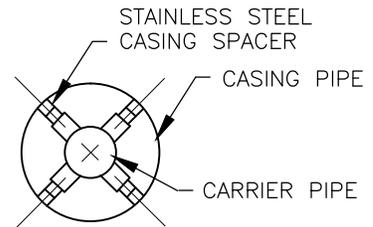
LOCATOR TAPE AND BALL MARKERS FOR PRESSURE MAINS
 NOT TO SCALE (REVISED 08/26/15)

MARCO ISLAND UTILITIES 960 North Collier Blvd. MARCO ISLAND, FL 34145	SCALE: NOT TO SCALE
	DATE: APRIL 2007
	DWG #: CB-14.DWG



NOTES:

1. UNDERGROUND CROSSING REQUIRED A MINIMUM VERTICAL CLEARANCE OF 48" BELOW PAVEMENT SURFACE FOR FREEWAYS, 36" FOR OTHER HIGHWAYS OR 30" BELOW UNPAVED GROUND INCLUDING DITCH GRADE PER F.D.O.T.
2. SEE MIU MANUAL OF STANDARDS AND SPECIFICATIONS FOR STEEL CASING SIZES, WELDING, AND SPACER REQUIREMENTS.



SECTION "A-A"

STAINLESS STEEL CASING SPACERS:

1. GENERAL – ONE SPACER SHALL BE PLACED NOT MORE THAN TWO FEET FROM EACH END OF CASING. SUBSEQUENT SPACERS SHALL BE PLACED AT 6'–10" INTERVALS WITHIN THE THE CASING, OR IN ACCORDANCE WITH PIPE MANUFACTURERS RECOMMENDATIONS.
2. PVC CARRIER – ONE SPACER SHALL BE PLACED ON THE SPIGOT END OF EACH SEGMENT AT THE LINE MARKING THE LIMIT OF INTERSECTION INTO THE BELL. WHEN THE JOINT IS COMPLETE, THE SPACER SHALL BE IN CONTACT WITH THE BELL OF THE JOINT SO THAT THE SPACER PUSHES THE JOINT AND RELIEVES COMPRESSION WITHIN THE JOINT. SUBSEQUENT SPACERS SHALL BE PLACED AT 6'–0" INTERVALS, OR IN ACCORDANCE WITH PIPE MANUFACTURERS RECOMMENDATIONS.



JACK AND BORE

NOT TO SCALE

(REVISED 08/26/15)

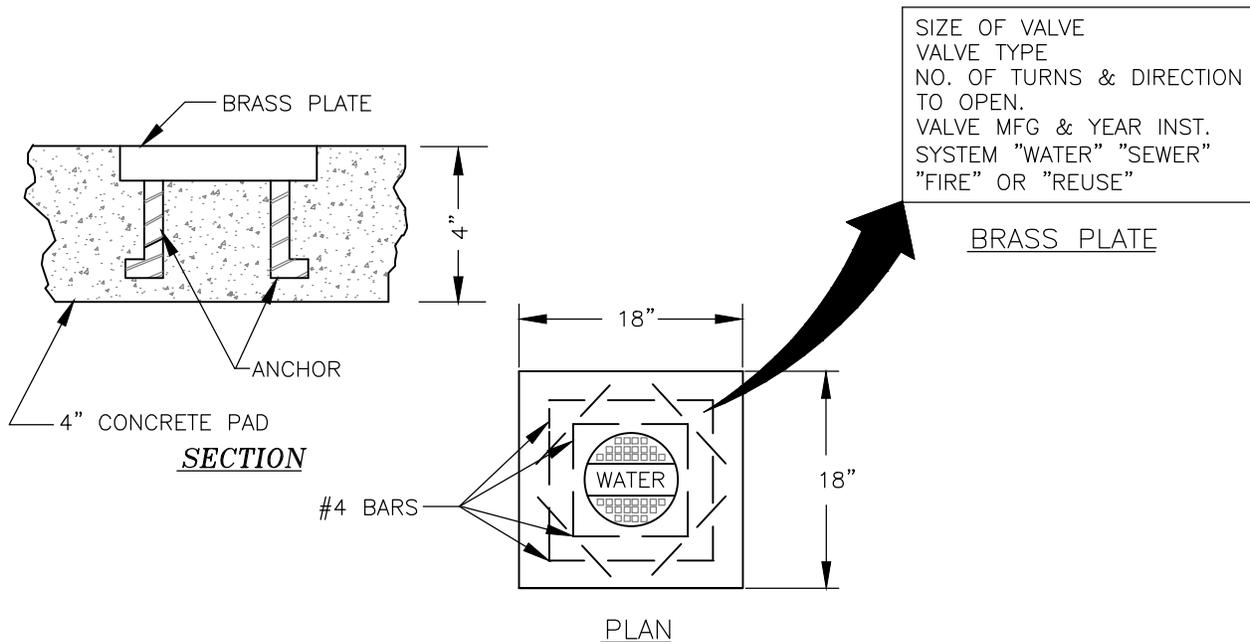
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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: CB-15.DWG



NOTES:

1. ALL VALVE BOX LIDS IN TRAFFIC AREAS ARE TO BE TYLER PIPE LOCKLID OR MIU APPROVED EQUAL.



VALVE PAD

NOT TO SCALE

(REVISED 08/26/15)

**MARCO ISLAND
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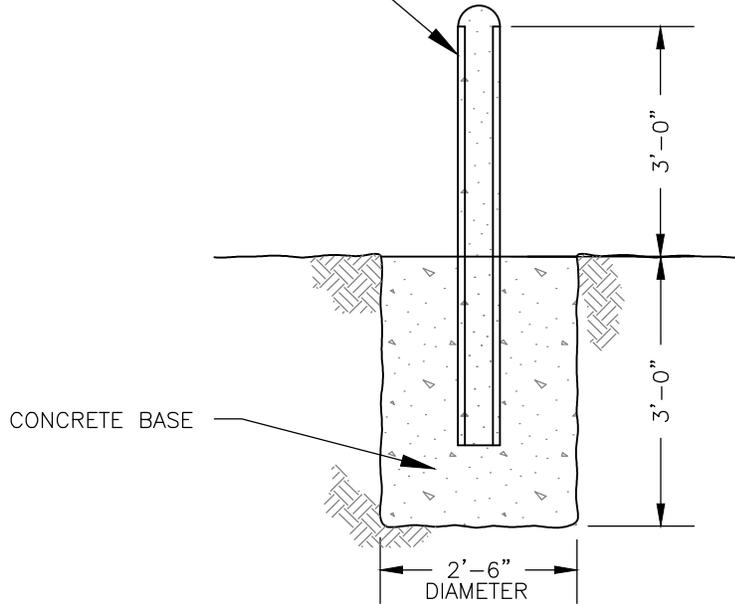
960 North Collier Blvd.
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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: CB-16.DWG

6" CLASS 50 D.I. PIPE
FILLED WITH CONCRETE
PAINT PIPE TWO COATS
STANDARD SAFETY YELLOW



GUARD POST

NOT TO SCALE (REVISED 08/26/15)

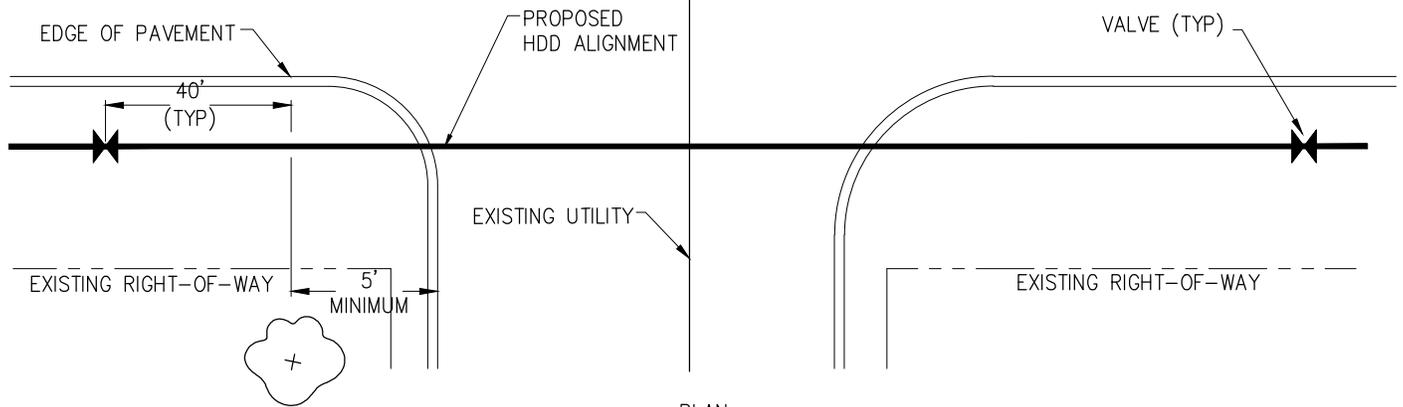
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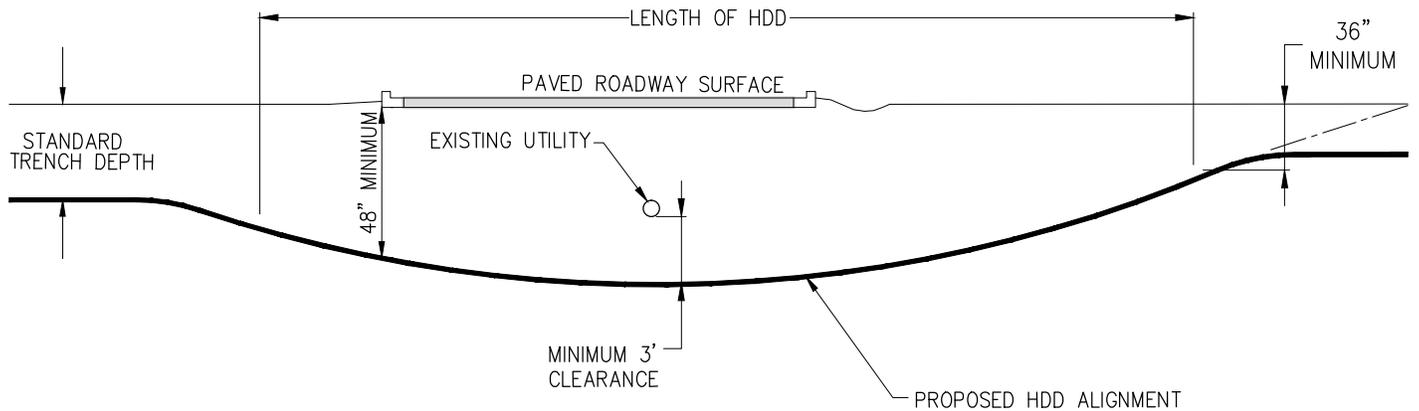
SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: CB-17.DWG



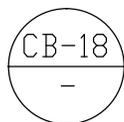
PLAN
HORIZONTAL MINIMUM CLEARANCES



PROFILE
VERTICAL MINIMUM CLEARANCES

HDD INSTALLATION NOTES:

1. ALL MATERIALS SHALL BE IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFICATION OF AFFECTED AGENCIES AND COORDINATION WITH ALL UTILITIES PRIOR TO CONSTRUCTION.
3. ALL CONSTRUCTION MATERIALS, INCLUDING DRILLING FLUID, SHALL BE REMOVED FROM THE SITE PRIOR TO RESTORATION OF DISTURBED AREAS.
4. ALL RESTORATION WORK SHALL BE IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.



TYPICAL HORIZONTAL DIRECTIONAL DRILL

NOT TO SCALE

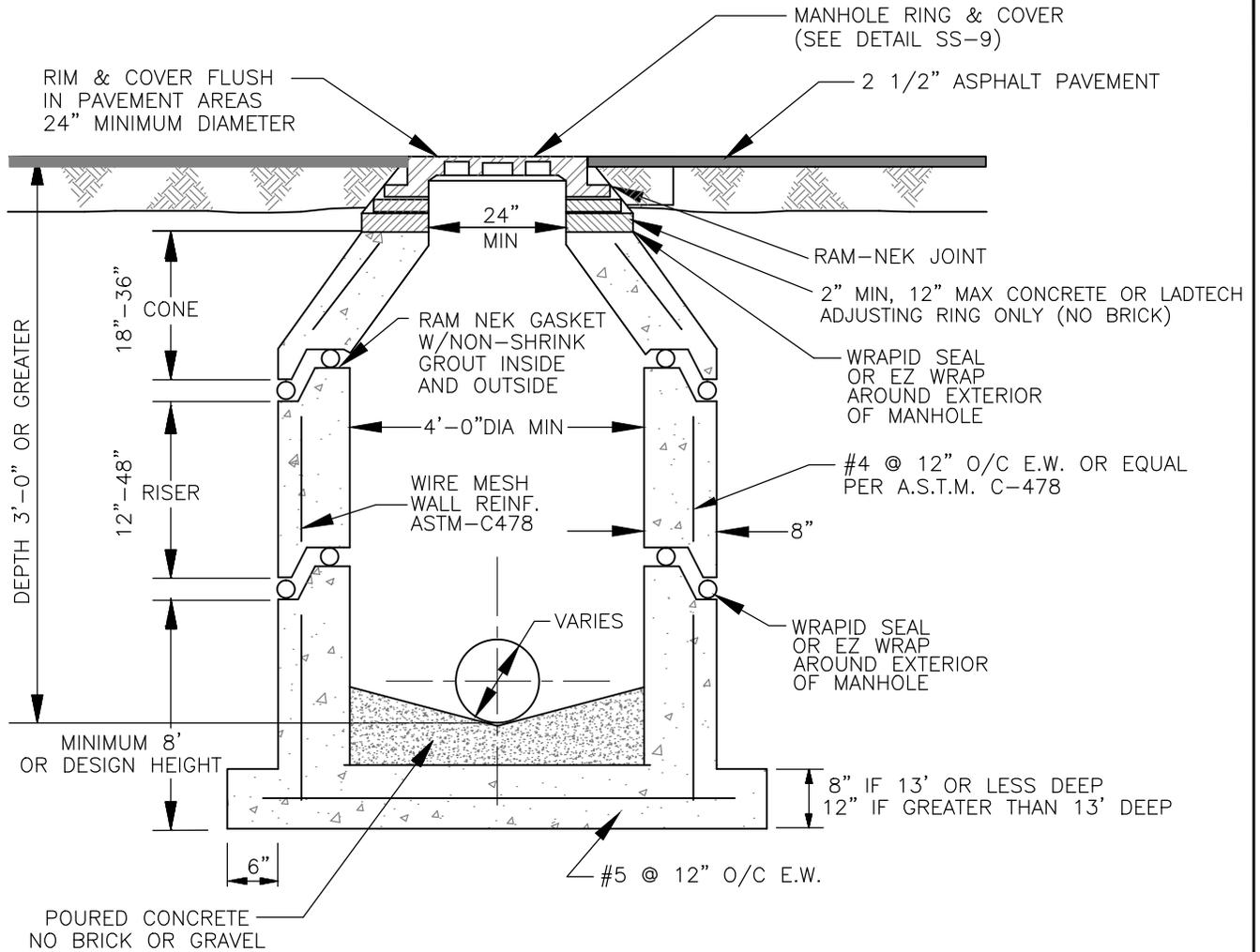
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SCALE: NOT TO SCALE

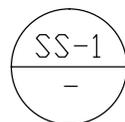
DATE: SEPTEMBER 2015

DWG #: CB-18.DWG



NOTE:

1. COAT INTERIOR OF MANHOLE WITH SYSTEM NO. 33 IET IN NEW STRUCTURE, COAT INTERIOR OF MANHOLE WITH RAVEN 405 OR SPRAY WALL IN EXISTING STRUCTURE WHEN SEWER INVERT IS FROM 1'-0" OR GREATER ABOVE BOTTOM OF MANHOLE.



PRECAST MANHOLE - CONCENTRIC

NOT TO SCALE

(REVISED 08/26/15)

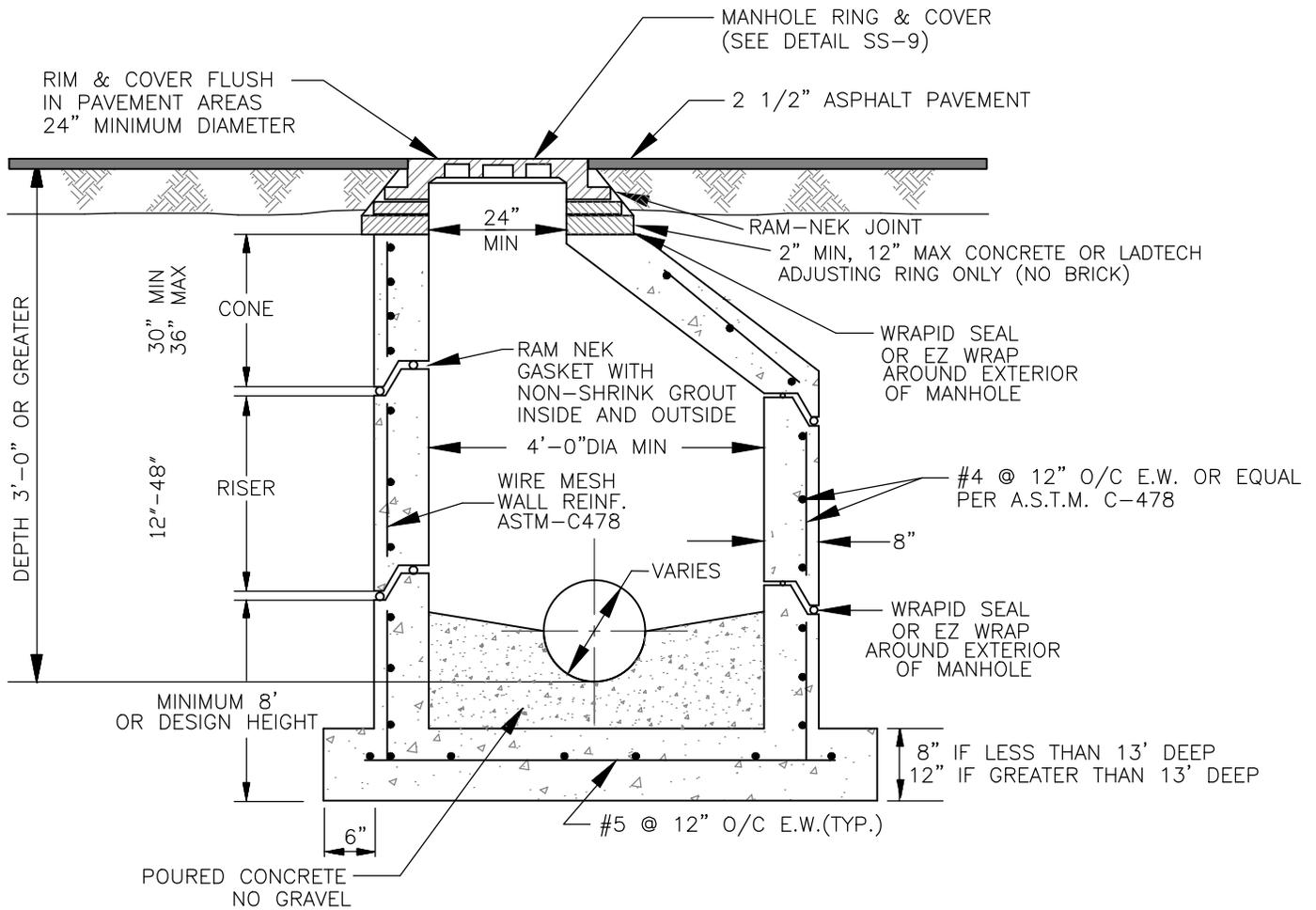
MARCO ISLAND UTILITIES

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SCALE: NOT TO SCALE

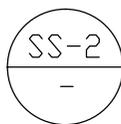
DATE: APRIL 2007

DWG #: SS-1.DWG



NOTE:

1. COAT INTERIOR OF MANHOLE WITH SYSTEM NO. 33 IET IN NEW STRUCTURE, COAT INTERIOR OF MANHOLE WITH RAVEN 405 OR SPRAY WALL IN EXISTING STRUCTURE, WHEN SEWER INVERT IS FROM 1'-0" OR GREATER ABOVE BOTTOM OF MANHOLE.



PRECAST MANHOLE - ECCENTRIC

NOT TO SCALE (REVISED 08/26/15)

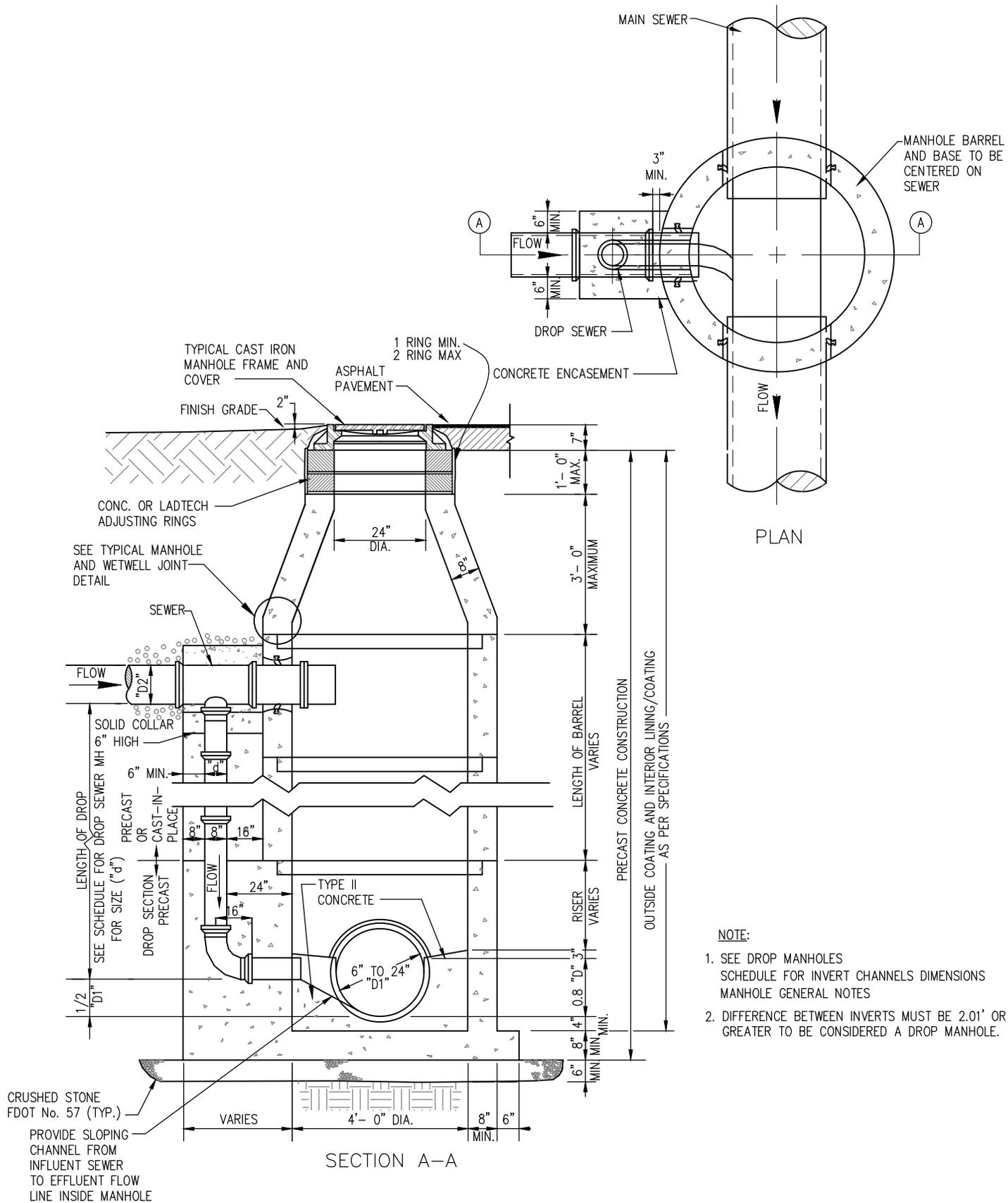
MARCO ISLAND UTILITIES

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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: SS-2.DWG



- NOTE:**
1. SEE DROP MANHOLES SCHEDULE FOR INVERT CHANNELS DIMENSIONS MANHOLE GENERAL NOTES
 2. DIFFERENCE BETWEEN INVERTS MUST BE 2.01' OR GREATER TO BE CONSIDERED A DROP MANHOLE.

SS-3
TYPICAL DROP MANHOLE
 NOT TO SCALE (REVISED 08/26/15)

MARCO ISLAND UTILITIES
 960 North Collier Blvd.
 MARCO ISLAND, FL 34145
 SCALE: NOT TO SCALE
 DATE: APRIL 2007
 DWG #: SS-3.DWG

SCHEDULE FOR DROP MANHOLE

INLET PIPE I.D. DIAMETER "D2"	DROP PIPE DIAMETER "d"
6"	6"
8"	8"
10"	8"
12"	10"
15"	12"
18"	16"
21"	18"
24"	18"

**STANDARD MANHOLE
SCHEDULE OF INVERT CHANNEL DIMENSIONS**

PIPE SIZE	ANGLE Δ	MH DIA.	R	X
6" TO 15"	0° TO 90°	4'-0"	1'-8"	0" TO 10"
8"	90° TO 120°	6'-0"	2'-0"	0" TO 10"
18", 21" & 24"	0° TO 60°	4'-0"	2'-0"	0" TO 4"
18" & 21"	60° TO 90°	5'-0"	2'-0"	4" TO 12"
30"	0° TO 60°	5'-0"	2'-0"	0" TO 6"
24" & 30"	60° TO 90°	6'-0"	2'-0"	6" TO 12"
OTHERS	ENGINEER APPROVED OR EQUAL			

MANHOLE GENERAL NOTES:

1. ALL STUBS FROM MANHOLES AND ENDS OF PIPE TO WHICH CONNECTIONS ARE TO BE MADE UNDER THIS CONTRACT SHALL BE PROVIDED WITH TEMPORARY WATERTIGHT PLUGS OR CAPS AND 3M LOCATOR BALL (GREEN FOR SEWER). ALL STUBS FOR CONNECTIONS TO OTHER CONTRACTS SHALL BE PROVIDED WITH WATERTIGHT PLUGS PLACED FROM INSIDE OF THE MANHOLE. SUCH PLUGS LOCATED AT JUNCTIONS OF TWO CONTRACTS SHALL REMAIN IN PLACE AND SHALL BE REMOVED BY THE SUB-CONTRACTOR ON COMPLETION AND TURN-OVER OF THE CONTRACT. SEWERS WHICH ARE TO BE CONNECTED TO MANHOLES WHICH WILL BE BUILT UNDER OTHER CONTRACTS SHALL BE PROVIDED WITH WATERTIGHT PLUGS AND CAPS. STUBS = ONE PIPE LENGTH.
2. THE SHELF SHALL SLOPE TOWARD THE INVERT CHANNEL AT A MINIMUM OF ONE INCH/FT. BUT A MINIMUM 3 INCH DIFFERENCE SHALL BE MAINTAINED FROM THE 0.8 POINT OF THE CHANNEL TO THE WALL.
3. THE DEPTH OF THE INVERT CHANNEL SHALL BE EQUAL TO 0.8 OF THE LARGEST DIAMETER SEWER IN THE MANHOLE.
4. MANHOLE SECTIONS SHALL BE JOINED TOGETHER WITH DOUBLE RAM NEK, O/E.
5. ALL INSIDE/OUTSIDE SECTIONS FILL WITH NON-SHRINK GROUT.
6. ALL OUTSIDE SECTION SHALL BE SEALED WITH WRAPID SEAL OR EZ WRAP.
7. ALL MANHOLES TO BE CONSTRUCTED OF PRECAST CONCRETE (BASES, BARRELS AND ECCENTRIC CONES) WITH FLEXIBLE RUBBER MANHOLE SLEEVES, PER ASTM C-923 BY KOR-N-SEAL, O/E. PROVIDE COATING ON ALL INSIDE AND OUTSIDE WALLS AND BASES IN ACCORDANCE WITH SPECIFICATIONS. NO BRICK MANHOLES WILL BE ACCEPTED. ALL CONCRETE SHALL BE TYPE II PORTLAND CEMENT.
8. SEE SPECIFICATIONS FOR MATERIAL REQUIREMENTS AND PLACEMENT AND COMPACTION OF PIPE BEDDING AND CRUSHED STONE (SEE TYP. BEDDING DETAILS).
9. REINFORCING FOR PRE-CAST MANHOLES AS PER ASTM C-478 (TYPICAL).
10. CONCRETE FOR MANHOLE STRUCTURE SHALL HAVE A COMPRESSIVE STRENGTH OF NO LESS THAN 4,000 PSI @ 28 DAYS.

SS-4
-

MANHOLE AND DROP MANHOLE SCHEDULE AND GENERAL NOTES

NOT TO SCALE (REVISED 08/26/15)

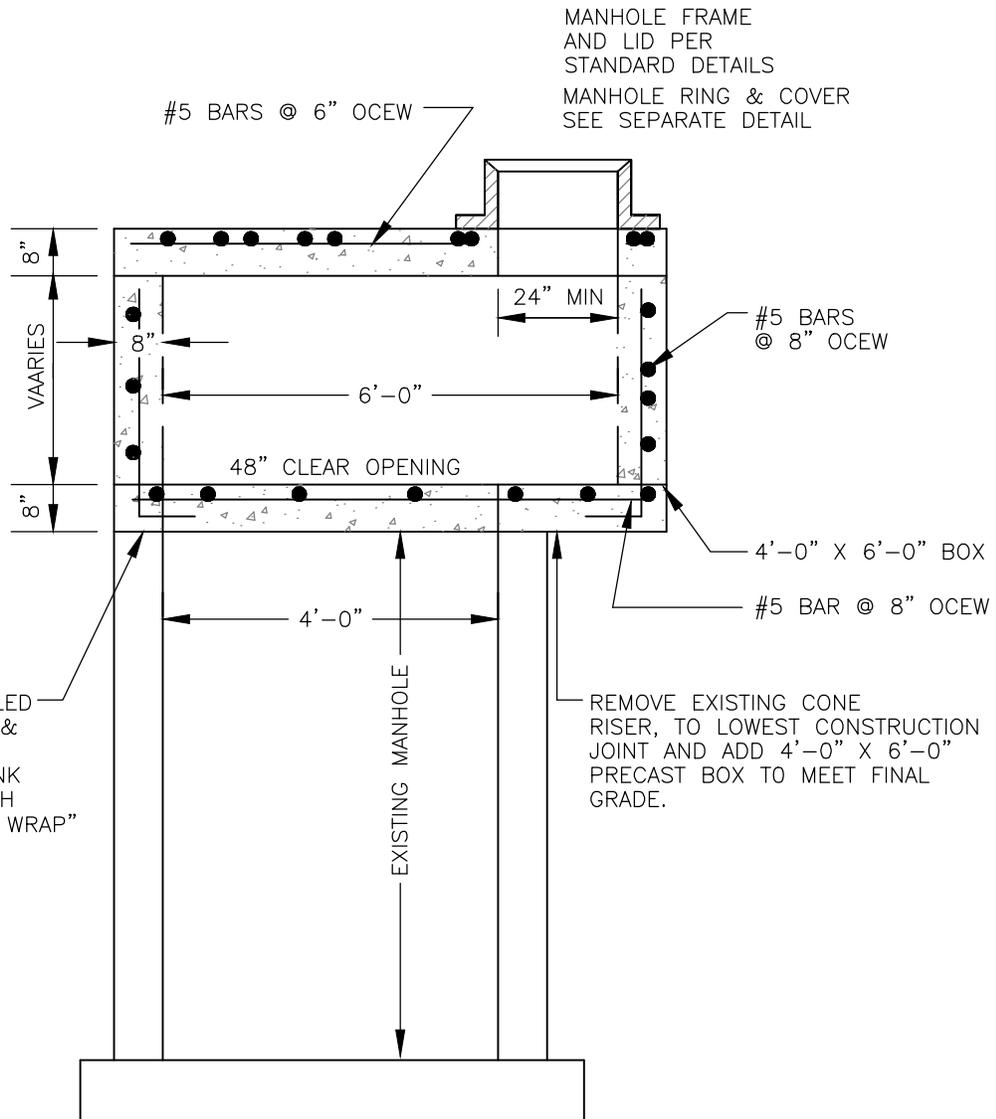
**MARCO ISLAND
UTILITIES**

960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: SS-4.DWG



SS-6 OFFSET MANHOLE RECONSTRUCTION
- NOT TO SCALE (REVISED 08/26/15)

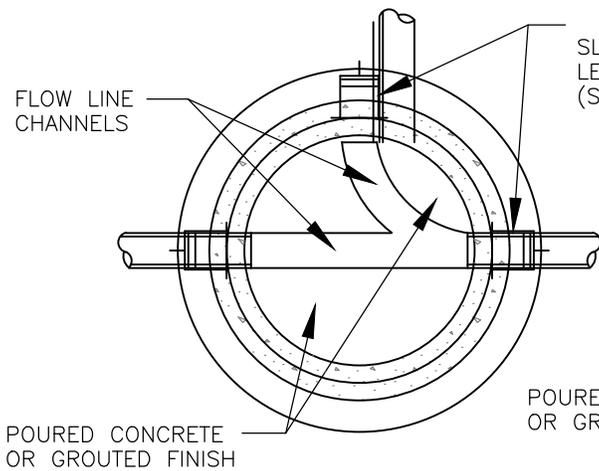
**MARCO ISLAND
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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: SS-6.DWG



FLEXIBLE RUBBER SLEEVE WITH STAIN-LESS STEEL STRAP (SEE DETAIL A)

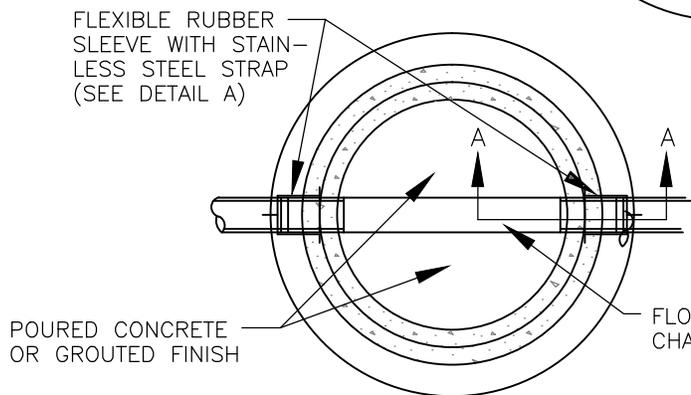
FLOW LINE CHANNELS

POURED CONCRETE OR GROUTED FINISH

FLOW LINE CHANNEL

POURED CONCRETE OR GROUTED FINISH

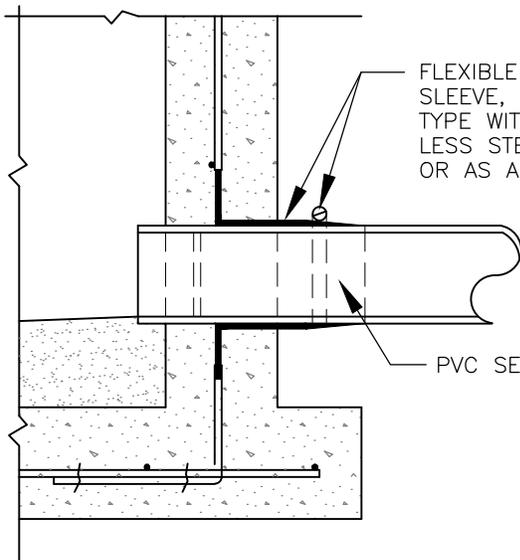
FLEXIBLE RUBBER SLEEVE WITH STAIN-LESS STEEL STRAP (SEE DETAIL A)



FLEXIBLE RUBBER SLEEVE WITH STAIN-LESS STEEL STRAP (SEE DETAIL A)

POURED CONCRETE OR GROUTED FINISH

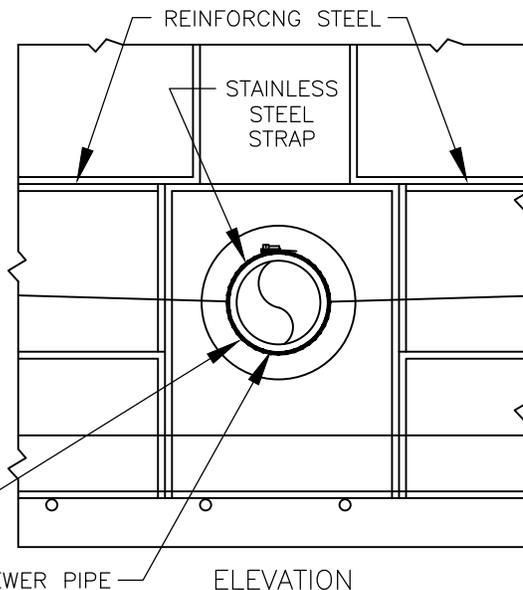
FLOW LINE CHANNEL



SECTION

FLEXIBLE RUBBER SLEEVE, LOCK JOINT TYPE WITH STAIN-LESS STEEL STRAP. OR AS APPROVED

PVC SEWER PIPE



ELEVATION

DETAIL A



FLOW LINE CHANNELS

NOT TO SCALE

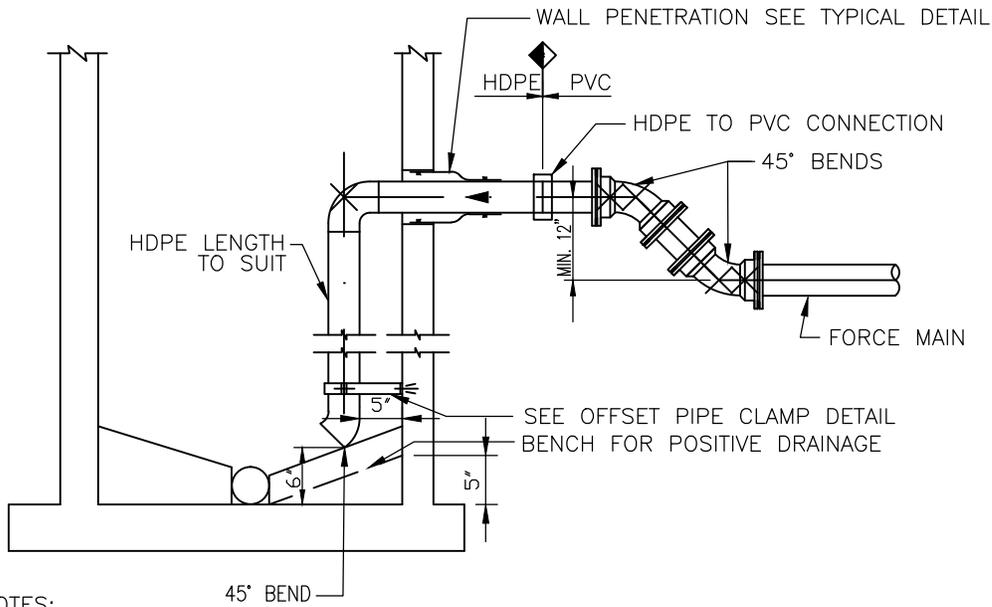
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

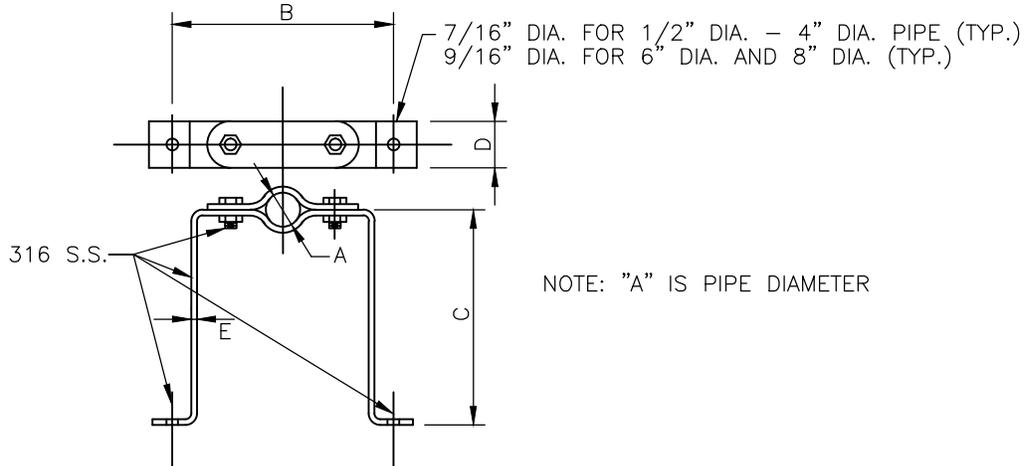
DATE: APRIL 2007

DWG #: SS-7.DWG



NOTES:

1. ALL PIPE INSIDE THE MANHOLE WILL BE HDPE OR PVC.
2. RESTRAIN PIPE PER RESTRAINT JOINT SCHEDULE DETAIL.
3. IET COATING INSIDE OF MANHOLE FOR NEW OR LIGHTLY COATED MANHOLE, RAVEN 405 OR SPRAY WALL FOR MODERATE OR SEVERELY DETERIORATED MANHOLES.



NOTE: "A" IS PIPE DIAMETER

DIM.	PIPE SIZE			
A	1/2"-2"	2"-4"	4"-6"	8"
B	6 1/4"	10"	14"	19"
C	5"+B/2	5"+B/2	5"+A/2	5"+A/2
D	1 1/4"	2"	3"	3"
E	3/16"	5/16"	3/8"	3/4"
C/C SPACING	4'-0"	6'-0"	8'-0"	8'-0"

OFFSET PIPE CLAMP DETAIL

SS-8
-

FORCE MAIN CONNECTION TO MANHOLE WITH INSIDE DROP

NOT TO SCALE (REVISED 08/26/15)

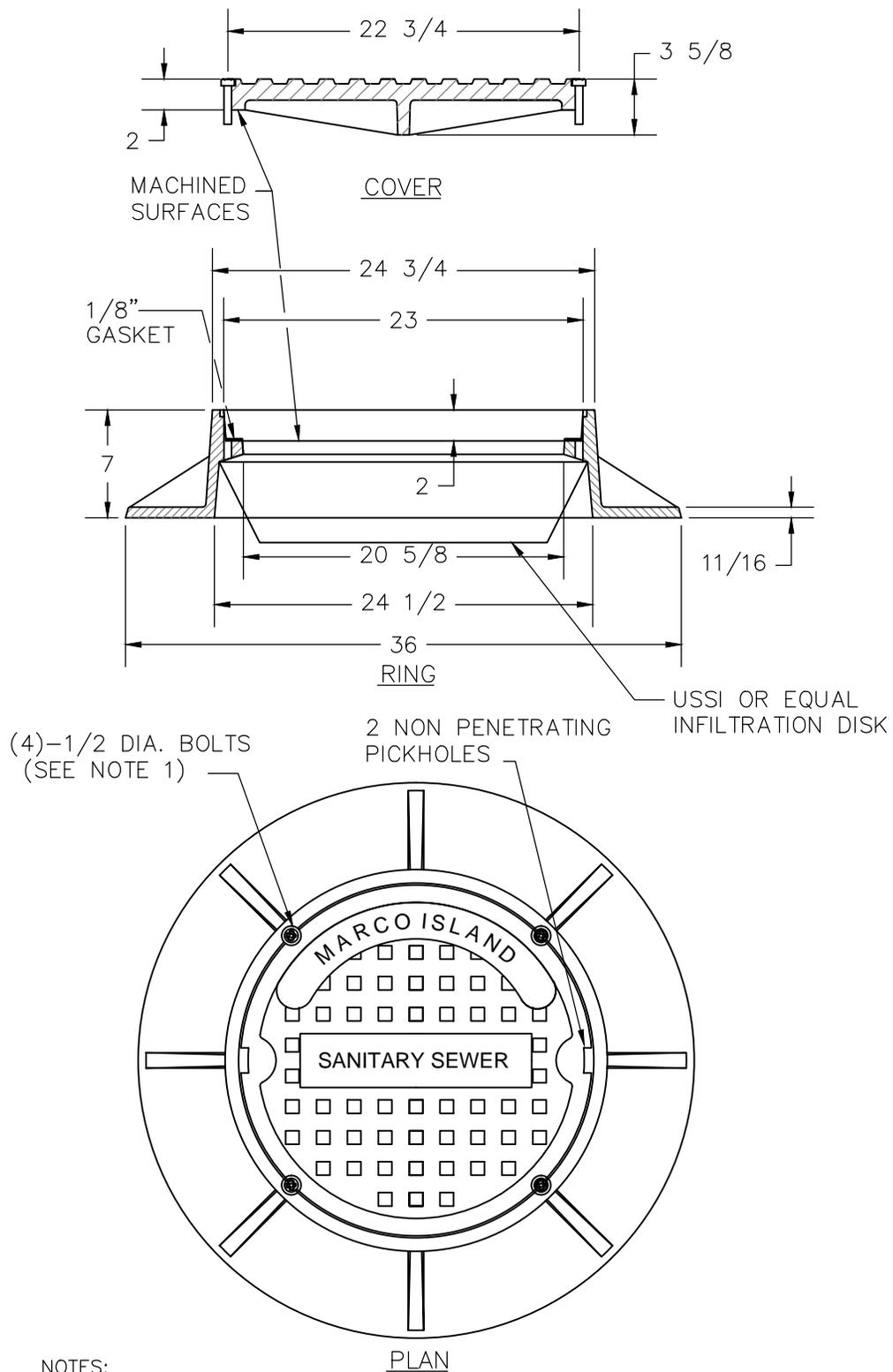
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: SS-8.DWG



(4)-1/2 DIA. BOLTS
(SEE NOTE 1)

2 NON PENETRATING
PICKHOLES

USSI OR EQUAL
INFILTRATION DISK

NOTES:

1. 1/2" DIA. 304 S/S HEX HEAD BOLTS DRILLED AND COUNTERSUNK TO ACCOMODATE REPLACING WITH MCGARD SECURITY BOLTS. (MCGARD BOLTS BY OWNER)
2. APPLY ANTI-SEIZE COMPOUND TO BOLTS PRIOR TO INSTALLATION.

SS-9
-

MANHOLE RING & COVER

NOT TO SCALE (REVISED 08/26/15)

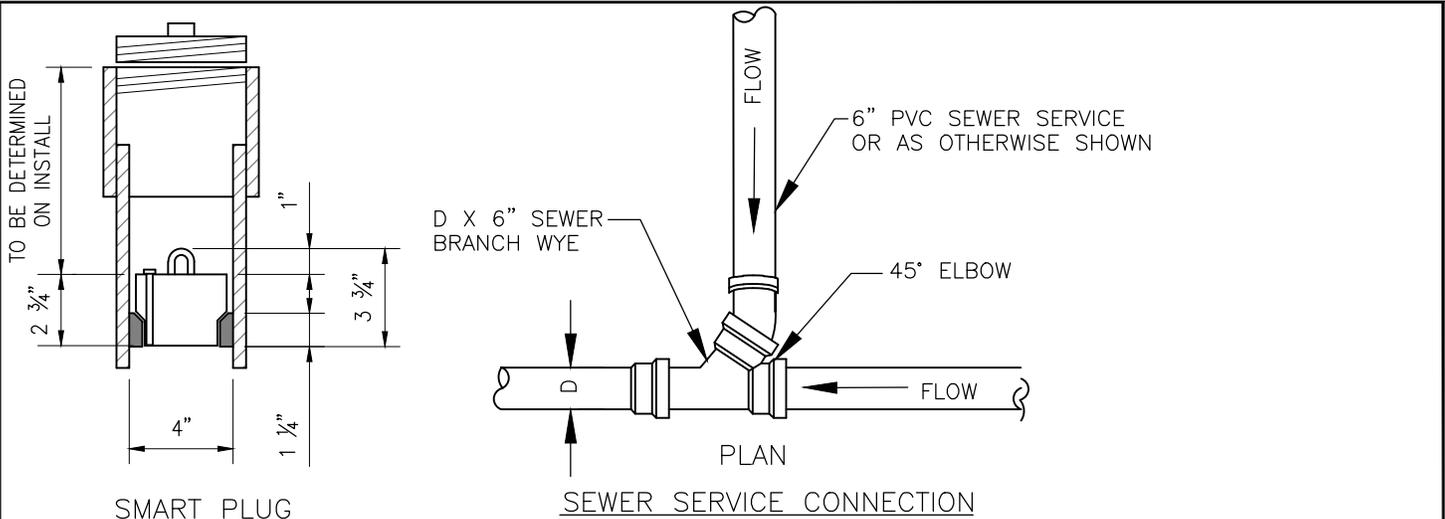
**MARCO ISLAND
UTILITIES**

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SCALE: NOT TO SCALE

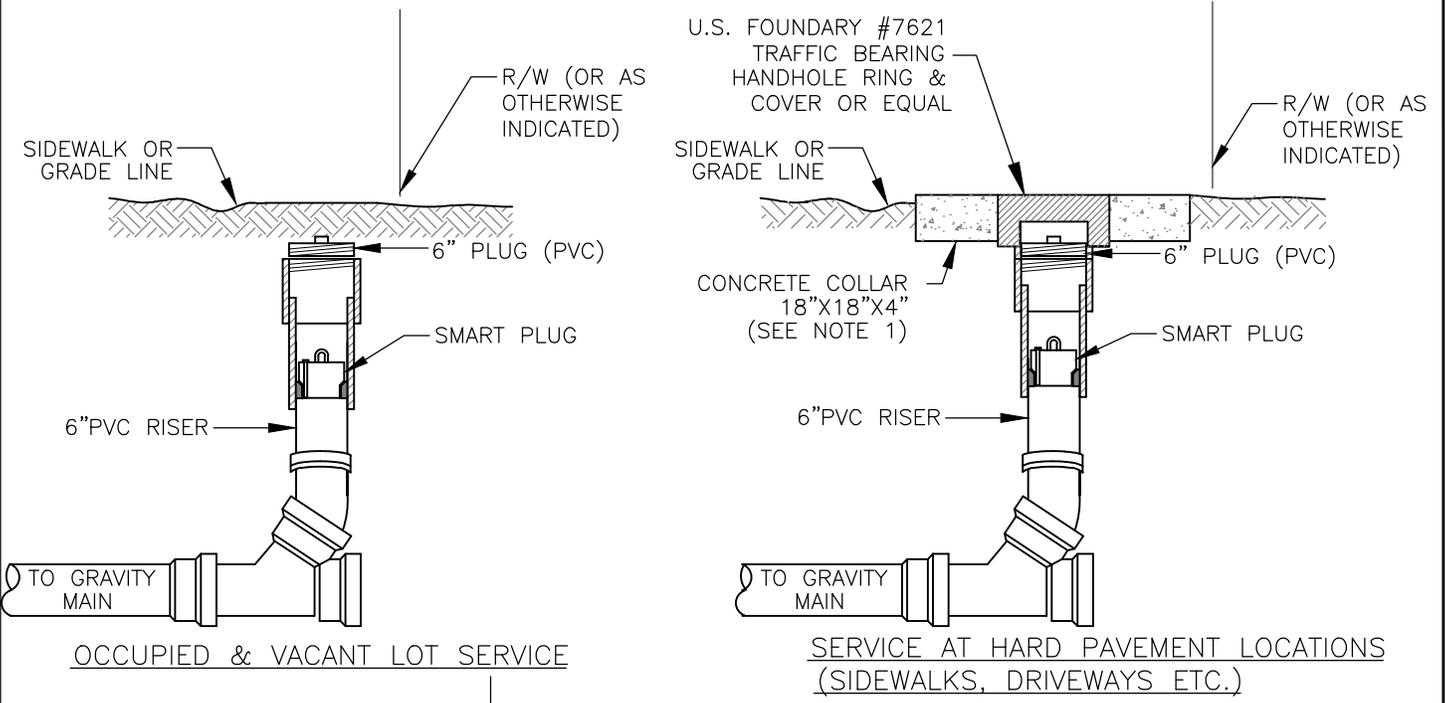
DATE: APRIL 2007

DWG #: SS-9.DWG



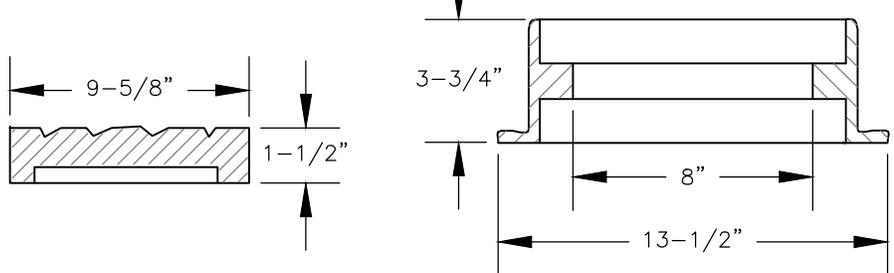
SMART PLUG

SEWER SERVICE CONNECTION

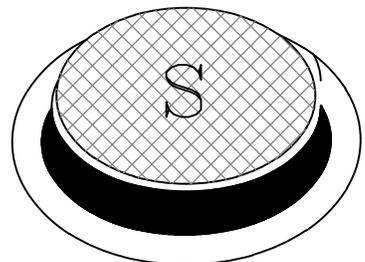


OCCUPIED & VACANT LOT SERVICE

SERVICE AT HARD PAVEMENT LOCATIONS (SIDEWALKS, DRIVEWAYS ETC.)



HANDHOLE RING & COVER



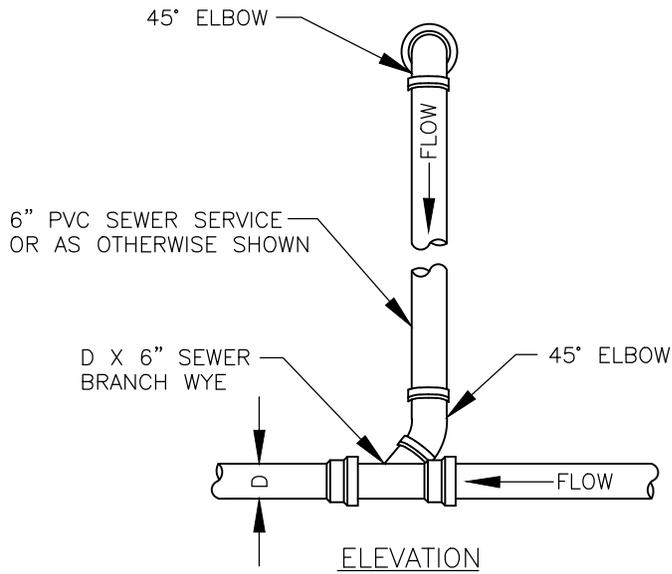
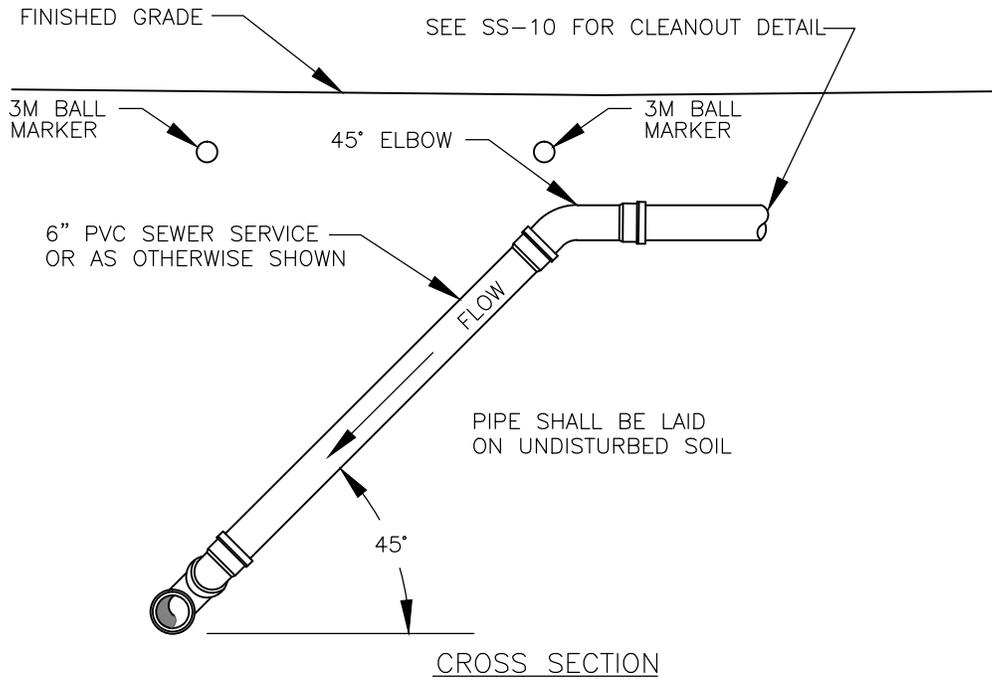
COVERS MARKED WITH "S"

NOTES:
 1. FURNISH AND INSTALL SMART PLUG IN EACH CLEANOUT ASSEMBLY. AS SUPPLIED BY USSI (SOLE SOURCE); UTILITY SEALING SERVICES, INC. 752 COMMERCE DRIVE-STE 15 VENICE, FLORIDA. TEL. 941-926-2646
 2. CONCRETE COLLAR TO BE INSTALLED AT HARD PAVEMENT AREAS ONLY (SIDEWALKS, DRIVEWAYS ETC.) AS DIRECTED BY OWNER.

SS-10 CLEANOUT ASSEMBLY
 NOT TO SCALE

MARCO ISLAND UTILITIES
 960 North Collier Blvd.
 MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE
 DATE: OCTOBER 2009
 DWG #: SS-10.DWG



SS-11
-

SEWER CONNECTION FOR DEPTHS OVER 8 FEET

NOT TO SCALE (REVISED 08/26/15)

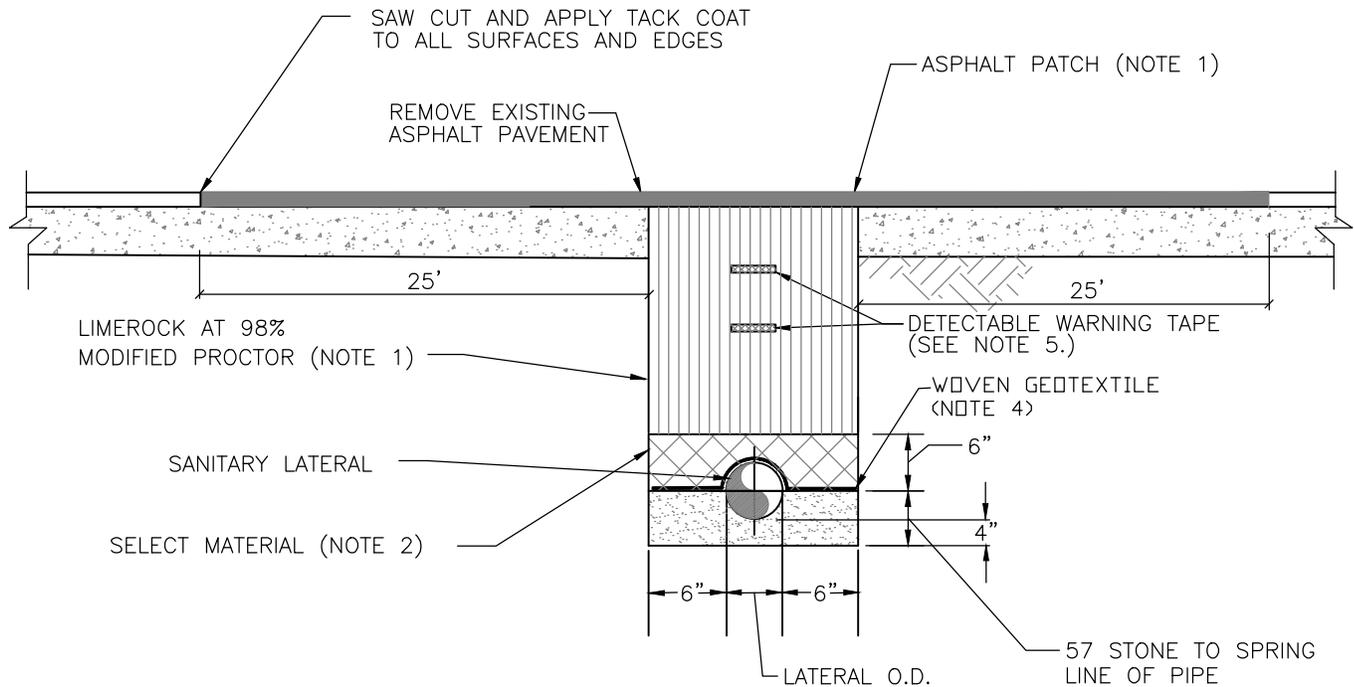
**MARCO ISLAND
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960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: SS-11.DWG



NOTES:

1. IN LIEU OF LIMEROCK AND ASPHALT CONCRETE FOR TRENCH BASE RESTORATION, ONE OF THE FOLLOWING TWO OPTIONS MAY BE SELECTED: (1) PROVIDE 12 INCHES MINIMUM THICKNESS OF EXCAVATABLE FLOWABLE FILL PER FDOT SECTION 121 OR (2) PROVIDE 6 INCHES MINIMUM OF TYPE ABC-3, BASE COURSE ASPHALT CONCRETE, PER FDOT SECTION 331. SELECT ONE OF THE THREE OPTIONS FOR USE THROUGHOUT THE ENTIRE PROJECT.
2. COMPACTED GRANULAR SELECT MATERIAL FREE OF ROCKS, CLAY, AND ORGANIC MATERIAL. MATERIAL SHALL PASS THROUGH A 3/8" SIEVE.
3. IN UNPAVED AREAS, CONSTRUCT BACKFILL TO BOTTOM OF SOD. INSTALL SOD IN AREAS DISTURBED BY CONSTRUCTION. MATCH EXISTING GRADE.
4. INSTALL GEOTEXTILE IN PAVED AREAS ALONG THE ENTIRE LENGTH AND WIDTH OF TRENCH. MIRAFLI FW402 OR PRE-APPROVED EQUAL.
5. INSTALL DETECTABLE WARNING TAPE ABOVE LATERAL IN ACCORDANCE WITH DETAIL CB-14.
6. INSTALL LOCATOR BALLS ABOVE LATERAL IN ACCORDANCE WITH DETAILS SS-20 THROUGH SS-23.



CUSTOMER SANITARY LATERAL TRENCH RESTORATION

NOT TO SCALE (REVISED 08/26/15)

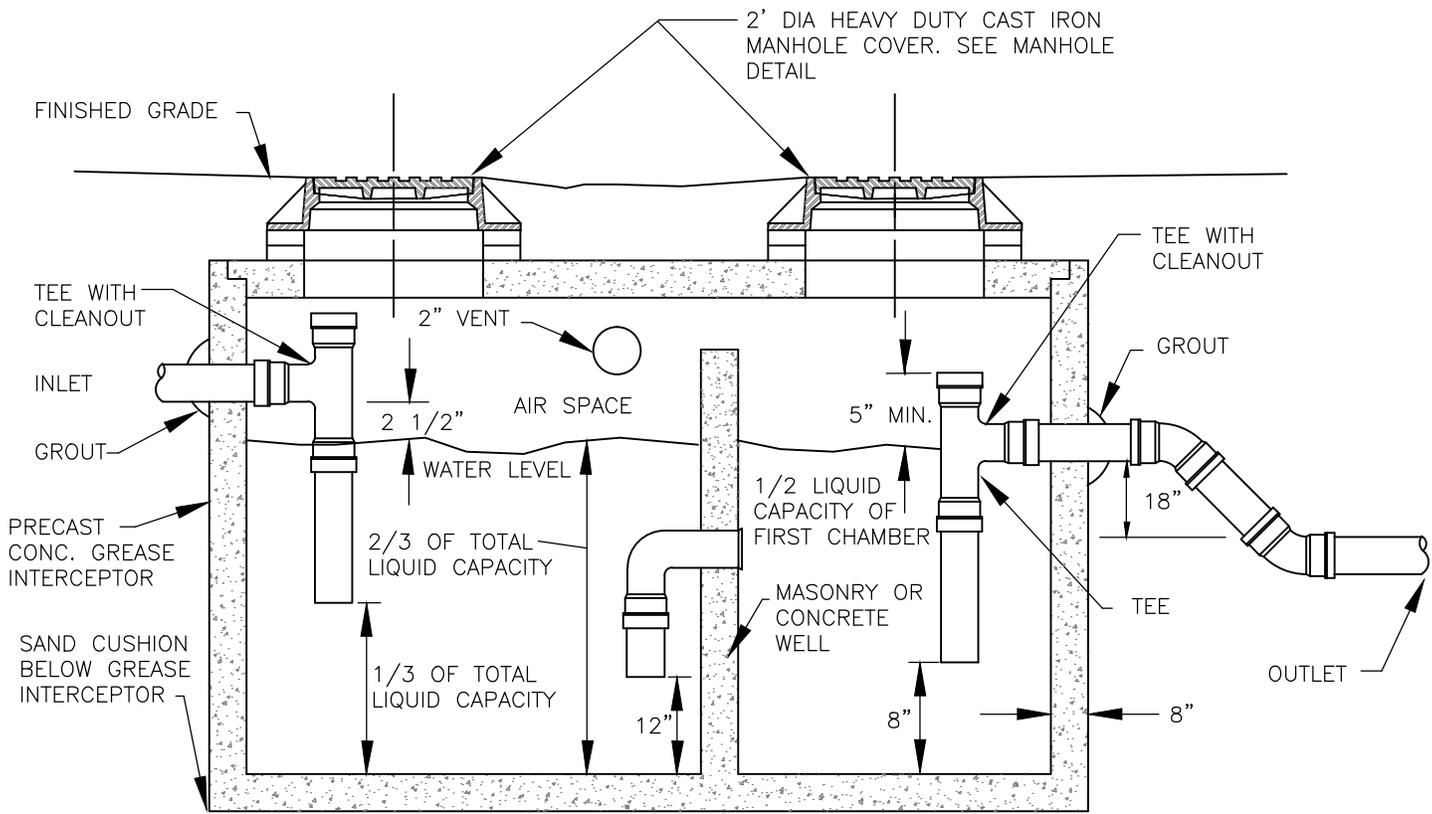
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: APRIL 2007

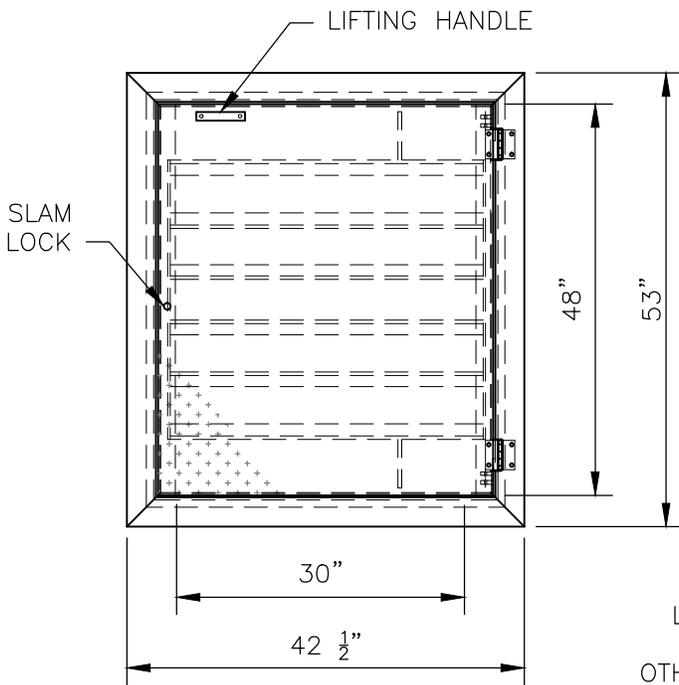
DWG #: SS-12.DWG



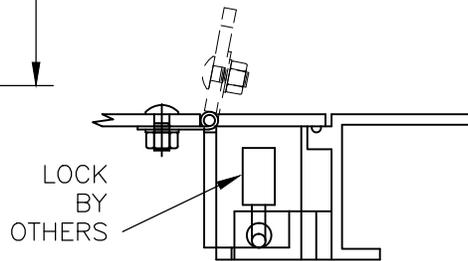
NOTE: REFERENCE SIZING REQUIREMENTS WITHIN STANDARD SPECIFICATIONS

SS-13 GREASE INTERCEPTOR
 NOT TO SCALE

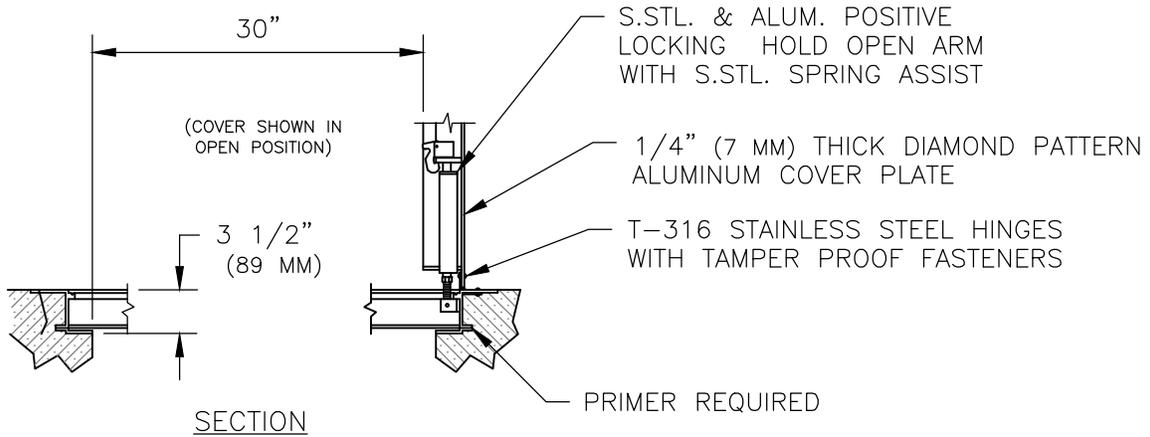
MARCO ISLAND UTILITIES 960 North Collier Blvd. MARCO ISLAND, FL 34145	SCALE: NOT TO SCALE
	DATE: APRIL 2007
	DWG #: SS-13.DWG



NOTES:
 1) HALLIDAY PRODUCTS
 MODEL H1W3048.
 2) SUITABLE FOR USE IN OFF STREET
 LOCATION WHERE NOT SUBJECTED TO
 HIGH DENSITY TRAFFIC.



RECESSED LOCK BOX

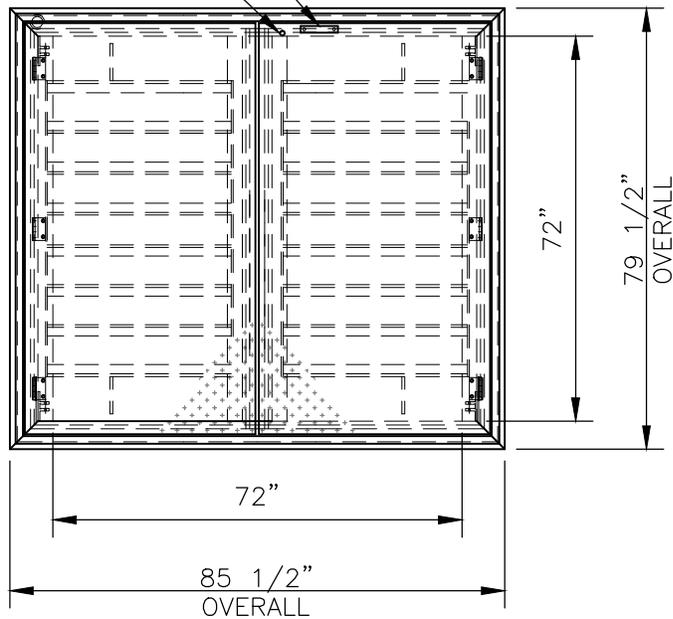


SECTION

SS-14 *LIFT STATION WET WELL ACCESS DOOR*
 - NOT TO SCALE

MARCO ISLAND UTILITIES 960 North Collier Blvd. MARCO ISLAND, FL 34145	SCALE: NOT TO SCALE
	DATE: APRIL 2007
	DWG #: SS-14.DWG

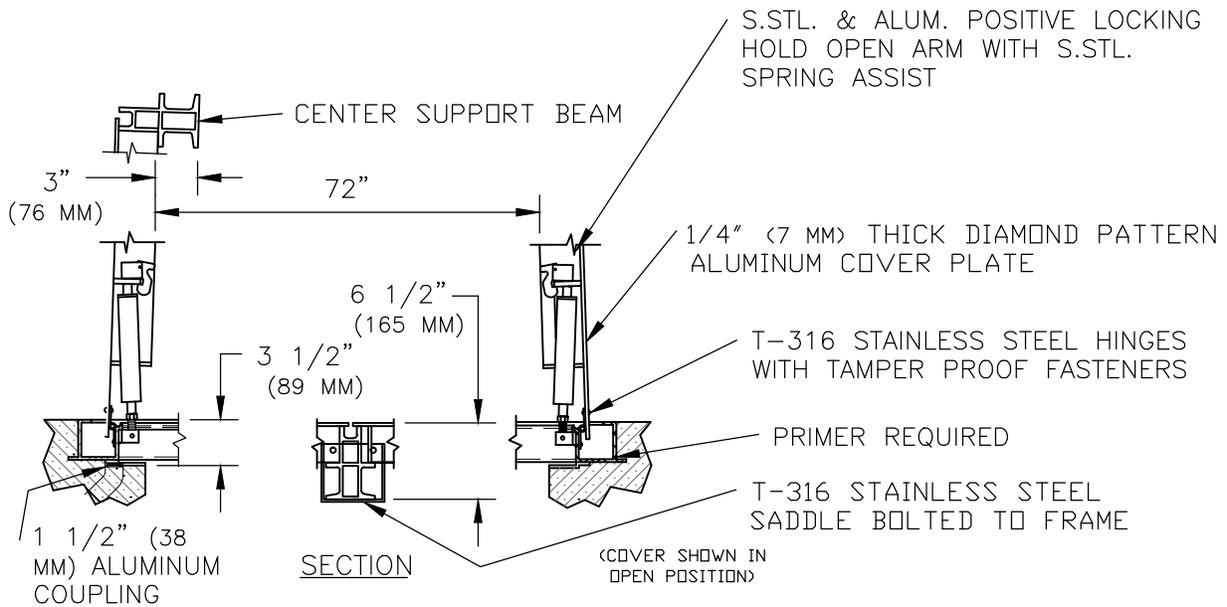
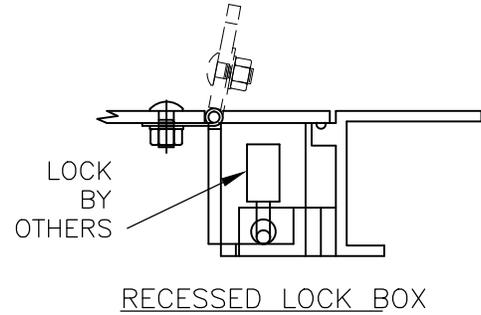
SLAM LOCK LIFTING HANDLE



NOTES:

1) HALLIDAY PRODUCTS
MODEL H2W7272.

2) SUITABLE FOR USE IN OFF STREET
LOCATION WHERE NOT SUBJECTED TO
HIGH DENSITY TRAFFIC.



SS-15
-

LIFT STATION VALVE VAULT ACCESS DOOR

NOT TO SCALE

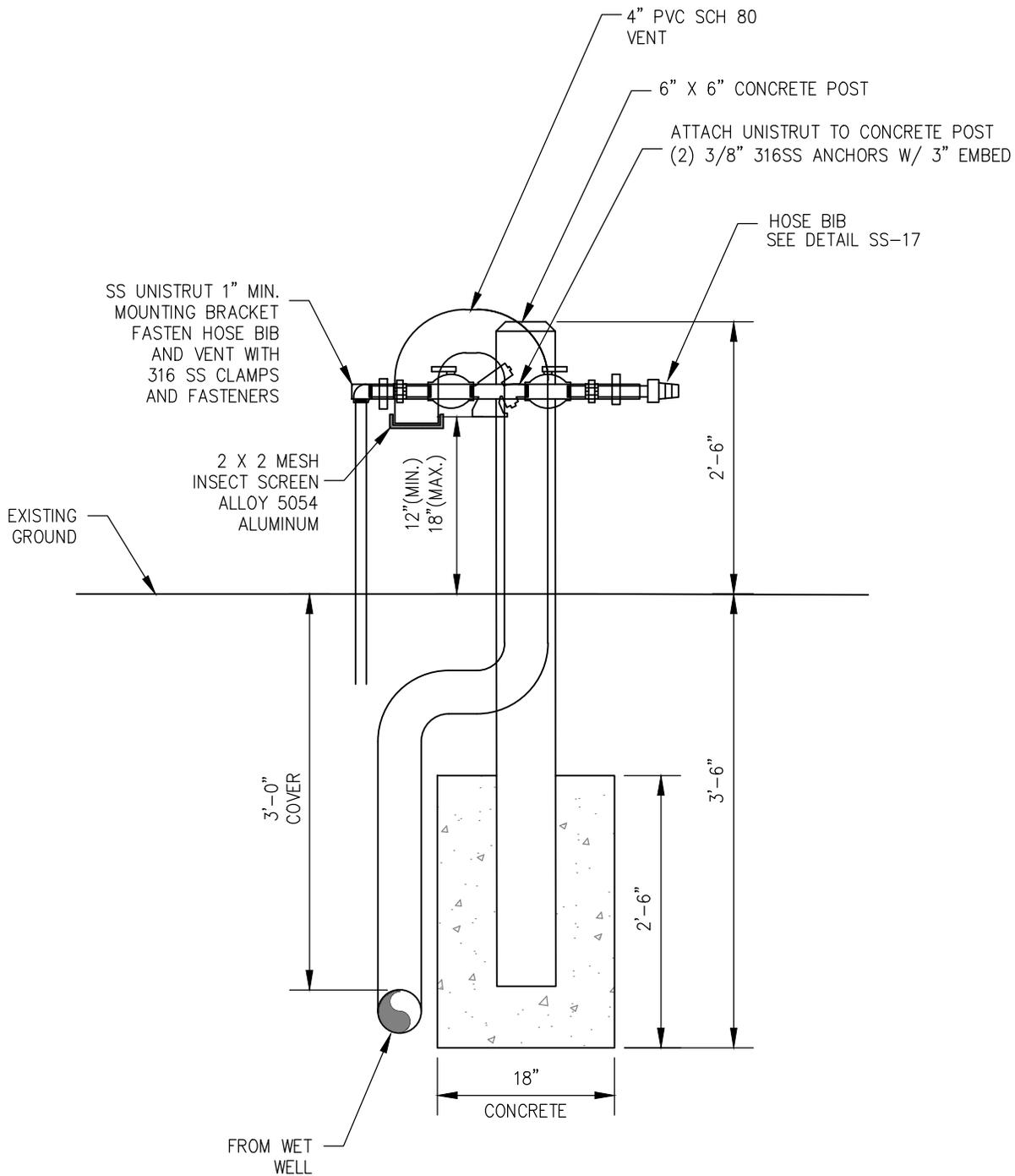
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: SS-15.DWG



SS-16
—

LIFT STATION HOSE BIB AND VENT MOUNTING

NOT TO SCALE

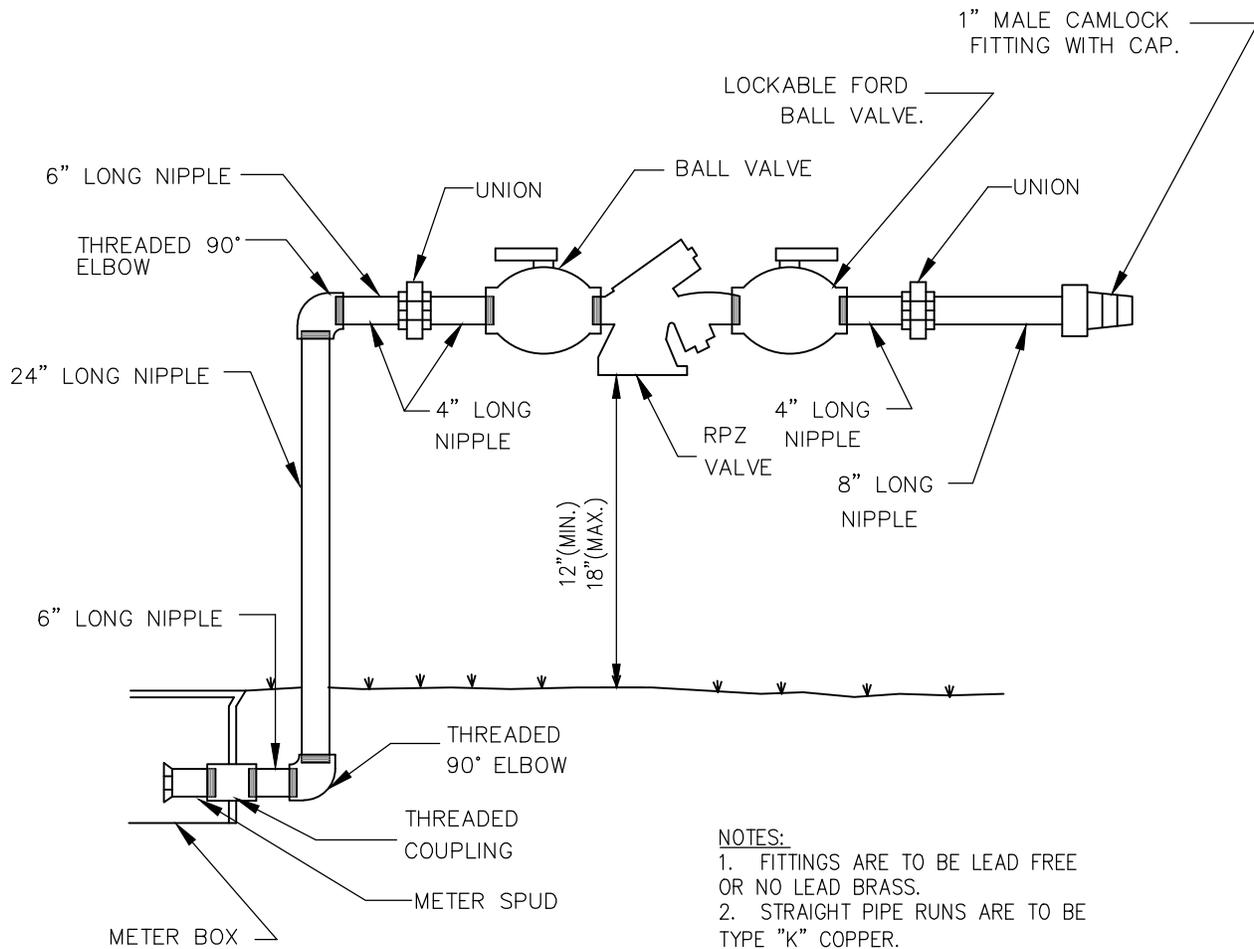
**MARCO ISLAND
UTILITIES**

960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: OCTOBER 2009

DWG #: SS-16.DWG



- NOTES:**
1. FITTINGS ARE TO BE LEAD FREE OR NO LEAD BRASS.
 2. STRAIGHT PIPE RUNS ARE TO BE TYPE "K" COPPER.
 3. ALL PIPING IS 1" DIA.
 4. SEE SS-16 FOR PIPE SUPPORTS.

SS-17 *LIFT STATION HOSE BIB*
 — NOT TO SCALE (REVISED 08/26/15)

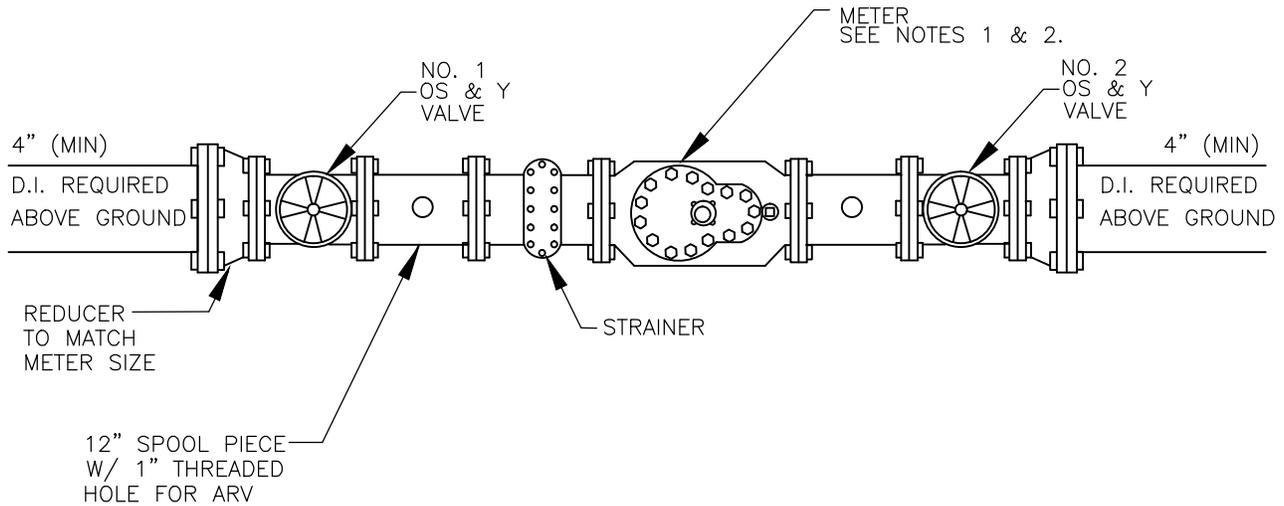
MARCO ISLAND UTILITIES

960 North Collier Blvd.
 MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: OCTOBER 2009

DWG #: SS-17.DWG

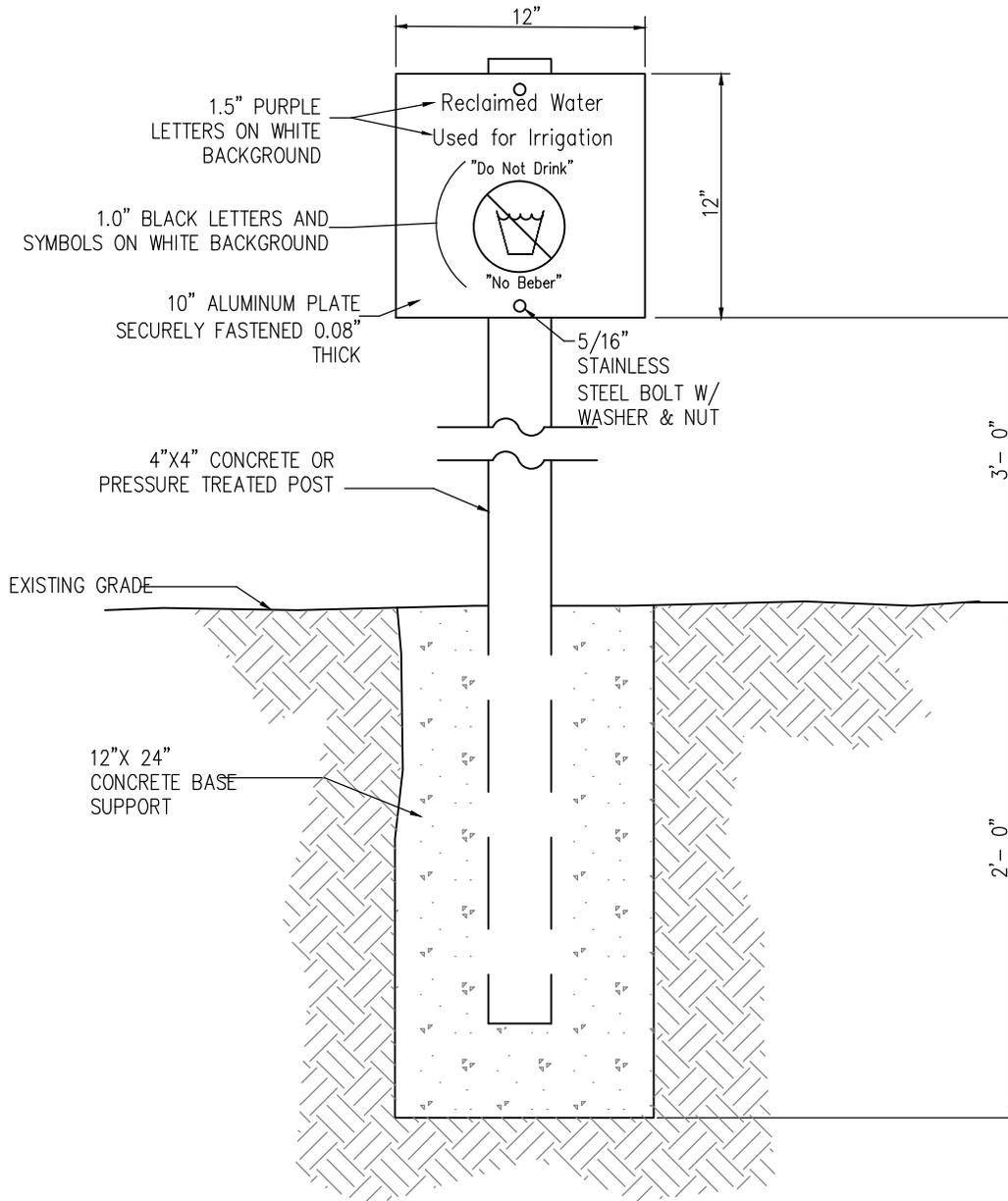


NOTES:

1. METER SIZE DETERMINES CONFIGURATION SIZE BETWEEN NO. 1 AND NO. 2 VALVE.
2. METER TO BE SENSUS OR NEPTUNE TOUCH PAD READ REGISTER ONLY.
3. ENTIRE APPARATUS TO BE PAINTED WITH UV RATED PAINT. (EXCEPT METER), PURPLE FOR NON-POTABLE SERVICE.
4. NO. 1 VALVE ON MAIN LINE TO BE CHAIN LOCKED IN OPEN POSITION THROUGH YOKE AND HANDWHEEL. LOCK TO BE FURNISHED BY MIU.
5. SUPPORTS TO BE 316 SS, ADJUSTABLE.
6. ALL ABOVE GRADE GATE VALVES SHALL BE RESILIENT SEAT, HAND WHEEL, OUTSIDE STEM & YOKE (OS&Y) TYPE.
7. INSTALL NON-POTABLE WATER SIGN. (SEE DETAIL SS-20).
8. SEE DETAIL BF-4 FOR PIPE SUPPORT AND CONCRETE PAD DETAILS.

SS-18 3" AND LARGER NON-POTABLE AND RAW WATER METER ASSEMBLY
 - NOT TO SCALE (REVISED 08/26/15)

MARCO ISLAND UTILITIES 960 N. COLLIER BLVD. MARCO ISLAND, FL 34145	SCALE: NOT TO SCALE
	DATE: APRIL 2007
	DWG #: SS-18.DWG



SS-19 NON-POTABLE WATER SIGN
NOT TO SCALE

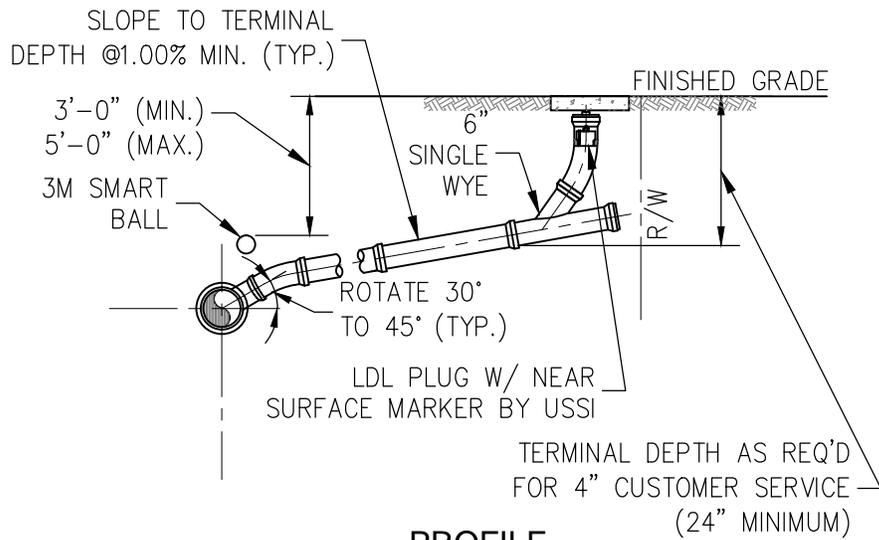
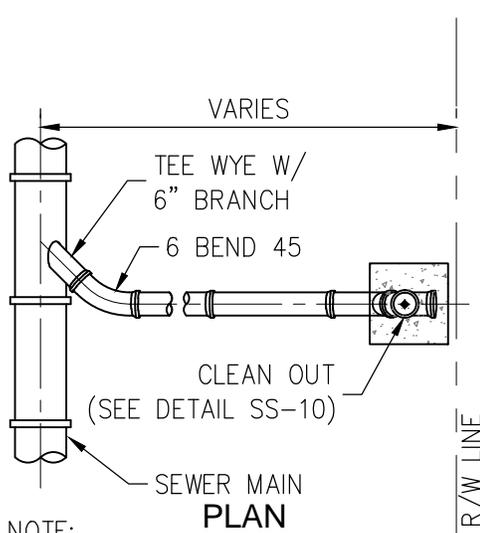
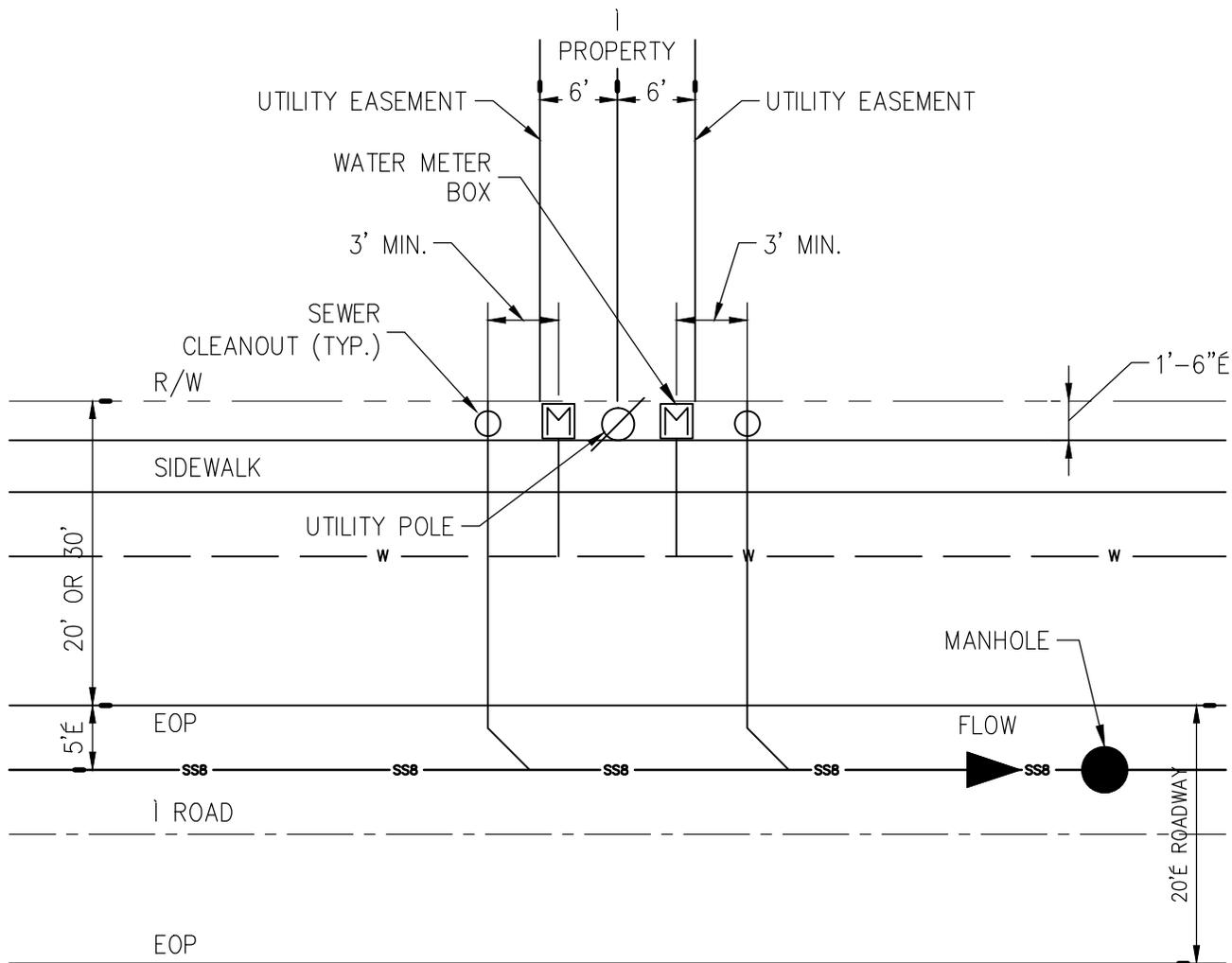
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: SS-19.DWG



NOTE:

1. LATERALS AND FITTINGS TO BE 6" PVC SDR 26.
2. INSTALL METALLIC LOCATOR TAPE ABOVE ALL LATERALS IN ACCORDANCE WITH DETAIL CB-14.
3. PROVIDE CONSTRUCTION RECORD DRAWINGS SHOWING THE LOCATION OF LOCATOR BALLS, THE BAR CODE, AND STREET ADDRESS FOR LOT FOR WHICH THE LATERAL AND LOCATOR BALLS WERE INSTALLED.

SS-20 SINGLE SEWER SERVICE CONNECTION
 NOT TO SCALE (REVISED 08/26/15)

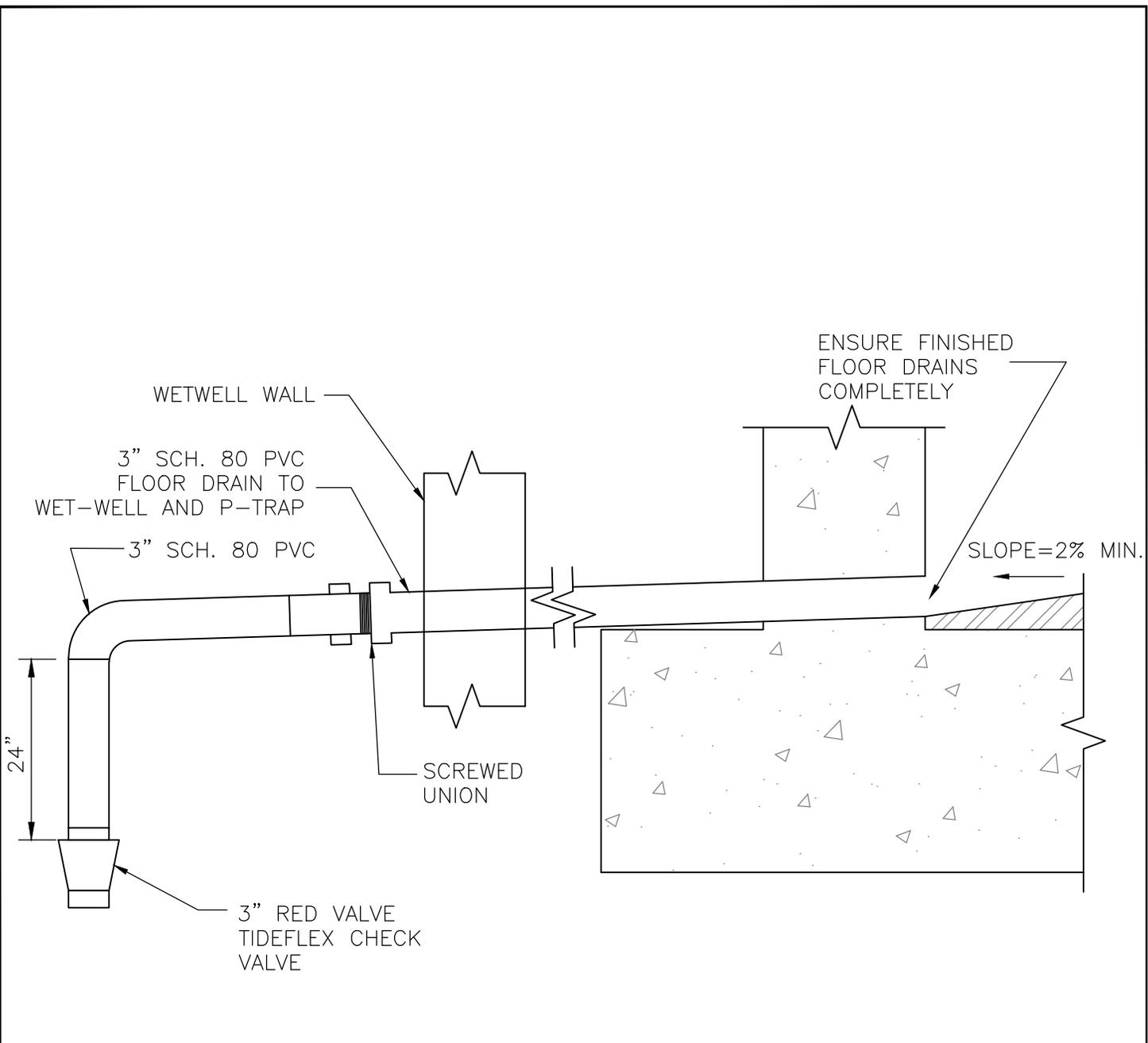
MARCO ISLAND UTILITIES

960 North Collier Blvd.
 MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

DATE: APRIL 2007

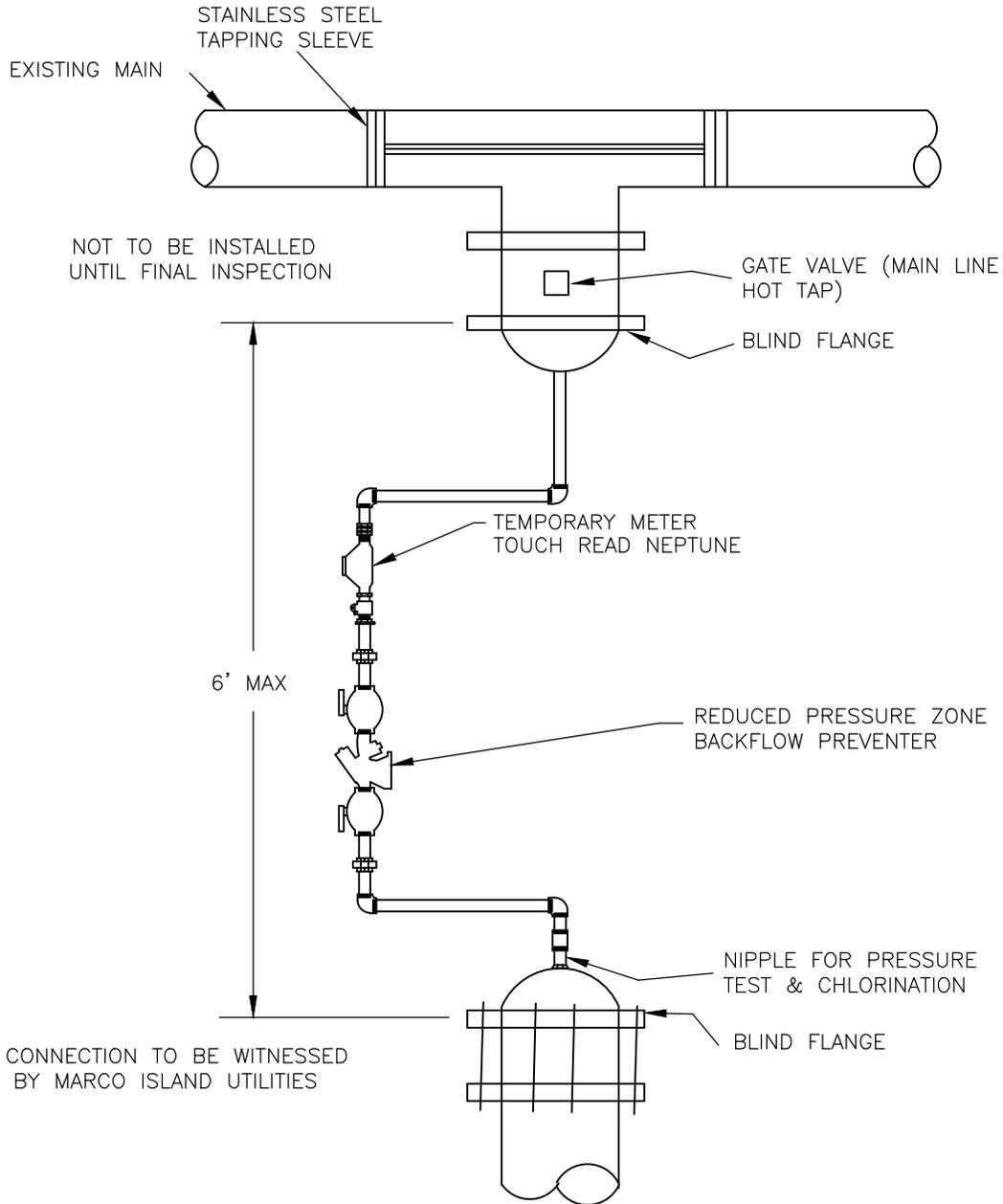
DWG #: SS-20.DWG



SS-24
-

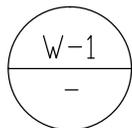
VALVE VAULT FLOOR DRAIN TO LIFT STATION
NOT TO SCALE (REVISED 08/26/15)

MARCO ISLAND UTILITIES 960 North Collier Blvd. MARCO ISLAND, FL 34145	SCALE: NOT TO SCALE
	DATE: APRIL 2007
	DWG #: SS-24.DWG



NOTE

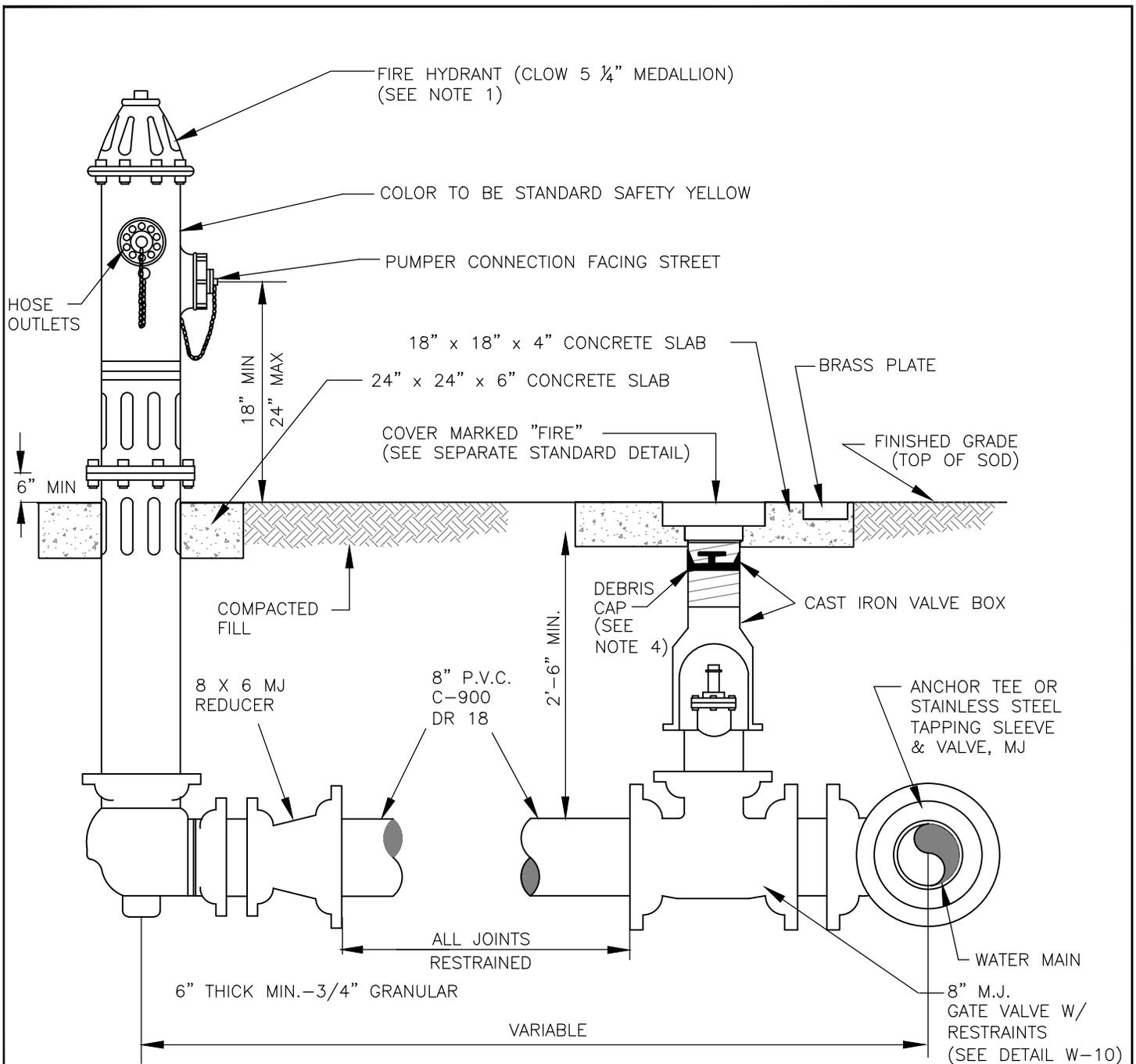
1. ALL BRASS WILL BE LEAD FREE OR NO LEAD.



CONSTRUCTION JUMPER ASSEMBLY (OPTIONAL)

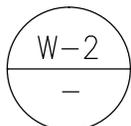
NOT TO SCALE (REVISED 08/26/15)

MARCO ISLAND UTILITIES 960 North Collier Blvd. MARCO ISLAND, FL 34145	SCALE: NOT TO SCALE
	DATE: APRIL 2007
	DWG #: W-1.DWG



NOTES:

1. FIRE HYDRANT TO BE DRY OR WET BARREL IN ACCORDANCE WITH AWWA C502 OR AWWA C503.
2. IF EXISTING WATER MAIN IS 8-INCHES OR LARGER, DRAFT TUBE ASSEMBLY AND TEE MUST BE A MINIMUM OF 8-INCH REDUCING TO 6-INCH FOR HYDRANT CONNECTION AS SHOWN.
3. IF EXISTING MAIN IS 6 INCHES IN DIAMETER, DRAFT TUBE ASSEMBLY AND TEE IS REQUIRED TO BE 6 INCHES MINIMUM.
4. ALL BURIED DUCTILE IRON FITTINGS AND VALVES TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.
5. CAST IRON VALVE RISER MUST BE ADJUSTED TO ACCEPT DEBRIS CAP.
6. ALL BOLTS AND NUTS TO BE 315 STAINLESS STEEL EXCLUDING MECHANICAL JOINT TEE BOLTS AND NUTS.



FIRE HYDRANT ASSEMBLY

NOT TO SCALE (REVISED 08/26/15)

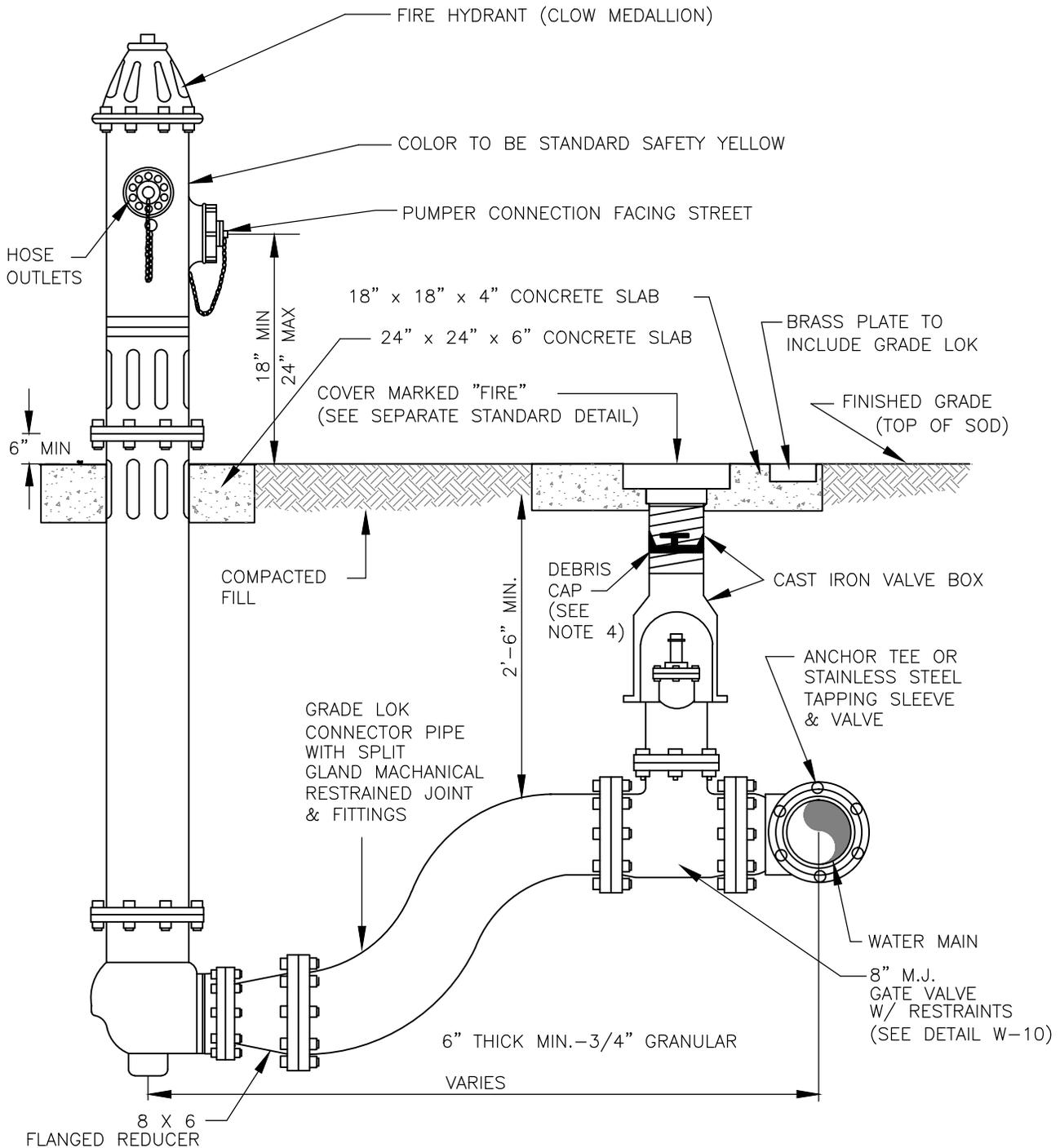
MARCO ISLAND UTILITIES

960 North Collier Blvd.
 MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

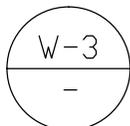
DATE: FEB 2011

DWG #: W-2.DWG



NOTES:

1. IF EXISTING WATER MAIN IS 10-INCHES OR LARGER, DRAFT TUBE ASSEMBLY AND TEE MUST BE A MINIMUM OF 8-INCH REDUCING TO 6-INCH FOR HYDRANT CONNECTION AS SHOWN.
2. IF EXISTING MAIN IS 8 TO 6 INCHES IN DIAMETER, DRAFT TUBE ASSEMBLY AND TEE IS REQUIRED TO BE 6 INCHES MINIMUM.
3. ALL BURIED DUCTILE IRON FITTINGS AND VALVES TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.
4. CAST IRON VALVE RISER MUST BE ADJUSTED TO ACCEPT DEBRIS CAP.
5. ALL BOLTS AND NUTS TO BE 316 STAINLESS STEEL EXCLUDING TEE BOLTS AND NUTS.



FIRE HYDRANT ASSEMBLY WITH GRADE-LOK ADAPTOR

NOT TO SCALE (REVISED 08/26/15)

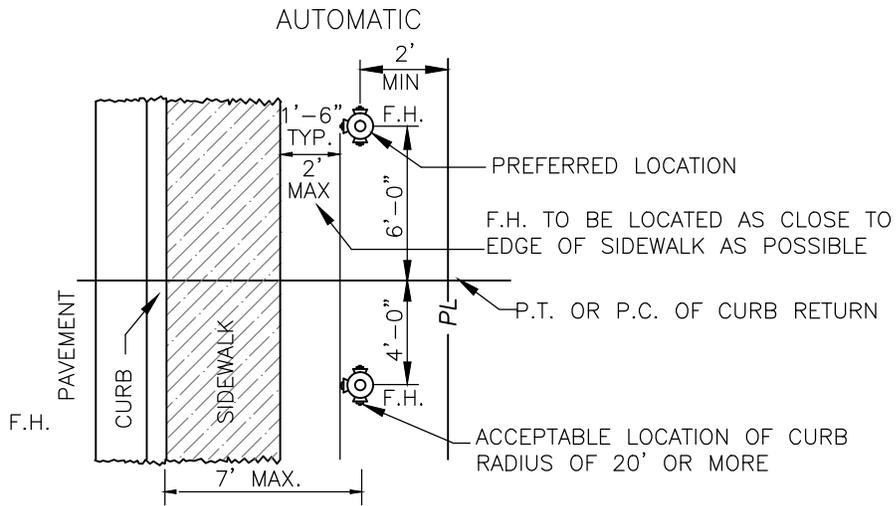
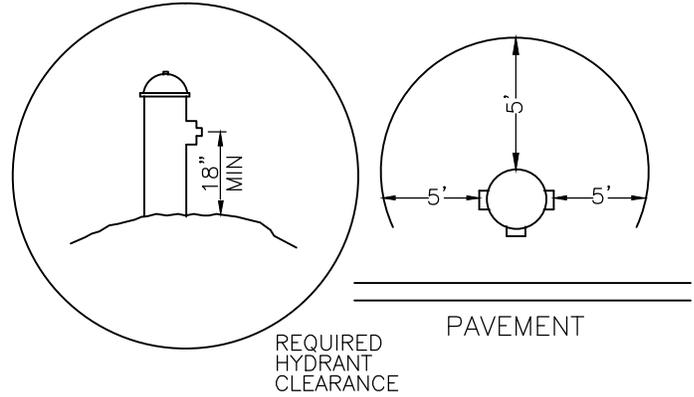
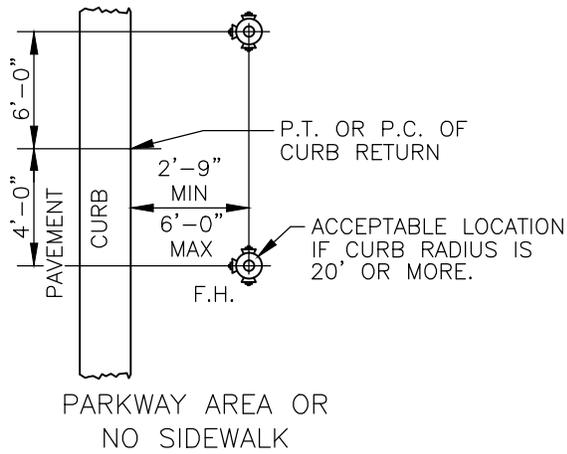
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

SCALE: NOT TO SCALE

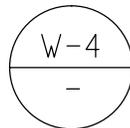
DATE: APRIL 2007

DWG #: W-3.DWG



NOTES:

1. OBSTRUCTIONS SUCH AS UTILITY POLES, STREET SIGNS, IRRIGATION BOXES, FENCES, ETC. MUST NOT BE PLACED BETWEEN CURB AND HYDRANT.
2. SOME LOCATIONS APPLY AT EITHER END OF CURB RETURNS.
3. DIMENSION SHOWN OF CONSTRUCTION DRAWINGS SUPERCEDE LOCATIONS SHOWN HERE.
4. PIPE BOLLARDS MAY BE APPROVED OR REQUIRED AT THE DISCRETION OF MIU.
5. ALL BURIED DUCTILE IRON FITTINGS AND VALVES TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.



FIRE HYDRANT LOCATIONS/CLEARANCE

NOT TO SCALE (REVISED 08/26/15)

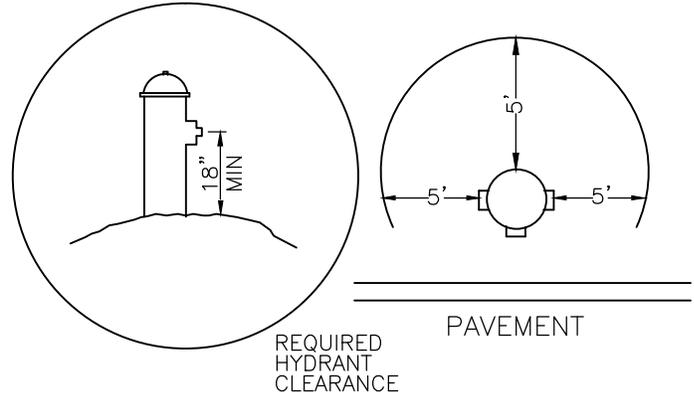
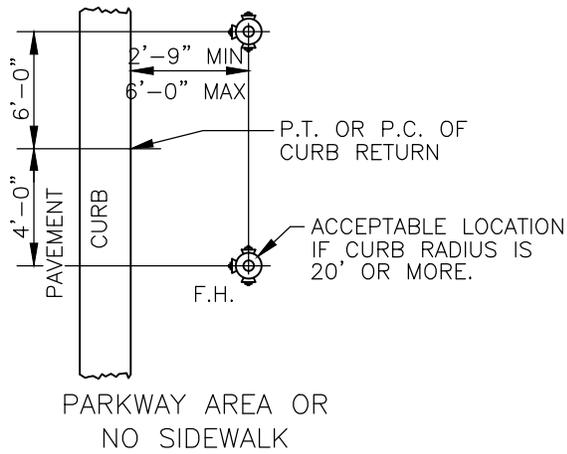
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

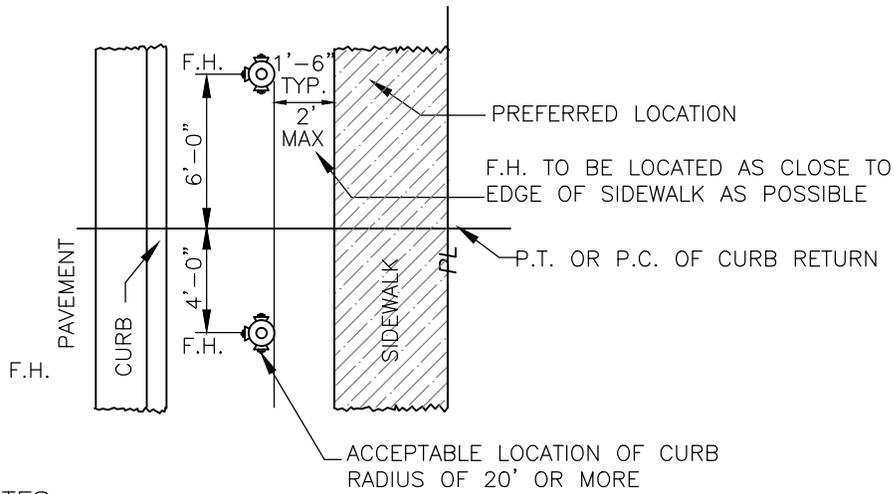
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DATE: APRIL 2007

DWG #: W-4.DWG

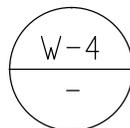


AUTOMATIC



NOTES:

1. OBSTRUCTIONS SUCH AS UTILITY POLES, STREET SIGNS, IRRIGATION BOXES, FENCES, ETC. MUST NOT BE PLACED BETWEEN CURB AND HYDRANT.
2. SOME LOCATIONS APPLY AT EITHER END OF CURB RETURNS.
3. DIMENSION SHOWN OF CONSTRUCTION DRAWINGS SUPERCEDE LOCATIONS SHOWN HERE.
4. PIPE BOLLARDS MAY BE APPROVED OR REQUIRED AT THE DISCRETION OF MIU.
5. ALL BURIED DUCTILE IRON FITTINGS AND VALVES TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.



FIRE HYDRANT LOCATIONS/CLEARANCE

NOT TO SCALE (REVISED 08/26/15)

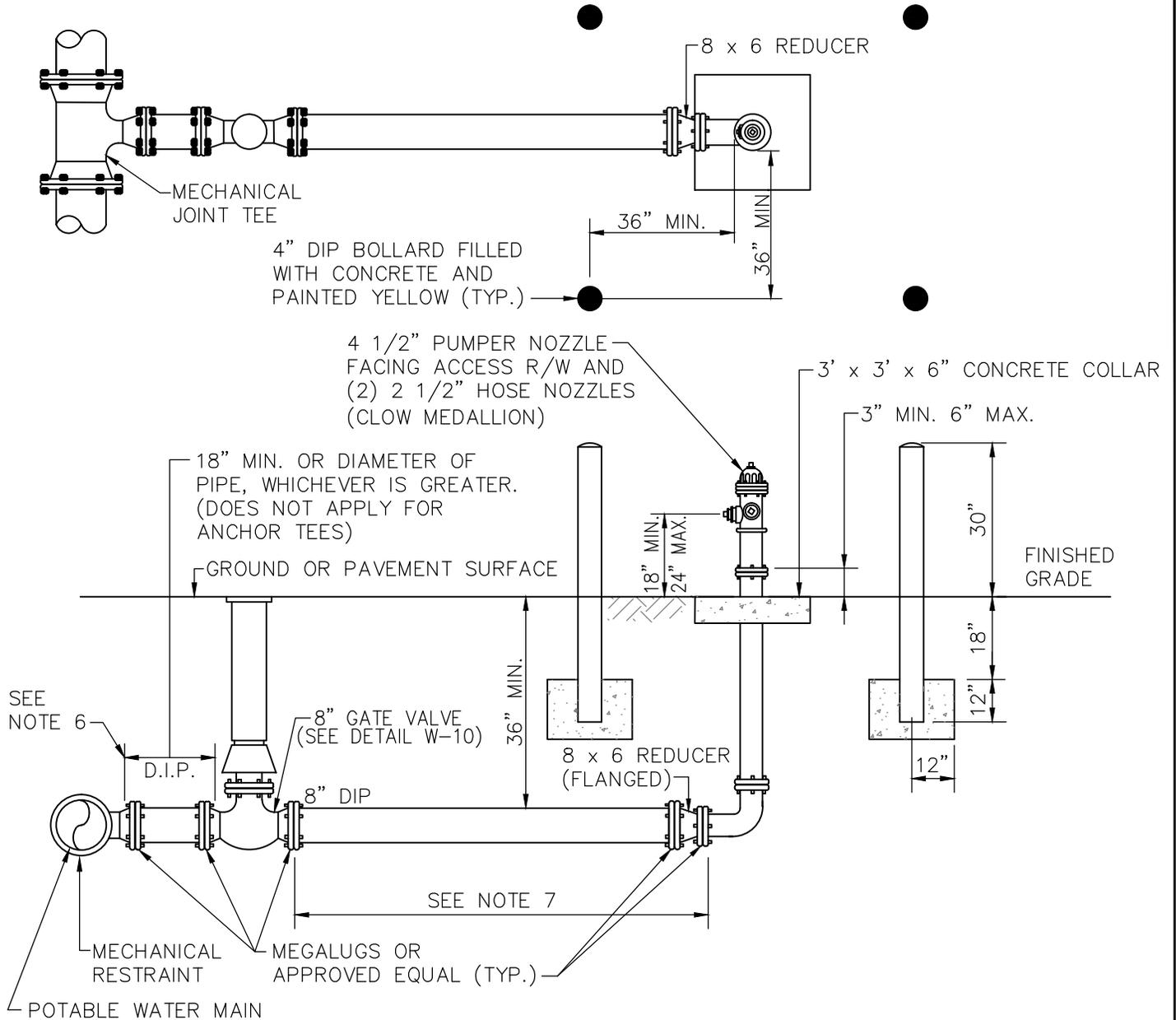
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

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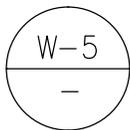
DATE: APRIL 2007

DWG #: W-4A.DWG



NOTES:

1. HYDRANT SHALL BE INSTALLED PLUMB AND TRUE IN UNOBSTRUCTED LOCATION (5 FEET CLEARANCE ON ALL SIDES).
2. THE SAME MODEL HYDRANT SHALL BE USED THROUGHOUT CURRENT CONTRACT PHASE. HYDRANTS MUST BE ORDERED SAFETY YELLOW IN COLOR, WITH FINISHED EPOXY COAT APPLIED BY THE HYDRANT MANUFACTURER. HYDRANT SHALL BE FACTORY EQUIPPED WITH PLUGGED DRAIN HOLES.
3. VALVE SHALL BE PLACED ADJACENT TO MAIN AND RESTRAINED WITH MEGALUGS OR EQUAL.
4. ANCHOR TEES ARE PERMITTED.
5. HYDRANTS SHALL NOT BE PLACED IN SIDEWALKS, ROADWAYS, OR BIKE PATHS.
6. TIP OF BOLT TO TIP OF BOLT
7. ON RUNS LONGER THAN 50 FEET ANOTHER VALVE IS REQUIRED.
8. PAINT SAFETY YELLOW, IF REQUIRED, WITH BENJAMIN MOORE M43 OR APPROVED EQUAL.
9. BOLLARDS ARE REQUIRED FOR HYDRANTS WITH LESS THAN 10 FEET TO EDGE OF PAVEMENT AND MUST BE PAINTED SAFETY YELLOW.
10. HYDRANT HARDWARE SHALL BE STAINLESS STEEL (TYPE 316 OR TYPE 316 BOLTS/TYPE 316 NUTS).
11. 10 INCH OR LARGER WATER MAIN MUST USE 8 INCH HYDRANT LEAD REDUCING TO 6 INCH FOR HYDRANT.
12. IF EXISTING MAIN IS 8 TO 6 INCHES IN DIAMETER, DRAFT TUBE ASSEMBLY AND TEE IS REQUIRED TO BE 6 INCHES MINIMUM.
13. ALL BURIED DUCTILE IRON FITTINGS AND VALVES TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.
13. BLUE REFLECTIVE MARKER REQUIRES IN MIDDLE OF ROAD LANE CLOSEST TO HYDRANT FOR EASY IDENTIFICATION OF HYDRANT.



TYPICAL FIRE HYDRANT INSTALLATION WITH BOLLARDS

NOT TO SCALE (REVISED 08/26/15)

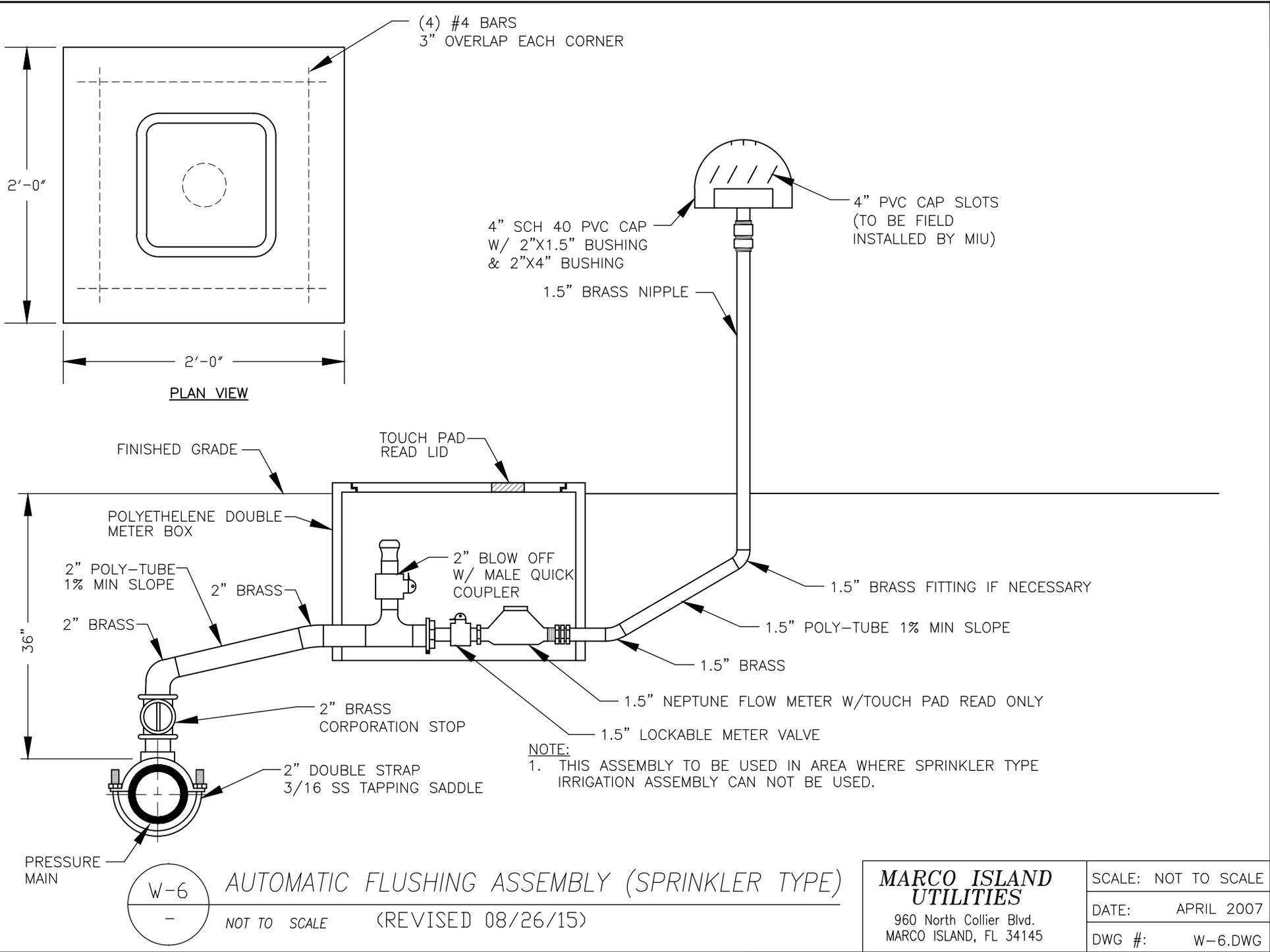
MARCO ISLAND UTILITIES

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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: W-5.DWG

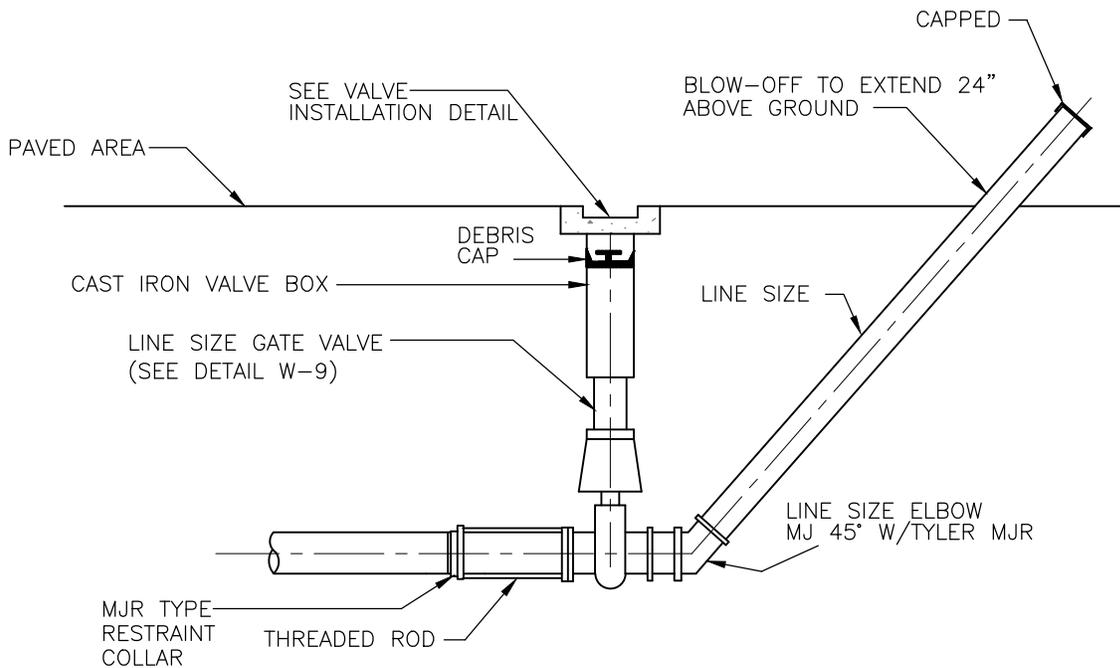


W-6
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AUTOMATIC FLUSHING ASSEMBLY (SPRINKLER TYPE)
 NOT TO SCALE (REVISED 08/26/15)

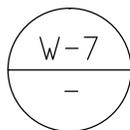
MARCO ISLAND UTILITIES
 960 North Collier Blvd.
 MARCO ISLAND, FL 34145

SCALE:	NOT TO SCALE
DATE:	APRIL 2007
DWG #:	W-6.DWG



NOTES:

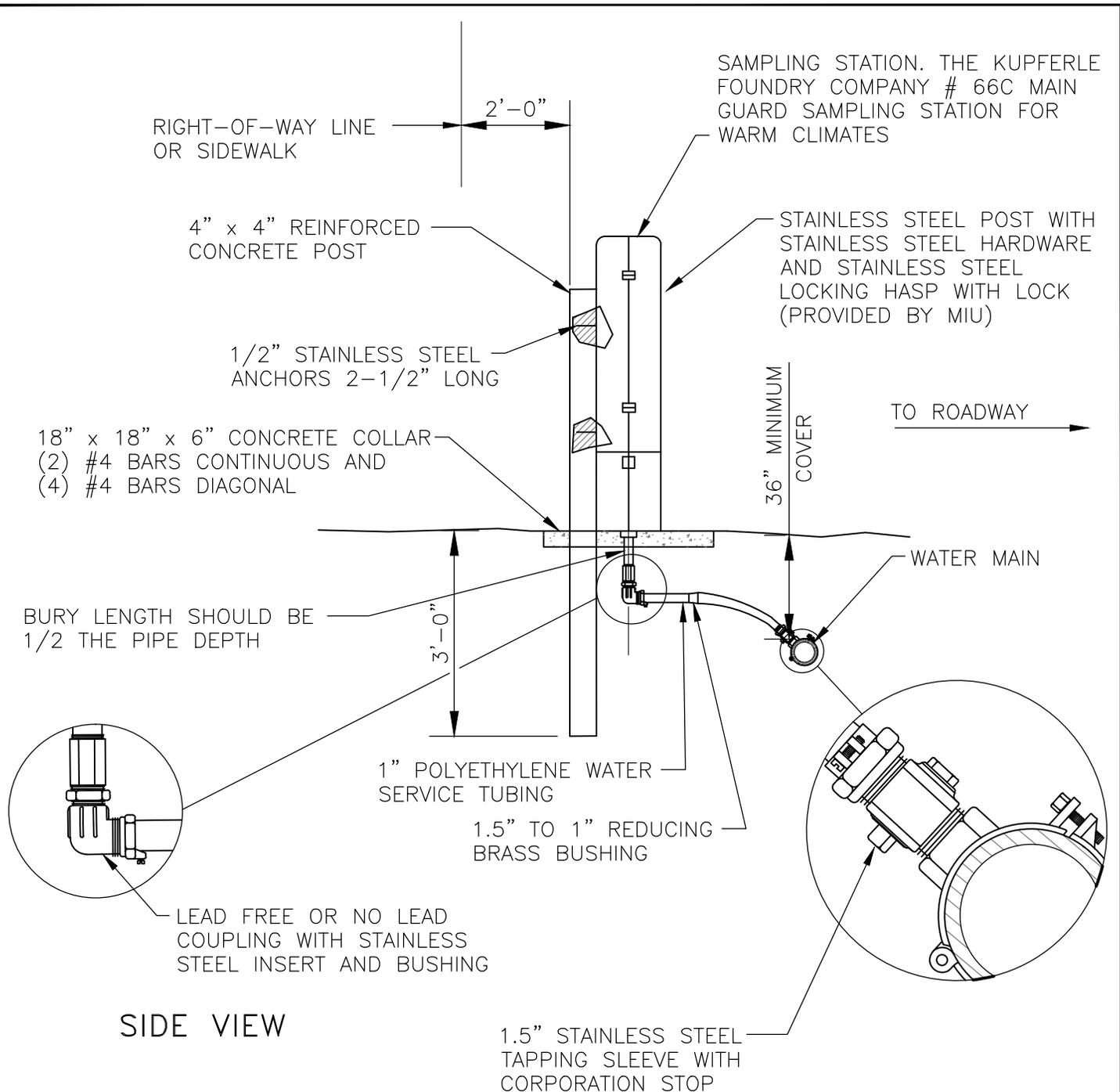
1. VALVE BOX RISER SHALL NOT BEAR ON THE VALVE OR PIPE.
2. SEE VALVE INSTALLATION DETAIL FOR VALVE SUPPORT.
3. TEMPORARY BLOW-OFF TO REMAIN IN PLACE UNTIL DISTRIBUTION SYSTEM HAS BEEN FLUSHED.
4. AFTER CLEARANCE IS OBTAINED REFER TO PERMANENT BLOW-OFF DETAIL FOR FINAL BLOW-OFF CONFIGURATION.
5. ALL BURIED DUCTILE IRON FITTINGS AND VALVES TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.



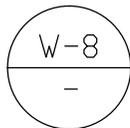
TEMPORARY FLUSHING ASSEMBLY

NOT TO SCALE

MARCO ISLAND UTILITIES 960 North Collier Blvd. MARCO ISLAND, FL 34145	SCALE: NOT TO SCALE
	DATE: APRIL 2007
	DWG #: W-7.DWG



SIDE VIEW



PERMANENT BACTERIOLOGICAL SAMPLE POINT

NOT TO SCALE

(REVISED 08/26/15)

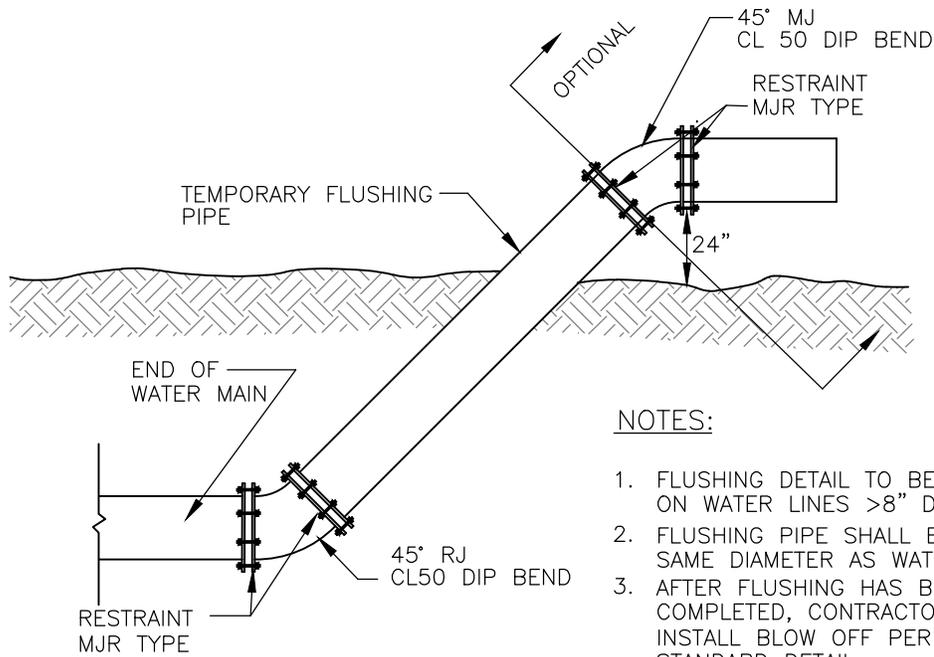
MARCO ISLAND UTILITIES

960 North Collier Blvd.
MARCO ISLAND, FL 34145

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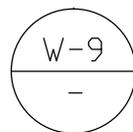
DATE: APRIL 2007

DWG #: W-8.DWG



NOTES:

1. FLUSHING DETAIL TO BE USED ON WATER LINES >8" DIAMETER.
2. FLUSHING PIPE SHALL BE THE SAME DIAMETER AS WATER MAIN.
3. AFTER FLUSHING HAS BEEN COMPLETED, CONTRACTOR SHALL INSTALL BLOW OFF PER STANDARD DETAIL.
4. CONTRACTOR SHALL PROVIDE ADEQUATE DRAINAGE FOR FLUSHED WATER.
5. SEPARATE CONCRETE FROM BOLTS WITH 1 LAYER POLY-FILM.
6. RESTRAINED BY MJR IN LIEU OF THRUST BLOCKS



WATER MAIN FLUSHING ASSEMBLY

NOT TO SCALE

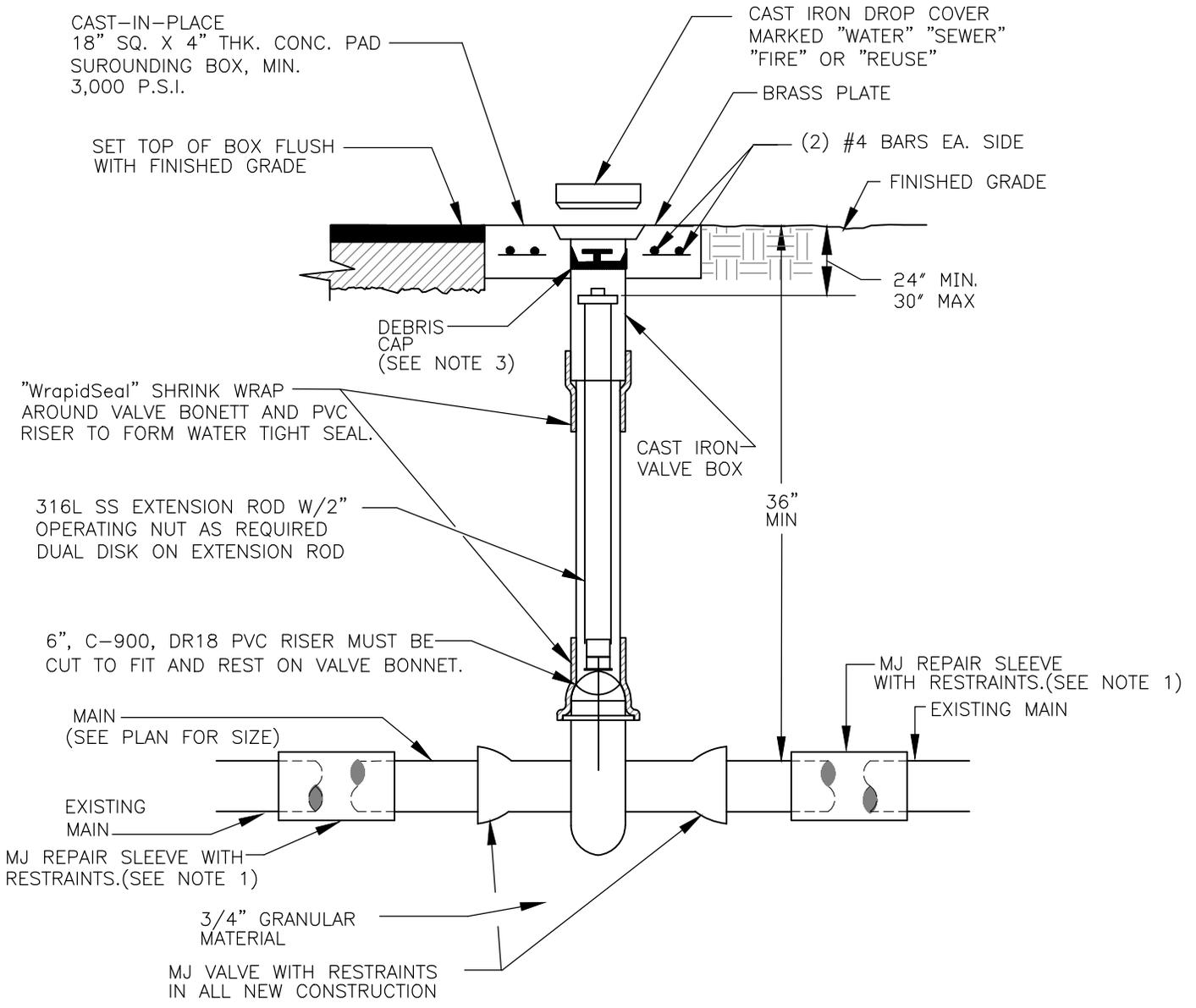
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SCALE: NOT TO SCALE

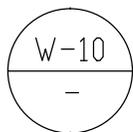
DATE: APRIL 2007

DWG #: W-9.DWG



NOTES:

1. WHEN INSTALLING A VALVE IN AN EXISTING MAIN USE TWO REPAIR SLEEVES (MJ FOR DIP, OR PVC FOR PVC MAINS) ONE AT EACH END OF THE CUT.
2. ALL BURIED DUCTILE IRON FITTINGS AND VALVES TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.
3. CAST IRON VALVE RISER MUST BE ADJUSTED TO ACCEPT DEBRIS CAP.
4. PROVIDE VALVE OPERATOR EXTENSION (DETAIL W-16) WHEN DEPTH TO TOP OF PIPE IS 48" OR GREATER.



VALVE INSTALLATION

NOT TO SCALE

(REVISED 08/26/15)

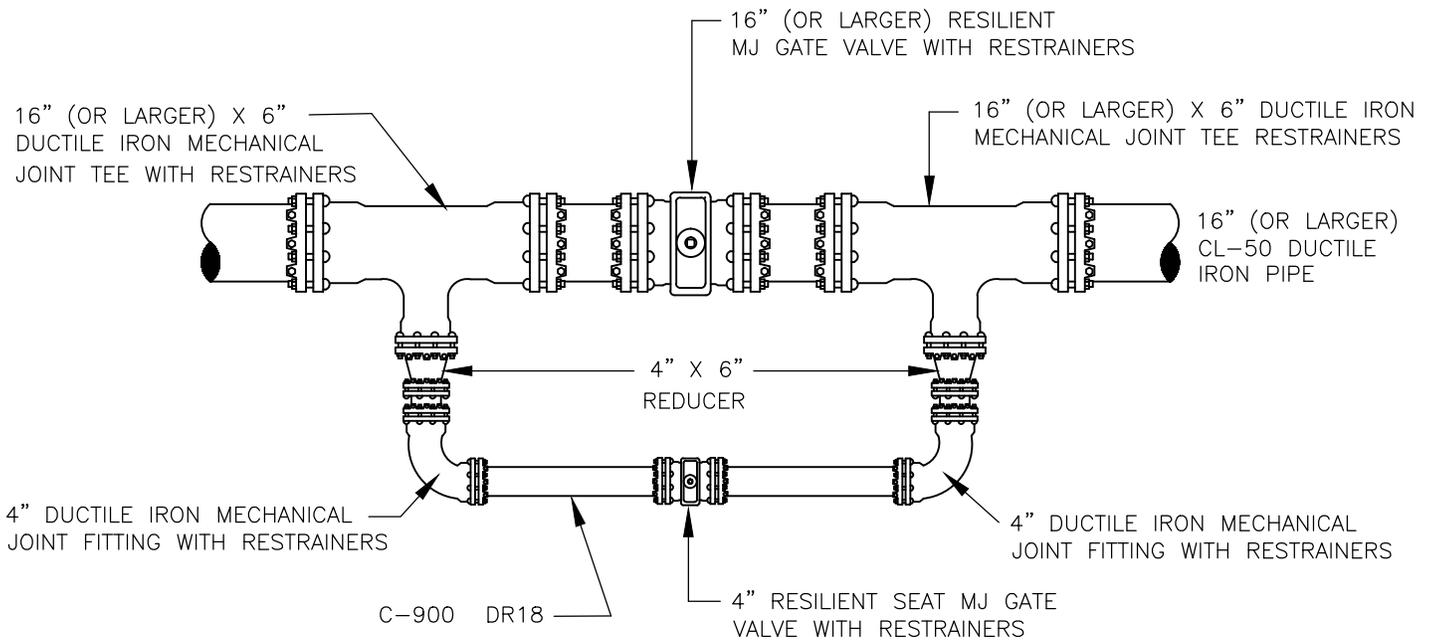
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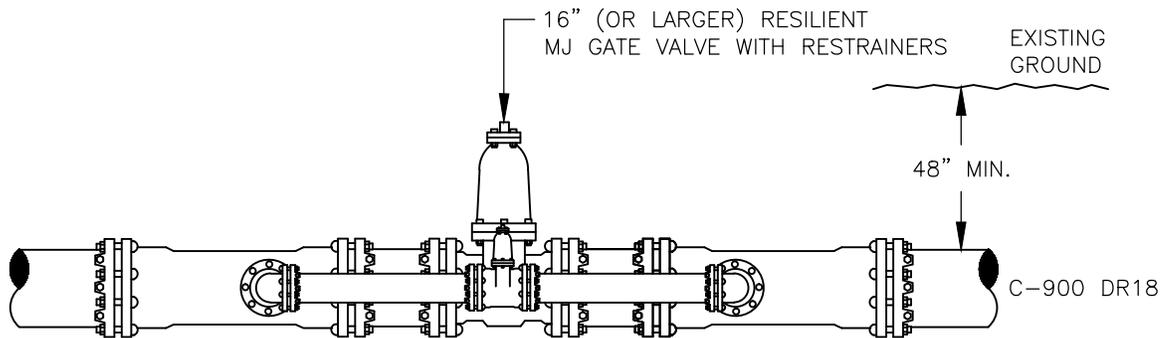
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DATE: APRIL 2006

DWG #: W-10.DWG



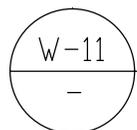
PLAN



PROFILE

NOTES:

1. THIS DETAIL USED WITH 16" AND LARGER GATE VALVES.
2. ALL 16" VALVES (REGARDLESS OF TYPE) REQUIRE BYPASS.
3. ALL GATE VALVES TO BE RESILIENT SEAT.
4. GEAR REDUCTION MAY BE REQUIRED ON ALL VALVES 16" AND LARGER.
5. ALL BURIED DUCTILE IRON FITTINGS AND VALVES TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.
6. GEAR REDUCTION CASING, EXTERNAL NUTS AND BOLTS MUST BE STAINLESS STEEL.
7. ALL GATE VALVES: GATE MUST OPEN AND CLOSE IN VERTICAL POSITION AFTER INSTALLED, NO SIDE OPENING VALVES WILL BE ACCEPTED.



16" AND LARGER VALVE INSTALLATION

NOT TO SCALE

(REVISED 08/26/15)

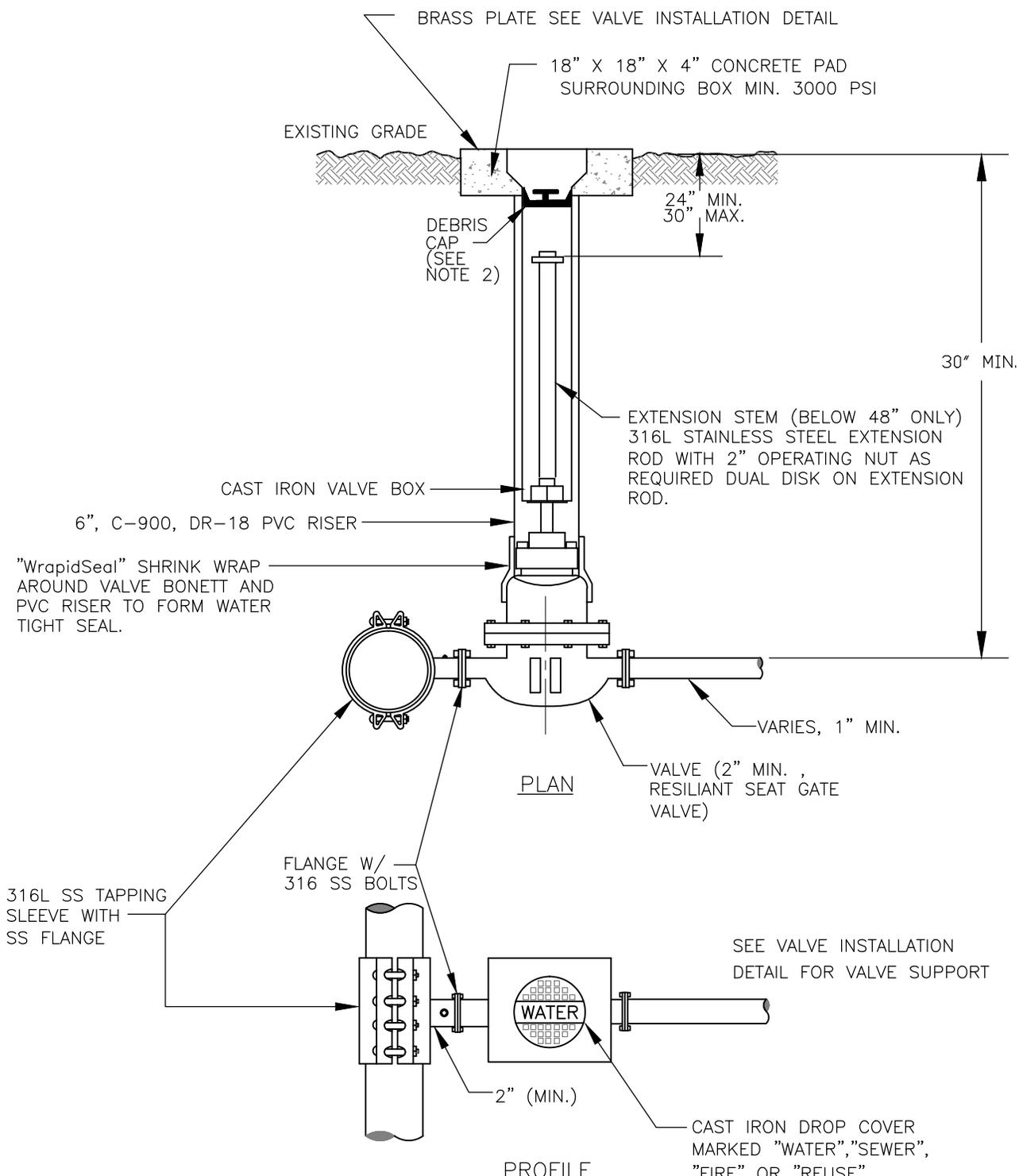
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SCALE: NOT TO SCALE

DATE: APRIL 2007

DWG #: W-11.DWG



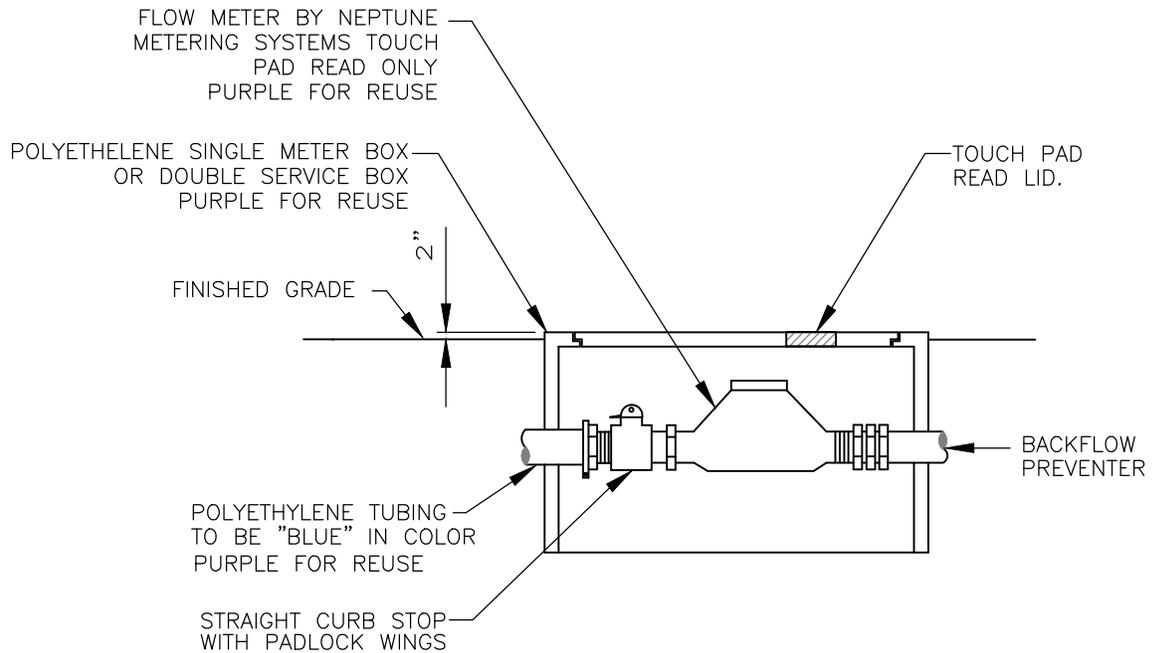
- NOTE:
1. ALL BURIED DUCTILE IRON FITTINGS AND VALVES TO BE POLYETHYLENE ENCASED IN ACCORDANCE WITH MIU STANDARD SPECIFICATIONS.
 2. CAST IRON VALVE RISER MUST BE ADJUSTED TO ACCEPT DEBRIS CAP.
 3. ALL GATE VALVES: GATE MUST OPEN AND CLOSE IN A VERTICAL POSITION AFTER INSTALLED, NO SIDE OPENING VALVES WILL BE ACCEPTED.

W-12
-

1" - 30" TAPPING SLEEVE AND VALVE FOR 1" TO 30" SERVICES

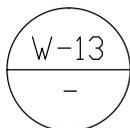
NOT TO SCALE (REVISED 08/26/15)

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	DATE: APRIL 2007
	DWG #: W-12.DWG



NOTE:

1. ALL METER BOXES AND LIDS WILL BE MANUFACTURED BY DFW PLASTICS "BEE PROOF" OR APPROVED EQUAL. SINGLE BOX LID: DFW1200-1T-NH-LD SINGLE BOX WITH BOX AND LID: DFW1200-12 1T-NH.
2. DOUBLE METER BOX DFW1500-12-T-NH BOX WITH LID, DFW1500-1T NH-LID "ONLY".
3. ALL BRASS FITTINGS AND METERS WILL BE LEAD FREE OR NO LEAD BRASS.



METER BOX ASSEMBLY

NOT TO SCALE

(REVISED 08/26/15)

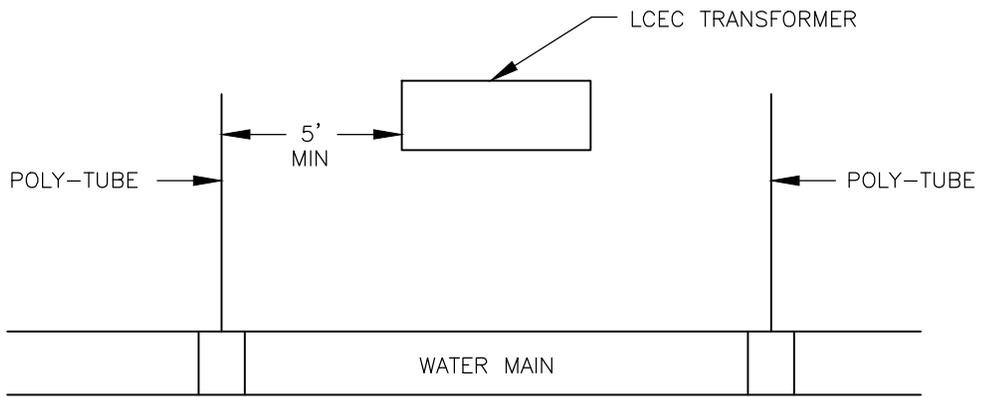
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DATE: APRIL 2007

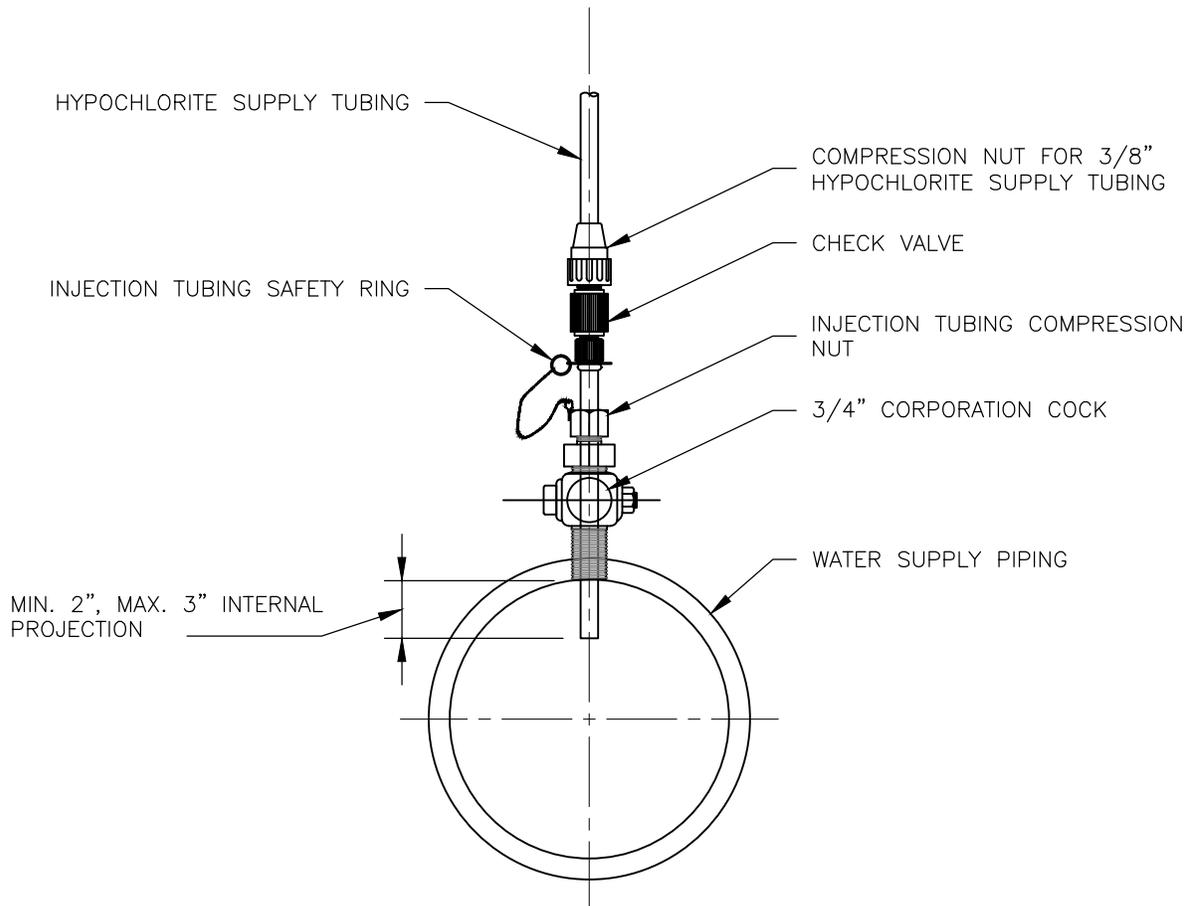
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W-14
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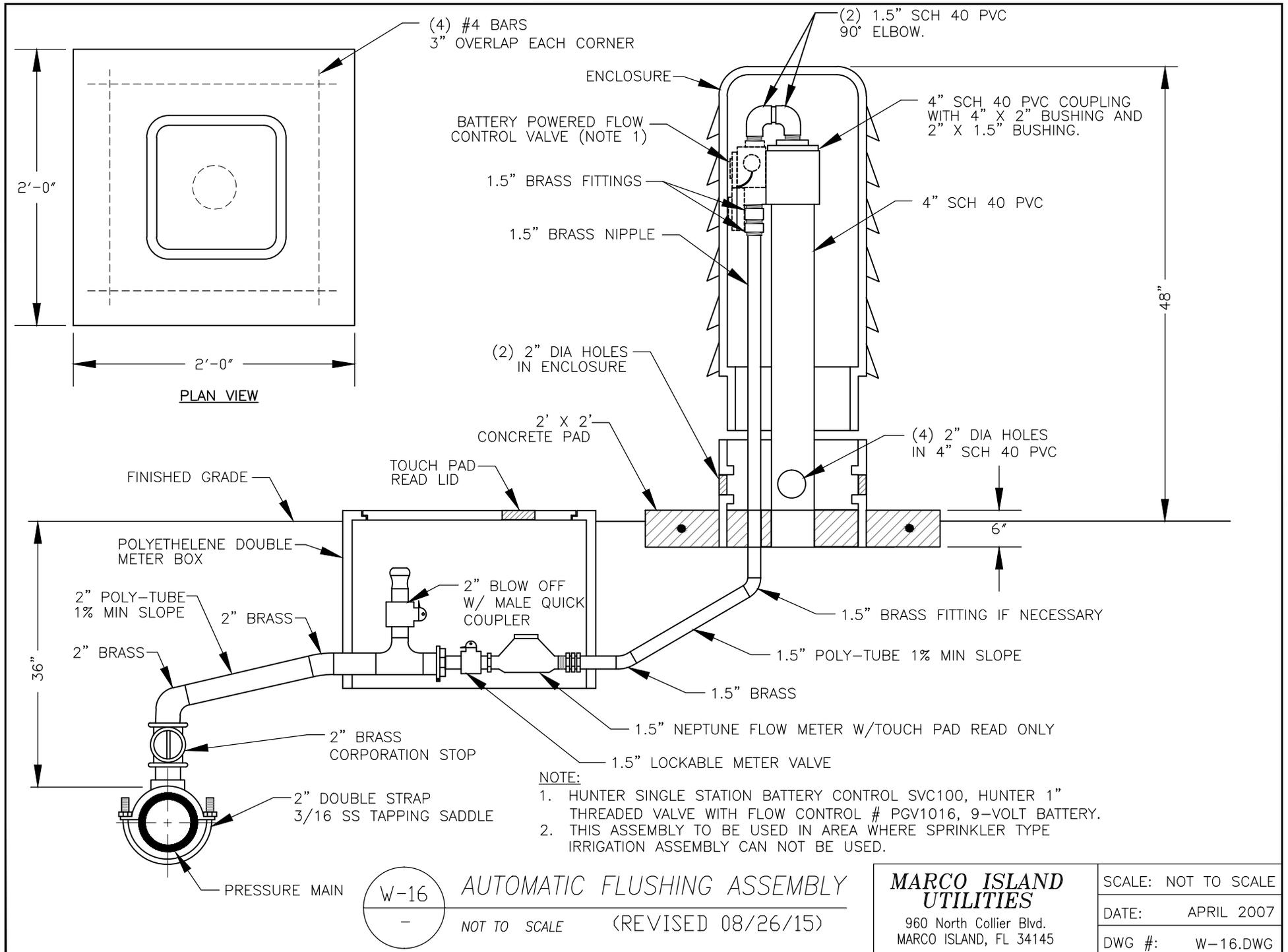
 MINIMUM LCEC TRANSFORMER SEPARATION
 FOR WATER SYSTEM CONNECTION
 NOT TO SCALE

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	DATE: APRIL 2007
	DWG #: W-14.DWG



W-15 *HYPOCHLORITE INJECTION DETAIL*
 - NOT TO SCALE

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	DATE: APRIL 2007
	DWG #: W-15.DWG



W-16
-

AUTOMATIC FLUSHING ASSEMBLY
NOT TO SCALE (REVISED 08/26/15)

MARCO ISLAND UTILITIES
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SCALE:	NOT TO SCALE
DATE:	APRIL 2007
DWG #:	W-16.DWG

APPENDIX I

LIST OF ABBREVIATIONS

List of Abbreviations

MIU	Marco Island Utilities Department
SFWMD	South Florida Water Management District
FDEP	Florida Department of Environmental Protection
USACOE	US Army Corps of Engineers
NAVD	North American Vertical Datum
NGS	National Geodetic Survey
NAD	North American Datum
NSF	National Science Foundation
GPM	gallons per minute
PSI	pounds per square inch
psig	pounds per square inch gage (relative to atmospheric)
ERC	Equivalent Residential Connection
AWWA	American Water Works Association
NSF	National Sanitation Foundation
HDPE	High-Density Polyethylene
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
VOC	Volatile Organic Compounds
USSI	US Seismic Systems Inc.
NEMA	National Electrical Manufacturers Association

SCADA Supervisory Control and Data Acquisition
FDOT Florida Department of Transportation
DFT Dry Film Thickness (for painting systems)