

City of
Melbourne
The Harbor City



Technical Specifications and Standards for Construction of Water Distribution Systems

Technical Specifications and Standards for Construction of Reclaimed Water
Distribution Systems

Technical Specifications and Standards for Construction of Wastewater Collection Systems

Appendix A: Technical Specification Detail Drawings

Appendix B: Approved Products List

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City of
Melbourne
On Florida's SpaceCoast



Technical Specifications and Standards for Water Distribution Systems

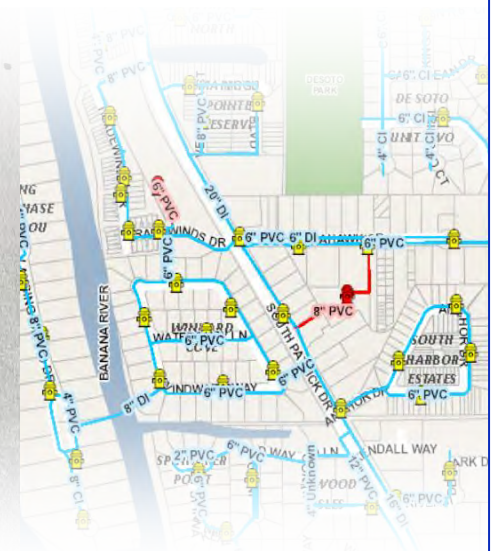




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W1000 GENERAL INFORMATION

These specifications and standards cover the design, drawings, specifications, installation, inspection, testing and acceptance of water distribution systems, water transmission main extensions, and all appurtenant items which are to be owned and maintained by the City of Melbourne (referenced herein as the City). This includes developer built on-site water distribution systems in residential subdivisions and commercial developments, off-site transmission main extensions to development sites, and on-site requirements for all water users.

The construction of water distribution systems shall be in accordance with the most current edition of Chapter 62-550, Drinking Water Standards, Monitoring, and Reporting, and 62-555, Permitting and Construction of Public Water Systems, Florida Administrative Code (F.A.C.), Florida Building Code, City of Melbourne Code of Ordinances, Florida Department of Environmental Protection (FDEP) Water Production Facility Operating Permits, City of Melbourne Cross-Connection Control Manual and City Technical Specifications and Standards for Water Distribution Systems, Latest Edition (referenced herein as technical specifications). In case of conflict, Chapter 62-550 and 62-555, Florida Administrative Code (F.A.C.) shall prevail.

If improvements are being made under the jurisdiction of another governmental entity and the requirements differ, the more stringent shall apply.

All referenced industry specifications are to be latest revision.

W1001 LICENSES

All Contractors must have one of the following current and valid licenses:

- State of Florida Certified Utility Underground Contractor License.
- State of Florida Registered Utility Underground Contractor License.

W1002 CONTRACTOR SCOPE OF WORK

The Contractor shall install all Public and Private water mains and appurtenances in accordance with these technical specifications. Any deviation from these technical specifications must be approved in writing by the City prior to commencement of construction of facility affected.

The Contractor shall furnish all labor, materials, tools and equipment necessary or incidental to the construction. Contractor shall obtain and pay all permits, official inspections by the City of Melbourne and other official fees in connection with the work.

The Contractor shall attend a pre-construction conference and receive a notice to proceed for capital improvement projects or approved construction plans for development projects from the City Engineering Department.

The Contractor shall not remove any thrust blocks or mechanical joints, connect to any water main or service line, or operate water control valves, except under direct supervision of a representative from the City.

The Contractor shall not backfill any fitting, thrust block, restrainer gland, valve, hydrant assembly and/or meter/backflow assembly until such appurtenances have been inspected in place by a designated representative of the City. All such inspections shall



be scheduled a minimum of two (2) working days in advance.

Upon completion of construction, the property owner shall properly maintain and operate privately owned systems and appurtenances in accordance with all applicable codes and regulations. Specifically, private hydrants shall be annually tested in accordance with NFPA 25. The City of Melbourne Utilities Operations Division shall be notified 48 hours prior to hydrant testing and all water used shall be recorded and reported with test results. All backflow devices installed immediately after the connection to the public water system shall be tested in accordance with the City's Cross-Connection Control Manual.

All referenced AWWA specifications are to be Latest Revision.

W1100 PLAN SPECIFICATIONS AND SUBMITTALS

The Engineer of Record shall submit signed, sealed and dated design drawings for all water distribution projects. The drawings shall include the following.

- Calculations showing the water mains having sufficient hydraulic capacity to transport peak hourly flows and average daily flow while meeting the requirements of Section W1206 (Pressure and Friction Loss). Head losses through meters and backflow devices shall also be included in calculations.
- Calculations showing water mains having sufficient hydraulic capacity to transport fire flow for largest building or worst case scenario, including peak flows and meeting the requirements of Section W1203 (Fire Flow Requirements).
- All property corners and control structures shall be designed with state plane coordinates. The following coordinate system shall be used: NAD 1983 HARN State Plane Florida East FIPS 0901. State Plane Coordinates shall be labeled and shown on a minimum of four (4) reference, right-of-way or property corner monuments shown on the Construction Plans that remain in their original condition after construction has been completed.
- Elevations based on NGVD 1929 or NAVD 1988. Control datum consistency shall be maintained throughout drawing submittals.
- Certification stating the basis of horizontal and vertical control.
- Water supply source main location, size, material, lengths, class and pressure ratings.
- Location of all mains within ten (10) feet of all buildings and structures including wall, fences, etc.
- All easements, property lines, right-of-ways, and structures. Location of water mains from property or easement lines at fifty (50) foot intervals.
- All water service connections, type and size of connections, and required meter size.
- All backflow prevention devices.
- All valves, including in-line valves, service valves, and air release valves.
- Distance from hydrant to hydrant valve.



- Separation between water mains and other utilities, including stormwater piping, sanitary sewer, force mains, and reclaimed water mains, if they exist within ten (10) feet of water mains.
- Show a profile of all conflicts between the potable waterlines and other water utilities, including reclaimed water, sanitary sewer and stormwater piping.
- Statement: “All water system construction shall be in accordance with City of Melbourne Technical Specifications and Standards for Water Distribution Systems and the Cross-Connection Control Manual, Latest Editions”.
- Service lines sized in one-half ($\frac{1}{2}$) inch increments or three (3) inch shall not be permitted. One (1) inch services shall be constructed of copper or high density polyethylene tubing and two (2) inch services shall be constructed of copper, high density polyethylene tubing, or brass.
- Automatic flushing device with a two (2) inch meter shall be placed at all dead end mains.
- When installing size on size taps, the City must first be consulted on the integrity and material of pipe to determine if allowed. In no case shall size on size taps on Class PVC or Cement Asbestos Pipe be permitted.
- Contractor is to verify the location of all existing utilities including depth and material prior to commencement of construction.
- Any existing service lines that need to be removed or relocated must be cut/capped at the corporation stop at the main and a new service line shall be installed.
- Any backflow preventer that is existing and reused shall be re-certified prior to issuance of Certificate of Occupancy.

W1200 TECHNICAL DESIGN CRITERIA

W1201 DESIGN CRITERIA

Water mains shall be designed for the estimated ultimate tributary population, as delineated in the most recent revision of the approved Water Distribution System Master Plan. Water systems shall be designed to satisfy the domestic/commercial water demand and fire protection requirements for the area. All water mains shall be designed and installed to the furthest point of the proposed project. When a distribution main will serve existing or future developments beyond the borders of the proposed site, the City may request over sizing.

W1202 AVERAGE DAILY FLOW AND PEAK FLOWS

Average daily and peak water flow shall be calculated by referencing and being consistent with the City of Melbourne Comprehensive Plan.



W1203 FIRE FLOW REQUIREMENTS

Fire flow requirements within the City limits shall be determined by the City of Melbourne Fire Official. Fire flow requirements outside the City limits shall be determined by the applicable County or City authority.

'Fire protection' water mains shall be installed as follows:

- Water mains designed for fire protection shall be sized to deliver the required fire flow at a velocity of not more than ten (10) feet per second.
- Water mains that include a hydrant or hydrants shall not be less than six (6) inch in diameter.
- Fire flow calculations are required on all proposed construction plans.
- At no time shall a two and one-half (2 ½) inch or three (3) inch tap be allowed. Pipe material shall be even sized and consistency maintained up to control valve.
- All waterlines specified and/or dedicated for the purpose of fire line sprinklers or other fire fighting purposes shall have a Double Check Detector Assembly. Assembly and fire line shall not be larger than the water main providing the service and shall be installed at the property/right-of-way line or closest point designated by the City. Fire line design shall be such that fire line can be isolated without disruption to potable water service.
- Installation of all fire line check assemblies shall also be in accordance with Florida Statutes 633.021, 633.521 and 633.557 in regards to Contractor certification and or certification exemption.

W1204 WATER MAIN LOCATION

Water mains shall be located in dedicated rights-of-way or utility easements. When installed in rights-of-way, water mains shall maintain a consistent alignment with respect to the centerline of the road. Mains shall be installed along one (1) side of the road, with crossings kept to a minimum.

Utility easements shall be consistent with City's Subdivision Code, Section 8.6(c). A minimum twenty (20) foot wide utility easement shall be provided if it is not adjacent to the road right-of-way for piping 6 inches or greater in diameter. Piping, within an easement, shall be located within the centerline of the easement. Structures or other obstructions not pertaining to public utilities or public sidewalks shall not be located in any utility easements; provided that fences or walls may be installed consistent with the Subdivision Code, Section 9.47(d).

If a water main is located adjacent to a road right-of-way, a minimum ten (10) foot easement shall be provided and shall be positioned such that there is a minimum of five (5) feet from centerline of pipe to edge of easement, opposite road right-of-way.

At the City's discretion, additional easement widths and/or water main/structure separation shall be provided when the pipe size, depth of cover or separation requirements so dictates.

Water mains shall not be placed under trees, buildings, retention ponds, tennis courts, swimming pools, parking lots or other structures, unless approved by the City. Large



hardwood trees, privacy walls, foundations and permanent structures shall not be placed over mains. Placement of mains under pavement shall be kept to a minimum. Any deviation from these technical specifications must have prior City approval and Owner/Developer must enter into a Hold Harmless Agreement with the City.

In general, water mains shall not be located along side or rear lot lines or along/under stormwater retention pond berms. Placement of a water main along side or rear lot lines or stormwater retention pond berms may be allowed on a case-by-case basis if such a water main configuration results in efficient placement and utilization of the water main network, as determined by the City.

Signage will be required to identify water mains located underneath ditch crossings or other structures where heavy maintenance equipment is used in or near such structures. See Technical Detail A-108.

In such cases where minimum cover cannot be maintained and/or placement of main so dictates, the City may require the use of restrained-joint ductile iron pipe and/or concrete cover for additional protection of water main.

W1205 UTILITY SEPARATION

Separation of potable water, reclaimed water, storm and sewer systems shall comply with FDEP regulations outlined in 62-555.314, F.A.C. Variances from the FDEP requirements must be approved individually by both FDEP and the City of Melbourne. See Technical Detail A-103 and A-104.

Water pipes shall not pass through or come into contact with, any part of a sanitary sewer manhole or stormwater manhole or inlet structure.

Water mains are to cross over sanitary, stormwater, reclaimed water or reverse osmosis pipes wherever possible as long as a minimum of twenty (20) inches of cover from top of finish grade is maintained. In such cases Pressure Class 200 (or greater) ductile iron pipe is to be used on those portions of water main with less than thirty (30) inches of cover from top of finish grade. The City may require concrete cover for additional protection of water main.

Where it is not possible to go over top of sanitary, stormwater, reclaimed water or reverse osmosis pipe, water main is to go under other pipe utilizing mechanically restrained fittings. Omission of fittings by deflection of water main will not be acceptable.

In cases where the water main crosses under a stormwater pipe with less than eighteen (18) inches of vertical separation, the stormwater piping shall be supported by concrete saddle per Technical Detail A-106.

In addition, drainage pipe joints within twenty (20) feet of water main are to be wrapped in a soil tight filter fabric. The crossing shall be arranged so that the water joints will be equidistant and as far as possible from center of crossing.

W1206 PRESSURE AND FRICTION LOSS

The system shall be designed to maintain a minimum pressure of twenty (20) psi at all points in the distribution system under all demand conditions. Higher pressures may be required at commercial, industrial and high-density residential areas.



The normal working pressure in the distribution system is between fifty (50) to seventy-five (75) psi, but in no case less than twenty (20) psi on the downstream side of a meter. For pressures greater than seventy-five (75) psi, special provisions may be required.

Friction losses through water mains shall be based on the Hazen and Williams formula. In the use of Hazen and Williams formula, the value for "C" shall be one hundred twenty (120) for ductile iron pipe, one hundred thirty (130) for PVC pipe and one hundred fifty (150) for HDPE. "C" values greater than one hundred fifty (150) shall not be allowed.

W1207 DIAMETER

Only 4, 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 42, 48, and 54 inch diameter water mains shall be permitted. Two (2) inch mains shall be evaluated and approved by the City on a case-by-case basis. Four (4) inch water mains shall be permitted only in cul-de-sac areas with a maximum length of five hundred (500) feet of pipe. As a minimum, six (6) inch grid or looped systems shall be required in low-density residential projects. All fire hydrants shall be served by six (6) inch or greater water mains. Where looping of mains is not practical, minimum eight (8) inch mains shall be required, unless detailed calculations are submitted to substantiate the sufficiency of a six (6) inch main. In commercial, industrial, and high-density residential areas, minimum eight (8) inch grid or looped mains shall be required. Larger size mains shall be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified.

For all systems containing mains less than eight (8) inches in nominal diameter, that supply water to hydrants and/or building fire protection systems, a complete hydraulic analysis of the system shall be provided to assure that the system and all elements thereof can supply the required fire flow without exceeding the prescribed velocity.

W1208 DEPTH OF COVER

Pipe will be installed with thirty (30) inches of minimum cover. A maximum cover of forty-two (42) inches will be accepted. Cover depth will be determined from finished grade at location of water main, as indicated on the plans. The ground cannot be mounded to obtain proper cover.

Exception to stated depth requirement will be those portions of water main that are directional drilled, installed within casings, or those portions that go over or under storm drains and structures, sanitary sewers or other utilities as shown on plans. In all such cases, water main shall be immediately brought back to proper grade by way of mechanically restrained mechanical joint fittings. The City may require use of concrete cover where minimum depth cannot be obtained. See Technical Detail A-105.

W1209 FIRE HYDRANT TYPE, LOCATION AND SPACING

Center of all hydrants shall be set not less than three (3) feet (minimum) or more than eight (8) feet (maximum) from back of curb. All hydrants shall have a five and one-fourth (5 ¼) inch valve opening, one four and one-half (4 ½) inch pumper nozzle and two (2), two and one-half (2 ½) inch hose nozzles.

For new construction, fire hydrants shall be located as follows:



W1209-1 Single family residential installation

- One thousand (1,000) feet spacing between hydrants and not over five hundred (500) feet from any point to a hydrant.
- Single family dwellings exceeding three thousand two hundred (3,200) sq ft may require additional fire protection or flow calculations.

W1209-2 Multi-family residential and commercial installation

- Spacing based on the required fire flow being available within five hundred (500) feet of the most remote point of all buildings.
- The number of fire hydrants required shall be based on 1 hydrant per one thousand (1000) gallons, or part thereof, of required fire flow as determined by the Fire Official.
- For average conditions, hydrants shall be placed at least forty (40) feet from buildings complying with the most current edition of NFPA standards.
- Spacing between fire hydrants shall not be less than one hundred (100) feet to permit use by more than one (1) fire apparatus complying with the most current edition of NFPA standards.
- A minimum fifteen (15) foot clearance shall be provided and maintained from hydrant ports and any parking spaces, utility poles, fencing, landscaping, or similar obstruction. A four (4) foot clearance must be provided in back of hydrant, complying with the most current edition of NFPA standards.

W1210 PRESSURE AND RESTRAINT

The transmission/distribution mains and fittings, including all restrained joint fittings shall be designed to withstand combined pump operating pressures and pressure surges, of not less than one hundred fifty (150) psi.

Restrained joints shall be provided at all changes in direction, valves, hydrant control valves and size changes of all mains. Restrained joint pipe shall be required, in conjunction with all conflict crossings, and in other situations that the City deems necessary. The use of thrust blocking as an alternate or additional means of restraint will be evaluated on a case-by-case basis and installed where required as determined by the City.

The restrained joint lengths shall be calculated consistent with the table format shown in the Technical Detail A-111. Where internal restrained joints are used, the entire bell shall be painted red with high quality enamel paint.

W1211 VELOCITY

Water distribution mains shall be designed so flow rates do not exceed ten (10) feet per second.

W1212 DEAD ENDS

In order to provide increased reliability of service and reduce head loss, dead ends shall be minimized by making appropriate tie-ins and/or looping whenever practical, as



determined by the City. Where dead end mains occur, they shall be provided with an automatic flushing device and meter.

A manually operated flushing device may be used on a case-by-case basis with prior approval from the City. No flushing device shall be directly connected to any storm or sanitary sewer.

W1213 VALVE LOCATION

Sufficient valves shall be provided on water mains so that customer inconvenience and sanitary hazards will be minimized during repairs. Valves shall be located at not more than five hundred (500) foot intervals in commercial and industrial areas and at not more than one thousand (1,000) foot intervals in residential and all other areas. Appropriate valving shall also be provided at all areas where water mains intersect to ensure effective isolation of waterlines for repair, maintenance or future extension. Valves shall be placed on either side of a canal crossing and on each side of a major road crossing (as determined by the City). The City may require additional valving during the construction plan review process.

W1214 VALVES

Valves installed on mains thirty (30) inches and larger shall be butterfly valve. Resilient seat gate valves shall be used on mains twenty-four (24) inches and smaller. The City shall have the final determination on type of valve to be used.

W1215 AIR VALVES

Air valves may be necessary to properly manage the accumulation of air in the distribution system. A determination shall be made during the plan review process for the need for air valves, proper valve selection, the location and appropriate installation of such valves.

W1216 SERVICES

Service lines sized in one-half ($\frac{1}{2}$) inch increments or three (3) inch shall not be permitted. For residential services, double water services shall be utilized whenever practical and shall be located at alternating lot lines. All water services shall be located at opposite lot corners from reuse services and/or sewer laterals. Water service lines shall terminate in such a way that properly allows each curb stop to lay horizontally on the appropriate side of respective lot line midway between curb and sidewalk. Any exception to this location must have prior approval by the City.

All water services connected to the public system shall have appropriate backflow protection in accordance with F.A.C. 62-555 and the City's Cross-Connection Control Manual. Domestic services shall incorporate a dual check valve into service line design immediately after meter. Properties with an auxiliary water source shall incorporate higher degree of protections as outlined in the City's Cross-Connection Control Manual.

Once utilities are constructed in accordance with approved construction plans, any relocation necessary due to conflict with sidewalks or driveways or per owner request shall be at the Contractor's expense.



W1217 METERS

During the plan review process, the City will establish the type of meter to be used on all service and fire lines, and will assist the Design Engineer in establishing the meter size best suited for the proposed improvements. The City will furnish all water meters up to and including two (2) inch, except the two (2) inch meters installed along with the automatic flushing device. All meters larger than two (2) inch shall be furnished by the Contractor and shall be an A.M.R. type meter.

Unless specifically approved by the City, meters and meter boxes shall not be installed in sidewalks, driveways or areas subject to vehicular traffic. A five (5) foot minimum height and two (2) foot minimum width setback is required between the meter box or concrete pad around meter assembly and any landscaping. Landscaping dimensions at full growth shall be considered.

All commercial services shall incorporate an above-ground meter and testable backflow prevention device into the design.

If a large meter assembly is going to be used for both potable water and fire protection requirements, the assembly shall be identified as a Fire Series/Master Meter Assembly and shall comply with current industry standards. Reference Fire Series/Master Meter Assembly Specification Section W1308-7.

On projects that require relocation of existing facilities, Contractor may be required to relocate and reuse existing meter and box.

W1218 METER LOCATION

All meters shall be installed in the public right-of-way or in a dedicated utility easement adjacent to public right-of-way that is accessible to City vehicles and equipment.

W1219 PIPE MATERIAL

The standard pipe material used in the construction of water distribution mains includes Ductile Iron, PVC and High Density Polyethylene Pipe. Use of non-standard piping material shall have prior City approval.

W1220 CEMENT ASBESTOS WATER MAINS

When working on cement asbestos water mains, the Contractor shall comply with all regulatory requirements. As a minimum, the Contractor shall keep the pipe thoroughly wetted down during cutting operations; all openings shall be filled with a mortar plug and use extreme care not to disturb the pipe while excavating.

If pipe is required to be removed or abandoned in-place, all work shall have prior City approval and be in accordance with City policies.

If removal is required, Latest Revision of OSHA 1910.1001 and 1910.1101 standards shall be adhered to.

Proper support shall be utilized during tapping of cement asbestos pipe.

Size on Size taps on cement asbestos pipe shall not be permitted.



W1221 PRESTRESSED CONCRETE CYLINDER PIPE (PCCP)

PCCP pipe will be allowed in the City of Melbourne's water distribution system as transmission pipe greater than twenty (20) inches in diameter on a case-by-case basis.

Valving, in addition to requirements set forth in Section W1214, may be required on PCCP transmission piping.

Any work involving PCCP must be done in the presence of a qualified manufacturer's representative. Only Contractors approved by the City shall be permitted to perform line stopping procedures on PCCP pipe. Contact the City of Melbourne Utilities Operations Division for additional information.

W1222 AERIAL CROSSINGS

It shall be the responsibility of the Engineer of Record to obtain all applicable regulatory permits. When the aerial crossing is accomplished by attachment to a bridge or drainage structure, the Engineer of Record shall meet all requirements of the agencies that own or have jurisdiction over such structures.

Adequate support and anchoring shall be provided for pipes utilized for aerial crossings. Pilings and anchoring are to be designed by an appropriately qualified Engineer. Signed and sealed calculations and design data are to be submitted by the Engineer for approval.

Flexible joints shall be designed by the Engineer to address expansion and contraction of the pipe. Flexible joints shall be provided between the aerial and buried sections of the pipe. Calculations and design data are to be submitted by the Design Engineer for approval.

For aerial stream crossings, the impact of floodwaters and debris shall be considered. The bottom of the pipe shall be placed no lower than one (1) foot above the bottom of bridge or three (3) feet above the one hundred (100) year floodplain, whichever is higher.

Underground valves shall be provided at both ends of the aerial crossing so that the section can be isolated for testing or repair. The valves shall be restrained, easily accessible and not subject to flooding. An air valve is required for all aerial crossings. Size and locations shall be determined by Engineer of Record and approved by the City.

Appropriate guards shall be installed at both ends of the aerial crossing to prevent public access to the pipe, as shown in the Technical Detail A-109.

W1300 MATERIAL SPECIFICATIONS

These specifications cover the pipes, fittings, and appurtenances used for potable water distribution systems. Acceptable Manufacturers, products and product numbers can be referenced in [Appendix B: Approved Products List](#).

The Contractor shall replace, at his expense, all materials found to be defective or damaged in handling and storage. The Contractor shall, if requested by the City, furnish certificates, affidavits of compliance, test reports, or samples for analysis for any



of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

All pipe and fittings shall meet ANSI/NSF 61 standards and all applicable Federal and State requirements regarding material used in drinking water systems.

No-Lead Requirements-(valid upon adoption of new lead standard as outlined in Federal Bill S.3874-Jan. 2014)

Brass pipe, fittings and components that come into contact with potable water shall be of NO LEAD/LOW LEAD alloy, UNS/CDA No C89833 or C89520 and shall conform to AWWA C800.

Pipe, fittings and components that do not come into contact with potable water may be UNS/CDA No C83600-85-5-5-5 and shall conform to AWWA C800.

W1301 PIPE

W1301-1 POLYVINYL CHLORIDE (PVC)

PVC pressure pipe size two (2) inch shall be SDR 21 and comply with ASTM D1784 and D2241.

PVC pressure pipes size four (4) inch through twelve (12) inch shall be SDR 18 and comply with AWWA C900 standard, Latest Edition.

PVC pressure pipe size sixteen (16) inch through thirty-six (36) inch shall be SDR 25 and comply with AWWA C905 standard, Latest Edition.

All joints shall be of the elastometric-gasket type with thickened, integral solid-wall bell or coupling with the same SDR as the barrel and conform to the requirements of ASTM D3139. The gasket shall meet the requirements of ASTM F477.

All PVC pressure pipe used for water distribution systems shall be blue in color having been impregnated into the structural resin at the pipe manufacturing plant.

At no time shall solvent weld pipe be allowed in the distribution system.

W1301-2 DUCTILE IRON PIPE

Ductile iron pipe shall be in accordance with ANSI A21.5/AWWA C150 and conform to requirements of ANSI A21.5/AWWA C151-2002 or latest standards.

Push-on, and restrained joint pipe shall have a minimum rated working pressure of one hundred and fifty (150) psi. All buried pipe shall be pressure class as follows:

- 4 inch -12 inch Pressure Class 350
- 16 inch - 20 inch Pressure Class 250
- 24 inch Pressure Class 200
- 30 inch - 64 inch Pressure Class 150

Pipe wall thickness shall be in accordance to bury depth as specified in the above referenced AWWA Latest Edition. Restrained joint ductile iron pipe shall be required, in conjunction with all conflict crossings and/or in situations that the City deems necessary.



All ductile iron shall be cement-lined and seal-coated in accordance with ANSI A21.4-2003/AWWA C104.

All ductile iron pipe for underground installation shall be outside coated with a 1-mil thick bituminous material applied by means of airless spray or other factory approved method.

The City may require use of polyethylene wrap around ductile iron pipe installations where conditions necessitate additional exterior protection. Polyethylene wrap shall be blue in color, 8-mil linear low-density polyethylene or 4-mil, high density, cross-laminated polyethylene encasement installed as per ANSI A21.5/AWWA C105.

W1301-3 PRESTRESSED CONCRETE CYLINDER PIPE (PCCP)

PCCP Pipe: All prestressed concrete cylinder pipe and fittings shall be furnished by reputable manufacturers with a minimum of ten (10) years of experience in manufacturing prestressed concrete cylinder pipe. Additionally, the pipe manufacturer shall be a member of the American Concrete Pressure Pipe Association. The pipe and fittings shall be manufactured and installed in accordance with industry standards and methods and shall comply in all respects with requirements of these technical specifications and with the Latest Edition of all referenced standards and specifications.

Acceptable types of pipe include Lined Cylinder (L301) and Embedded Cylinder (E301) pipe.

The design materials and workmanship for PCCP pipe shall conform to the requirements of AWWA C301. Core and coating thickness for pipe shall be as specified in AWWA C301.

The pipe shall be designed in accordance with the AWWA C304 Standard. A Portland cement mortar interior and exterior coating of the steel cylinder shall be a requirement of all PCCP pipe used in the water distribution system in accordance with AWWA C301.

The date of manufacture or a serial number traceable to the date of manufacture and the design strength classification shall be clearly marked by stencil with waterproof paint at the end of the pipe barrel.

PCCP Fittings: Fabrication of the fittings shall be as per AWWA M9 Manual and AWWA C301.

Steel thickness of all fittings shall be designed in accordance with Chapter 8 of the AWWA M9 Manual. Fittings shall be designed for the same conditions as the adjacent pipe.

In areas of the alignment where the pipe will be subject to unbalanced hydrostatic thrust forces (bends, tees, bulkheads, wyes, and valves), the pipe joints shall be restrained (harnessed) by field welding joints or by mechanically restrained joints.

Two acceptable types of mechanically harnessed or restrained joints are the harness clamp and Snap Ring® types of flexible restrained joints. The clamp type consists of two (2) semicircular steel clamps which fit over steel lugs that are factory welded or rolled into the steel bell and spigot sections. The semicircular clamps are drawn together by bolts at the springline on both sides of the pipe to form a flexible restrained joint.



The Snap Ring® type of flexible restrained joint consists of a split steel ring which is recessed in the special steel bell section of the pipe until the joint is made. Once the joint is made, the split steel ring is drawn down into position to form a lock between the bell and spigot by tightening a single steel bolt.

The rubber gaskets shall be in accordance with AWWA C301 and shall be designed and manufactured so that the completed joint will withstand an internal water pressure in excess of the highest pressure to which the pipe will be subjected to without showing any leakage by the gasket or displacement of it.

W1301-4 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

Reference Section W1513 for HDPE material specifications.

W1302 VALVE AND VALVE BOXES

W1302-1 RESILIENT SEAT GATE VALVES - (2 inch)

All two (2) inch gate valves located below grade must be ductile iron resilient seat and shall meet or exceed AWWA C509/C515 specifications. The interior and exterior of the valve body shall be fusion-bonded epoxy coated in order to provide a corrosion resistant seat, in accordance with AWWA C550, applied in a manner to withstand the action of line fluids and operation of the sealing gate under long-term service. All two (2) inch gate valves shall have a standard two (2) inch operating nut and standard FIPT inlet and outlet. Opening shall be in the counter-clockwise direction. The upper bonnet assembly shall be bolted to the lower valve body with 304 stainless steel hardware.

No bronze/brass type gate valves will be accepted in underground applications.

W1302-2 RESILIENT SEAT GATE VALVES - (4 inch – 24 inch)

Ductile iron resilient seat gate valve as described shall be used on all water mains sized from four (4) inch through twenty-four (24) inch.

All gate valves shall incorporate resilient seats and mechanical joint ends.

All gate valves shall meet or exceed AWWA C509/C515 specifications, Latest Edition. Resilient seats shall be of synthetic rubber and be bonded to the gate and shall be rated at a working pressure of two hundred fifty (250) psi.

The interior and exterior of the valve body shall be fusion-bonded epoxy coated in accordance with AWWA C550, Latest Edition, in order to provide a corrosion resistant seat, applied in a manner to withstand the action of line fluids and operation of the sealing gate under long-term service. Valve seats shall seal by compression only. Valves shall be supplied with two (2) inch square operating nuts and shall be designed to provide a bubble tight seal regardless of direction of flow. Opening shall be in the counter-clockwise direction. The upper bonnet assembly shall be bolted to the lower valve body with 304 stainless steel hardware.

During plan review process, the City may determine need for alternate valve design to accommodate bury depths.



W1302-3 BUTTERFLY VALVES (30 inch and greater)

Butterfly valves shall be designed, manufactured, and tested in accordance with AWWA C504, AWWA Class 150B, Latest Revision, and include the following design features. Valves shall be rated and tested for absolute, zero leakage shut-off.

Valve body shall be ductile iron per ASTM A536 Grade 65-45-12. Flanged end valves shall be faced and drilled per ANSI B16.1, Class 125. Mechanical joint ends shall be per ANSI A21.11 and include mechanical joint end accessories.

Valve body to include a stainless steel seat ring that is mechanically retained without use of clamping devices, adjusting segments, or other hardware being in the waterway.

Valve disc shall be solid type ductile iron without any external vanes, ribs, etc. to obstruct flow. Resilient seat shall be located on edge of disc, offset from the shaft, and seal against mating stainless steel body seat with three hundred sixty (360) degrees uninterrupted contact. The resilient seat shall be locked to the disc by three (3) separate means of retention, and be field adjustable, if necessary, with no tools other than a standard socket wrench. Replacement of seat in field shall be possible without valve disassembly.

The disc shall be connected to the offset stainless steel shaft by locked taper wedge keys and stainless steel retaining nuts on the stainless steel for added strength. Shaft material construction shall be in accordance with ASTM A276 (Type 304). Shaft shall be stub type for valves thirty (30) inch and larger. The valve shall be equipped with adjustable thruster for centering the disc on thirty (30) inch and larger valves if required.

Shaft shall have nylon sleeve or woven teflon fiber-glassed backed sleeve for bearing surfaces. Bearings shall be self-lubricating.

Manual actuators shall be manufactured and assembled to the valve by the valve manufacturer. They shall be direct mounted to the valve or be located on top of an extended bonnet as required. All actuators shall be worm gear or LS Traveling Nut with external adjustable stops only and be capable of holding disc stationary in any position under full rated pressure. Stop-limiting devices must withstand three hundred (300) ft./lbs. of input torque without failure. All buried or submerged actuators shall be totally enclosed. All above ground service valves shall have a position indicator.

All external hardware for buried valves shall be stainless steel type 304.

The valve interior and exterior surfaces shall be coated in accordance with the latest revisions of AWWA C504 and must be NSF 61 certified.

W1302-4 VALVE BOXES

Cast iron valve boxes shall be provided for all valves installed underground. The valve boxes shall be adjustable to fit the depth of earth cover over the valve and shall be designed so as to prevent the transmission of surface loads directly to the valve or piping. The valve boxes shall be manufactured of integral cast iron unit and shall be of the two piece telescopic and adjustable screw type design, including a bottom section and top section with lid cover. Lids shall be stamped "**Water**" for all public water system valves and stamped "**Fire**" for all private fire service main valves.



The casting shall be manufactured of clean, even grain, gray cast iron with a minimum tensile strength of twenty-one thousand (21,000) psi. It shall be smooth, true to pattern, free from blowholes, sand holes, projections and other harmful defects. The seating surface of both the lid cover and the top section shall be casted so that the cover will not rock after it has been seated, and will fit tightly with little or no play. A letter of certification may be required stating these compliances from the manufacturer.

W1303 FITTINGS

All fittings shall be ductile iron mechanical joint for use with previously specified ductile iron, PVC or HDPE pipe. Cast ductile iron fittings four (4) inch through twenty-four (24) inch shall be pressure rated at three hundred fifty (350) psi minimum. All fittings thirty (30) inch and greater shall be pressure rated at two hundred fifty (250) psi minimum.

All fittings shall conform to ANSI A21.10/AWWA C110 and/or ANSI A21.53/AWWA C153, Latest Editions. Ductile iron pipe joints shall be push-on or mechanical joints conforming to ANSI A21.11/AWWA C111. Flanged joints shall be used on all above-ground installations and shall be faced and drilled per ANSI Standard B16.1-125 pound.

All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline.

Only those fittings and accessories that are of domestic (USA) manufacture or a United States based manufacturing company will be acceptable.

All fittings shall be cement-lined and seal-coated in accordance with ANSI A21.4/AWWA C104. All fittings shall have double cement lining thickness.

All fittings for underground installation shall have an exterior asphaltic seal-coat conforming to ANSI A21.4/AWWA C151.

The material supplier and/or Contractor shall furnish data certified by the fitting manufacturer that the fittings are of the material specified, and shall furnish physical and chemical certifications.

All fittings manufacturers shall furnish to the Engineer certifications that all fittings comply to the following requirements: All fittings shall be capable to withstanding, without bursting, hydrostatic tests of three (3) times the rated water working pressure. The results of the specified tests (AWWA Standards) shall be retained for one (1) year, and shall be available by the foundry. All fittings, furnished by the approved manufacturer(s), shall be cast and machined at one foundry location to assure quality control and provide satisfactory test data.

Note the term “manufacture” shall be construed to mean the actual foundry performing the said casting of the component. All fittings must be identified by the name of the manufacturer. Name of third party broker will not be accepted. Brokers and/or suppliers are not considered manufacturers and shall not be approved.

All manufactured ductile iron fittings must comply with the following and must be certified by the manufacturer of compliance.

- All fittings must be tested and manufactured in accordance with all applicable AWWA standards.



- The foundry of origin shall be ISO certified.
- Each fitting shall have a cast in date code that identifies the date and shift of the manufacturer of that fitting.
- Each fitting must have cast in markings on the sides of each fitting which name the manufacturer, identify the AWWA C110/C153 pressure rating, the nominal diameter of the openings, the country where fitting was cast, the letters DI or word Ductile Iron and the number of degrees or fraction of circle of all bends.

W1304 TAPPING SLEEVES AND VALVES

Tapping sleeves size four (4) inch through twelve (12) inch shall be an all stainless tapping sleeve and be stainless steel 304/18.8 for sleeve, body (shell), branch, bolts and nuts. All fitting parts are to be heli-arc welded.

Tapping sleeves for sixteen (16) inch and larger shall be epoxy coated steel with all stainless steel hardware.

Tapping valves shall be iron body with 304 stainless steel bolts and nuts, bronze mounted gate valves, non-rising stem, open counter-clockwise, resilient seat, two (2) inch square operating nut, for vertical mounting in approximately level setting on buried waterlines. The tapping valve ends shall be mechanical joint on one (1) side and standard flanged ANSI B16.1-125 with MSS SP-60 on the other. Valves shall conform to the applicable sections of these technical specifications.

W1305 LINE STOP SADDLES

Line stop saddles up to twelve (12) inch shall be all stainless steel. Line stop saddles for piping greater than twelve (12) inches shall be approved on a case-by-case basis.

W1306 FIRE HYDRANTS

All hydrants shall have a five and one-fourth (5 ¼) inch valve opening, one (1), four and one-half (4 ½) inch pumper nozzle and two (2), two and one-half (2 ½) inch hose nozzles. Fire hydrants shall be manufactured in accordance with AWWA C502 Latest Edition and be UL/FM approved.

All fire department connections shall be in accordance with NFPA 24 and NFPA 1963 and shall utilize NHS standard threads.

All hydrants shall be traffic types and drain holes shall be plugged at the factory. All hydrants with upper valve plates, the plates shall be bronze. Safety couplings shall be stainless steel or epoxy coated cast iron for corrosion resistance. All fire hydrants shall have exterior stainless steel nuts and bolts – Grade 304.

W1307 AUTOMATIC FLUSHING DEVICES

Automatic flushing devices shall be installed on all permanent dead end mains.



W1308 SERVICE CONNECTIONS

W1308-1 SERVICE PIPE

One (1) inch service lines are to be constructed using blue polyethylene tubing, 200 psi, SDR9, CTS size conforming to specifications in AWWA C800, C901 and ASTM 2737, or Type K annealed temper soft copper tubing.

Two (2) inch service lines are to be constructed using blue polyethylene tubing, 200 psi, SDR9, CTS size conforming to specifications in AWWA C800, C901 and ASTM 2737, Type K annealed temper soft copper tubing or lead-free, threaded brass pipe.

All HDPE service lines shall be constructed with one (1) strand of twelve (12) AWG blue tracing wire (two (2) strands if HDPE line is installed using the HDD method). HDPE tubing with tracer wire integral to the tubing shall be permitted.

For service lines larger than two (2) inch, refer to Section W1301.

W1308-2 SERVICE SADDLES

Single strap saddles may be used on four (4) inch and six (6) inch water mains for one (1) inch service taps. Double strap saddles for one (1) inch service taps shall be used on water mains eight (8) inches or larger.

All two (2) inch service taps require a double strap saddle.

Saddles shall be all brass body with bronze straps. (Exception: service saddle for two (2) inch HDPE IPS size pipe shall be stainless steel band with epoxy coating).

W1308-3 SERVICE SADDLE CONNECTIONS

Service saddle connections for one (1) inch services shall be brass body, full port corporation stop with AWWA (CC) tapered thread inlet and compression outlet compatible with polyethylene or copper tubing or AWWA (CC) tapered thread inlet and flare outlet for copper tubing.

Service saddle connections for two (2) inch services shall be constructed using threaded brass and a resilient seat gate valve with two (2) inch square operating nut. See Section W1302-1.

W1308-4 CURB STOPS

Service control valves (curb stops) shall be brass body, full port ball valve with locking pad wing conforming to specifications in AWWA C800 and C901. Curb stop shall have compression inlet joint and FIPT outlet for copper or HDPE services or FIPT by FIPT for all brass services, or flare inlet by FIPT outlet for copper services.

W1308-5 BACKFLOW PREVENTERS

Reduced Pressure and Double Check backflow preventer assemblies shall be installed in accordance with the City's Cross-Connection Control Manual. Assemblies shall be all brass or stainless steel body construction with corrosion resistant moving parts. The devices shall have the capability of in-line repair for ease of maintenance and be



approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California. Use of assemblies with alternate materials of construction must have prior City approval.

W1308-5.1 REDUCED PRESSURE ASSEMBLY

The reduced pressure backflow prevention device shall contain within its structure a minimum of two (2) independently acting, approved check valves, together with an automatically operating pressure differential relief valve located between the two (2) check valves. The unit shall include tightly closing shut-off valves located at each end of the device, and each device shall be fitted with the properly located resilient seated test cocks.

W1308-5.2 DOUBLE CHECK VALVE ASSEMBLY

The double check valve assembly backflow preventer shall be a device containing within its structure two (2) spring-loaded independently operating poppet-type valves mounted in a common body. Two (2) gate valves and four (4) test cocks shall be designed for installation in a normal horizontal flow attitude. The test cock arrangement will be such that each check valve can be tested without removal of the assembly from the line.

W1308-5.3 DOUBLE CHECK DETECTOR ASSEMBLY

Double Check Detector Assemblies shall have OS and Y gate valves before and after the check valves, with an approved five-eighths (5/8) inch by three-fourths (3/4) inch detector meter as shown in Technical Detail A-204. All double detector check valves must register in gallons and shall be manufactured and installed as per AWWA M-14, Rule 62.555.360 (F.A.C.) and Section W1900 of these technical specifications. All back flow devices must be approved as per The University of Southern California Foundation for Cross-Connection Control and Hydraulic Research.

W1308-6 STRAINER

Plate Strainer: (2 inch – 6 inch dedicated domestic assemblies) shall be dual ANSI B16.1-125 flanged plate brass strainer. Straining area shall be 2x the diameter of the meter inlet. Strainer shall have removable stainless steel screen and drain plug.

Basket Strainer (for use in fire series/master meter assemblies) shall be flanged x flanged outlets, steel construction, epoxy lined and coated with 304 stainless steel mesh basket with one-fourth (1/4) inch perforations and clean out port(s) and in accordance with AWWA C703.

W1308-7 FIRE SERIES/MASTER METER ASSEMBLIES

Large meter assembly that will be used for both potable and fire protection-assembly shall consist of an AWWA Class II in-line horizontal axis turbine meter, basket type strainer with six (6) times the pipe diameter installed upstream of meter, check valve and by-pass turbine meter with isolation and check valves. Assembly shall be in



accordance with AWWA C703 and be UL/FM approved. Alternative meter types shall have prior City approval. See Technical Detail A-203.

W1308-8 METER BOXES

For waterline replacement projects, the City may provide meter boxes as needed on a case-by-case basis. Should boxes be supplied by Contractor refer to Appendix B: Approved Products List for manufacturers and model numbers.

W1309 INSPECTION OF MATERIALS

Materials delivered to the job site will be subject to inspection by the City prior to installation. All materials found during inspection or during the progress of the work to be defective or not meeting specifications shall be rejected and removed from the job site without delay.

All materials delivered to the job shall be in accordance with the material specifications.

Materials not inspected by the City prior to installation shall be uncovered by the Contractor at his expense to verify compliance with these technical specifications. Copies of the packing list shall be furnished on demand.

W1400 CONSTRUCTION

W1401 PROTECTION

Temporary supports and/or adequate protection and maintenance shall be installed on all underground and surface structures encountered in the progress of the work. Structures and both public and private properties that have been disturbed shall be restored to original condition upon completion of the work.

W1402 NOTIFICATION

Official written and oral communication must be given to all properties to be affected by construction activities. Notification shall be the responsibility of the Contractor and shall be given no less than forty-eight (48) hours in advance of the actual start of construction in the area.

W1403 OBSTRUCTIONS

All utilities shall be notified prior to beginning construction. Any known obstructions shall be shown on the plans. The utmost caution shall be taken in all operations to avoid damage to existing obstructions whether or not shown on the plans. Water mains shall be designed to go over obstructions such as drainage and or sewer pipes wherever possible.



W1404 TRENCH PREPARATION

W1404-1 EXCAVATION

All excavation shall be done in accordance with the Florida Statute 553.62- Florida Trench Safety Act and OSHA 29 CFR 1926.650, Latest Revisions.

A trench shall be opened so that the pipe can be installed to the alignment and depth required. It shall be excavated only so far in advance of pipe laying as necessary.

The trench shall be excavated to the depth required so as to provide a uniform and continuous bearing support for the pipe on undisturbed ground. Bell holes shall be provided at each joint to permit jointing to be made and inspected properly.

During excavation, if ashes, cinders, muck or other organic material considered unstable is uncovered at the bottom of the trench at subgrade, it shall be removed and backfilled with approved material for a depth not less than twelve (12) inches.

All backfill material shall be tamped in layers of six (6) inches to provide a uniform and continuous bearing characteristic of that area's soil condition.

Where the bottom of the trench at subgrade consists of unstable material to such a degree that it cannot be removed and replaced with an approved material to support the pipe properly, a suitable foundation shall be constructed. Excavated material shall be piled in such a manner that it will not endanger work, obstruct natural watercourse, sidewalks or driveways.

Fire hydrants under pressure, valve boxes, or other utility controls shall be left unobstructed and accessible at all times. Street gutters shall be kept clear or other satisfactory provisions made for street drainage, to include stormwater inlet protection devices. Erosion/Sedimentation control devices shall be utilized in accordance with best management practices and/or Stormwater Pollution Prevention Plan. All surface materials, which are suitable for reuse in restoring the surface, shall be kept separate from the excavated materials.

W1404-2 SHEETING AND BRACING

Open cut trenches shall be sheeted and braced as required by Florida Statute 553.62- Florida Trench Safety Act and OSHA 29 CFR 1926.650, Latest Revisions, and as may be necessary to protect life, property and/or the work.

Trench bracing may be removed after the backfilling has been completed or has been brought up to such an elevation as to permit its safe removal. The use of a trenching box may be used in place of sheeting and bracing as long as said box is in compliance with above referenced OSHA regulations.

W1404-3 DEWATERING

All dewatering procedures shall be in strict adherence to St. John's River Water Management District and FDEP regulations.

Water shall not be allowed in the trench at any time. An adequate supply of well points, headers and pumps, all in first class operating condition, shall be used to remove the ground water. The use of gravel and pumps shall also be an acceptable means of



removing the water on a case-by-case basis as approved by the City. At no time shall any pumps emit an unacceptable noise level or Contractor will be required to shut down pumping operations.

The trench shall be excavated no more than the available pumping facilities are capable of handling. The discharge from pumps shall be routed to settling basins or other acceptable erosion and sedimentation control devices prior to discharging to natural or existing drainage channels or storm sewers. Any and all plans, permits, laboratory analysis and associated fees required for dewatering are the responsibility of the Contractor and shall be obtained prior to commencement of construction.

W1405 PIPE LINE CONSTRUCTION

All water mains, service lines and appurtenances shall be installed as specified in these technical specifications and in accordance with the approved plans and appropriate standard detail sheets as provided herein.

Construction sequencing shall be such that pipeline is constructed in one direction and does not terminate in the middle of pipe segment. The bottom of the trench shall not be excavated below the specified grade. If undercutting occurs, the bottom of the trench shall be brought up to the original grade with approved material, thoroughly compacted as directed by the City Engineer and/or City Engineer's representative.

Before placing pipe into the trench, the outside of the spigot and the inside of the bell shall be wiped clean and dry, free from oil and grease. Every precaution shall be taken to prevent foreign material from entering the pipe. During laying operation, no debris, tools, clothing or other material shall be placed in the pipe.

All mechanical joints shall be made up in strict accordance with the manufacturer's specifications. Gaskets shall be evenly seated, the gland placed in position with the bolts, and evenly tightened.

All slip joints shall be made up in strict accordance with the manufacturer's specifications. The bell shall be carefully cleaned before the gasket is inserted.

After placing a length of pipe in the trench, the spigot end shall be centered in the bell, the pipe forced home and brought to correct alignment. Prior to covering with an approved backfill material, one (1) strand of twelve (12) AWG insulated blue tracing wire shall be placed directly on top of pipe and HDPE service lines (two (2) strands if HDPE line is installed using the HDD method) prior to any backfilling. Contractor is responsible for maintaining wire on top of pipe either with use of industrial grade tape or wrapping wire around fittings and bells. Wire splices shall be made using wire nuts with silicone sealant appropriate for direct bury applications. Using tape to wrap splices is not acceptable. All new water systems shall be sounded prior to or during the pre-final inspection to assure a continuous strand of wire. Any disruption of sounding shall be repaired by the Contractor and re-sounded prior to final acceptance. Where repair is not practical, soft-digs shall be provided and an electronic ball marker shall be placed on portions of the pipe where sounding cannot be re-established in intervals not to exceed twelve (12) feet. Wire end shall terminate at closest valve. Wire shall be brought up to grade along outside of valve box, then inserted into valve box between the top and bottom sections of box. Wire shall be coiled up just underneath valve box lid so wire can be extended a minimum of twelve (12) inches out of valve box.



All pipe is to have a three (3) inch wide metalized marker tape installed over the pipe after the backfill, in the secondary zone, is compacted; but no less than eighteen (18) inches of ground cover shall be provided over marker tape. Marker tape shall be identified with the words "Water". Caution to maintain marking tape over pipe during backfill operation is imperative. Electronic ball-type marking devices shall be placed every one hundred (100) feet along water main. Marking devices shall be placed directly on top of main and Contractor shall ensure device remains in place during backfill operations. In addition, marking devices shall also be placed at each valve, fitting and directional change.

Pipe will be installed with thirty (30) inches of minimum cover. Maximum cover of forty-two (42) inches will be accepted. Cover depth will be determined from finished grade at the location of the pipe as indicated on the plans.

Exception to stated depth requirement will be those portions of water main within casings or those portions that go over or under storm drains, sanitary sewers or other utilities as shown on plans. In all such cases, water main shall be immediately brought back to proper grade by way of mechanically restrained mechanical joint fittings. Reference Technical Detail A-105.

In those cases where depth differences are extreme or other circumstances prevent the use of offset fittings, properly restrained mechanical joint forty-five (45) degree bends can be used in conjunction with ductile iron pipe. All said restraints must meet or exceed the standards as specified by the DIPRA Engineering Tables. Reference Technical Detail A-111. Alignment and depth of pipe will be spot checked during construction and/or "As-Built" inspections.

Where internal restrained joints are used, the entire bell shall be painted red with high quality enamel paint.

At all times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other approved means. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

Underground metal pipe shall be color coded or marked using blue as a predominant color. The markings shall be permanently affixed to the top and each side of the pipe. If tape is used, tape shall be adhesive tape at least 5-mils in thickness, at least two (2) inches in width, and made of an aluminum material sandwiched between two (2) layers of polyethylene or vinyl. There shall be a minimum of three (3) colored stripes per length of pipe. These bands shall be placed at least sixty (60) degrees apart on the pipe and shall be two (2) inches in width. All pipes shall be laid so that the center stripe is on the top as viewed from above.

The City may require use of blue polyethylene wrap around ductile iron pipe installations where conditions necessitate additional exterior protection.

W1405-1 PCCP PIPE LAYING

All prestressed concrete cylinder pipe shall have a minimum of forty-two (42) inches of cover. Pipe shall be laid to the elevations shown on the drawings unless approved otherwise by the Engineer. Design pressures shall be in accordance with AWWA C304.



The field test pressure is recommended to be twenty (20) percent above the working pressure. This recommendation is contained in the AWWA M9 Manual for concrete pressure pipe.

Unsatisfactory or damaged pipe will be permanently rejected.

The completed pipeline (or completed sections of the pipeline) shall be bulkheaded, filled with water, and pressure tested to one hundred twenty (120) percent of the internal working pressure. After the line is filled, and prior to pressure testing, it shall be allowed to soak under low pressure to allow the pipe walls to absorb water and for temperature stabilization. While filling the line, the Contractor shall be responsible for properly bleeding off trapped air to avoid adversely affecting the leakage test results.

During the hydrostatic test, the Contractor shall use a calibrated meter or other device to accurately measure the quantity of water necessary to maintain the test pressure on the gauge. The line will not be accepted until this measured quantity is less than ten (10) gallons per inch of diameter per mile of pipe per twenty-four (24) hours. All visible leaks must be repaired regardless of the measured leakage.

Gasket, gasket groove, and bell sealing surfaces shall be cleaned and lubricated with a lubricant furnished by the pipe manufacturer. The lubricant shall be approved for use in potable water and shall be harmless to the rubber gasket. Use only lubricant supplied by the pipe manufacturer. Pipe shall be laid with bell ends looking ahead in the direction of laying. As soon as the spigot ring is centered in the bell of the previously laid pipe, it shall be forced home with approved equipment. After the gasket is compressed, verify the position of the gasket in the spigot ring groove with a feeler gage provided by the pipe manufacturer.

The grout diaper for PCCP shall consist of a Tyvar synthetic fiber layer (gray in color) and a layer of closed cell foam. These layers are sewn together along with a pair of five-eighths (5/8) inch wide steel bands at each edge which are used to secure the diaper to the pipe exterior. Use only grout diapers supplied by the pipe manufacturer. A stretching tool is used to tighten the steel bands. Once the bands are pulled tight, a steel clip is crimped around the bands to hold them in position. It is important that the diaper be carefully placed against the exterior surface of the pipe to ensure that it is flush with no gaps or gathers. The closed cell foam surface is to be placed against the pipe exterior.

The wet grout will flow down to the bottom of the diaper and begin to bulge it out. It is often helpful to place some bedding material (or sandbags) directly under the diaper at the bottom to support the weight of the wet grout. Take care to not push excessive amounts of bedding material under the diaper such that the diaper is pushed up into the joint recess impeding the flow of wet grout.

Mix the grout using one part ASTM C150 Type 1 or Type 2 portland cement to not more than three (3) parts clean sand with sufficient water to achieve a pourable consistency. The grout should look and pour like a thick cream. Carefully pour the mixed grout into the gap at the top of the diaper. As the pouring proceeds, the workers must inspect the diaper around the joint periphery to insure that the grout is flowing all around. Once the diaper is full and wet grout is puddling at the gap at the top, apply a stiffer mix the consistency of wet brick mortar over the joint insuring that all steel components of the joint are covered.

All pipe shall be sound and clean before laying. When laying is not in progress,



including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means to prevent unauthorized entrance of people, animals, dirt, or water into the pipeline already installed. Good alignment shall be preserved in laying. The deflections at joints shall not exceed the amount recommended by the pipe manufacturer.

Underground concrete pipe shall be color coded or marked using blue as a predominant color. The markings shall be permanently affixed to the top and each side of the pipe. If tape is used, tape shall be adhesive tape at least 5-mils in thickness, at least two (2) inches in width, and made of an aluminum material sandwiched between two (2) layers of polyethylene or vinyl. There shall be a minimum of three (3) colored stripes per length of pipe. These bands shall be placed at least sixty (60) degrees apart on the pipe and shall be two (2) inches in width. All pipes shall be laid so that the center stripe is on the top as viewed from above.

W1406 BACKFILLING

Machine excavation shall be carried to the depth above the final pipeline grade that will allow the final grading, using hand tools. If excavation is carried below the required depth, the overcut depth shall be backfilled with Type "B" backfill material or bedding material compacted to provide pipe support at least equal to that of the original material.

Contractor may, at their option, elect to overcut the trench using machine excavators and backfill with Type "B" backfill or bedding material, as above, to minimize the hand excavation. If Contractor so elects, the depth of overcut shall be such that a minimum of two (2) inches of compacted backfill material will result under the lowest projection of the pipe bell.

Type "B" - This material shall be a select granular material free from organic matter and of such size and gradation that the desired compaction can be readily attained.

Type "D" - This material shall be unclassified material obtained from the Contractor's excavations. The material shall be substantially free from wood, roots and other organic matter. The maximum size of stone shall not exceed three (3) inches.

Trees, stumps and roots within the limits of the trench excavation shall be removed to a depth of at least twelve (12) inches below the bottom of trench. Stump and root holes shall be refilled to existing grade and compacted by tamping. No stumps, roots, or organic matter of any description shall remain under concrete slabs or footings.

The trench shall be excavated so that the pipe can be laid to the alignment and grades shown on drawings.

The trench shall be dry when the bottom is prepared. A continuous trough shall be excavated by hand to receive the bottom one hundred twenty (120) degrees of the pipe barrel. In addition, bell holes shall be excavated so that after placement only the barrel of the pipe receives bearing pressure from, and is uniformly supported by, the bottom of the trench.

Preparation of the trench bottom and placement of the pipe shall be such that the final position of the pipe is true to line and grade and uniformly supported throughout the barrel of each pipe length. When pipe is placed in backfill over rock or other material,



additional backfill of the same material shall be tamped on each side of the barrel to the height of the spring line, thus forming a trough of firm bedding.

Wherever excavation of the trench exposes unsuitable materials such as peat, soft clay, quicksand or other unstable material in the bottom of the trench which, in the opinion of Engineer of Record is unsuitable foundation upon which to lay or support the pipe backfill and expected superimposed loads, such unsuitable materials shall be removed to a depth necessary to reach material having adequate bearing capacity and a width of trench at least equal to the minimum trench width as specified. The City reserves the right to require soils report for determination of suitable material. The spaces created by removal of this unsuitable material shall be backfilled using Type "B" backfill or bedding material. The backfill material shall be placed in eight (8) inch layers and compacted, using mechanical compaction equipment, to a dry density equal to ninety-eight (98) percent under roads, curb, gutters, and shoulders and ninety-five (95) percent in all other places, of the maximum dry density as determined by the Modified Proctor Compaction Test, AASHTO T-180, each layer being compacted to the required density prior to placing the next layer.

After the pipe has been properly laid and inspected, Type "D" backfill shall be carefully placed around the pipe to a depth of six (6) inches over the pipe. The backfill material shall be carefully placed loosely in horizontal layers, equally on both sides of the pipe, and shall be spaded, "walked-in" and compacted with hand tampers to obtain a firm, dense support for the pipe. When one such layer is completed on both sides of the pipe a second layer shall be started. The backfill material shall not be obtained from the trench walls within one (1) foot above top of pipe. Use mechanical tamping equipment. No further backfilling will be permitted until the initial backfill has been accomplished by an approved method.

Above the level of the initial backfill, the trench shall be filled with material placed in accordance with one (1) of the following classifications:

1) Compacted Backfill:

Materials for compacted backfill shall be Type "D" except as otherwise shown on drawings or specified. The backfill material shall be placed in horizontal layers not exceeding twenty-four (24) inches in loose depth and compacted by power operated tampers, rollers, or vibratory equipment to a specified dry density as determined by AASHTO T-180. Each layer shall be compacted to the specified density prior to placing subsequent layers. The thickness of the loose layer may be increased when in-place densities show that the specified density can be obtained. Compacted backfill shall be used in all street and road rights-of-way.

2) Plain Backfill:

Material for plain backfill shall be Type "D". Plain backfill shall be placed where compacted backfill is not required. The backfill material may be placed in layers, each layer being compacted so that a depression does not form along the trench line. Any depression formed by settlement of the backfill shall be immediately filled by the Contractor.

The Contractor shall hire a testing laboratory approved by the State of Florida to perform density testing of backfill. One (1) set of density tests shall be performed at two hundred (200) foot intervals staggered along the pipe run. The City reserves the right to



require density tests at other locations as the inspector may deem necessary. Each set of density tests shall consist of one (1) test two (2) feet above the crown of the pipe and one (1) test for each one (1) foot interval up to the bottom of the sub-grade or to the ground surface if not under a road. The minimum required field densities are as follows: ninety-eight (98) percent of the maximum density determined by the Modified Proctor Compaction Test, AASHTO T-180, under roads, curbs, gutters and roadway shoulders; ninety-five (95) percent of the maximum density per AASHTO T-180 outside road rights-of-way.

W1407 VALVES AND FITTINGS

All valves and fittings shall be set and joined to the pipe in the proper location as specified in the plans. A roadway valve box shall be provided for every valve. This valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve. A valve nut extension shall be secured to valves deeper than forty-eight (48) inches from finish grade as per standard drawings. Utilities Operations Division must give approval for all valves deeper than forty-eight (48) inches prior to installation. The box cover should be flush with surface of the finished pavement or grade level as specified in the plans.

A bronze or stainless steel three (3) inch diameter disc shall be cast into the pad for all valves two (2) inches or larger. Marking disc shall be attached to tracing wire inside valve box for valves located within pavement.

Valve nomenclature to be stamped into the disc shall include the valve size, the type of valve, utility type, direction to open, and the number of turns to open. See Technical Detail A-115.

Valve boxes shall be set flush with finished pavement, squarely centered to permit easy use of a valve wrench, and set to prevent surface loads from being transmitted to the valve or pipe. Field manufactured extensions will not be accepted. Valve box lids, not on designated fire lines, shall have the word "WATER" cast on the top. All valve boxes located outside of roadway pavement shall have a three thousand (3,000) psi concrete pad poured around the box at finished grade level (24 inch x 24 inch x 8 inch with a minimum of four (4) sections of # 5 reinforced rod located at right angles to each other). All water valve box tops shall be painted blue with approved paint. In addition, all valve locations shall be scored with a "V", one-fourth ($\frac{1}{4}$) inch deep, four (4) inches wide and six (6) inches long, in nearest curb with point of "V" facing valve and the "V" painted blue.

Valve box risers will not be permitted on new construction. Valve box risers will only be allowed on existing valve boxes that require pavement overlay.

W1407-1 AIR VALVES

Air valves shall be installed above ground and in an enclosure. Above ground enclosure shall be installed as close to the right-of-way as practical. Installation of air valve in traffic bearing pre-cast concrete vaults may be necessary, as determined by the City on a case-by-case basis.



A full-port brass ball valve with handle must be installed in between tapping saddle and air valve. Tapping saddle shall meet the requirements of Section W1308-2.

Fittings from the main to the brass ball valve shall be iron-pipe thread, brass rated for two hundred (200) psi. At no time, will galvanized fittings be allowed on air valve installations.

W1408 MECHANICALLY RESTRAINED FITTINGS

Mechanical joint restraints shall be installed at all connections, on any bends, tees, fire hydrants, and dead end valves as specified on the plans. Mechanical restraint schedule must be adhered to in all cases, see Technical Detail A-111. All restraint fittings shall be domestically manufactured or manufactured by a company based in the United States following same quality control standards of a domestic company.

W1409 PIPE INSTALLED IN CASING

Pipe to be installed by the jack and bore method shall be installed through steel casing, which has been jacked and/or bored. Casing shall extend beyond edge of pavement ten (10) feet.

Casing size shall be as indicated below:

<u>Pipe Size</u>	<u>Minimum Casing Size</u>
2"	6"
4"	12"
6"	14"
8"	18"
10"	20"
12"	24"
16" or larger	In accordance with manufacturer's recommendation

Water mains shall be pushed or pulled through the casing on casing spacers placed at five (5) foot intervals. Mechanically restrained joints are required on all mains installed within casings.

Casing spacers shall be all stainless steel with high-density polyethylene or glass filled polymer runners.

All casing ends shall be sealed with appropriate rubber seals secured by stainless steel straps. Casing end seals shall be of the same manufacture as the casing spacers.

Casing vents shall be installed on ends of casing pipe prior to casing seals. Vents four (4) inches and smaller shall be constructed of PVC pipe. Vents six (6) inches and larger shall be constructed of ductile iron piping. Vents shall terminate below grade in approved meter box outside of pavement.



W1410 FIRE HYDRANTS

All public hydrants shall be painted yellow and private hydrants painted red. All hydrants shall be primed to a thickness of 3-mils and painted to an additional thickness of 3-mils.

Acceptable grade for all fire hydrants shall be interpreted as center of steamer port nozzle heights of twenty (20) to twenty-eight (28) inches above final grade. A six (6) inch riser may be used for installations of new hydrants on existing mains. Risers are not acceptable where hydrants are installed along with new mains.

A six (6) inch MJ hydrant connection shall be provided using a hydrant valve anchoring tee with integrally cast standard MJ gland on six (6) inch plain end branch. In addition, all hydrant weepholes must be plugged at the factory prior to delivery.

Both public and private fire hydrants shall be located as shown on the plans and marked on the pavement with a blue reflector located in middle of adjacent roadway. Separation requirements as referenced in Section W1205 shall apply. On unpaved streets a blue reflector shall be affixed to a post and placed as close to the edge of the road as practical so as to be visible. The hydrants shall be located in such manner as to provide complete accessibility and also in a manner that the possibility of damage from vehicles or injury to pedestrians will be minimized (between three (3) feet to eight (8) feet) from roadway). All hydrants shall stand plumb with the pumper nozzle facing at the curb and the bury line of the hydrant at the finished grade. Fire hydrants installed in state highway right-of-ways shall be in accordance with any Department of Transportation requirements. All fire hydrants shall be connected to the main in the manner shown in the Technical Detail A-200.

Prior to City acceptance, the Contractor must demonstrate that the threads of the hydrants port cap are well lubricated with white lithium grease and the caps turn easily.

The retaining chains and swivel clips for the fire hydrant port caps must be removed.

W1411 BLOW OFFS

Blow offs are to be installed prior to City acceptance. Gate valves for blow offs shall be accessible through valve box as previously indicated in specifications.

Blow offs at dead end water mains shall be an automatic flushing device. Automatic flushing devices shall include a two (2) inch meter installed in a meter box to monitor water usage. Meter shall be furnished and installed by the Contractor. See Technical Detail A-211 and Technical Detail A-212.

Manual blow offs installed during pipeline construction shall be constructed of all threaded brass in accordance with Technical Detail A-124. At no time, will galvanized fittings be allowed on blow off installations.

W1500 HORIZONTAL DIRECTIONAL DRILL

W1501 GENERAL

This section includes materials, performance and installation standards and Contractor responsibilities associated with the furnishing of all labor, materials, equipment and incidentals required to install and complete trenchless installation of pressure mains.



For connection procedures for two (2) inch and smaller HDPE tubing, see Section W1800.

The Contractor shall furnish all material, equipment, transportation, tools, and labor to install pipe by directional drilling method, or direct trenchless pipe installation as required, and all related work for complete installation.

NOTE: Sizing of HDPE pipe shall be based on nominal pipe diameters and shall be equivalent to C900 piping systems.

W1502 EXPERIENCE

The Contractor must demonstrate expertise in horizontal directional drilling (HDD) trenchless methods by providing a list of ten (10) utility projects similar in scope performed in the State of Florida within the last two (2) years. The references should include a name and telephone number where contact can be made to verify the Contractor's capability. The Contractor must provide documentation showing successful completion of the projects used for reference. Conventional trenching experience will not be considered applicable.

All supervisory personnel must be adequately trained and will have at least five (5) years' experience in directional boring. Prior to approval for directional boring, the Contractor must submit names of supervisory field personnel and fusion technicians and historical information of directional boring experience. Proof of certification shall be maintained on-site and made available to the City upon request. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed, must be in direct charge and control of the operation at all times. In all cases the supervisor must be continually present at the job site during the actual directional bore operation. The Contractor shall have a sufficient number of competent workers on the job at all times to insure the bore is made in a timely and satisfactory manner.

The directional boring equipment shall be designed and constructed for the intended purpose of installing the appropriate diameter pipe. Manufacturer's data shall be maintained on-site and made available to the City upon request. Contractor shall use equipment that is in good working condition and free of damage, including drilling machine, drill pipe, drill bits, cables, pipe pulling devices, swivels, tracking equipment and all other equipment necessary for a complete horizontal directional bore installation of the pressure main.

W1503 WARRANTY

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

W1504 JURISDICTION OF WORK

For installations not within the jurisdiction of the City, the Contractor shall comply with regulations of the governing authority. State highway casing installations shall be as



specified in the Florida Department of Transportation “Utility Accommodation Manual” as supplemented by the Florida Department of Transportation permit and/or FDEP permit.

W1505 REFERENCED STANDARDS

The work shall conform to applicable provisions of these technical specifications and the following standards, Latest Editions:

- AWWA C906: Polyethylene Pressure Pipe and Fittings, 4 inch through 63 inch
- ASTM D618: Standard Methods of Conditioning Plastics and Electrical Insulating Materials for Testing
- ASTM D638: Standard Test Method for Tensile Properties of Plastics
- ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter (IPS/DIPS)
- ASTM D1238: Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
- ASTM 1248 : Standard Specifications for Polyethylene Plastics Molding and Extrusion Materials
- ASTM D1505 : Standard Test Method for Density of Plastics by the Density-Gradient Technique
- ASTM D1598 : Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
- ASTM D1599 : Standard Test Method for Short-time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings
- ASTM D1603 : Standard Test Method for Carbon Black in Olefin Plastics
- ASTM D2122: Standard Method of Determining Dimensions of Thermoplastics Pipe and Fittings
- ASTM D2290: Standard Test Method for Apparent Tensile Strength or Tubular Plastics and Reinforced Plastics by Split Disk Method
- ASTM D2683: Standard Specification for Socket-type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
- ASTM D2737: Standard Specification for Polyethylene (PE) Plastic Tubing
- ASTM D2837: Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Material
- ASTM D2839: Standard Practice for Use of a Melt-Index Strand for Determining Density of Polyethylene
- ASTM D3035: Standard Specification for Polyethylene Plastic Pipe Based on Controlled/Outside Diameter (IPS only)
- ASTM D3261: Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene Plastic Pipe and Tubing.



- ASTM D3350: Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
- ASTM D4218: Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
- ASTM F412: Standard Terminology Relating to Plastic Piping Systems

W1506 SUBMITTALS

Prior to beginning work, the Contractor shall submit an HDD work plan, specific to the site, outlining procedures and schedules to be used to execute the project. The Contractor shall submit the following required information for all individual HDD segments to the City Engineering Department.

HDD Work Plan

The HDD work plan should include a description of all equipment to be used, down-hole tools, a safety plan (including MSDS of any potentially hazardous substances to be used), traffic control plan (if applicable), an environmental protection plan and a contingency plan. The HDD work plan shall be comprehensive, realistic and based on actual working conditions for the particular project. The HDD work plan shall document the thoughtful planning required to successfully complete the project that includes a schedule of work activity. The HDD Contractor shall submit and obtain approval of a pre-construction bore-log depicting a plan and profile (horizontal and vertical alignment) of the proposed bore path. The bore-log shall show all utility crossings and existing structures. All deviations from the approved construction drawings shall be clearly identified. The HDD work plan shall specifically address the following potential problems:

- A Frac-Out and Surface Spill Contingency Plan
- Loss of returns
- Obstructions along bore path during reaming or pull-back
- Drill pipe or product pipe cannot be advanced
- Deviations from design line and grade exceed allowable tolerances
- Drill pipe or product pipe broken off in bore hole
- Collapse of product pipe or excessive deformation
- Damage to a utility
- Excessive subsidence or heave

The Contractor shall investigate and verify site specific soil and ground water conditions as necessary to select drilling fluids and design bore paths. All costs for investigations and verification shall be borne by the Contractor.

The Contractor shall submit technical data for drilling equipment including clay slurry material (including MSDS), method of installation, spoils removal units with working drawings and proposed sequence of construction for approval by the City.



The Contractor is required to bring to the attention of the City any known design discrepancies between the approved construction plans with actual tunneling methods that the Contractor will be performing. This shall be stated in writing to the City no later than the pre-construction meeting.

As part of the HDD work plan, the Contractors shall submit to the City an emergency response plan in the event of contamination of project site waterways by fluids and materials used and/or developed by the drilling process. Contractor shall certify that the equipment and material used in the response plan are available at the project site at all times during construction.

The City shall be notified two (2) working days, at a minimum, in advance of starting the drilling work. The HDD work shall not begin until the proper preparations (see HDD work plan) for the operation have been completed and approved by City Engineering Inspector.

W1507 PERMITS

The Contractor shall have all applicable permits in hand prior to construction.

W1508 QUALITY ASSURANCE

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

HDPE Pipe Standards:

- AWWA C906 ASTM D3350. DR11 High Density Polyethylene (HDPE) distribution pipe; 4 inches to 24 inches. For pipe sizes 2 inch or 30 inches and larger, the HDPE may be IPS size, DR11 in accordance with ASTM D2239.
- Meet Pipe and Fitting requirements and be approved by the National Sanitation Foundation (NSF 61) standards.
- All HDPE pipe shall be manufactured in accordance with AWWA C906, ASTM D3350/3261 standards. With minimum material designation code of 3608 with 4710 preferred and a minimum cell classification of 345464C.

W1509 EXECUTION

It shall be the Contactor's responsibility to perform the directional drilling work in strict conformance with the requirements of the agency in whose right-of-way or easement the work is being performed. Any special requirements of the agency such as insurance, flagman, etc. shall be strictly adhered to during the performance of work. The special requirements shall be performed by the Contractor at no additional cost to the City.

Protection of Existing Utilities - Contractor shall coordinate utilities locates with Sunshine State One-Call of Florida-811. Once the locate service has field marked all



utilities, the Contractor shall verify each utility (including any service laterals, i.e. water, sewer, reclaimed, cable, gas, electric, phone, etc.) and those within each paved area.

Verification may be performed utilizing ground penetrating radar, hand digging, or vacuum excavation. Prior to initiating drilling, the Contractor shall record on the drawings both the horizontal and vertical location of the utilities off of a predetermined baseline. The Contractor shall be responsible for all losses and repairs as a result of damage to underground utilities resulting from drilling operations. The Contractor shall make reasonable effort to locate evidence of any other potential subsurface obstructions such as piles or piers.

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

Pipe shall be handled, stored and joined in accordance with manufacturer's specifications and/or these technical specifications. All directional drill operations, with the exception of delivery, shall be conducted while a City inspector is present.

W1510 EXCAVATION

Required directional drilling pits shall be excavated and maintained to minimum dimension. Said excavations shall be adequately barricaded, sheeted, braced and dewatered, as required, in accordance with the applicable portions of these technical specifications.

W1511 DRILLING OPERATIONS

A City representative must be present during drill operations. Contractor shall coordinate drill operations with the City and Contractor is responsible for overtime cost incurred by the City as a result of drill operations conducted outside of normal business hours.

Installation shall be in a trenchless manner producing continuous bores.

The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, movement or distortion of surface features.

The tunneling system shall be remotely steerable and permit electronic monitoring of tunnel depth and location.

Pipe shall be handled, stored and joined in accordance with manufacturer's specifications and/or these technical specifications.

Pre-excavate pipe entry and receiving areas to provide a gradual entry of the pipe without stress to the pipe or joints and to allow free movements into the bore hole at an acceptable depth. Carefully guide pipe in such a manner as to avoid deformation of, or damage to the pipe.

Continuous monitoring of boring head is required, including across open water. Equipment shall be fitted with a permanent alarm system capable of detecting an electrical current. The system shall have an audible alarm to warn the operator if the drill head contacts electrified cables.



Contractor shall track horizontal and vertical alignment of pilot hole at intervals not exceeding five (5) feet. Contractor shall provide the City with the tracked position and inclination of the pilot hole in a bore-log report at completion of drill.

Every effort shall be made to maintain pipe installation to the minimum/maximum depth noted on approved construction plans. Where depth or shallower installations are required, Contractor shall make adjustments without additional cost to the City. Deviations from the plans may be made only with the approval of the City.

If unexpected subsurface conditions are encountered during the bore, the procedure shall be stopped. The installation shall not continue until the City has been consulted.

The Contractor shall construct the pilot hole conforming to the following alignment requirements:

- Throughout its alignment, pilot hole shall be within five (5) feet of horizontal alignment shown and no shallower than vertical alignment shown on approved construction plans or work plan.
- Alignment shall have no intermediate high points that may trap air in pipe after installation.
- Curvature of completed pilot hole shall not exceed that which after pipe installation will result in pipe wall stress greater than 0.50 yield stress.

Acceptance: If pilot hole alignment fails to conform to specified requirements, Contractor shall drill a new pilot hole with alignment meeting specified requirements.

The carrier pipe shall be installed using the wet insertion construction technique. At the Contractor's option, the pipe may be installed full of water.

Tunneling shall be performed by a steerable drill head with drill bit cutting process, utilizing liquid clay, i.e. bentonite slurry drilling fluid. The drilling fluid will maintain tunnel stability and provide lubrication during the drilling process and to reduce frictional drag while the pipe is being installed. In addition, the clay fluid shall be totally inert and contain no environmental risk. The Contractor shall have a mobile spoils recovery system on-site to remove drilling spoils from the access pits. The spoils shall be transported from the job site and be disposed of in accordance with local, state and federal regulations.

Liquid clay type colloidal drilling fluid shall consist of high-grade, processed bentonite clay to consolidate cuttings of soil, to seal the walls of the hole and to furnish lubrication for subsequent removal of cuttings. The slurry shall be high in colloids of the bentonite type. Drilling fluid shall facilitate lubrication of the drill head, transport of drill cuttings, to stabilize the bore hole from collapse, and inhibit the loss of slurry into surrounding formations. The drilling mud shall be in accordance with state/federal regulations and/or permit conditions. The Contractor shall install erosion and sedimentation control measures including, but not limited to, straw bales to prevent drilling mud from inadvertently spilling out of the entrance/exit pit.

Mechanical, pneumatic, or water-jetting methods will be considered unacceptable due to the possibility of surface subsidence.

After the initial bore has been completed, a reamer will be installed at the termination pit and the pipe will be pulled back to the starting pit. The reamer must also be capable of



discharging liquid clay to facilitate the installation of the pipe in to a stabilized and lubricated tunnel. All drilling fluids and cuttings brought to the surface shall be promptly removed and disposed of off-site.

Upon completion of boring and pipe installation, the Contractor will remove all fluids, materials and spills from the starting and termination pits and project sites. All pits and project sites will be restored to their original condition.

All waterways, ditches, wetlands and channels shall be protected by the Contractor from contamination by fluids and materials used and developed by the drilling process for this project. Contractor shall be fully responsible for any contamination of local waterways and wetlands by fluids and materials used and developed by the drilling process for this project.

Contractor shall maintain traffic during all phases of construction in accordance with the project specifications or HDD work plan. All open pits shall be covered and/or secured at the end of each work day.

W1512 REAMING AND PULLING

Contractor shall obtain the City's approval to proceed before enlarging pilot hole and pulling pipe into position. A City inspector shall be present to monitor the pulling of the pipe. The Contractor is to notify the City in writing two (2) working days in advance of the operation.

Pre-excavate pipe entry and receiving areas to provide a gradual entry of the pipe without stress to the pipe or joints and to allow free movement into the bore hole at an acceptable depth. Carefully guide pipe in such a manner as to avoid deformation of, or damage to, the pipe. Pipe roller may be required where ground and/or pull-back conditions dictate. When used, pipe rollers shall be of sufficient size to fully support the weight of the pipe during pull-back operations. Sufficient number of rollers shall be used to prevent excessive sagging of pipe.

While pulling pipe, Contractor shall handle pipe in a manner that does not overstress pipe. Pipe that buckles or is otherwise damaged will not be accepted; and shall be replaced with new pipes at no additional expense to the City.

Drilling constraints:

- Max drill entry (pipe exit) angle = 20 degrees
- Max ring deflection = 5/8 inch (5 percent)
- No directional drill operations and pulling operations shall exceed manufacturer's recommendation.

Contractor shall protect interior lining and exterior coating from damage. Pipe with gouges, cuts or scarring in excess of ten (10) percent of the pipe wall thickness will not be acceptable.

Contractor shall pull pipe so that a minimum of ten (10) feet of pipe is exposed on both ends of the bore. Pull-back of product pipe shall be made in continuous single pull without interruptions or delays.



A minimum of two (2) strands of locate wire shall be provided for all HDD pipe installations. Locate wire shall be twelve (12) AWG copper-clad steel with 30-mils (minimum) insulation. The external color shall be blue. Locate wire shall be brought to grade at all 'entry point' and 'exit point' locations. Non-twist connectors shall be used for all splices. A sounding test will be conducted prior to acceptance. Any disruption of sounding shall be repaired by the Contractor and re-sounded prior to final acceptance. Where repair is not practical, soft-digs shall be provided and an electronic ball marker shall be placed on portions of the pipe where sounding cannot be re-established in intervals not to exceed twelve (12) feet.

Contractor shall, after pulling pipe, clean exposed ends for installation of fittings. Both ends of HDPE pipe for all horizontal directional drills shall terminate to accommodate connection to ductile iron pipe, C900 pipe or mechanical joint fittings. Said adaptors shall be attached by the butt fusion method only. Mechanical insertion methods will be evaluated and approved by the City on a case-by-case basis.

W1513 HDD MATERIAL

W1513-1 PIPE

Pipe shall be homogeneous throughout. It shall be free from voids, cracks, inclusions or defects. It shall be uniform as commercially practical in color, density, and other physical properties. Pipe surface shall be free from nicks and scratches. Joining surfaces shall be free from gouges and imperfections that could cause leakage. Pipe with gouges, cuts or scarring in excess of ten (10) percent of the pipe wall thickness will not be acceptable.

Carrier pipe size four (4) inch through twenty-four (24) inch shall be minimum DR11, DIPS, black in color with three (3) equally spaced, longitudinal blue stripes. Carrier pipe sized two (2) inch or thirty (30) inches and larger may be IPS size, DR11, black in color with 3 equally spaced, longitudinal blue stripes. Minimum cell classification shall be 3608 with 4710 preferred.

Pipe shall be marked with the following:

- Nominal size
- Standard material code designation
- Dimension ratio
- Pressure Class
- AWWA, ASTM and NSF specification

W1513-2 TUBING

Tubing shall be manufactured of PE 4710, High Density Polyethylene, in accordance with AWWA C901, ASTM D1248, ASTM D2737 and ASTM D3350. The tubing shall have a minimum working pressure of two hundred (200) psi with a SDR of 9 for copper tubing size (CTS) outside controlled diameter and be colored blue. Tubing shall have ultraviolet (UV) protection. Inserts for polyethylene tubing shall be 316 stainless steel. The use of brass couplings, tees and "Y" fittings are acceptable on poly service tubing, if



not located under the roadway. Tubing shall be approved for use with potable water by the National Sanitation Foundation (NSF 61) and be continuously marked with the following:

- Nominal size
- Pressure rating
- Manufacturer's name or trademark
- Standard dimension ratio
- ASTM and NSF specification

W1513-3 JOINTS

Heat Fusion: Joints between plain end pipes and HDPE fittings shall be made by butt fusion. The on-site welder making the joints shall have received specific training from the manufacturer of the fittings and/or pipe being welded and shall have written proof of proper training/certification from the associated manufacturers. Only certified welders who have written training certifications from the fitting and/or pipe manufacturer, on-site, will be allowed to perform this work. Contractor shall submit fuse log prior to pressure test.

Heat Fusion Training Services: Upon request, the manufacturer shall provide training and training materials in the manufacturer's recommended butt fusion, saddle fusion and to the Contractor's installation personnel, and to inspectors representing the City. Only certified (manufacturer's certification) employees will be allowed to complete this fusion work.

The fuse joint shall provide a leak tight joint and a positive seal against pressure or vacuum.

W1513-4 END FITTINGS

Both ends of HDPE pipe for all directional drills shall be terminated to accommodate connection to ductile iron pipe, C900 pipe or mechanical joint fittings. Acceptable method includes the butt fusion of a mechanical joint adaptor. Mechanical insertion using a stiffener and restraint shall be considered on a case-by-case basis.

For the fusion of mechanical joint adapter, butt fusion is the only allowable method. Electrofusion methods will not be permitted.

Mechanical coupled joints shall maintain leak tight joint when subjected to the same hydrostatic tests designated for the pipe.

W1513-5 PIPE TRANSITION RESTRAINT

Contractor shall protect against pullout when HDPE pipe is connected to unrestrained joint piping or components such as bell and spigot joint PVC or ductile iron. Protection measures may include external mechanical restraints, in-line anchoring or a combination of both in the transition area between the HDPE pipe and traditional pipe material. Installation of protection measures shall be in accordance with *AWWA M55*



PE Pipe-Design and Installation Manual. Restraint procedures shall be detailed in Approved Construction Plans.

W1513-6 TRACING WIRE

Locate tracing wire shall be twelve (12) AWG copper-clad steel conductor with 30-mils (minimum) insulation. The external color shall be blue.

W1514 HDD PRESSURE TESTING

All carrier piping, four (4) inches and larger, installed via horizontal directional drilling methods shall be pressure tested in accordance with Section W1602 of these technical specifications. The City reserves the right to require pressure testing of two (2) inch water mains where conditions warrant.

Contractor shall wait a minimum of twenty-four (24) hours after pull-back before pressure testing of pipe. Pressure test prior to pull-back may be done under special conditions.

In the case of pipelines that fail to pass leakage test, the Contractor shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipelines. Allow the test section to remain depressurized for at least eight (8) hours before retesting. In the event the leakage cannot be repaired, the Contractor shall abandon the pipe and notify the City.

W1515 PIPE ABANDONMENT

In the event the bore hole operations fail, Contractor shall completely fill bore hole with grout so as to prevent future settlement.

In the event Contractor cannot complete pull-back of HDPE pipe, Contractor shall cut pipe off at least three (3) feet below ground surface, grout pipe and place pipe out of service. Contractor shall fill all voids with excavatable flowable fill.

W1516 RESTORATION OF PAVED, IMPROVED AND UNIMPROVED AREAS

At the completion of the project work, the parking area pavement, shoulders, ditches, banks and slopes of property crossed and paralleled shall be restored to their former condition and properly sodded so that they shall not wash out before becoming consolidated. Restoration shall be as required by the jurisdictional authority. Parking area installations are to be continuously maintained until the completion of the work.

In the event roadway subsidence or heaving occurs during the HDD operation, the roadway shall be reconstructed, milled and repaved at a one hundred (100) foot distance centered on-site.

W1517 FINAL SUBMITTALS

The directional boring Contractor shall submit certification, by a Professional Engineer or Professional Land Surveyor licensed in the State of Florida, that the directional boring has been performed in accordance to the construction drawings, or provide signed and sealed Record Drawings of the installation if it



varies from the design as shown in the construction drawings. Horizontal and vertical locations (bore-log) shall be shown on the Record Drawings at five (5) foot intervals.

W1600 CLEANING, FLUSHING AND TESTING

The Contractor may physically connect water mains to existing City water system prior to FDEP clearance and in accordance with Section W1400 of this manual, however, valve must remain shut off, locked and only opened under the direct supervision of City personnel.

A "jumper" connection that incorporates an AWWA approved double check backflow prevention device shall be used on all newly constructed water mains to facilitate the cleaning, flushing, filling and testing of the new water main. This jumper shall be "hard piped" with either brass or HDPE materials and shall be a minimum of two (2) inches in size for eight (8) inch or smaller water mains and one (1) inch in size for ten (10) inch and larger water mains. No PVC jumper assembly components will be accepted. It shall be the Contractor's responsibility to furnish the backflow prevention device and be able to show proof that such a device has been tested on site and is in good working order at time of installation. Reference Technical Detail A-207 for backflow assembly testing requirements. Point of jumper installation must have prior approval from the City and may include but not necessarily be limited to existing fire hydrants, existing blow offs, or wet tap on existing water main.

W1601 CLEANING AND FLUSHING

All mains shall be cleaned and flushed to remove all dirt, sand and other foreign matter in conjunction with the initial filling. The line to be cleaned shall only be connected to the existing system at a single connection point.

Cleaning and flushing of eight (8) inch and smaller water mains must take place through the jumper while ten (10) inch and larger mains may be flushed directly through water main tie-in valve in accordance with Section W1400 of these technical specifications. The Contractor shall receive approval of its flushing plan from the Utilities Operations Division prior to actual flushing procedures. Flushing of ten (10) inch and larger mains shall be scheduled with the City a minimum of two (2) working days in advance. It is recommended that no more than two thousand (2,000) LF of water main be cleaned and pressure tested at any one time. The pressure in the City's system shall be monitored during the flushing; at no time shall pressure in the City's system be allowed to drop below fifty (50) psi.

Prior to flushing, the pipeline shall be cleaned with a polyurethane foam swabbing device, of an appropriate density (2 lbs/ft³) for the pipeline to be cleaned, so as not to damage the interior lining of the pipeline. If swabbing access and egress points are not provided in the design, Contractor shall be responsible to install and remove appropriate connections to accomplish the required pipeline 'pigging'.

The Contractor shall insert swab complete with rear polyurethane drive seal, into the pipe at the appropriate location. The swab shall remain there until the pipeline construction is completed.



Only City personnel shall operate the supply valve from the existing distribution system. Cleaning shall be accomplished by propelling the swab down the pipeline to the exit point. Passage of the swab through the system shall be constantly monitored, controlled and all pigs entered into the system shall be individually marked and identified so that the exiting of the pig from the system can be confirmed.

Swabbing and flushing shall continue until the water is completely clear. All water flushed during main clearance shall be de-chlorinated as per AWWA and FDEP specifications/requirements. Any permits required for the disposal of flushing water shall be the responsibility of the Contractor. The Contractor is responsible for creating a safe environment for collection of debris, water and swabs and disposal shall be in a manner so as to not cause a nuisance or property damage.

W1602 TESTING

All newly installed pipe which has been backfilled shall be cleared and hydrostatically tested at a gauge pressure of one hundred fifty (150) psi for a minimum of two (2) hours. A leakage test shall be conducted during the hydrostatic test.

W1602-1 HYDROSTATIC TEST PROCEDURE

Construction of all service lines, fire hydrants and any/all other connections involving restrained joints and/or thrust blocking shall have been completed and inspected prior to scheduling of hydrostatic pressure test. Hydrostatic pressure test shall be scheduled with the Utilities Operations Division a minimum of two (2) working days in advance so Utilities Operations Division personnel may be present at time of testing. The line under test shall be slowly filled with water at the specified test pressure. Per manufacturer's recommendations, ductile iron pipe must sit in a wetted condition for twenty-four (24) hours prior to testing.

The lowest elevation point on the section being tested shall be determined and any corrections necessary shall be corrected to the elevation of the test gauge.

A blow off or fire hydrant shall be installed at the end of the line under test. Before applying the specified test pressure, all air shall be expelled from the test section including service connections. If fire hydrants or blow offs are not available at high places, taps at points of highest elevation shall be made to facilitate testing. When testing is complete, the service shall be removed at the discretion of the Utilities Operations Division or City Engineering Inspector. Contractor shall have line cleared of air and pumped up to specified test pressure prior to scheduled appointment. If line is not holding specified pressure at time of arrival of Utilities Operations Division personnel, test will be cancelled and rescheduled at the convenience of the Utilities Operations Division.

The line shall hold the one hundred fifty (150) psi test pressure for a minimum two (2) hour test period; sufficient manpower shall be employed to insure inspection.

If the line fails to meet the test, it shall be repaired and test rescheduled at a later date. This shall be repeated until the test requirements are satisfactory. If more than two (2) pressure tests are required on any section of line, a fee of \$125.00 shall be charged to the Contractor for each additional test.



Line pressure shall be maintained to within five (5) psi of the test pressure at all times. If at any time during hydrostatic test, the line pressure drops more than five (5) psi, test shall be considered null and void. Pressure test shall be rescheduled for a later date after leak has been repaired.

Utilities Operations Division must be notified a minimum of one (1) full working day in advance of any pressure test cancellation, otherwise the Contractor will be charged accordingly.

W1602-2 LEAKAGE TEST

The test procedures of ANSI/AWWA C600, shall be observed. Leakage for Ductile Iron pipe during the test shall not exceed the allowable leakage specified in the ANSI/AWWA C600 Equation.

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD (P)^{0.5}}{148,000}$$

L = Allowable Leakage (gal./hr.)
 S = Length of pipe being tested (ft.)
 D = Diameter of Pipes (in.)
 P = Average test pressure (psi) during leak test

The allowable leakage for C900 PVC pipe (20 foot lengths) shall be in accordance with AWWA M23.

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND (P)^{0.5}}{7,400}$$

L = Allowable Leakage (gal./hr.)
 N = Number of joints in length of pipe being tested (ft.)
 D = Diameter of Pipes (in.)
 P = Average test pressure (psi) during leak test

W1700 STERILIZATION, BACTERIOLOGICAL TESTING, AND CLEARANCE

After successful completion of line cleaning and pressure testing, the Contractor shall disinfect all pipes, fittings, service connections and hydrants that are part of the newly installed main and receive the required approvals and clearances prior to placing the newly constructed section in service. All chlorination procedures and bacteriological testing shall conform to applicable provision of AWWA C651 "Disinfecting Water Mains", Latest Revision. It is recommended that no more than one thousand (1,000) LF of water main be chlorinated and bacteriologically tested at any given time due to the increased risk of test failure.



All chlorination procedures shall be in accordance with AWWA C651 "Disinfecting Water Mains". The residual chlorine concentration shall be monitored and documented by the Contractor for the initial application and after a twenty-four (24) hour contact period.

Following chlorination, all treated water shall be thoroughly flushed from the new main. If there is any possibility that the chlorinated discharge will cause damage to the environment, then the flushed water shall be neutralized of all residual chlorine. Flushing shall take place until, upon testing, the total chlorine residual obtained is not in excess of that normally carried in the system for that particular location.

Each sample result shall show acceptable bacteriological results, in accordance with AWWA C651 and total chlorine in accordance with F.A.C. 62-555.340(2)(b), for two (2) consecutive days. Flushing of main between samples is not permissible. If such samples do not demonstrate satisfactory results, re-chlorination will be required.

The following guidelines and procedures must be followed for bacteriological testing of water mains:

1. Bacteriological testing shall be performed by a laboratory certified for testing of public drinking water systems by the State of Florida. The Contractor is responsible for securing the services of a properly certified laboratory.
2. Testing for total chlorine must be performed on all sample points defined by the FDEP permit as well as any additional points desired by the City. The City may designate additional sampling points following receipt of the FDEP permit.
3. The City reserves the right to require additional testing due to changes or other circumstances that may occur during construction. Proper chain of custody procedures must be followed and samples shall only be collected by certified laboratory personnel in the presence of City personnel.
4. The name, address, phone number, and current HRS identification number of the laboratory that is going to collect and perform the bacteriological testing must be submitted to and approved by the City's Engineering Department at the pre-construction meeting.
5. A copy of the FDEP permit "Specific Conditions" identifying required sample points as well as an eight and one-half (8 ½) inch x eleven (11) inch development phase map showing corresponding locations of sample points must be submitted and approved by the City's Engineering Department a minimum of two (2) weeks prior to testing.
6. The Contractor must notify the City's Engineering Department of proposed sampling at least two (2) full working days prior to the laboratory taking the samples for bacteriological testing. (By City ordinance, only authorized City employees or agents may operate the valves, etc.)
7. Test results must indicate the following information:
 - a) Name of development including phase as identified on FDEP permit.
 - b) Identification of the sampling points.
 - c) Types and lengths of pipe materials.
 - d) Date of sampling and testing.



- e) Analysis for free and combined chlorine residual.
 - f) Date of Chlorination.
8. Test results (one (1) original and two (2) copies) must be submitted to the City Engineering Department. Engineering will distribute two (2) copies to the City Utilities Operation Division for confirmation of the results. Copies for FDEP and the Engineer of Record should be sent by the laboratory to the Contractor or his representative.
 9. Test results will be held by the City Engineering Development until approved "record" drawings, pressure test, recorded right-of-way or easement documents, completed FDEP Certificate of Construction Completion and Request for Clearance signed by the Engineer of Record (and submitted for the City's acceptance as owner/operator) are provided to the City by the Contractor.

These documents should be submitted in a timely manner since subsequent clearance by FDEP will only be issued if the bacteriological test results are current. When all documents are received and are satisfactory, the City Engineer will execute the Statement (of acceptance) by Owner.
 10. Engineering will contact the developer's representative as soon as the Certificate is executed. The developer will be responsible for submittal of all documents to FDEP and for acquiring the letter of clearance from FDEP.
 11. The City will allow no water system to be placed into service until a letter of clearance is issued by FDEP, and a copy is received by the City.

W1800 CONNECTION TO EXISTING SYSTEM

The Contractor shall, without exception contact the City's Utilities Operations Division a minimum of two (2) working days in advance of any connection to the City water system and schedule an appointment so City personnel can be present. Once connection is completed, City personnel will immediately "lock-out" the connecting valve. This valve shall remain locked. Contractor shall also obtain all required permits and notify all other utilities prior to excavation of existing water main. Notice of excavation shall be given a minimum of two (2) working days in advance of actual excavation.

All tapping sleeves and valves being installed on an existing water main shall be disinfected in the field prior to installation. The application of a concentrated solution of sodium hypochlorite (minimum one (1) percent available Chlorine) shall be applied to the host pipe along with the inside of the sleeve and valve either by swabbing or pressure spraying or as outlined in AWWA C651-92 Section 10.

Prior to tapping a potable water main, the drilling machine's pilot bit, shell cutter and cutter hub shall be sterilized in accordance with the following procedures:

Four (4) gallons of potable water shall be combined with eight (8) ounces of sodium hypochlorite: the pilot drill, shell cutter and cutter hub shall be swabbed until clean or totally immersed in the sterilizing solution and allowed to remain wet at least five (5) minutes before tapping operations commences. It is not necessary to rinse sterilizing solution from tapping components prior to use.

Size on size taps on class PVC and cement asbestos pipe will not be allowed.



W1801 SERVICE INSTALLATIONS

Service saddles shall be used on all one (1) inch and two (2) inch service connections. Tap must be installed at the two (2) or ten (10) o'clock positions.

Services shall not terminate in a sidewalk or driveway at any time. It is the Contractor's responsibility to ensure all services, both residential and commercial do not terminate in a driveway or sidewalk or other materials which prevent easy excavation for maintenance and for repairs.

Temporary Marking of Services - All service line curb stop terminations shall be exposed to view prior to and during pre-final and final inspection. Service line shall be attached by means of tape to a two (2) inch x one (1) inch (minimum twenty-four (24) inch in length) stake with the top painted blue and marked with the lot number to be served.

Permanent Marking of Services - All water service locations shall be permanently etched into concrete curb with "W", one-fourth ($\frac{1}{4}$) inch deep, four (4) inches wide and six (6) inches long, and painted blue. Any exception must have prior approval of the City.

One (1) inch Residential Services

All residential services shall terminate to a below grade meter. Single service line shall be one (1) inch and can reduce with a one (1) inch x three-fourth ($\frac{3}{4}$) inch brass bushing after curb stop. Double water services shall be utilized whenever practical for three-fourth ($\frac{3}{4}$) inch meter sets and can reduce with a three-fourth ($\frac{3}{4}$) inch x three-fourth ($\frac{3}{4}$) inch x one (1) inch tee. Double service curb stops shall be located no more than twelve (12) inches from the tee.

All service lines between corporation stop and double service tee or single service curb stop shall be an unspliced full-length of copper or HDPE tubing. Brass wyes, tees or couplings on copper or tubing shall only be allowed outside of roadway.

All connections to one (1) inch copper service lines shall be flare or compression. All connections to HDPE service lines shall be the compression type. Stainless steel metal stiffener insert shall be used when connecting to HDPE tubing.

All efforts shall be made to keep service lines at a depth not to exceed twenty-four (24) inches but no shallower than eighteen (18) inches, with a gradual upward slope so to allow depth of meter connection to be twelve (12) inches from grade. Service line shall terminate midway between the curb and the sidewalk. Reference Technical Detail A-118.

All one (1) inch service lines shall terminate meter side utilizing a compression by FIPT ball curb stop for copper or HDPE service lines or flare by FIPT ball curb stop for copper only.

All "long side" services shall be installed through a blue HDPE sleeve extending beyond the edge of curb or gutter, where present. In any such case, sleeves shall not terminate under roadway, curb, gutter or sidewalk. Sleeve shall be sealed at both ends with a polyurethane-base insulating foam sealant. Refer to Table W1801-1 for sleeve size.

All HDPE service lines shall be constructed with two (2) strands of twelve (12) AWG blue tracing wire if installed using the HDD method (one (1) strand acceptable for



service lines installed through casings). Tracing wire shall be brought up into the meter box and coiled up so wire is capable of being extended twelve (12) inches above meter box and grade. Locating wire can be coiled back inside box for future access.

Two (2) inch Residential Services

Two (2) inch residential services shall have prior City approval.

All residential services shall terminate to a below grade meter.

Service line shall be two (2) inch and can reduce with a two (2) inch x one and one-half (1 ½) inch brass bushing at the curb stop to accommodate one and one-half (1 ½) inch meter.

For all two (2) inch service lines constructed of copper or HDPE tubing, an unspliced, full-length of copper or HDPE tubing shall be used between the gate valve and double service tee or single service curb stop.

Approved backflow prevention devices shall be installed on all service lines downstream of the City's meter.

All connections to two (2) inch copper or HDPE service line shall be the compression type. Stainless steel metal stiffener insert shall be used when connecting to HDPE tubing.

All HDPE service lines shall be constructed with two (2) strands of twelve (12) AWG blue tracing wire if installed using the HDD method (one (1) strand acceptable for service lines installed through casings). Tracing wire shall be brought up into the meter box and coiled up so wire is capable of being extended twelve (12) inches above meter box and grade.

All "long side" services shall be installed through a blue HDPE sleeve extending beyond the edge of curb or gutter, where present. In any such case, sleeves shall not terminate under roadway, curb, gutter or sidewalk. Ends of casing pipe shall be sealed with a polyurethane-based insulating foam sealant. Refer to Table W1801-1 for sleeve size.

All two (2) inch service lines shall terminate meter side utilizing a two (2) inch compression by FIPT ball curb stop for copper or HDPE service line or two (2) inch FIPT by FIPT ball curb stop for all brass service.

All efforts shall be made to keep service lines at a depth not to exceed thirty-six (36) inches but no shallower than twenty-four (24) inches, with a gradual upward slope so to allow depth of meter connection to be twelve (12) inches from grade.

Commercial Services

All commercial services shall terminate to an above-ground meter assembly and testable backflow prevention device.

All one (1) inch services shall be constructed using a CC threaded corporation stop at the saddle connection and transition to an unspliced, full-length of copper or HDPE tubing.

All connections to one (1) inch copper or HDPE service lines shall be the compression type. Stainless steel metal stiffener insert shall be used when connecting to HDPE tubing. One (1) inch services shall terminate with brass ball curb stop then transition to above ground meter and backflow assembly using threaded brass fittings. All one (1)



inch commercial service lines are to be buried a minimum of eighteen (18) inches and a maximum of twenty-four (24) inches below grade up to transition point.

All two (2) inch services shall be constructed using threaded brass and a resilient seat gate valve at the saddle connection and shall transition from the two (2) inch gate valve to an unspliced, full-length of copper or HDPE tubing. All connections to two (2) inch copper or HDPE service lines shall be the compression type. Stainless steel metal stiffener insert shall be used when connecting to HDPE tubing. Two (2) inch copper or HDPE services shall terminate with brass ball curb stop then transition to above ground meter and backflow assembly using threaded brass.

In lieu of copper or HDPE, two (2) inch service constructed of all threaded brass is permissible. Reference Technical Detail A-119.

All “long side” services shall be installed through a blue HDPE sleeve extending beyond the edge of curb or gutter, where present. In any such case, sleeves shall not terminate under roadway, curb, gutter or sidewalk. Ends of casing pipe shall be sealed with a polyurethane-based insulating foam sealant. Refer to Table W1801-1 for sleeve size.

All two (2) inch service lines are to be buried a minimum of twenty-four (24) inches and a maximum of thirty-six (36) inches below grade.

For all road crossings, unless road conditions dictate otherwise, there will be a gate valve at the main, a gate valve on opposite side of crossing and gate valve on customer side of meter/backflow assembly for isolation and maintenance. Control valve on customer side shall be located a maximum of ten (10) feet from meter/backflow assembly. Exception to distance shall have prior City approval.

All HDPE service lines shall be constructed with two (2) strands of twelve (12) AWG blue tracing wire if installed using the HDD method (one (1) strand acceptable for service lines installed through casings). Tracing wire shall terminate inside the gate valve box installed immediately before meter/backflow assembly. For services with no gate valve before meter assembly, locating wire shall be secured to brass inlet pipe with a stainless steel clamp within twelve (12) inches of grade.

TABLE W1801-1	
Service Line Size	HDPE Sleeve Size (SDR 9 or 13)
1 inch	2 inch
2 inch	4 inch

For commercial services larger than two (2) inch, see Section W1405 for construction requirements.

W1802 FIRE LINE SERVICES

All service lines that will serve as fire service only must include a double check detector assembly with control valves on either side of device. Device shall be both UL (Underwriter’s Laboratory) and FM (Factory Mutual Research Corporation) Approved.



For fire service lines four (4) inches and larger, isolation valves shall be below-grade, installed at a distance of five (5) feet before meter/backflow assembly.

Isolation valves shall be gate valve type in accordance with Section W1302.

Fire service assembly shall be primed with rust inhibitive primer and painted red. Lids for valve boxes used on private fire service main valves shall have the word 'Fire' stamped into the lid and be painted red.

Fire service assemblies shall have a three thousand (3,000) psi concrete pad poured underneath assembly. For applicable dimensions, pipe support requirements, and other details refer to Technical Detail A-204.

W1803 TESTING CONNECTIONS TO EXISTING SYSTEM

The Contractor shall without exception contact the City's Utilities Operations Division a minimum of two (2) working days in advance to schedule an appointment so that the City personnel can be present at the time of connection to existing system. Once connection is completed, City personnel will immediately lock out the connecting valve. This valve shall remain locked in accordance with Section W1600 of these technical specifications. Contractor shall also obtain all required permits and notify all other utilities prior to excavation of existing water main.

Tapping saddles and sleeves supplied by Contractors shall be approved and inspected by the on-site City representative prior to installation and shall meet all requirements of Section W1308-2 and W1304, respectively, of these technical specifications. The installed sleeve shall be tested with water at one hundred fifty (150) psi for twenty (20) minutes prior to the tapping to insure a watertight installation. The pressure test will be performed by a City approved Contractor and witnessed by the City's Utilities Operations Division. The Contractor shall notify the City's Utilities Operations Division a minimum of two (2) working days in advance and schedule appointments so Water Distribution personnel can be present at time of connection to existing City water system. The Contractor shall physically verify the size and type of pipe to be tapped and clear the type of sleeve to be used with Utilities Operations Division prior to purchase of tapping sleeve.

W1804 METERS

The City will furnish all water meters and meter boxes up to and including two (2) inch. All meters larger than two (2) inches shall be furnished by the Contractor and shall be an A.M.R. meter. Meter shall be installed per manufacturer's recommendations, including the upstream and downstream straight pipe diameter and turbo-style strainer requirements. Domestic meter assemblies 3" and larger shall incorporate 2" taps with 2" ball valves upstream and downstream of meter for bypass and testing purposes.

On projects that require relocation of existing facilities, Contractor may be required to relocate and reuse existing meter and box.

All below-grade meters (residential) shall not terminate more than twelve (12) inches below-grade. Meter shall be installed so that the register cap is five (5) inches – eight (8) inches below meter box lid allowing adequate distance for meter transmitter.



All above-grade meter/backflow assemblies shall be installed a minimum of twelve (12) inches and a maximum of thirty (30) inches above-grade measured at lowest check of backflow device.

All commercial meter/backflow water assemblies shall have a three thousand (3,000) psi concrete pad poured underneath assembly. For applicable dimensions, pipe support requirements, and other details refer to Technical Detail A-201 and A-204.

The City will not provide water meter or approve water service use until FDEP letter of clearance has been received.

All potable water meter assembly, including Fire Series/Master Meter assemblies, shall be primed with rust inhibitive primer and painted blue.

If tampering switch is not installed on gate valve wheels, steel chain with padlock must be installed through handwheels to prevent unauthorized operation.

W1900 CROSS-CONNECTION CONTROL

As a water purveyor, the City is required by the FDEP, under Rule 62-555.360, to determine if a backflow prevention assembly is required for the protection of the public water system. In such cases the water purveyor shall require the consumer, at the consumer's expense, to install an "Approved Backflow Prevention Assembly", at each service connection.

This assembly is to be tested by a "Certified Backflow Prevention Assembly Tester" upon installation and prior to acceptance of water system by the City. Contractor is to contact the Engineering Department to schedule an onsite inspection of installed backflow prevention device. Completed City of Melbourne Backflow Prevention Device Test and Maintenance form is to be given to City representative at that time.

These assemblies are to be tested in accordance with the City's Cross-Connection Control Manual or more often in those instances where successive inspections indicate repeated failure. The owner is required to properly repair and maintain such assembly or assemblies and keep adequate record of each test and subsequent maintenance and repair, including materials and/or replacements parts.

Backflow prevention assemblies shall be installed at all locations where cross-connections may occur. The need and type of such assemblies shall be determined by the City's Utilities Operations Division following guidelines set forth in the City's Cross-Connection Control Manual. All commercial assemblies shall be installed above finish grade in accordance with manufacturer's recommendations and Technical Detail A-201 and A-203. Residential assemblies shall be installed in accordance with manufacturer's recommendations and Technical Detail A-202.

Without exception all backflow prevention assemblies shall be approved by the "Manual of Cross-Connection Control" as published by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, University Park, Los Angeles, CA 90089-0231 and shall comply with the Latest Version of the M-14 manual as published by the AWWA, and as adopted in the Latest Revision of the City's Cross-Connection Control Manual.

The City shall determine during the plan review process whether a double check or reduced pressure type backflow prevention device shall be used.



Assemblies shall be installed directly after the water meter. Once installed, all backflow assemblies shall be roughly cleaned, primed and painted blue. All double detector check backflow prevention assemblies on private fire lines shall be roughly cleaned, primed and painted red.

W2000 FINAL CLEAN UP

Upon completion of the work and before acceptance by the City, the Contractor shall remove all debris, complete sodding, sprigging or seeding if required by the plans, and shall leave all areas affected by his operations in a neat and presentable condition.

A release must be signed by owners of private property that the Contractor used for storage or equipment, materials, vehicles, etc., releasing the City from any liability. Release must be submitted prior to issuance of certificate of completion.

W2100 AS-BUILT SURVEY AND RECORD DRAWINGS

As-built/record drawings are required for all constructed public utilities, as well as all private utilities constructed and connected to the public system.

Record Drawings depicting the as-built conditions of the project are required for all utility systems being accepted by the City. Record Drawings shall consist of the construction plans as prepared by the Engineer of Record and approved by the City, revised to include the information provided by the As-Built survey along with any additional deviations from the original design drawings as deemed appropriate by the Engineer of Record.

The As-Built survey must be prepared by a surveyor registered in the State of Florida and shall contain the following information:

- All property corners and control structures shall be designed with state plane coordinates. The following coordinate system shall be used: NAD 1983 HARN State Plane Florida East FIPS 0901. State Plane Coordinates shall be labeled and shown on a minimum of four (4) reference, right-of-way or property corner monuments shown on the Construction Plans that remain in their original condition after construction has been completed.
- Elevations shall be based on NGVD 1929 or NAVD 1988. Control datum consistency shall be maintained throughout drawing submittals.
- Certification stating the basis of horizontal and vertical control.
- At least two (2) ties to all valves, service lines, fitting and fire hydrants from permanent points (manholes, property lines, property corners, curbs, or pavement). An acceptable station and offset system may be used.
- Location of mains from property or easement lines and alignment distance from centerline of road at fifty (50) foot intervals.
- Conflict crossing details, including separation between utilities, depth of water main at lowest point of crossing and whether water main crosses over or under utility in conflict.



- Type of water main material for each run of pipe and at any material change and distance of mains from buildings or structures within ten (10) feet of the water main.
- Distance from hydrant to hydrant valve.
- Pertinent easement information, including width of easement, and distance from water main to sides of easement. Official Record Book and page number for easement must be shown on plans.
- Note City's Point of Acceptance.
- Note all private utility systems.
- All Horizontal Directional Drilling Bore-Logs
- A certification by the Surveyor/Engineer accepting responsibility for accuracy of information supplied on the As-Built drawings and a statement that all mains are within easements and/or public right-of-ways.

As-Builts shall be drawn at an engineering scale of one (1) inch = fifty (50) feet or larger (i.e. 1 inch = 40 feet). Areas requiring additional detail may be enlarged as necessary. Right-of-way, easements and lot lines shall be accurately shown. Lot and block numbers and street names shall be included.

Two (2) signed and sealed blue-line prints are required to be submitted to the City Engineering Department a minimum of forty-eight (48) hours prior to scheduled pre-final inspection.

If As-Builts are not submitted to the City a minimum of forty-eight (48) hours prior to the scheduled pre-final inspection, the inspection will be cancelled and rescheduled. Owner will be assessed a re-inspection fee.

In addition to the hard copy submittals, a digital copy of the As-Built drawings shall be submitted to the City in AutoCAD format on a disc.

After the surveyor has certified the As-Built survey, the Engineer of Record shall incorporate that information into the conformed contract documents and include the designation that they are now Record Drawings. The Engineer of Record will certify that the system depicted on the Record Drawings was constructed in substantial conformance with approved plans and will function as intended. The FDEP requires that Record Drawings be signed and sealed by the Engineer of Record.

W2200 REQUIREMENTS FOR SCHEDULING PRE-FINAL INSPECTION

There are several criteria that projects must meet prior to the City's scheduling a pre-final inspection for any development project or waterline extension. The criteria are:

1. The City should receive two (2) sets of As-Built drawings at least two (2) days prior to the desired inspection date. City staff must have time to review the drawings and to confirm that the data shown is accurate.
2. The City must receive satisfactory results for the leakage, pressure, bacteriological tests and backflow certifications on the new waterlines. If the waterlines do not pass these tests, the project is not ready for an inspection.



Technical Specifications and Standards for Water Distribution Systems

July 1, 2016

3. The City should receive the punch list, which has been incorporated into this section. The purpose of the pre-final inspection is to determine if the project is complete and if the work is acceptable.
4. The purpose is not to inspect a partially completed project and provide the Contractor a list of things he/she must do to complete it. In short, the project should be complete. The punch list, checked off by the Contractor, will indicate to the City that the project is completed in the Contractor's opinion.
5. The contact for scheduling the pre-final inspection is the City Engineering Inspector who has been assigned to your project.

During the Pre-final inspection, the items listed in Table W2200-1 will be checked.

TABLE W2200-1		
WATER DISTRIBUTION PRE-FINAL PUNCH LIST		√
1	As-Builts received 2 days prior to pre-final inspection.	
2	All public fire hydrants primed and painted yellow, all private hydrants primed and painted red.	
3	All fire hydrants at proper height (20 inch - 28 inch) and 3 foot - 8 foot off edge of road.	
4	All chains and hooks removed from hydrants and all 3 caps greased.	
5	If construction meter placed on existing hydrants, hydrant must be re-painted and caps greased.	
6	All fire hydrants designated by a blue reflector in the road.	
7	All valve boxes clear of debris and centered over operating nut. Operating nut will be checked for proper depth.	
8	All valves operate smoothly and have correct direction of opening.	
9	All valves constructed outside of asphalt have properly constructed 24 inch x 24 inch x 8 inch concrete valve box pad.	
10	All valve box lids identified as "water" and painted blue. Valve box lids for private fire service lines identified as "fire" and painted red.	
11	All valves identified with a "V" etched on nearest curb with the point facing valve and "V" painted blue.	
12	All boxes two-piece telescopic and adjustable. (No "riser" pipes will be acceptable).	
13	Bronze marking disc with appropriate nomenclature installed on concrete pad on valves 2 inch and larger.	
14	All permanent and temporary blow-offs are on the property line.	
15	All service assemblies free of crimps.	
16	All service assemblies on property line between lots and between curb and sidewalk and properly secured to temporary marking stake where applicable.	



Technical Specifications and Standards for Water Distribution Systems

July 1, 2016

17	All service lines having a "W" etched on curb and "W" painted blue.	
18	Above-ground backflow preventers, meter assemblies and double detector check valve assemblies primed and painted. Assemblies must have proper pipe support stands. Meter registers properly installed. Compound registers are correct.	
19	If tampering switch not installed on large meter assemblies, steel chain with padlock installed through handwheels.	
20	Concrete pads around backflow preventers, large meter assemblies and double detector check valves per these technical specifications.	
21	Backflow preventers, meter assemblies and double detector check valve assemblies having proper permits and tested by certified technician.	
22	Successful bacteriological testing must be completed prior to scheduling of pre-final inspection.	
23	Proper meter and flushing devices on dead ends; installed on the property line.	
24	Tracing wire properly terminated in meter and valve boxes, capable of extending 12 inches above grade and tested for continuity.	
25	Electronic ball markers installed every 100 feet and on all valves, fittings and directional changes.	

W2300 MAINTENANCE BOND

A two (2) year maintenance bond is required on all projects. This bond can be a cash or paper bond. This bond is for the dedicated portion of the work only. The bond is ten (10) percent or a minimum of \$1,000.00 whichever is greater.

At the end of the two (2) year maintenance bond period the following items will be checked.

TABLE W2300-1		
WATER DISTRIBUTION MAINTENANCE BOND PUNCH LIST		√
1	All fire hydrants checked for proper height and alignment.	
2	All fire hydrants checked for blue reflector in the road.	
3	All valve boxes checked for broken 24 inch x 24 inch x 8 inch concrete pad, proper alignment and intact bronze I.D.	
4	Settling over pipes and around valves.	
5	All large meter assemblies, double detector check valves and fire hydrants showing signs of cracked, peeling paint or excessive rust or corrosion must be re-primed and re-painted.	
6	Flushing devices fully operational and draining properly. No signs of erosion and/or leakage.	

Technical Specifications
and Standards for Water
Distribution Systems
Appendix A- Technical
Detail Drawings



Appendix A- Technical Detail Drawings

General Details

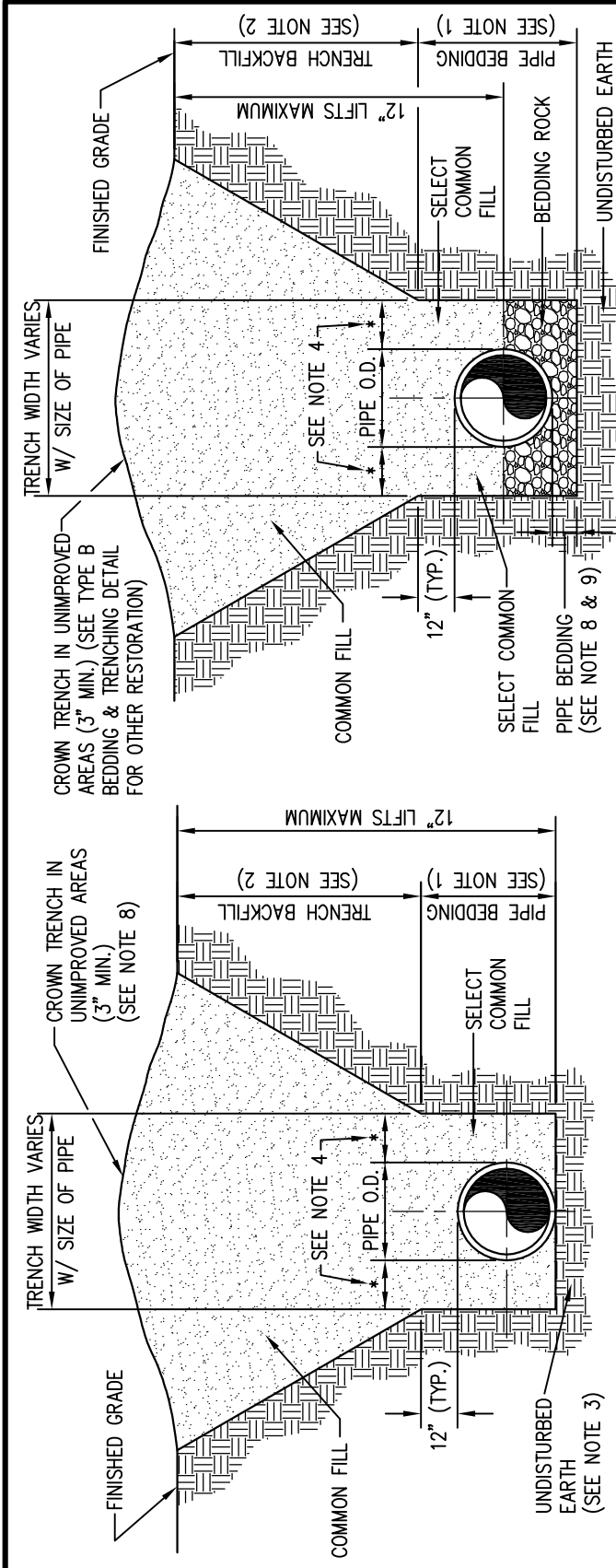
A-100	Pipe Bedding Details- Type A & B
A-101	Utility Trench Detail (Typ.)
A-102	Open Roadway Cut
A-103	Utility Pipe Minimum Separation Requirements Table
A-104	Utility Pipe Minimum Separation Requirements Figure
A-105	Utility Crossing
A-106	Typical Concrete Saddle Detail
A-107	Thrust Collar Detail
A-108	Ditch Crossing
A-109	Aerial Pipe Crossing and Barricade
A-110	Jack and Bore
A-111	Restrained Pipe Table- Potable & Reclaimed (150 psi)
A-112	Restrained Pipe Table- Wastewater (100 psi)
A-113	Gate Valve and Box
A-114	Butterfly Valve and Box Detail
A-115	Valve Box Lid, Pad and Marker
A-116	Valve Extension
A-117	Bollard Detail
A-118	Residential Services Layout- Potable and Reclaimed
A-119	Typical Service Saddle Connection- Potable and Reclaimed
A-120	Typical Tapping Sleeve Service Connection- Potable and Reclaimed
A-121	Air Valves- Above Grade (Potable and Reclaimed)
A-122	Air Valves In Vault (Reclaimed and Wastewater)
A-123	Air Valves In Vault – Offset (Reclaimed and Wastewater)
A-124	Manual Blow Off

Potable Water Details

A-200	Typical Fire Hydrant Detail
A-201	3/4", 1", 1 1/2", or 2" Commercial Potable Water Meter
A-202	Residential Potable Meter with Double Check Assembly
A-203	Combination Fire Series/Master Meter Assembly
A-204	Domestic Water Meter with Dedicated Fireline Connection DDCV
A-205	Fireline Connection DDCV
A-206	Dual Backflow Detection Devices
A-207	Notes- Temporary Jumper Connections
A-208	Details- Temporary Jumper Connection Alternate A
A-209	Details- Temporary Jumper Connection Alternate B
A-210	Residential Potable Water Meter and Meter Box
A-211	Permanent Automatic Flushing Device Assembly Detail
A-212	Temporary Automatic Flushing Device Assembly Detail



General Details



- NOTES:**
- PIPE BEDDING: SELECT COMMON FILL COMPACTED TO 98% UNDER ROADS, CURB, GUTTER AND SHOULDERS; AND 95% IN ALL OTHER PLACES, OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR COMPACTION TEST, AASHTO T-180
 - TRENCH BACKFILL: COMMON FILL COMPACTED TO 98% UNDER ROADS, CURB, GUTTER AND SHOULDERS; AND 95% IN ALL OTHER PLACES, OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR COMPACTION TEST, AASHTO T-180
 - USE TYPE "A" BEDDING TO BE DETERMINED IN THE FIELD AS DIRECTED BY THE ENGINEER.
 - (*): 15" MAX. FOR PIPE DIAMETER LESS THAN 24", AND 24" MAX. FOR PIPE DIAMETER 24" AND LARGER.
 - WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
 - ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF FLOW FOR SEWERS.
 - REFER TO SPECIFICATIONS FOR SHEETING AND BRACING IN EXCAVATIONS.
 - GRAVITY SEWERS SHALL UTILIZE TYPE "A" BEDDING, IF REQUIRED BY THE ENGINEER. BEDDING DEPTH SHALL BE 4" MINIMUM FOR PIPE DIAMETER LESS THAN 15", AND 6" MINIMUM FOR PIPE DIAMETER 16" AND LARGER.
 - DEPTH FOR REMOVAL OF UNSUITABLE MATERIAL SHALL GOVERN DEPTH OF BEDDING ROCK BELOW THE PIPE. THE ENGINEER SHALL DETERMINE IN THE FIELD REQUIRED REMOVAL OF UNSUITABLE MATERIAL TO REACH SUITABLE FOUNDATION.

- NOTES:**
- PIPE BEDDING: SELECT COMMON FILL COMPACTED TO 98% UNDER ROADS, CURB, GUTTER AND SHOULDERS; AND 95% IN ALL OTHER PLACES, OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR COMPACTION TEST, AASHTO T-180
 - TRENCH BACKFILL: COMMON FILL COMPACTED TO 98% UNDER ROADS, CURB, GUTTER AND SHOULDERS; AND 95% IN ALL OTHER PLACES, OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR COMPACTION TEST, AASHTO T-180
 - PIPE BEDDING UTILIZING SELECT COMMON FILL OR BEDDING ROCK IN ACCORDANCE WITH TYPE "A" BEDDING AND TRENCHING DETAIL MAY BE REQUIRED AS DIRECTED BY THE ENGINEER.
 - (*): 15" MAX. FOR PIPE DIAMETER LESS THAN 24", AND 24" MAX. FOR PIPE DIAMETER 24" AND LARGER.
 - WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
 - ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF THE FLOW FOR SEWERS.
 - REFER TO SPECIFICATIONS FOR SHEETING AND BRACING IN EXCAVATIONS.
 - FINAL RESTORATION IN IMPROVED AREAS SHALL BE IN COMPLIANCE WITH SPECIFICATIONS. ROAD SURFACE RESTORATION SHALL COMPLY WITH SPECIFICATIONS.

PIPE BEDDING DETAILS TYPE "A" & "B"

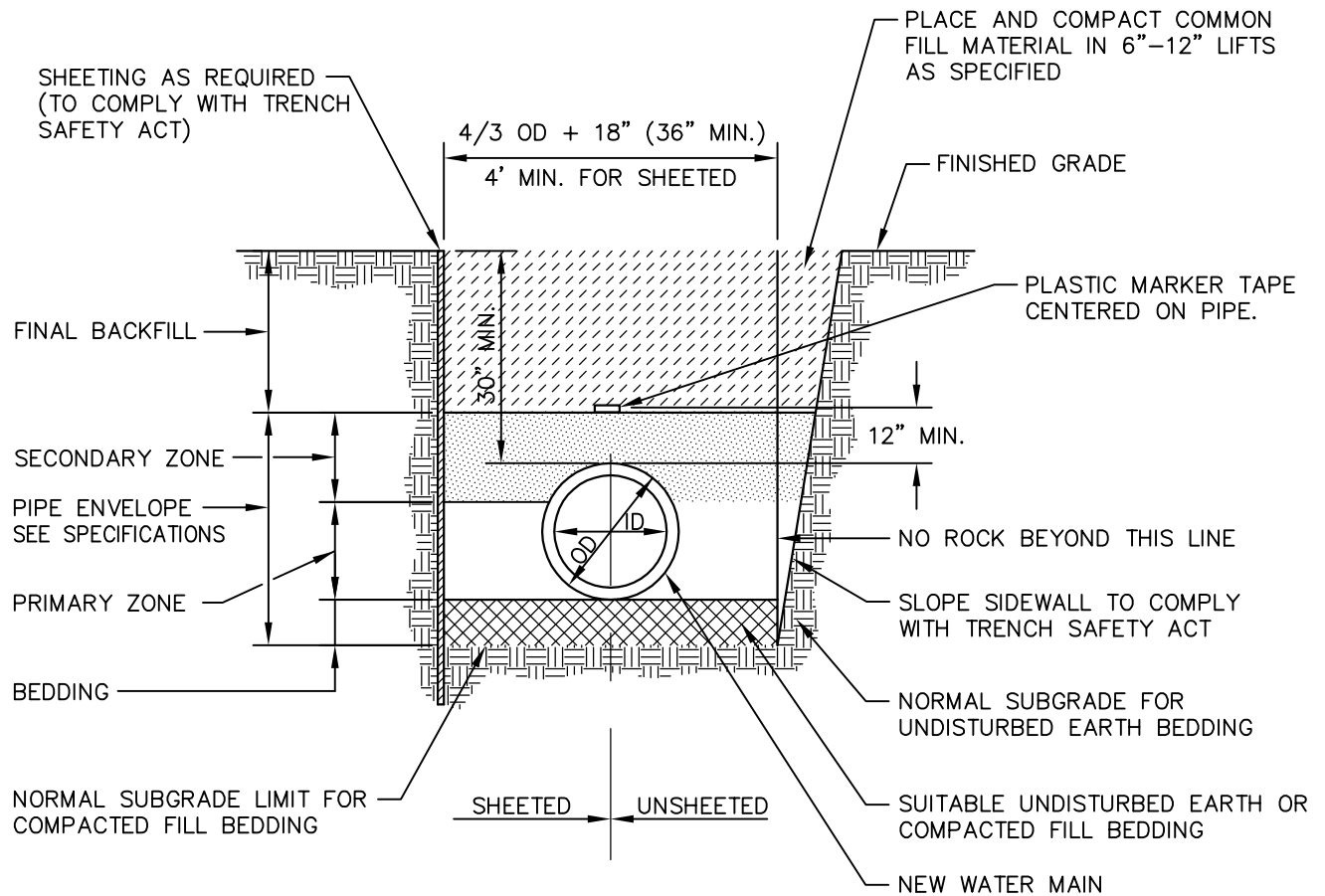
REV:	REV:
DATE:	BY
7/1/16	JOB NO.:
DRAWN BY:	DSGN. BY
J.R.P.	L.A.M.

**CITY OF MELBOURNE
UTILITIES ADMINISTRATION**

SCALE:	N.T.S.
DWG NO.:	A-100

DETAIL -- TYPE A

DETAIL -- TYPE B



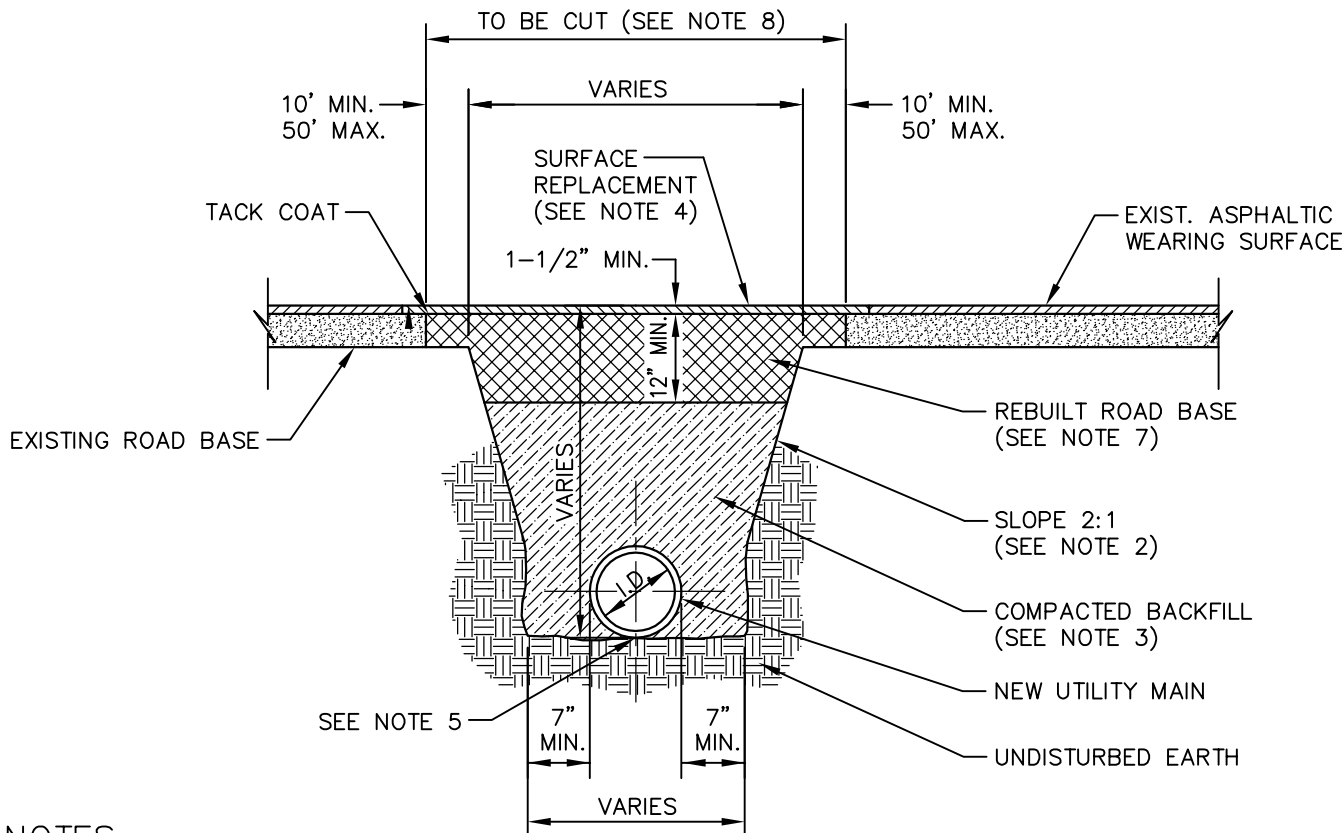
NOTES:

1. PIPE BEDDING: SELECT COMMON FILL COMPACTED TO 98% UNDER ROADS, CURB, GUTTER AND SHOULDERS; AND 95% IN ALL OTHER PLACES, OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR COMPACTION TEST, AASHTO T-180.
2. TRENCH BACKFILL: COMMON FILL COMPACTED TO 98% UNDER ROADS, CURB, GUTTER AND SHOULDERS; AND 95% IN ALL OTHER PLACES, OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED PROCTOR COMPACTION TEST, AASHTO T-180.
3. PIPE BEDDING UTILIZING SELECT COMMON FILL OR BEDDING ROCK IN ACCORDANCE WITH TYPE 'A' BEDDING AND TRENCHING DETAIL, MAY BE REQUIRED – DIRECTED BY THE CITY OF MELBOURNE.
4. WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
5. ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF THE FLOW.
6. REFER TO SECTION OF THE MANUAL FOR SHEETING AND BRACING IN EXCAVATIONS
7. FINAL RESTORATION IN IMPROVED AREAS SHALL BE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OF GOVERNING AGENCIES. SURFACE RESTORATION WITHIN THE RIGHT-OF-WAY SHALL COMPLY WITH REQUIREMENTS OF RIGHT-OF-WAY UTILIZATION REGULATIONS AND ROAD CONSTRUCTION SPECIFICATIONS.

SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS

UTILITY TRENCH DETAIL (TYP.)

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY	L.A.M.	A-101
J.R.P.			



NOTES:

1. ASPHALT SHALL BE ASPHALTIC TYPE SP 9.5 FOR COMMERCIAL/INDUSTRIAL MINIMUM 1800 P.S.I.
2. A SLOPE OF 2:1 RATIO SHALL BE USED ONLY WHEN SOIL CONDITIONS DO NOT ALLOW VERTICAL TRENCHING.
3. COMPACTED BACKFILL MATERIAL SHALL BE FREE OF ASPHALT, LARGE ROCKS (3" DIA. MAX.), WOOD AND OTHER ORGANIC MATTER.
4. NEW ASPHALT SURFACE SHALL BE THE SAME THICKNESS AS EXISTING ASPHALT SURFACE (1.5" MINIMUM)
5. CONTRACTOR SHALL EXCAVATE BOTTOM OF TRENCH TO ALLOW FOR BELL SECTION OF PIPE.
6. BACKFILL SHALL BE COMPACTED BENEATH THE HAUNCHES OF THE PIPE USING MECHANICAL TAMPS. THIS COMPACTION APPLIES TO THE MATERIAL PLACED BENEATH THE HAUNCHES OF THE PIPE AND ABOVE ANY BEDDING REQUIRED. COMPACTION SHALL BE DONE IN 8" LAYERS. BACKFILL SHALL BE COMPACTED TO 98% MINIMUM DENSITY UNDER ROADS, CURB AND GUTTER AND SHOULDERS OR 95% MINIMUM DENSITY OUTSIDE ROAD R/W. MAXIMUM DENSITY SHALL BE AS DETERMINED BY THE STANDARD PROCTOR COMPACTION TEST AASHTO T-99.
7. REPLACED BASE MATERIAL OVER TRENCH SHALL BE TWICE THE THICKNESS OF THE ORIGINAL BASE (12" MIN.)
8. ASPHALT CONCRETE PAVEMENT JOINTS SHALL BE MECHANICALLY SAWED. SURFACE TREATED PAVEMENT JOINTS SHALL BE LAPPED AND FEATHERED.
9. BASE MATERIALS SHALL BE EITHER OF THE SAME TYPE AND COMPOSITION AS THE MATERIALS REMOVED OR EQUAL OR GREATER STRUCTURAL ADEQUACY. BASE MATERIAL IS TO BE COMPACTED IN 6" LIFTS.
10. REPLACEMENT OF EXISTING ASPHALT OR CONCRETE TO BE AN EVEN STRAIGHT CUT FROM THE WIDEST DAMAGED AREA.

SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS

OPEN ROADWAY CUT (TYP.)

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY:		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY:	L.A.M.	A-102
J.R.P.			

HORIZONTAL & VERTICAL MINIMUM SEPARATION REQUIREMENTS								
PROPOSED UTILITY	POTABLE WATER		RECLAIMED WATER NOTE 2		WASTEWATER (GRAVITY & FM)		STORM SEWER	
	HORIZ.	VERT.	HORIZ.	VERT.	HORIZ.	VERT.	HORIZ.	VERT.
POTABLE WATER	N/A	N/A	3'	12"	6'/10' NOTE 3	12" NOTE 4	3'	12" NOTES 1 & 4
RECLAIMED WATER NOTE 2	3'	12"	N/A	N/A	3'	12"	3' NOTE 5	12" NOTE 1
WASTEWATER (GRAVITY & FM)	6'/10' NOTE 3	12" NOTE 4	3'	12"	N/A	N/A	3' NOTE 5	12" NOTE 1

SEPARATION REQUIREMENTS COMPLY WITH MINIMUM FDEP SEPARATION REQUIREMENTS OUTLINES IN 62-555.314, F.A.C. VARIANCES FROM THE FDEP REQUIREMENTS MUST COMPLY WITH 62-555.314, F.A.C., AND MUST BE APPROVED INDIVIDUALLY BY BOTH FDEP AND CITY OF MELBOURNE.

DISTANCES GIVEN ARE FROM OUTSIDE OF PIPE TO OUTSIDE OF PIPE.

NO WATER SHALL PASS THROUGH OR COME IN CONTACT WITH ANY PART OF SANITARY OR STORMWATER MANHOLE OR STRUCTURE.

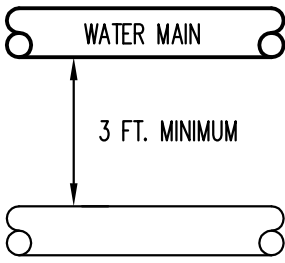
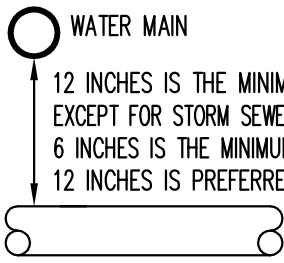
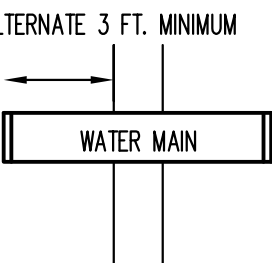
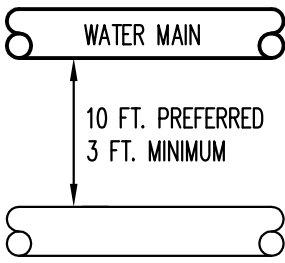
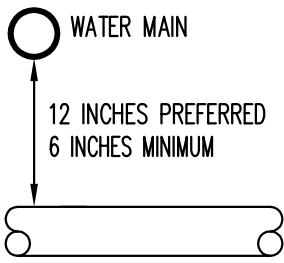
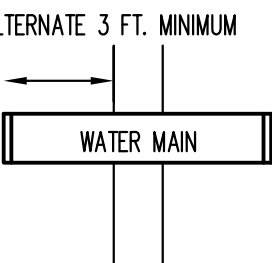
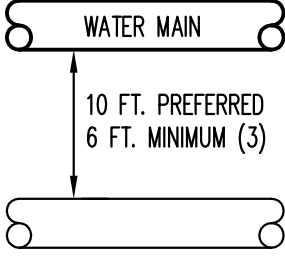
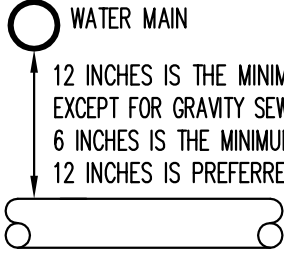
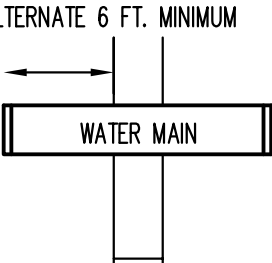
NOTES:

1. WHERE UTILITY PIPE CROSSES UNDER STORMWATER PIPE WITH LESS THAN 18 INCHES OF SEPARATION, STORMWATER PIPE SHALL BE SUPPORTED BY CONCRETE SADDLE.
2. FOR THE PURPOSE OF THIS TABLE AND SEPARATION REQUIREMENTS, RECLAIMED WATER SHALL MEAN UNRESTRICTED, PUBLIC ACCESS RECLAIMED WATER AS DEFINED BY PART III OF CHAPTER 62-610, F.A.C., ADDITIONAL SEPARATIONS SHALL APPLY FOR RECLAIMED WATER NOT REGULATED UNDER PART III OF CHAPTER 62-610, F.A.C.
3. MINIMUM SEPARATION IS 6 FEET, AND PREFERABLY 10 FEET, BETWEEN POTABLE WATER AND WASTEWATER GRAVITY SEWER OR FORCE MAIN.
4. WHERE POTABLE WATER MAINS CROSS OVER WASTEWATER GRAVITY SEWER OR STORM SEWER, 6 INCH MINIMUM SEPARATION IS ACCEPTABLE, HOWEVER, 12 INCHES OF SEPARATION IS PREFERRED.
5. THIS SEPARATION REQUIREMENT IS FOR ACCESSIBILITY PURPOSES AND NOT A FDEP REQUIREMENT. VARIANCES FROM THESE PREFERRED SEPARATIONS MAY BE APPROVED BY THE CITY ON A CASE BY CASE BASIS.

UTILITY PIPE MINIMUM SEPARATION REQUIREMENTS TABLE

REV:	REV: BY	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DATE: 7/1/16	JOB NO.:		DWG NO.: A-103
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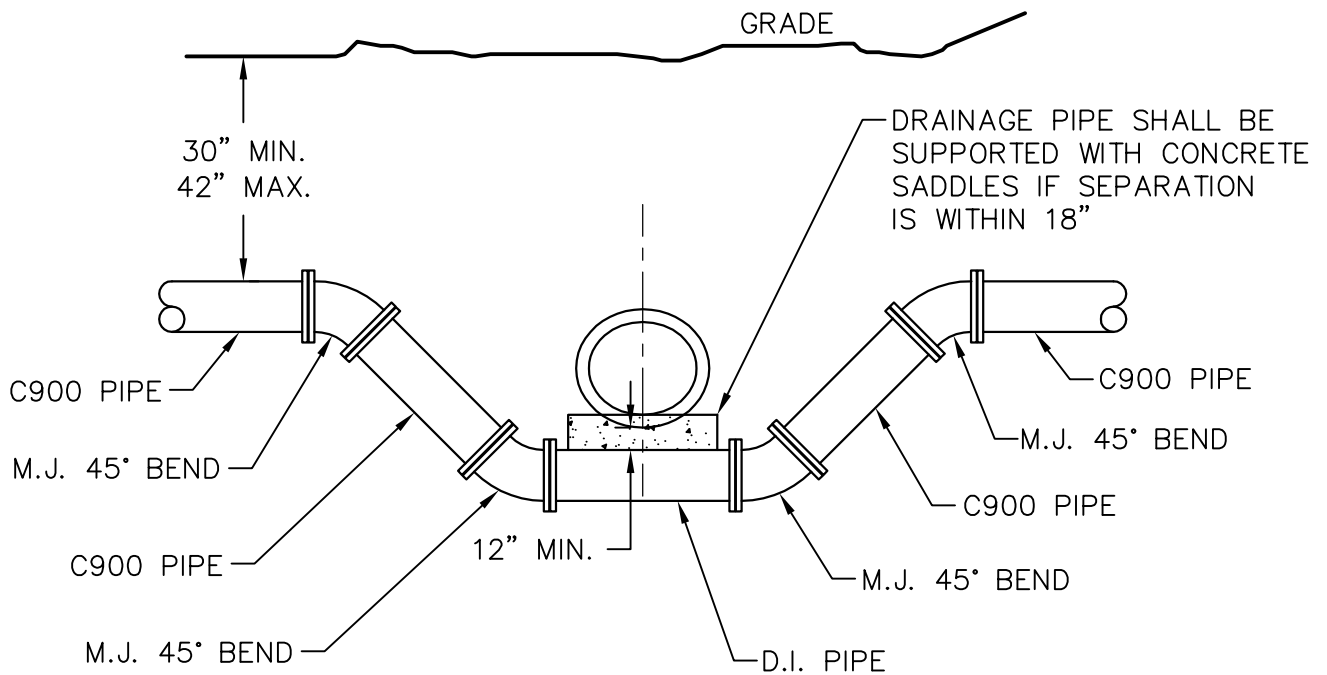
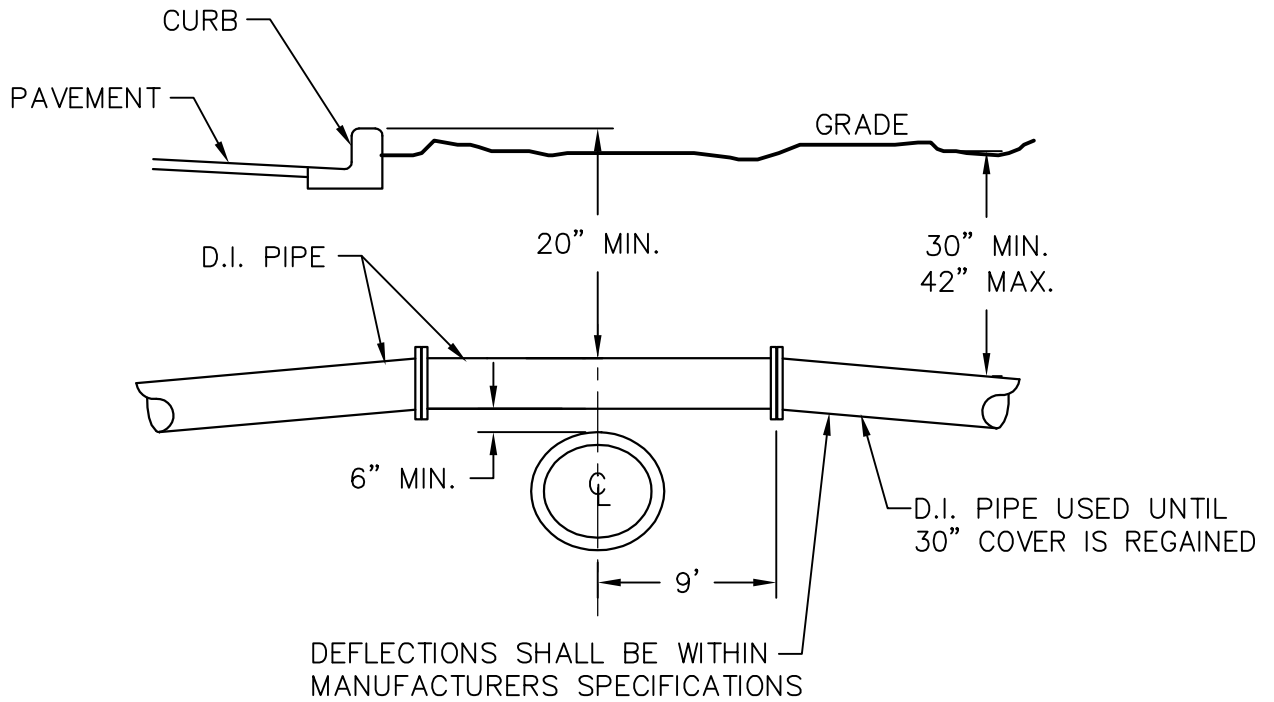
LOCATION OF PUBLIC WATER SYSTEM MAINS IN ACCORDANCE WITH F.A.C. RULE 62-555.314

OTHER PIPE COMPONENT	HORIZONTAL SEPARATION	CROSSINGS (1)	JOINT SPACING @ CROSSINGS (FULL JOINT CENTERED)
STORM SEWER, STORMWATER FORCE MAIN, RECLAIMED WATER (2)	 <p style="text-align: center;">WATER MAIN</p> <p style="text-align: center;">3 FT. MINIMUM</p>	 <p style="text-align: center;">WATER MAIN</p> <p style="text-align: center;">12 INCHES IS THE MINIMUM, EXCEPT FOR STORM SEWER, THEN 6 INCHES IS THE MINIMUM AND 12 INCHES IS PREFERRED</p>	 <p style="text-align: center;">ALTERNATE 3 FT. MINIMUM</p> <p style="text-align: center;">WATER MAIN</p>
VACUUM SANITARY SEWER	 <p style="text-align: center;">WATER MAIN</p> <p style="text-align: center;">10 FT. PREFERRED 3 FT. MINIMUM</p>	 <p style="text-align: center;">WATER MAIN</p> <p style="text-align: center;">12 INCHES PREFERRED 6 INCHES MINIMUM</p>	 <p style="text-align: center;">ALTERNATE 3 FT. MINIMUM</p> <p style="text-align: center;">WATER MAIN</p>
GRAVITY OR PRESSURE SANITARY SEWER, SANITARY SEWER FORCE MAIN RECLAIMED WATER (4)	 <p style="text-align: center;">WATER MAIN</p> <p style="text-align: center;">10 FT. PREFERRED 6 FT. MINIMUM (3)</p>	 <p style="text-align: center;">WATER MAIN</p> <p style="text-align: center;">12 INCHES IS THE MINIMUM, EXCEPT FOR GRAVITY SEWER, THEN 6 INCHES IS THE MINIMUM AND 12 INCHES IS PREFERRED</p>	 <p style="text-align: center;">ALTERNATE 6 FT. MINIMUM</p> <p style="text-align: center;">WATER MAIN</p>
ON-SITE SEWAGE TREATMENT AND DISPOSAL SYSTEM	10 FT. MINIMUM	---	---

- (1) WATER MAIN SHOULD CROSS ABOVE OTHER PIPE. WHEN WATER MAIN MUST BE BELOW OTHER PIPE, THE MINIMUM SEPARATION IS 12 INCHES.
- (2) RECLAIMED WATER REGULATED UNDER PART III OF CHAPTER 62-610, F.A.C.
- (3) 3 FT. FOR GRAVITY SANITARY SEWER WHERE THE BOTTOM OF THE WATER MAIN IS LAID AT LEAST 6 INCHES ABOVE THE TOP OF THE GRAVITY SANITARY SEWER
- (4) RECLAIMED WATER NOT REGULATED UNDER PART III OF CHAPTER 62-610, F.A.C.

UTILITY PIPE MINIMUM SEPARATION REQUIREMENTS FIGURE

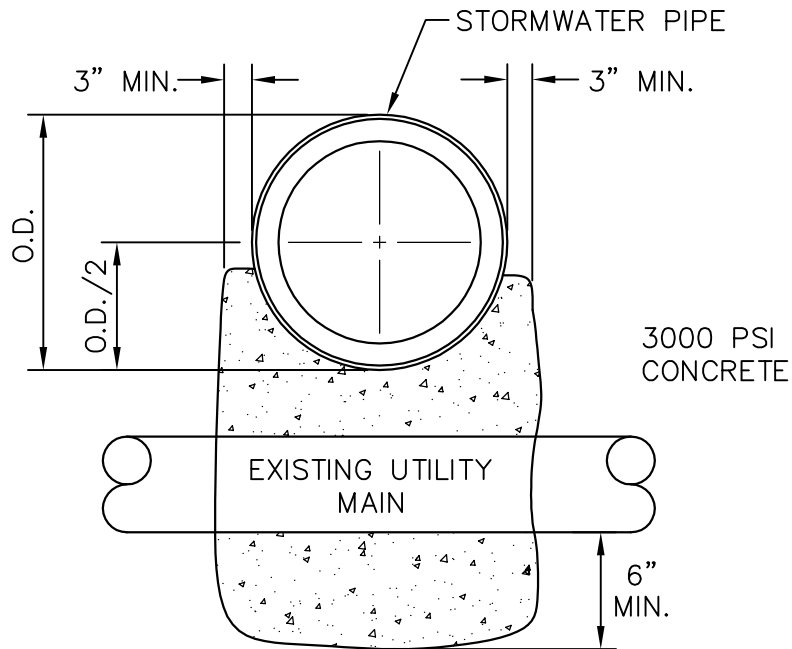
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DATE:	JOB NO.:		DWG NO. A-104	
DRAWN BY:	DSGN. BY:			
7/1/16	L.A.M.			



NOTE:
ALL JOINTS MECHANICALLY RESTRAINED

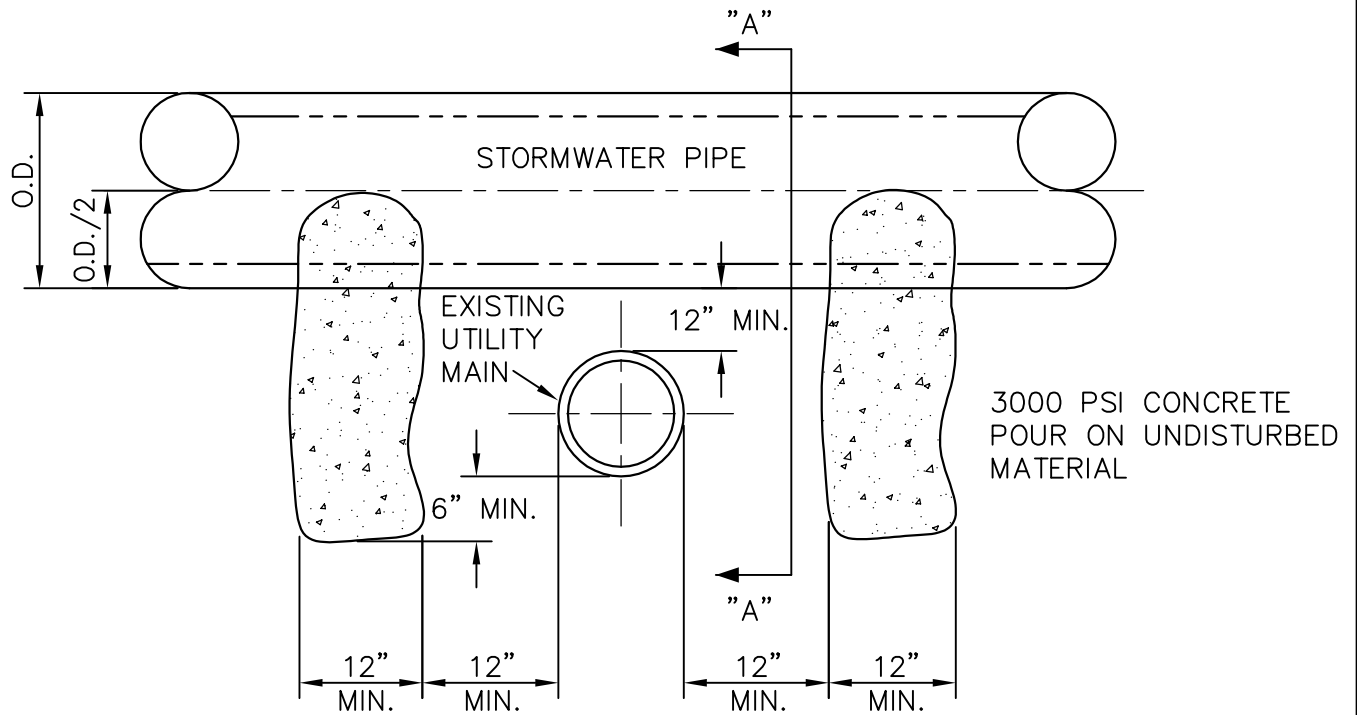
UTILITY CROSSINGS

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY:		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY:		A-105
J.R.P.	L.A.M.		



CONCRETE SADDLE WILL BE USED IN ALL CASES WHERE PROPOSED PIPE OVERLAY IS WITHIN 18" OF EXISTING UTILITY MAIN.

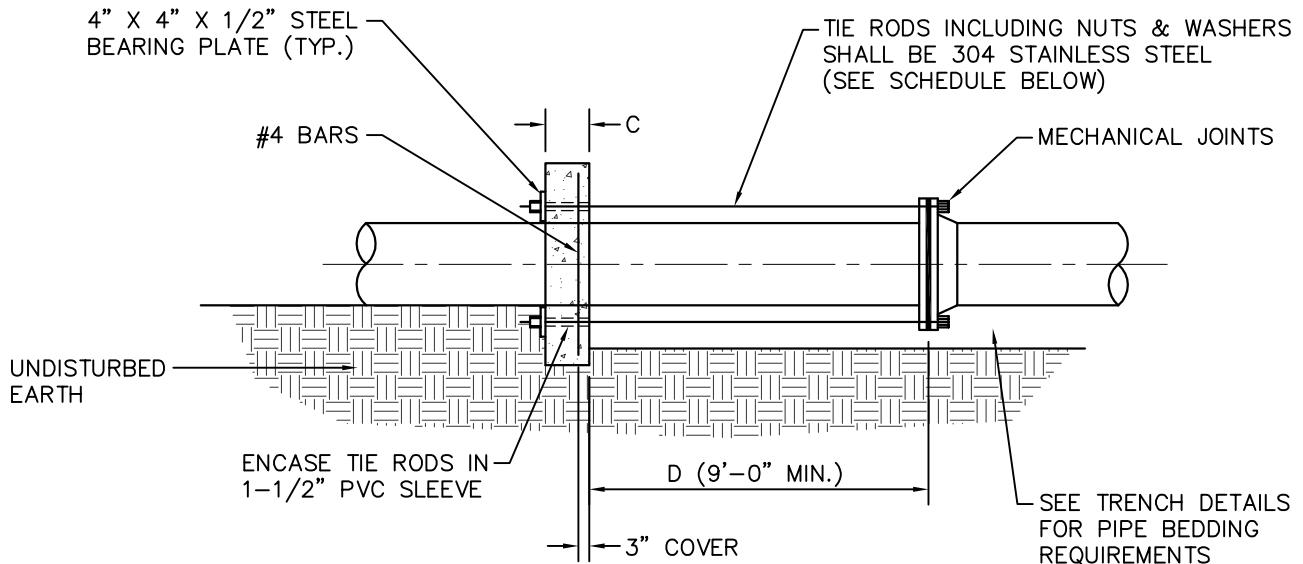
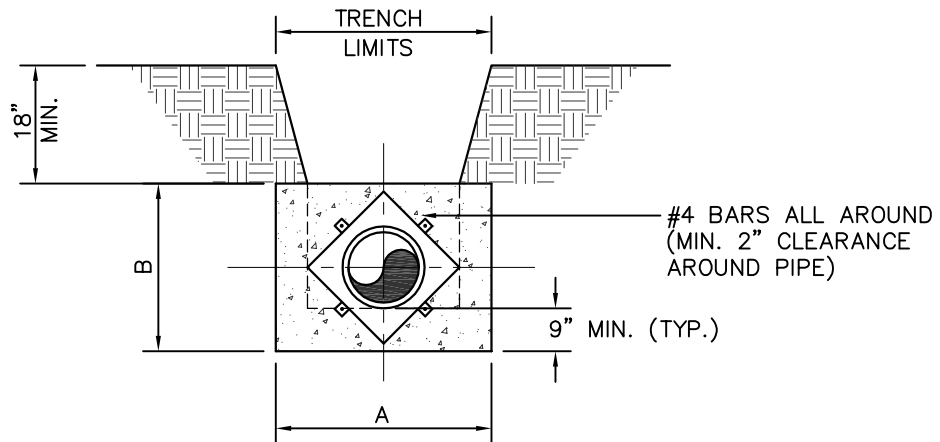
SECTION "A"



CONCRETE SADDLE SHALL NOT COME IN CONTACT WITH UTILITY MAIN.

TYPICAL CONCRETE SADDLE DETAIL

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY	L.A.M.	A-106
J.R.P.			



NOTES:

1. ADDITIONAL REINFORCEMENTS SHALL BE SPECIFIED BY THE ENGINEER.
2. MINIMUM COMPRESSIVE STRENGTH FOR CONCRETE SHALL BE 3000 PSI.
3. BEDDING, BACKFILL AND COMPACTION SHALL BE SPECIFIED IN THE STANDARD DRAWING.
4. ALL FORM BOARDS SHALL BE REMOVED PRIOR TO BACKFILLING.
5. NO ALLOWANCE SHALL BE MADE FOR FRICTION BETWEEN THE PIPE WALL.
6. DESIGN PRESSURE: 150 PSI.
7. REQUIRED FOR LINE STOP OPERATIONS WHERE APPLICABLE.

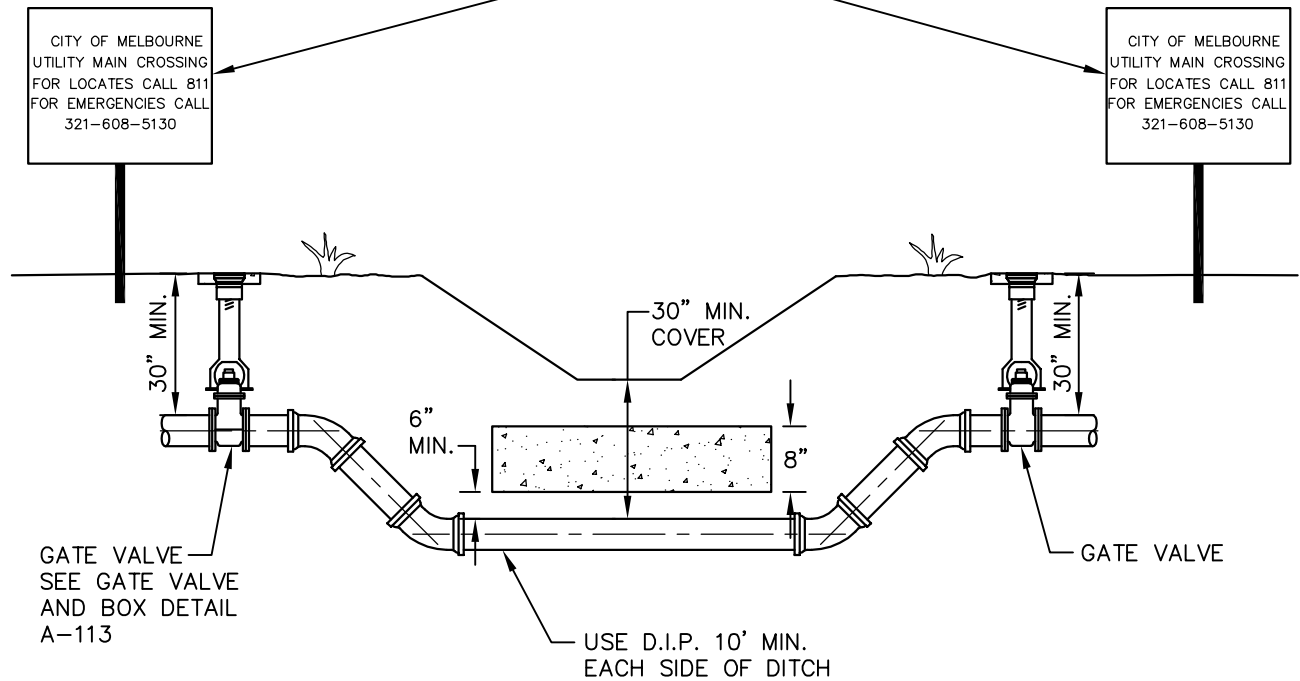
SCHEDULE OF DIMENSIONS AND MATERIALS						
PIPE SIZE (INCHES)	DIMENSIONS (FT.)				TIE RODS REQ'D	
	A	B	C	D	DIA.	NO.
6	2.0	2.0	1.0		3/4	2
8	2.5	2.5	1.0		3/4	2
10	3.5	3.0	1.0		3/4	2
12	5.0	3.0	1.0		3/4	2
16	6.0	4.0	1.5		3/4	4
20	8.0	5.0	1.5		3/4	6
24	9.0	6.0	1.5		3/4	8

NOTE: THRUST COLLAR AREAS TO BE COMPUTED ON BASIS OF 2000 LBS/SF SOIL RESTRAINT BEARING.

THRUST COLLAR DETAIL

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION		SCALE:	N.T.S.
DATE:	JOB NO.:			DWG NO.:	A-107
DRAWN BY:	DSGN. BY:				
7/1/16	L.A.M.				

24" x 18" SIGN, WHITE BACKGROUND
WITH 2" BLACK LETTERS (SEE NOTE 4)

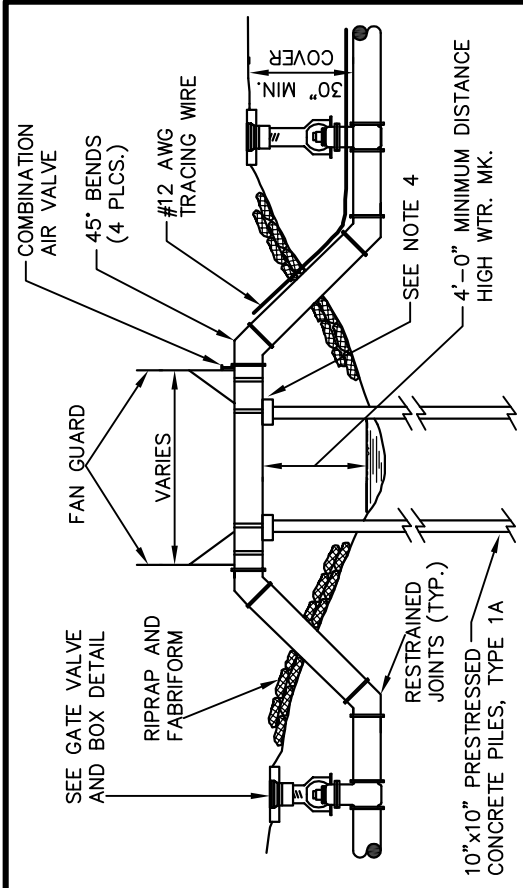


NOTES:

1. MAIN SHALL BE INSTALLED WITH MINIMUM NUMBER OF MECHANICALLY RESTRAINED JOINTS WITHIN THE CANAL OR DITCH. ALL JOINTS WITHIN THE CANAL OR DITCH SHALL BE RESTRAINED.
2. CONCRETE SLAB SHALL BE 2" WIDER THAN THE PIPE O.D.
3. CONCRETE IS REQUIRED WHEN COVER IS LESS THAN 36".
4. FOR WASTEWATER CROSSINGS, DEPTH OF PIPE SHALL BE NOTED ON SIGNAGE IN ACCORDANCE WITH 62-604.400 F.A.C..

DITCH CROSSINGS

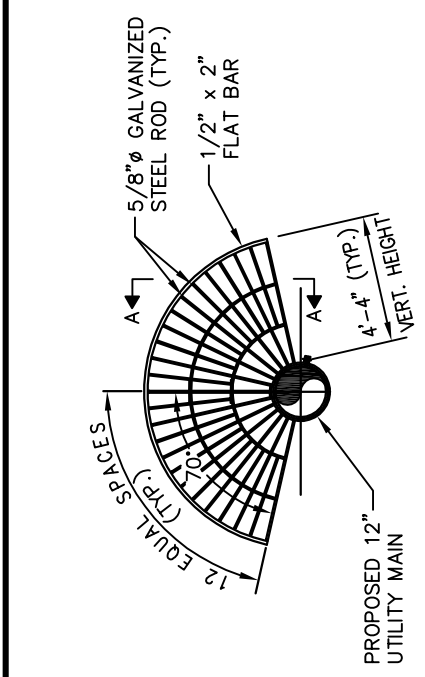
REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY:		N.T.S.
DRAWN BY:	DSGN. BY:		DWG NO.:
7/1/16	L.A.M.	A-108	



CROSSING NOTES:

1. ALL PIPES SHALL BE DUCTILE IRON WITH STAINLESS STEEL HARDWARE.
2. ALL EXPOSED PIPING SHALL BE SAND BLASTED, PRIMED AND PAINTED COLOR CODING ACCORDING TO UTILITY. SEE APPROVED PRODUCTS LIST.
3. PROVISIONS SHALL BE MADE FOR EXPANSION OF ASSEMBLY A SUPPORTED MECHANICAL JOINT OR APPROVED EQUAL.
4. TIE PIPE TO PIERS WITH STAINLESS STEEL STRAPS AND HARDWARE.
5. CONCRETE PILES PLACEMENT WILL BE DESIGNED BY A STRUCTURAL ENGINEER.

AERIAL CROSSING



PIPE BARRICADE

BARRICADE NOTES:

1. ANY ALTERNATE DESIGNS MUST BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
2. ALL STEEL TO BE HOT DIPPED GALVANIZED AFTER FABRICATION.
3. ALL BOLTS, NUTS AND WASHERS TO BE MIN. 304 STAINLESS STEEL.
4. TWO PIPE BARRICADES ARE REQ'D. (ONE ON EACH END) EXACT LOCATION TO BE DETERMINED BY ENGINEER.
5. BARRICADE IS LOCATED PERPENDICULAR TO PIPE.

SECTION A-A

PERSONNEL BARRICADE-FAN GUARD

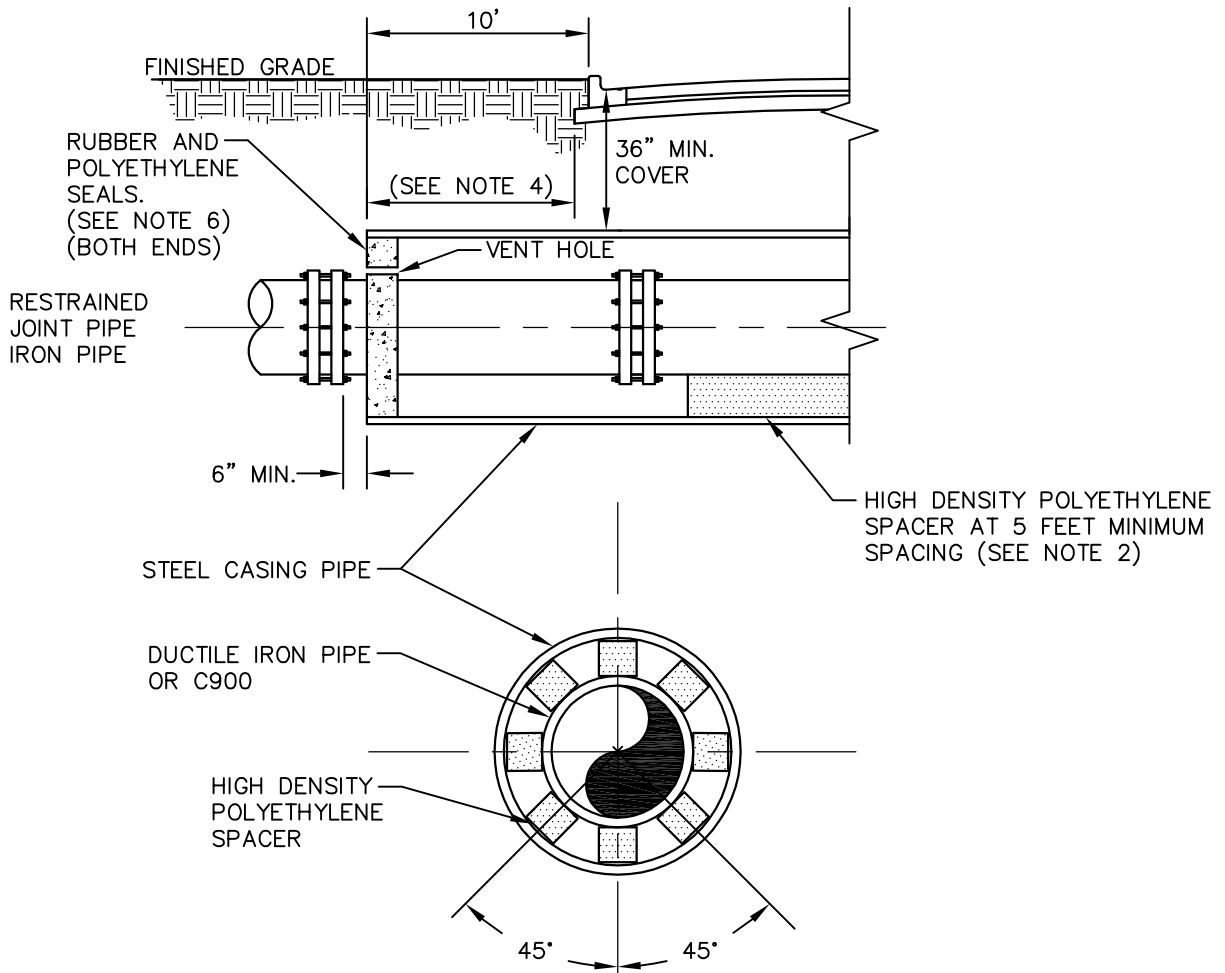
NOT TO SCALE

AERIAL PIPE CROSSING AND BARRICADE

REV:	REV:
DATE: 7/1/16	BY:
DRAWN BY: J.R.P.	DSGN. BY: L.A.M.

**CITY OF MELBOURNE
UTILITIES ADMINISTRATION**

SCALE:	N.T.S.
DWG NO.:	A-109



NOTES:

1. WHEN CONSTRUCTION IS WITHIN FDOT JURISDICTION, ADDITIONAL REQUIREMENTS OF THE UTILITY ACCOMMODATION MANUAL SHALL BE MET.
2. UTILITY MAINS SHALL BE PUSHED/PULLED THROUGH THE CASING ON HIGH DENSITY POLYETHYLENE CASING SPACERS, PLACED AT 5 FOOT INTERVALS.
3. ALL PIPE JOINTS IN CASING SHALL BE REATRINED.
4. CASING SHALL EXTEND 10' BEYOND EDGE OF PAVEMENT. THE CITY MAY REQUIRE LONGER CASING FOR DEEPER BORES.
5. CASING SPACERS SHALL BE ALL STAINLESS STEEL WITH HIGH DENSITY POLYETHYLENE RUNNERS.
6. ALL CASING ENDS SHALL BE SEALED WITH THE APPROPRIATE RUBBER SEALS SECURED BY STAINLESS STEEL STRAPS. CASING END SEALS SHALL BE OF THE SAME MANUFACTURER AS THE CASING SPACERS.

JACK AND BORE DETAIL

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
DRAWN BY:	DSGN. BY		DWG NO.:
7/1/16	L.A.M.	A-110	

MINIMUM LENGTH (FT) TO BE RESTRAINED ON EACH SIDE OF FITTING(S)

FITTINGS	PIPE SIZE								
	6"	8"	10"	12"	16"	20"	24"	30"	36"
90° BEND	44(51)	57(66)	68(78)	78(92)	99(116)	119(137)	137(158)	161(185)	183(210)
45° BEND	18(21)	24(29)	29(33)	33(38)	42(48)	50(57)	57(66)	66(77)	77(87)
22.5° BEND	9(11)	12(14)	14(17)	17(18)	21(24)	24(29)	27(32)	33(38)	38(42)
11.25° BEND	5(6)	6(8)	8(9)	9(9)	11(12)	12(14)	14(17)	17(20)	18(21)
BRANCH OF TEE	42(59)	69(99)	92(131)	116(165)	161(230)	204(291)	245(348)	300(428)	353(503)
DEAD END	92(131)	120(171)	143(204)	168(239)	213(305)	257(366)	299(425)	354(507)	408(582)

NOTES:

1. ALL FITTINGS SHALL BE RESTRAINED JOINT TYPE UNLESS OTHERWISE INDICATED.
2. INSTALL FULL LENGTH JOINTS WITH TOTAL LENGTH EQUAL TO, OR GREATER THAN THE LENGTH SHOWN IN THE TABLE.
3. WHERE TWO OR MORE FITTINGS ARE TOGETHER, USE FITTING WHICH YIELDS, GREATEST LENGTH OF RESTRAINED PIPE.
4. IN-LINE VALVES OUTSIDE THE LIMITS OF RESTRAINED JOINTS FROM OTHER FITTINGS, NEED NOT BE RESTRAINED UNLESS OTHERWISE INDICATED.
5. LENGTH OF RESTRAINED JOINT PIPING FOR REDUCERS, REDUCING TEES, AND VERTICAL POSITION FITTINGS SHALL BE DESIGNED ON AN INDIVIDUAL BASIS, WITH DESIGN CALCULATIONS FOR EACH BEING SUBMITTED FOR REVIEW.
6. LENGTHS SHOWN IN THE TABLE HAVE BEEN CALCULATED IN ACCORDANCE WITH THE PROCEDURE OUTLINED IN "THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE" AS PUBLISHED BY DIPRA, WITH THE FOLLOWING ASSUMPTIONS:

WORKING PRESSURE:	70	P.S.I.
DESIGN PRESSURE:	150	P.S.I.
SOIL DESIGNATION:	SAND-SILT	
LAYING CONDITION:	TYPE 2	
7. FOR PIPE ENCASED IN POLYETHYLENE, USE VALUES GIVEN IN PARENTHESES, OR INCREASE THE GIVEN VALUE BY A FACTOR OF 1.2
8. WHERE INTERNAL RESTRAINED JOINTS ARE USED, ENTIRE BELL SHALL BE PAINTED RED.

RESTRAINED PIPE TABLE – POTABLE AND RECLAIMED (150 psi)

REV:	REV: BY	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DATE: 7/1/16	JOB NO.:		DWG NO.: A-111
DRAWN BY: J.R.P.	DSCN. BY: L.A.M.		

MINIMUM LENGTH (FT) TO BE RESTRAINED ON EACH SIDE OF FITTING(S)

FITTINGS	PIPE SIZE								
	6"	8"	10"	12"	16"	20"	24"	30"	36"
90° BEND	29(34)	38(44)	45(52)	52(61)	66(77)	70(91)	91(105)	107(123)	122(140)
45° BEND	12(14)	16(19)	19(22)	22(25)	28(32)	33(38)	38(44)	44(51)	51(58)
22.5° BEND	6(7)	8(9)	9(11)	11(12)	14(16)	16(19)	18(21)	22(25)	25(28)
11.25° BEND	3(4)	4(5)	5(6)	6(6)	7(8)	8(9)	9(11)	11(13)	12(14)
BRANCH OF TEE	28(39)	46(66)	61(87)	77(110)	107(153)	136(194)	163(232)	200(285)	235(335)
DEAD END	61(87)	80(114)	95(136)	112(159)	142(203)	171(244)	199(283)	236(338)	272(388)

NOTES:

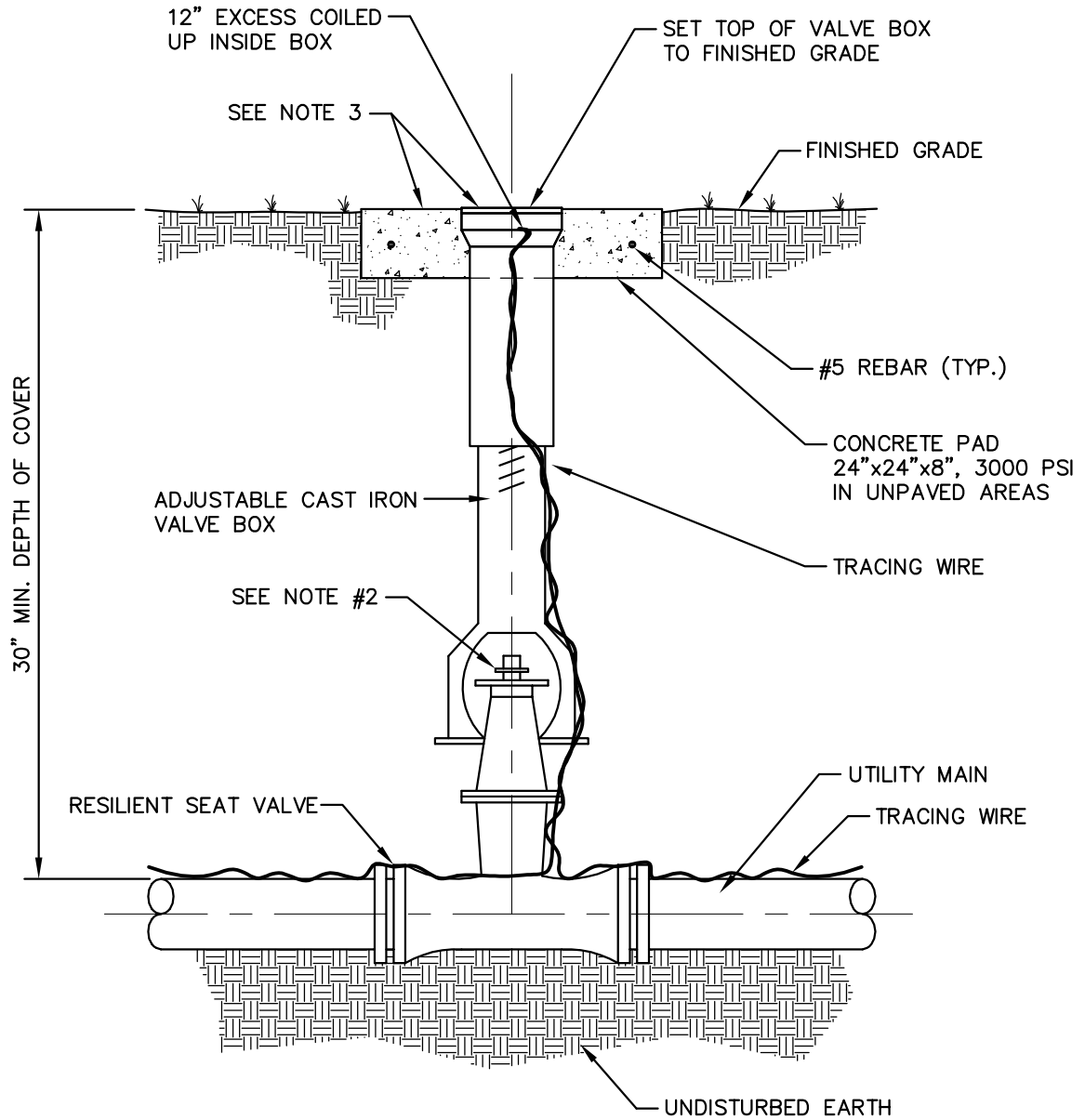
1. ALL FITTINGS SHALL BE RESTRAINED JOINT TYPE UNLESS OTHERWISE INDICATED.
2. INSTALL FULL LENGTH JOINTS WITH TOTAL LENGTH EQUAL TO, OR GREATER THAN THE LENGTH SHOWN IN THE TABLE.
3. WHERE TWO OR MORE FITTINGS ARE TOGETHER, USE FITTING WHICH YIELDS, GREATEST LENGTH OF RESTRAINED PIPE.
4. IN-LINE VALVES OUTSIDE THE LIMITS OF RESTRAINED JOINTS FROM OTHER FITTINGS, NEED NOT BE RESTRAINED UNLESS OTHERWISE INDICATED.
5. LENGTH OF RESTRAINED JOINT PIPING FOR REDUCERS, REDUCING TEES, AND VERTICAL POSITION FITTINGS SHALL BE DESIGNED ON AN INDIVIDUAL BASIS, WITH DESIGN CALCULATIONS FOR EACH BEING SUBMITTED FOR REVIEW.
6. LENGTHS SHOWN IN THE TABLE HAVE BEEN CALCULATED IN ACCORDANCE WITH THE PROCEDURE OUTLINED IN "THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE" AS PUBLISHED BY DIPRA, WITH THE FOLLOWING ASSUMPTIONS:

WORKING PRESSURE: 100 P.S.I.
 SOIL DESIGNATION: SAND-SILT
 LAYING CONDITION: TYPE 2
 SAFETY FACTOR: 1.5

7. FOR PIPE ENCASED IN POLYETHYLENE, USE VALUES GIVEN IN PARENTHESES, OR INCREASE THE GIVEN VALUE BY A FACTOR OF 1.2

RESTRAINED PIPE TABLE – WASTEWATER FORCE MAIN (100 psi)

REV:	REV: BY	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DATE:	JOB NO.:		DWG NO.:	A-112
DRAWN BY:	DSCN. BY			
J.R.P.	L.A.M.			



PROFILE

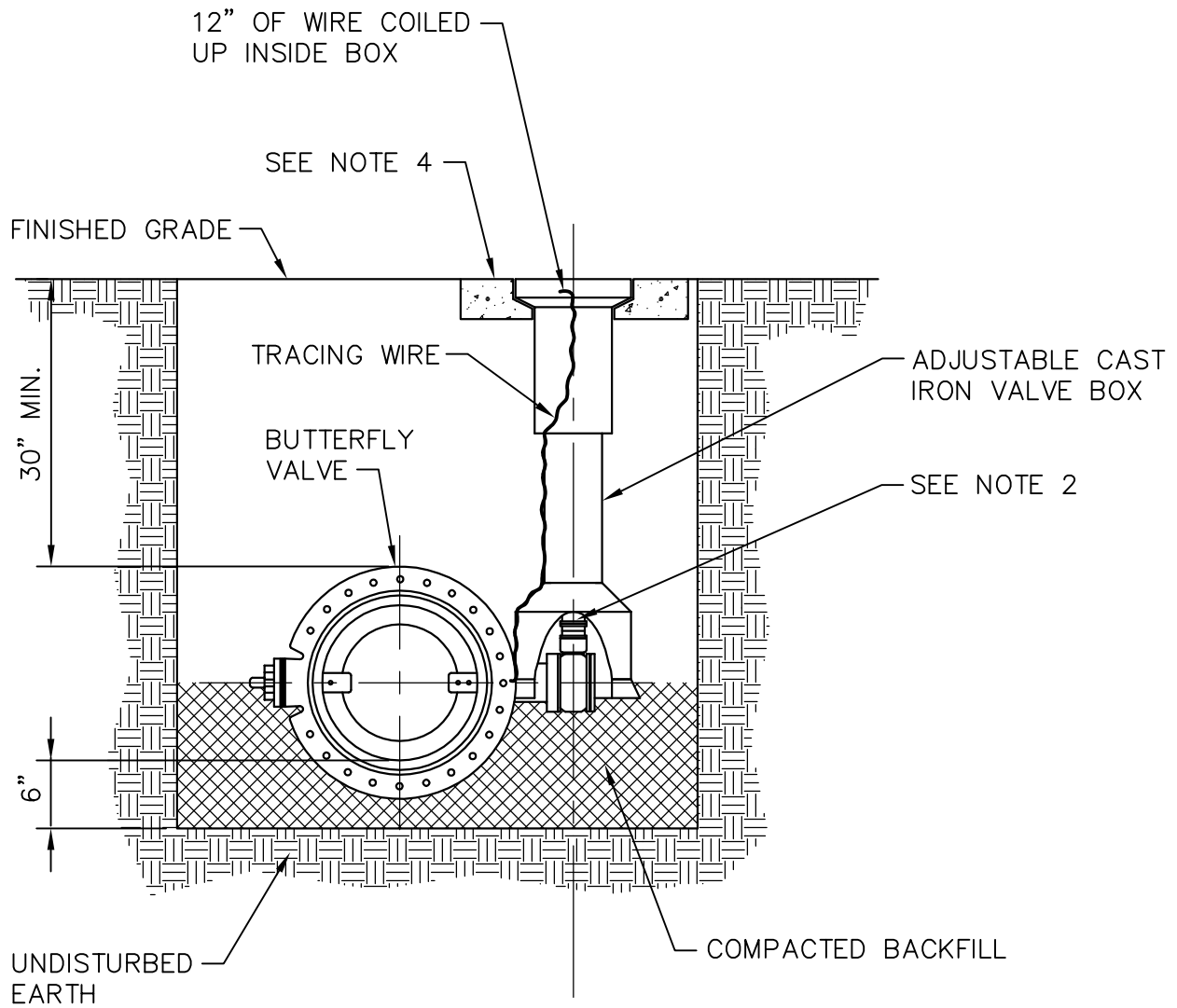
NOT TO SCALE

NOTES:

1. FIELD MANUFACTURED VALVE BOX EXTENSIONS NOT PERMITTED. CITY SHALL GIVE APPROVAL FOR FIELD EXTENSION ONLY WHEN VALVE DEPTH EXCEEDS VALVE BOX HEIGHTS OBTAINABLE THROUGH MANUFACTURERS LISTED IN APL.
2. VALVE NUT EXTENSIONS SHALL BE INSTALLED ON VALVE NUTS DEEPER THAN 48 INCHES FROM FINISH GRADE. EXTENSION SHALL BE INSTALLED SO OPERATING NUT IS 12 TO 20 INCHES BELOW FINISH GRADE.
3. FOR VALVE BOX LID AND CONCRETE PAD DETAIL, SEE A-115
4. SIDE ACTUATED GATE VALVES MAY BE REQUIRED WHERE DEPTH REQUIREMENTS DICTATE.

GATE VALVE AND BOX DETAIL

REV:	REV:		
DATE:	BY:		SCALE:
7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	N.T.S.
DRAWN BY:	DSGN. BY:		DWG NO.:
J.R.P.	L.A.M.		A-113



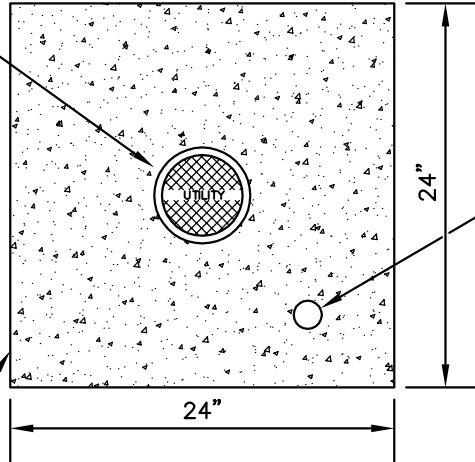
NOTES:

1. PVC EXTENSIONS SHALL NOT BE USED ON VALVE BOX EXTENSIONS
2. THE ACTUATING NUT FOR DEEPER VALVES SHALL BE EXTENDED TO COME UP TO 4 FOOT DEPTH BELOW FINISHED GRADE.
3. ALL WATER SHUT-OFF VALVES (30") INCHES AND LARGER SHALL BE BUTTERFLY VALVES.
4. FOR VALVE BOX LID AND CONCRETE PAD DETAIL, SEE A-115

BUTTERFLY VALVE AND BOX DETAIL

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY:		N.T.S.
DRAWN BY:	DSGN. BY:		DWG NO.:
7/1/16	L.A.M.	A-114	

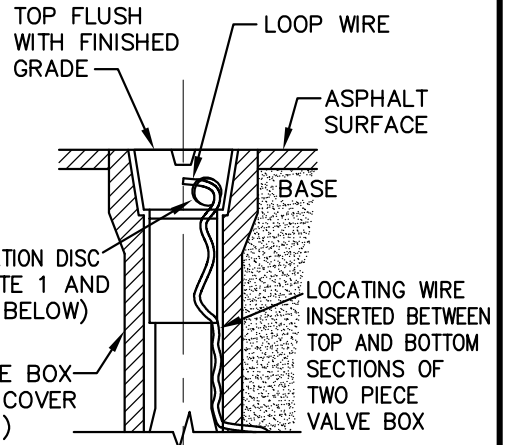
VALVE BOX LID
(SEE NOTE 2)



8" THICK 3,000 PSI
(MIN.) CONCRETE WITH
#5 REBAR CONTINUOUS
(SEE NOTE 2)

OUTSIDE PAVEMENT

NOT TO SCALE

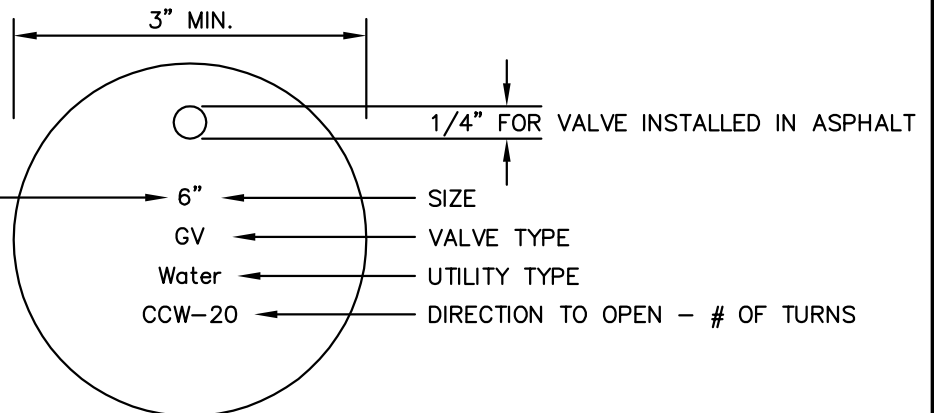


DISC TO BE HANGING IN THE BOX
ANCHORED TO THE LOCATING WIRE

INSIDE PAVEMENT

NOT TO SCALE

LETTERING TO BE MACHINE
ENGRAVED WITH 1/4" TO 3/8"
CAP. LETTERS



IDENTIFICATION DISC

EXAMPLE

ABBREVIATIONS

VALVE TYPE

- GV - GATE VALVE
- BF - BUTTERFLY VALVE
- PV - PLUG VALVE
- SA - SIDE ACTUATED

UTILITY TYPE

- WATER - POTABLE WATER
- RW - RECLAIMED WATER
- SEWER - WASTEWATER COLLECTION

DIRECTION TO OPEN

- CCW - COUNTER CLOCKWISE
- CW - CLOCKWISE

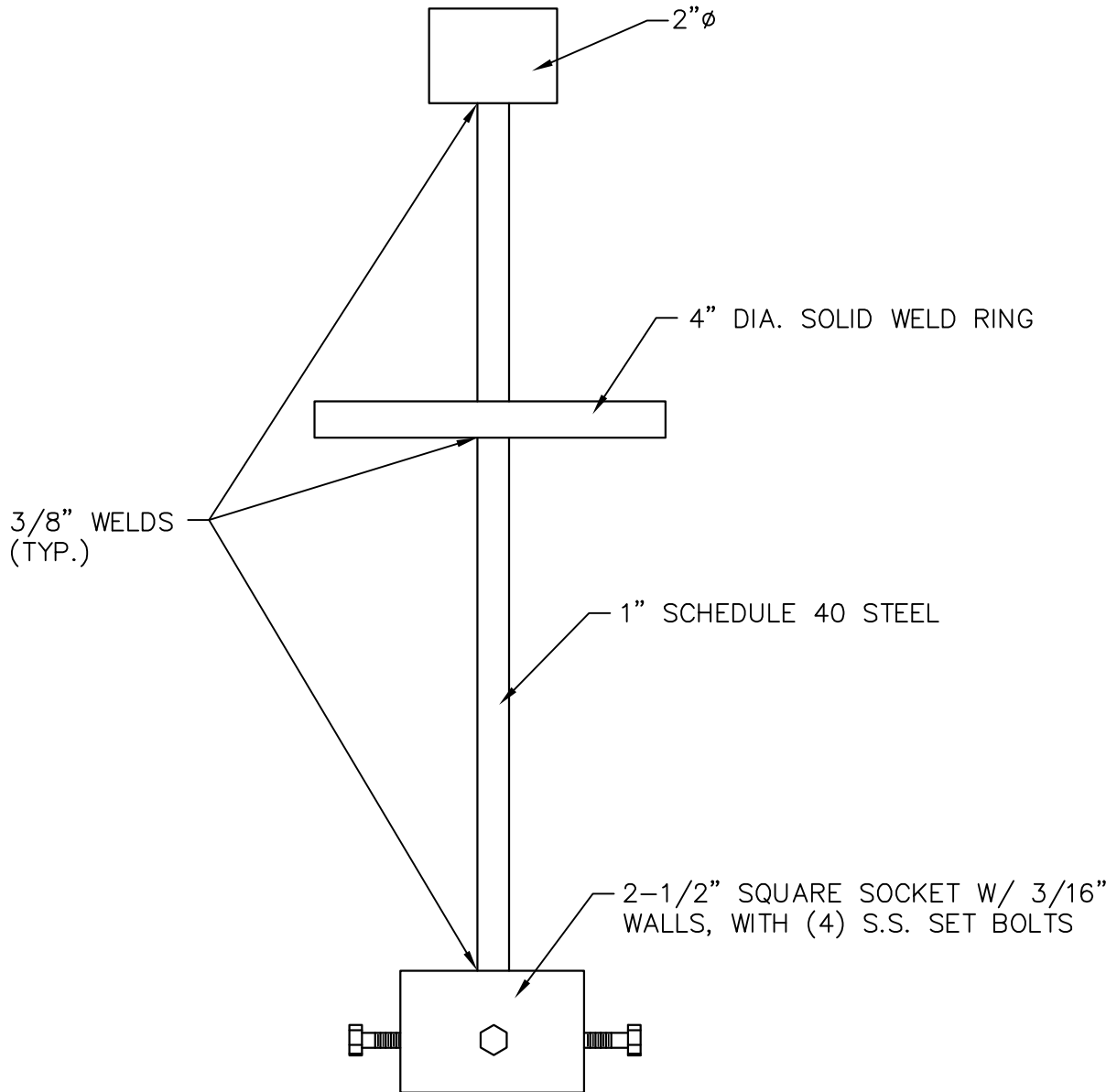
NOTES:

1. BRONZE (OR STAINLESS STEEL) IDENTIFICATION DISC SHALL BE REQUIRED FOR ALL VALVES, EXCEPT HYDRANT VALVES.
2. FOR POTABLE WATER SYSTEMS, VALVE BOX LID STAMPED "WATER" AND PAINTED BLUE. FOR RECLAIMED WATER SYSTEMS, VALVE BOX LID STAMPED "REUSE" AND PAINTED PURPLE. FOR WASTEWATER COLLECTION SYSTEMS, VALVE BOX LID STAMPED "SEWER" AND PAINTED GREEN. SEE APPENDIX B - APPROVED PRODUCTS LIST FOR PAINT SPECIFICATIONS.

VALVE BOX LID, PAD AND MARKER

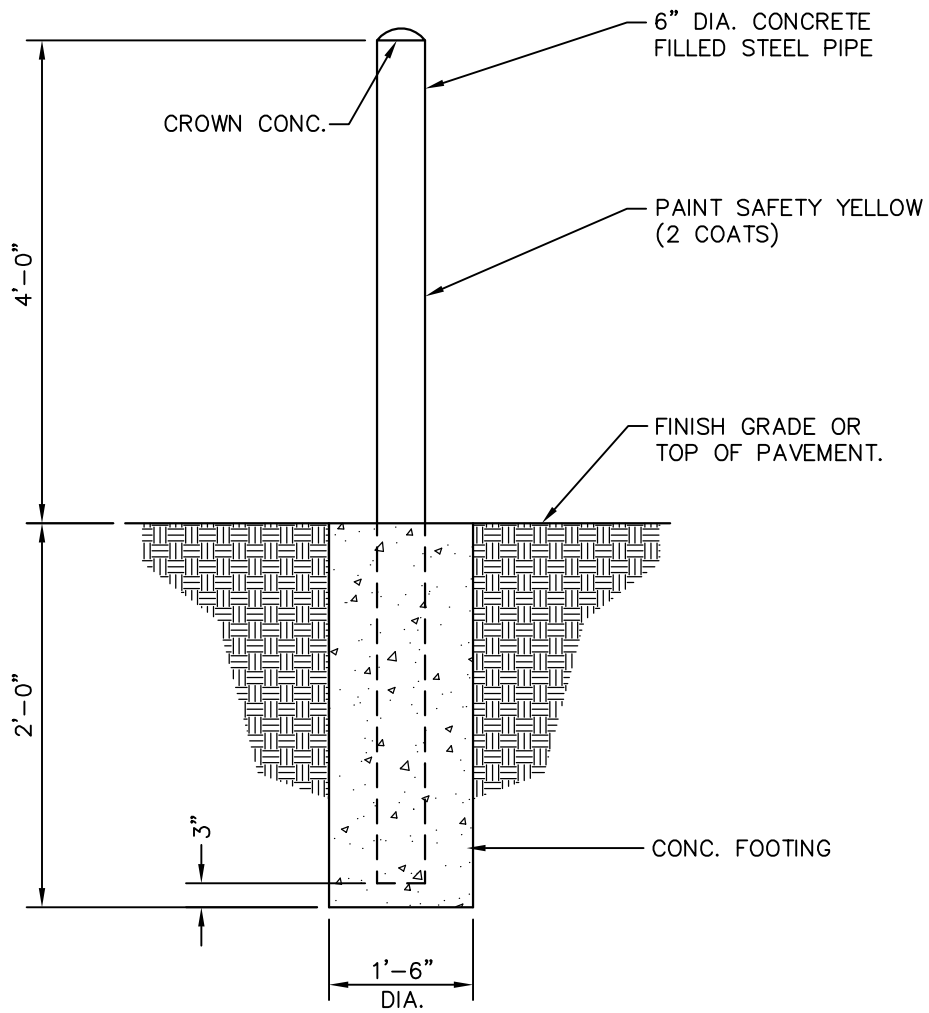
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DATE:	BY:		N.T.S.
DRAWN BY:	DSGN. BY:		DWG NO.:
7/1/16	L.A.M.	A-115	

VALVE EXTENSION



VALVE EXTENSION

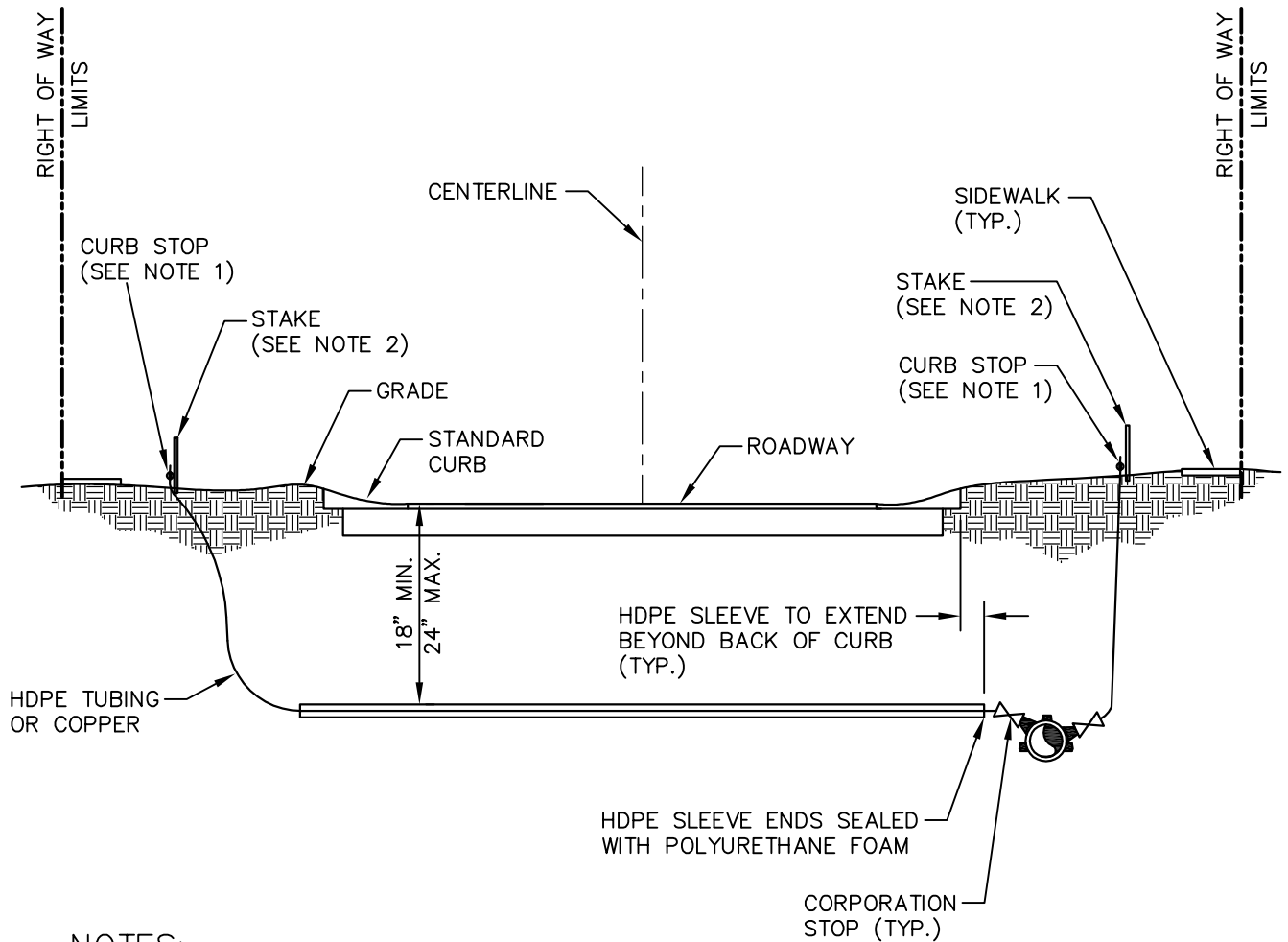
REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION		SCALE:	N.T.S.
DATE:	BY:			DWG	A-116
7/1/16	JOB NO.:			NO.:	
DRAWN BY:	DSGN. BY:	L.A.M.			
J.R.P.					



NOTE: USE 3,000 PSI (MIN.) CONCRETE

BOLLARD DETAIL

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY:		A-117
J.R.P.	L.A.M.		



NOTES:

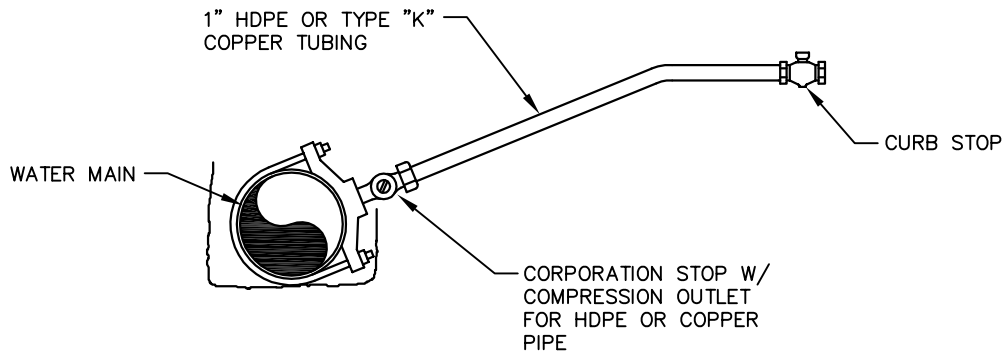
1. CURB STOP SHALL BE INSTALLED ON STREET SIDE OF THE SIDEWALK BETWEEN SIDEWALK AND CURB.
2. TEMPORARY MARKING OF SERVICE – ALL SERVICE LINE CURB STOP TERMINATIONS SHALL BE EXPOSED TO VIEW PRIOR TO AND DURING PRE-FINAL AND FINAL INSPECTION. SERVICE LINE SHALL BE ATTACHED BY MEANS OF TAPE TO A 2 INCH x 1 INCH (MINIMUM 24 INCH IN LENGTH) STAKE WITH THE TOP PAINTED COLOR OF UTILITY AND MARKED WITH THE LOT NUMBER TO BE SERVED.

PERMANENT MARKING OF SERVICE – ALL WATER SERVICE LOCATIONS SHALL BE PERMANENTLY ETCHED INTO CONCRETE CURB WITH "W" AND PAINTED BLUE FOR POTABLE WATER AND "R" AND PAINTED PURPLE FOR RECLAIMED WATER. ANY EXCEPTION MUST HAVE PRIOR APPROVAL OF CITY.
3. 18 INCH MINIMUM SPACING BETWEEN SERVICE TAPS.

RESIDENTIAL SERVICES LAYOUT – POTABLE AND RECLAIMED

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY:	L.A.M.	A-118
J.R.P.			

1" SERVICE TAP

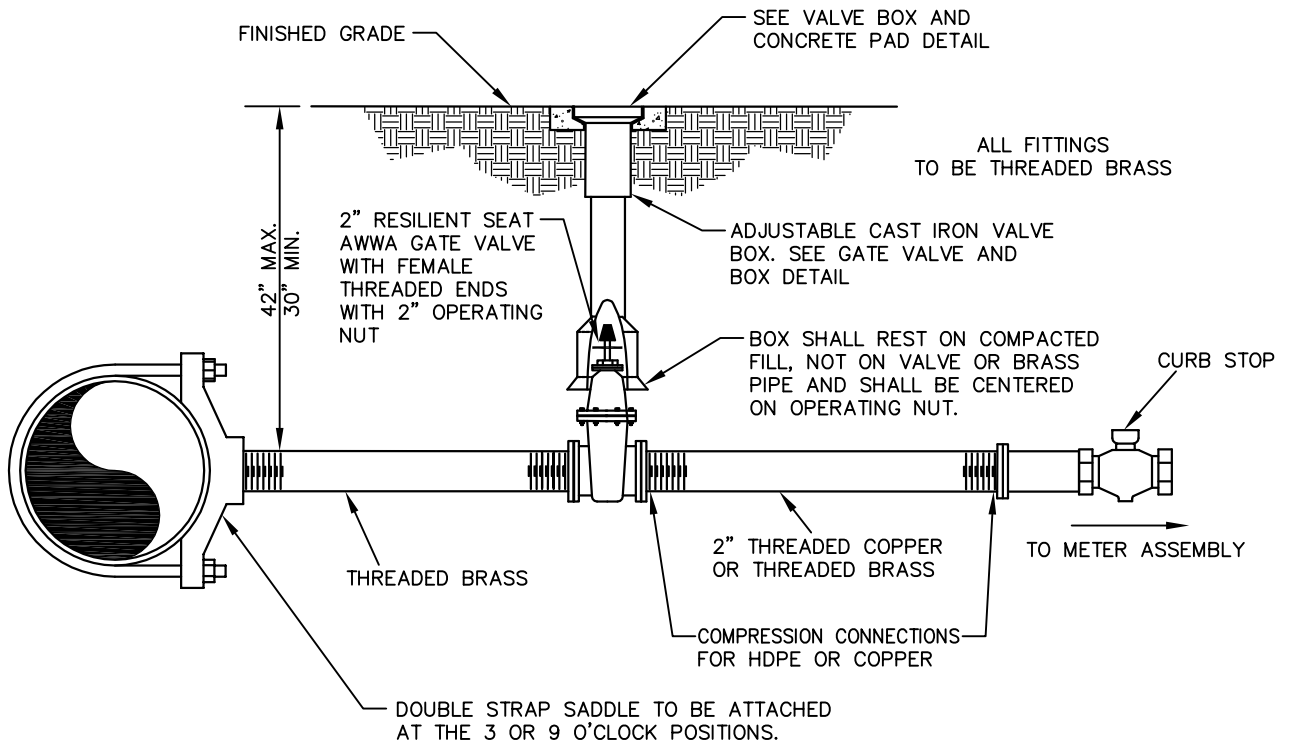


MAIN SIZE	OUTLET SIZE	SERVICE SADDLE
4"	1"	SINGLE STRAP
	2"	DOUBLE STRAP
6"	1"	SINGLE STRAP
	2"	DOUBLE STRAP
8" & LARGER	1"	SINGLE STRAP
	2"	DOUBLE STRAP

MAXIMUM SIZE OUTLET FOR USE WITH
DOUBLE STRAP SERVICE CLAMP

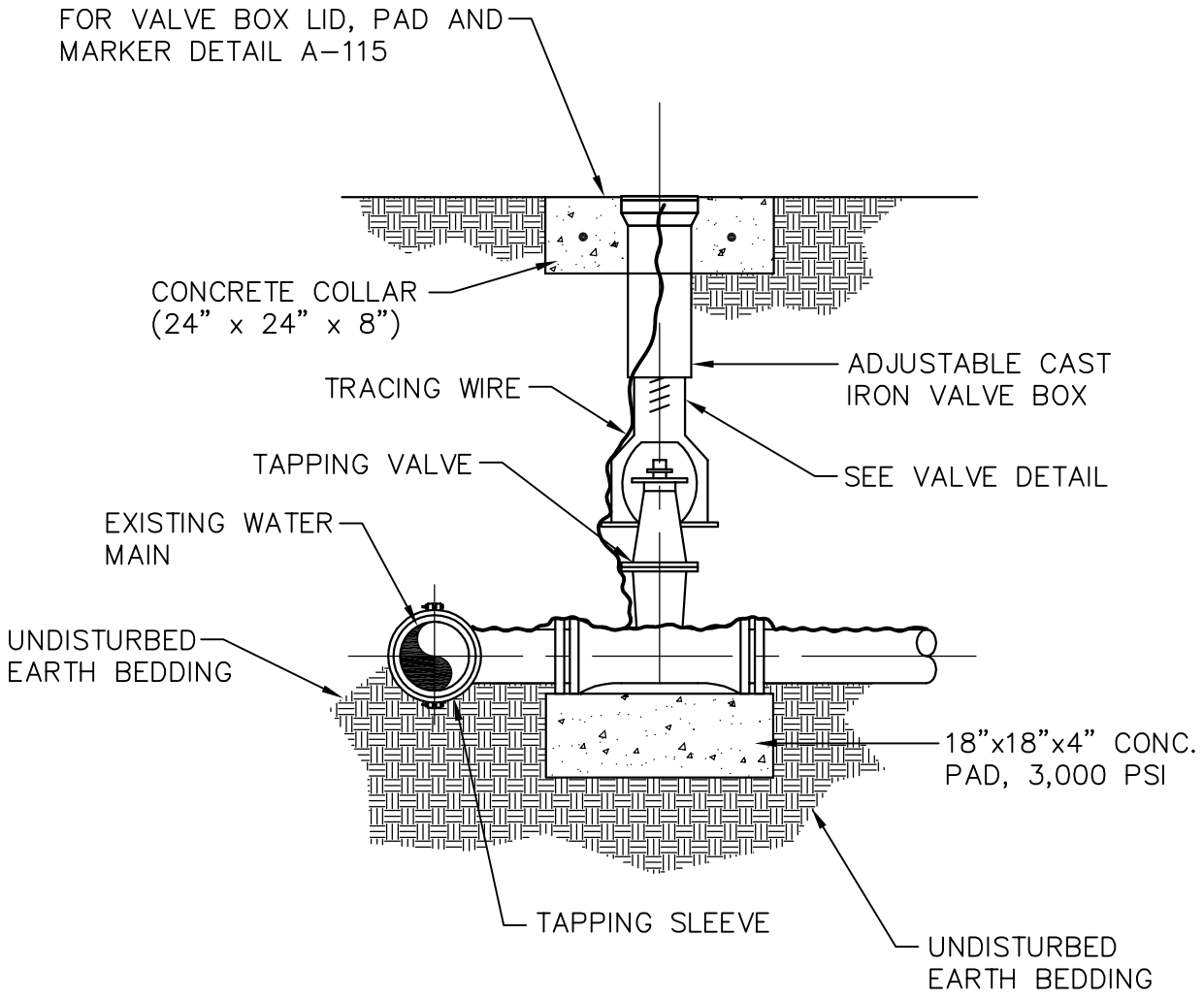
PIPE SIZE	OUTLET SIZE
4"	2"
6"	2"
8"	2"
10"	2"
12" & GREATER	2"

2" SERVICE TAP



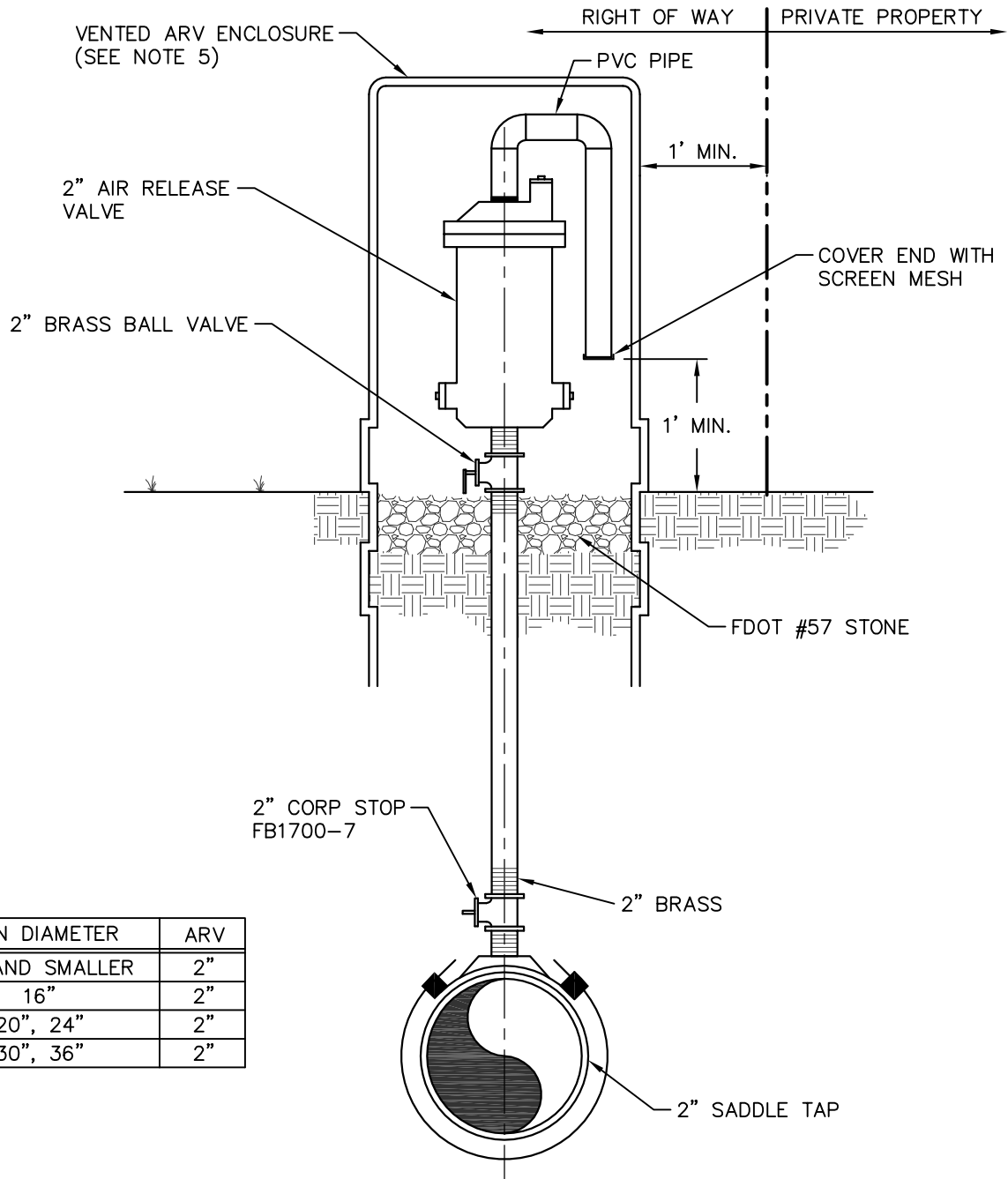
TYPICAL SERVICE SADDLE CONNECTION – POTABLE AND RECLAIMED

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.	
DATE:	BY:		J.R.P.	DWG	A-119
7/1/16	JOB NO.:			NO.:	
DRAWN BY:	DSGN. BY:	L.A.M.			



TYPICAL TAPPING SLEEVE SERVICE CONNECTION – POTABLE AND RECLAIMED

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY:		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY:	L.A.M.	A-120
J.R.P.			



MAIN DIAMETER	ARV
12" AND SMALLER	2"
16"	2"
20", 24"	2"
30", 36"	2"

NOTES:

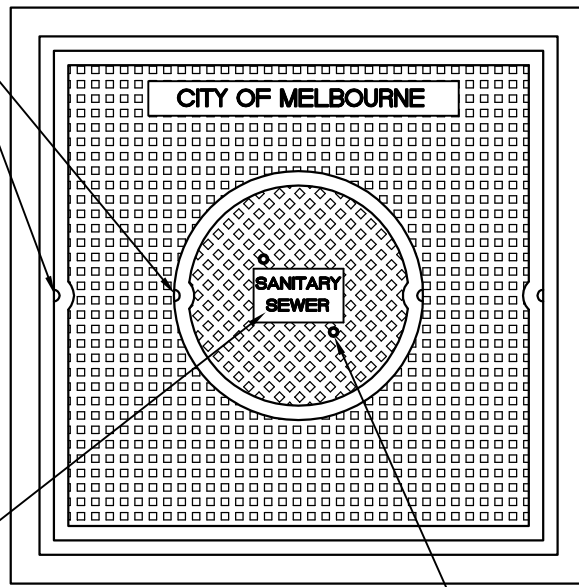
1. APPROVED FOR POTABLE AND RECLAIMED SYSTEMS ONLY.
2. ABOVE DETAIL APPLIES TO A 2" ARV. FOR LARGER ARVS, PIPE DIAMETER AND VALVES SHALL BE EQUAL TO THE SIZE OF THE ARV.
3. ALL PIPING, VALVES AND APPURTENANCES TO BE BRASS OR 316 S.S. EXCEPT WHERE SPECIFIED OTHERWISE.
4. THE ENCLOSURE VENTS MUST BE CAPABLE OF ALLOWING AT LEAST THE SAME AMOUNT OF AIRFLOW AS THE VALVE. BLUE ENCLOSURE FOR POTABLE WATER; GREEN ENCLOSURE FOR RECLAIMED WATER.
5. BOLLARDS SHALL BE REQUIRED WHERE CONDITIONS WARRANT ADDITIONAL PROTECTION.

AIR VALVES – ABOVE GRADE – POTABLE AND RECLAIMED

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY	L.A.M.	A-121
J.R.P.			

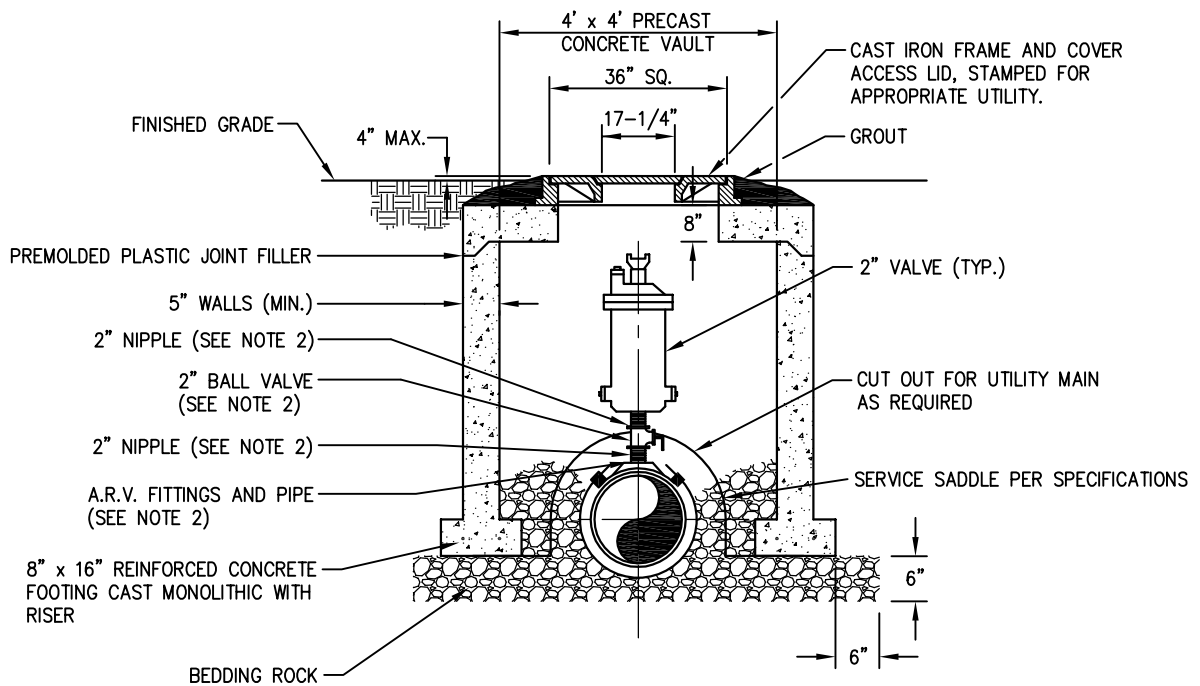
(4) - PENETRATING PICKHOLES

COVER TO BE STAMPED WITH THE
APPROPRIATE UTILITY;
'RECLAIMED WATER'
'SANITARY SEWER'



(2) - 5/8"Ø VENT HOLES

FRAME AND COVER DETAIL



NOTES:

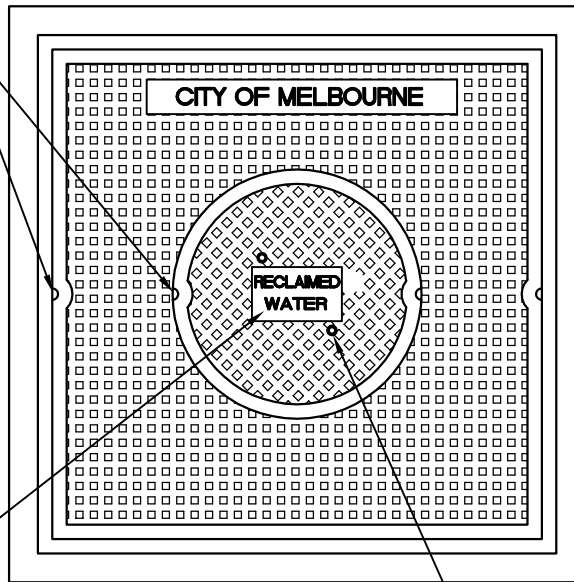
1. ABOVE DETAIL IS BASED ON 2" COMBINATION AIR/VACUUM RELEASE VALVE. CHANGE PIPE AND FITTINGS ACCORDINGLY FOR OTHER VALVE SIZES AND TYPES. VALVE SIZES TO BE DETERMINED BY THE ENGINEER AND APPROVED BY THE CITY PRIOR TO INSTALLATION.
2. MATERIAL USED FOR RECLAIMED WATER SHALL BE MADE OF BRASS; MATERIAL USED FOR WASTEWATER SHALL BE MADE OF STAINLESS STEEL.

AIR VALVES IN VAULT – RECLAIMED AND WASTEWATER

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
DRAWN BY:	DSGN. BY:		DWG NO.:
7/1/16	L.A.M.	A-122	

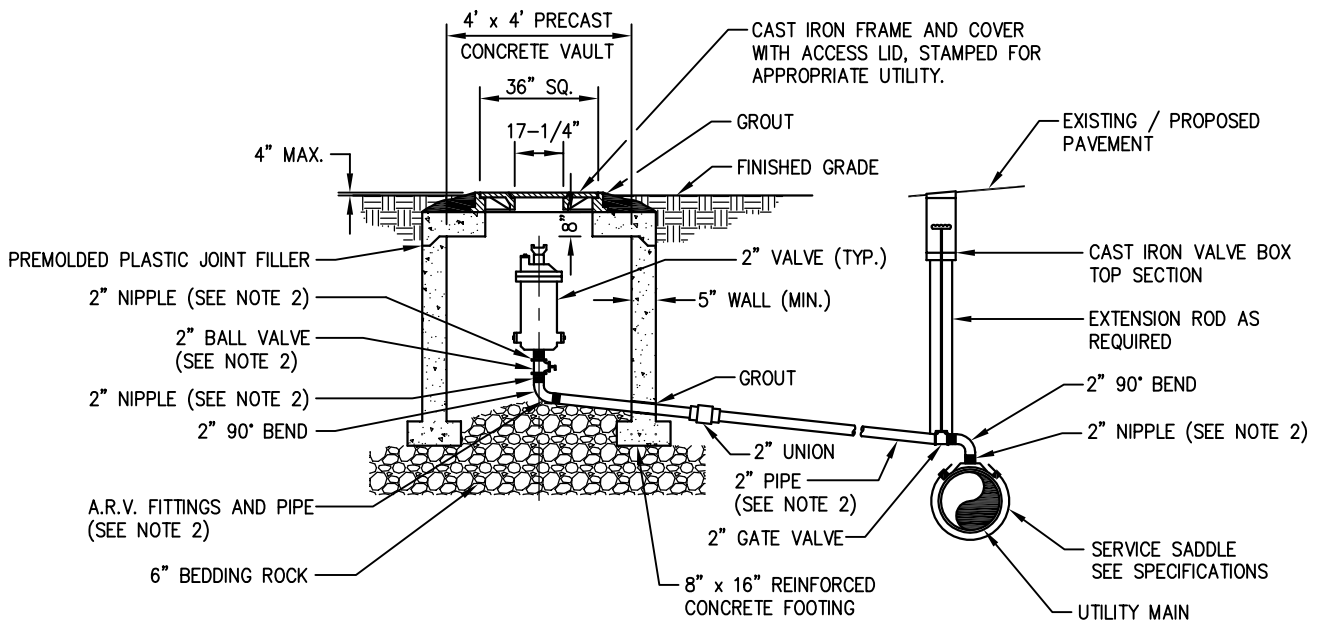
(4) - PENETRATING PICKHOLES

COVER TO BE STAMPED WITH THE APPROPRIATE UTILITY; 'RECLAIMED WATER' 'SANITARY SEWER'



(2) - 5/8"Ø VENT HOLES

FRAME AND COVER DETAIL

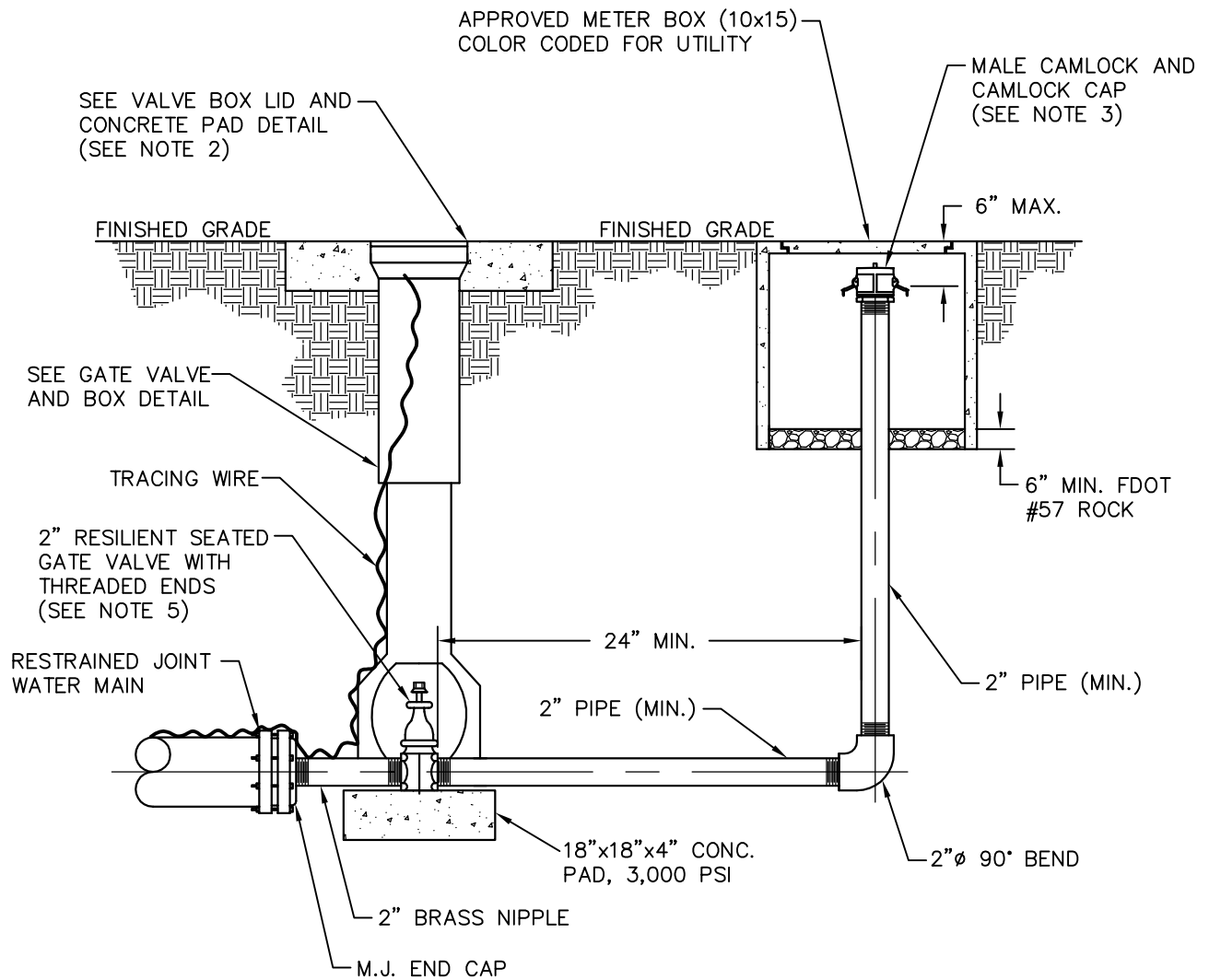


NOTES:

1. ABOVE DETAIL IS BASED ON 2" COMBINATION AIR/VACUUM RELEASE VALVE. CHANGE PIPE AND FITTINGS ACCORDINGLY FOR OTHER VALVE SIZES AND TYPES. VALVE SIZES TO BE DETERMINED BY THE ENGINEER AND APPROVED BY THE CITY PRIOR TO INSTALLATION.
2. MATERIAL USED FOR RECLAIMED WATER SHALL BE MADE OF BRASS; MATERIAL USED FOR WASTEWATER SHALL BE MADE OF STAINLESS STEEL.
3. IF DISTANCE BETWEEN MAIN AND VALVE IS GREATER THAN 15', A.R.V. MUST BE ENGINEERED.

AIR VALVES IN VAULT – OFFSET – RECLAIMED AND WASTEWATER

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
DRAWN BY:	DSGN. BY		DWG NO.:
7/1/16	L.A.M.	A-123	



NOTES:

1. ALL 2" PIPE AND FITTINGS SHALL BE BRASS WITH THREADED (NPT) JOINTS.
2. VALVE BOX LIDS USED IN POTABLE WATER SYSTEMS SHALL BE STAMPED "WATER" AND PAINTED BLUE. VALVE BOX LIDS USED IN RECLAIMED WATER SYSTEMS SHALL BE STAMPED "REUSE" AND BE PAINTED PURPLE. SEE APPROVED PRODUCTS LIST FOR APPROVED PAINT.
3. CAMLOCK AND CAMLOCK CAP SHALL BE ALUMINUM.
4. PROTECT ALL FITTINGS, NIPPLES AND BOLTS FROM CONCRETE WITH VISQUEEN.
5. IF TERMINUS VALVE IS INSTALLED, OMIT 2" GATE VALVE.

MANUAL BLOWOFF

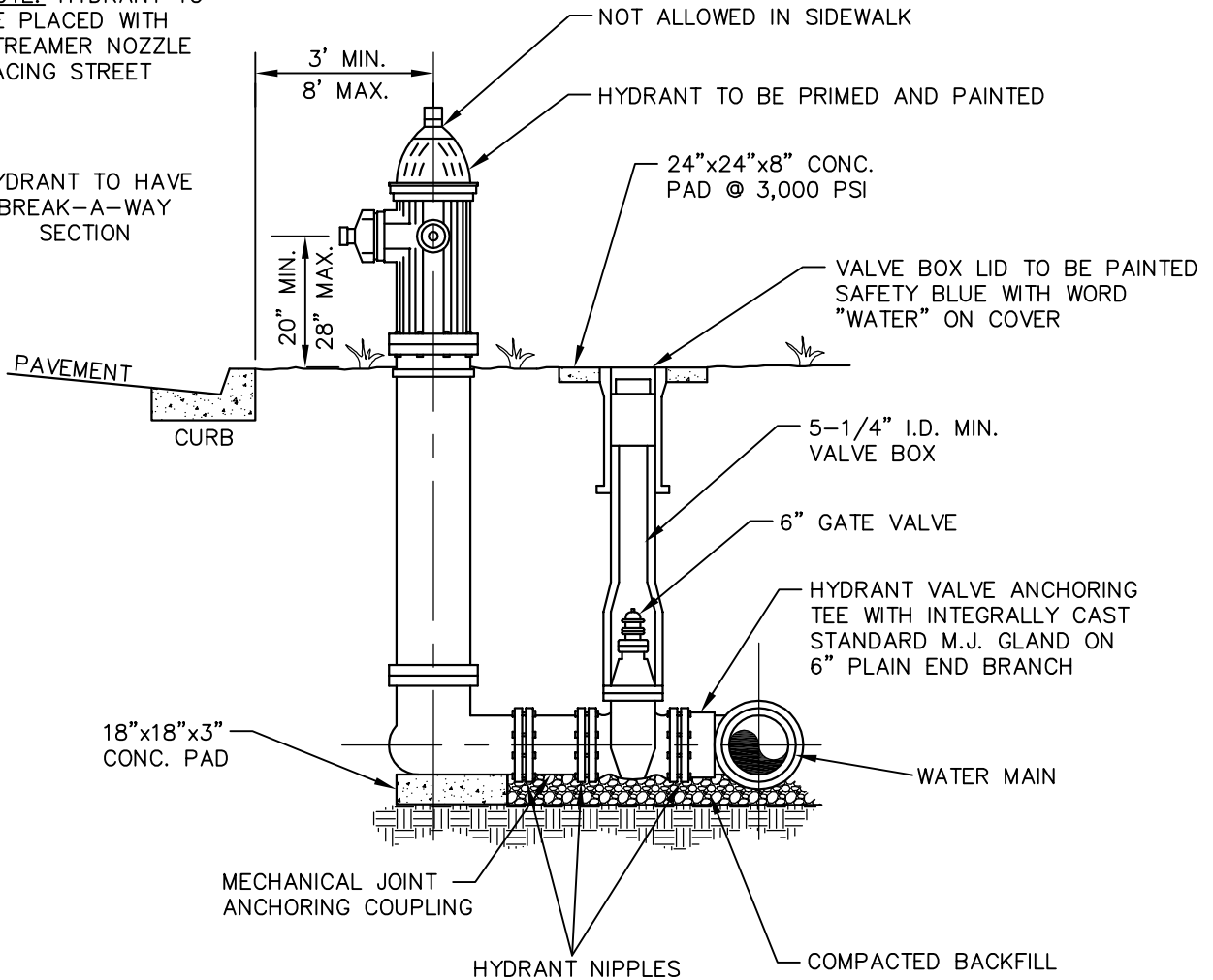
REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION		SCALE:	N.T.S.
DATE:	BY:			DWG	A-124
7/1/16	JOB			NO.	
DRAWN	DSGN.				
BY:	BY:				
J.R.P.	L.A.M.				



Potable Water Details

NOTE: HYDRANT TO BE PLACED WITH STREAMER NOZZLE FACING STREET

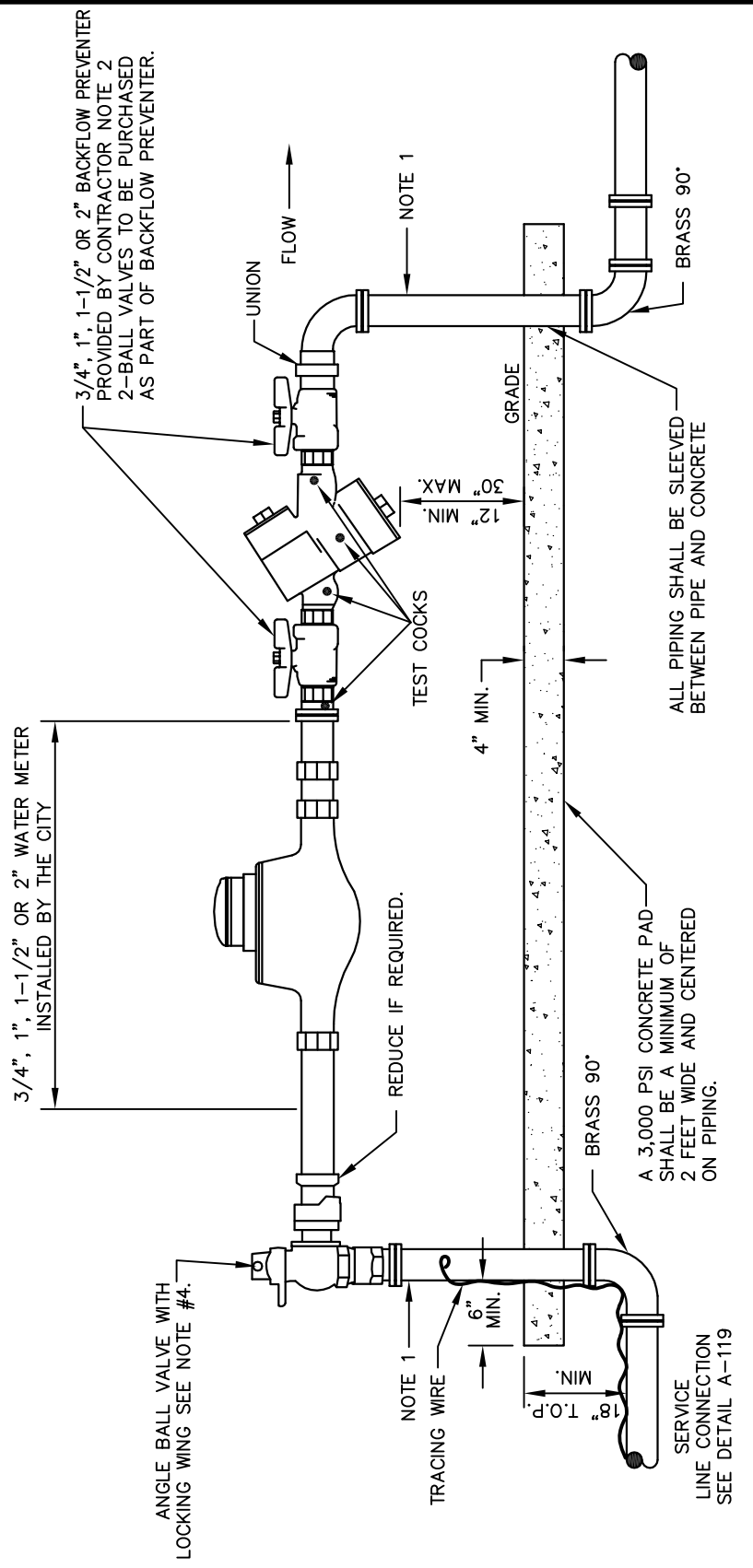
HYDRANT TO HAVE BREAK-A-WAY SECTION



NOTE: ALL EXTERIOR BOLTS AND NUTS SHALL BE STAINLESS STEEL.

TYPICAL FIRE HYDRANT DETAIL

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE: 7/1/16	BY:		N.T.S.
DRAWN BY: C.S.	DSGN. BY: L.A.M.		DWG NO.: A-200



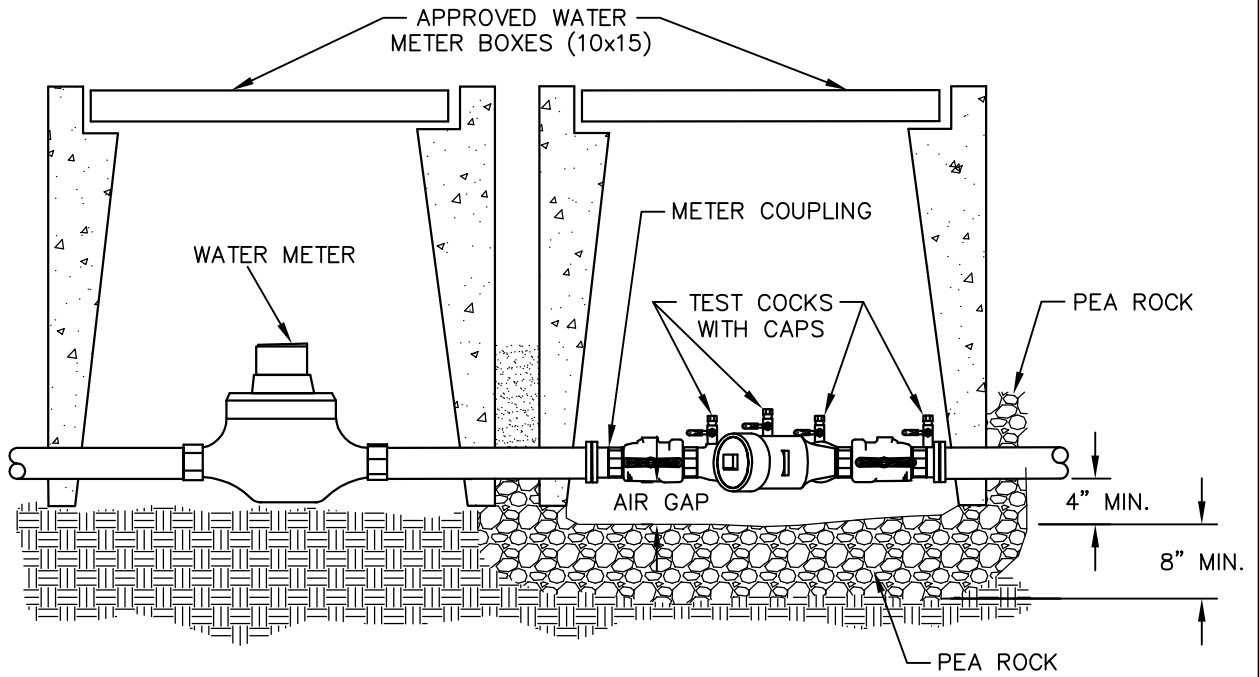
WATER METER PROFILE AND BACKFLOW PREVENTER

NOTES:

1. ALL PIPING AND FITTINGS SHALL BE THREADED BRASS, TO THE POINT WHERE THE 90° BEND MEETS THE CUSTOMER'S SERVICE LINE UNDERGROUND (EXCEPTION FOR ANGLED BALL VALVE WITH METER FLANGE)
2. TYPE OF BACKFLOW PREVENTER IS TO BE DETERMINED BY THE CITY OF MELBOURNE UTILITIES OPERATIONS IN ACCORDANCE WITH THE CITY'S CROSS CONNECTION CONTROL MANUAL.
BACKFLOW PREVENTER TO BE PROVIDED BY THE CONTRACTOR AND INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. BACKFLOW PREVENTER AND ASSOCIATED PIPING TO BE MAINTAINED BY CUSTOMER.
3. ASSEMBLY TO BE PRIMED AND PAINTED BLUE. SEE APPROVED PRODUCTS LIST FOR APPROVED PAINT.
4. ANGLE BALL VALVE FOR 3/4" OR 1" METERS SHALL BE FIP INLET XFIP OUTLET.
ANGLE BALL VALVE FOR 1-1/2" OR 2" METERS SHALL BE FIP INLET X METER FLANGE.

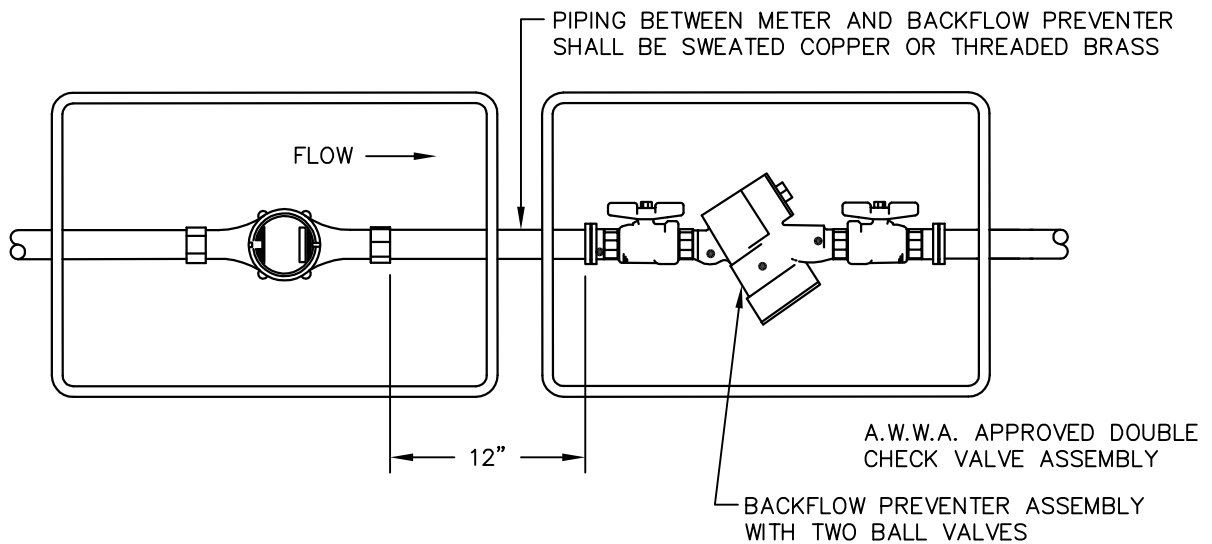
3/4", 1", 1-1/2" OR 2" COMMERCIAL POTABLE WATER METER

REV:	REV. BY:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DATE:	JOB NO.:		DWG NO.:	A-201
DRAWN BY:	DSGN. BY:			
J.R.P.	L.A.M.			



WATER METER AND BACKFLOW PREVENTER SET UP REPRESENTED IS REQUIRED IN RESIDENTIAL AREAS WHERE RECLAIMED WATER IS AVAILABLE FOR RESIDENTIAL USE

PROFILE

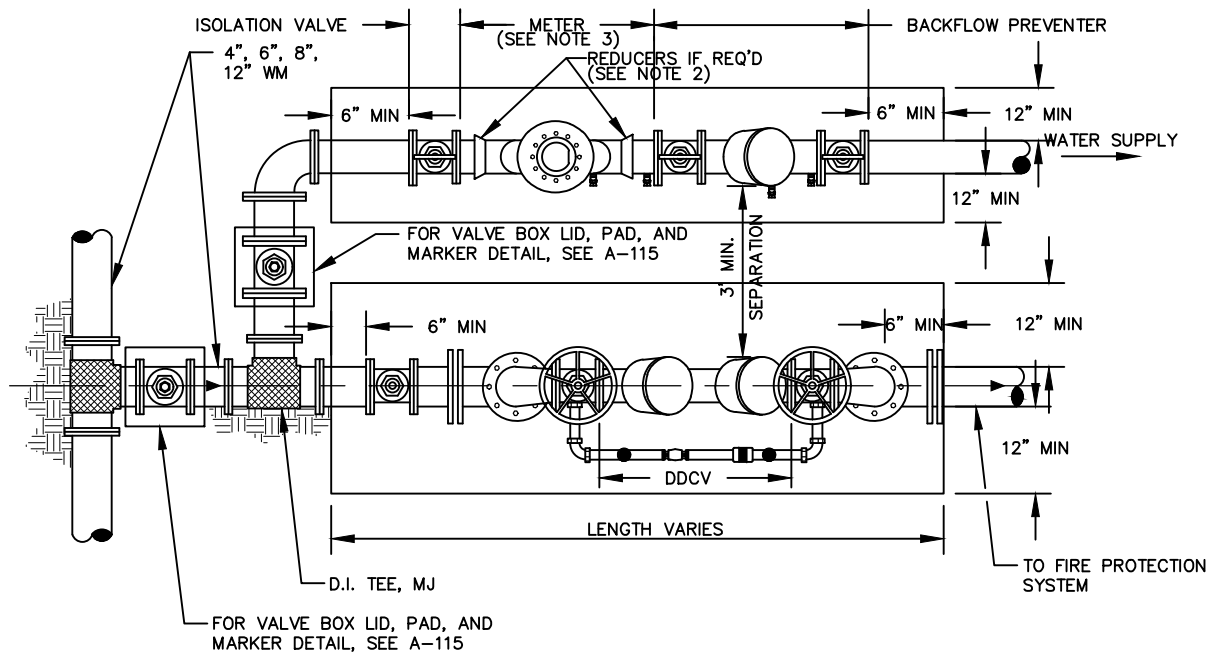


PLAN

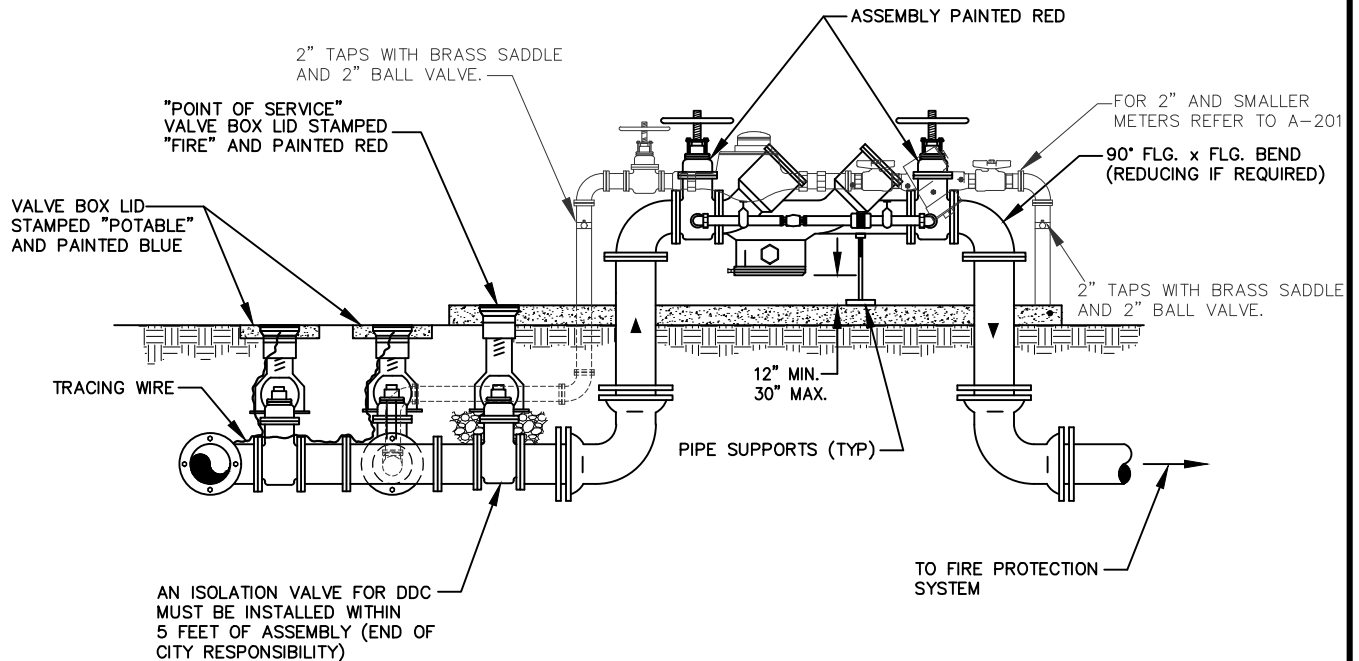
TEST COCK ADAPTERS ARE TO BE INSTALLED AND LEFT IN PLACE FOR FUTURE USE ON ALL "NEW" INSTALLATIONS BACKFLOW PREVENTER TO BE PROVIDED BY CONTRACTOR AND INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. BACKFLOW PREVENTER AND ASSOCIATED PIPING TO BE MAINTAINED BY CUSTOMER.

RESIDENTIAL POTABLE WATER METER WITH DOUBLE CHECK ASSEMBLY

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE: 7/1/16	BY:		N.T.S.
DRAWN BY: C.S.	DSGN. BY: L.A.M.		DWG NO.: A-202



PLAN



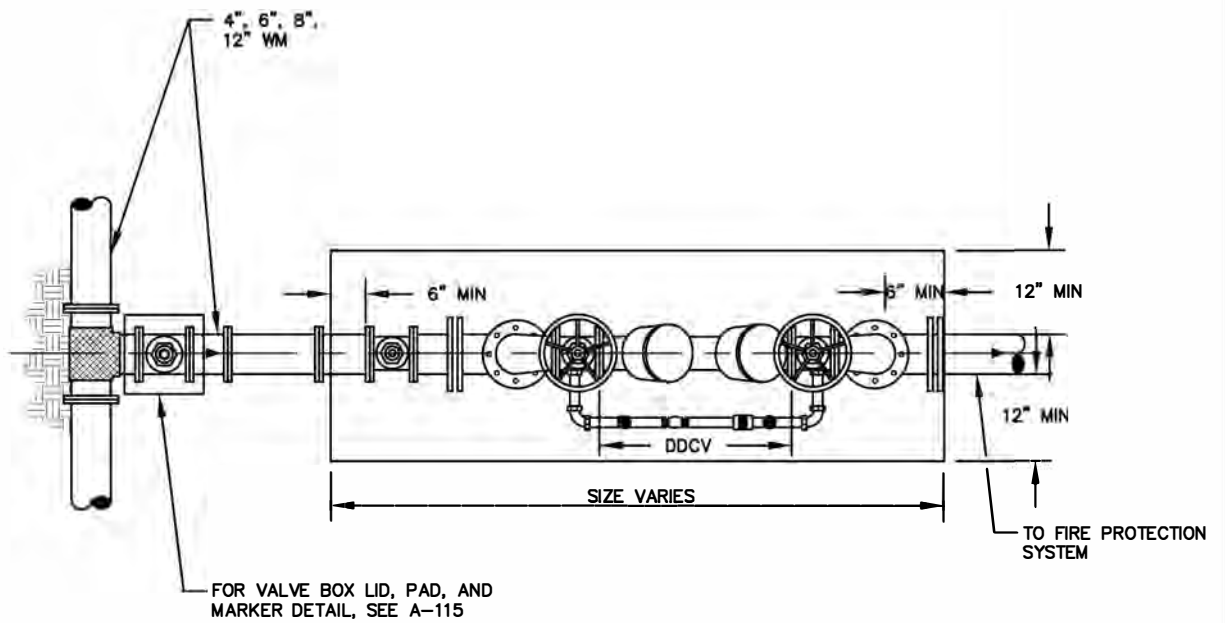
PROFILE

NOTES:

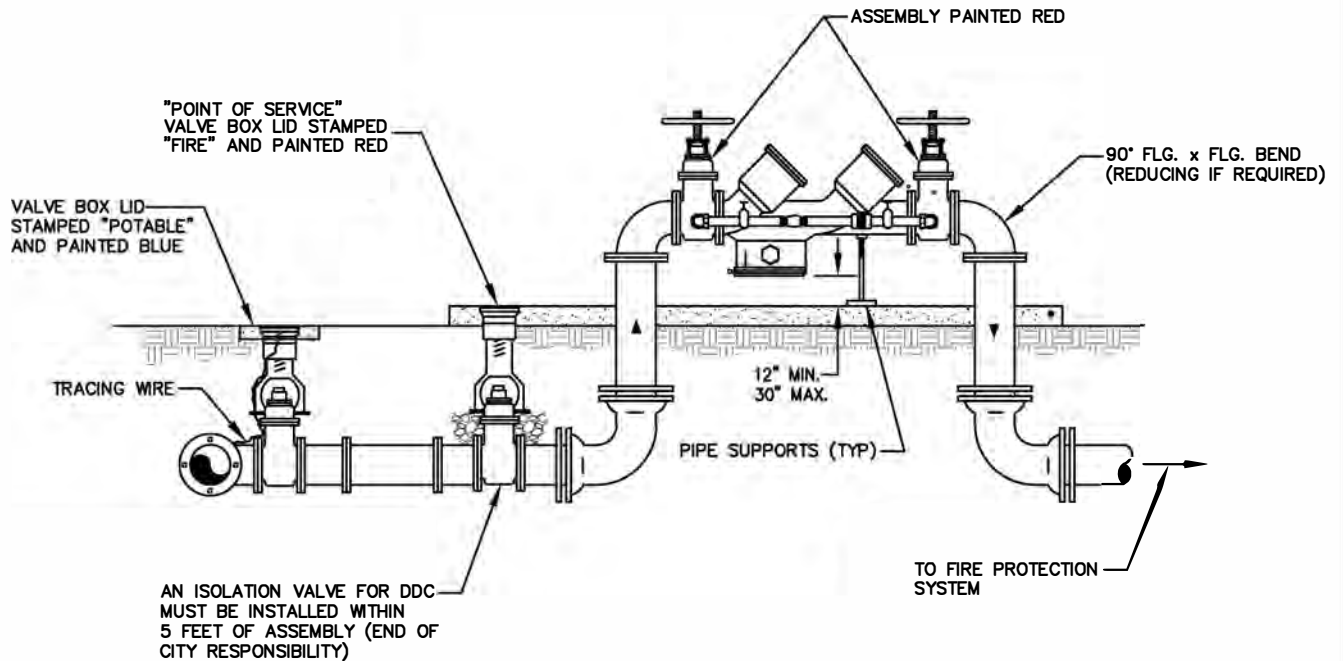
1. IF N-STYLE DDC USED, 12" CLEARANCE SHALL BE MEASURED FROM VALVE BONNET TO CONCRETE PAD.
2. FOR 3" METER, 4" X 3" REDUCERS REQUIRED.
3. SEE METER MANUFACTURER'S RECOMMENDATIONS FOR UPSTREAM AND DOWNSTREAM STRAIGHT PIPE REQUIREMENTS UPSTREAM AND DOWNSTREAM OF METER.

**COMBINATION POTABLE WATER METER (3" AND LARGER) AND DEDICATED FIRELINE CONNECTION
DOUBLE DETECTOR CHECK VALVE ASSEMBLY**

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY:		N.T.S.
DRAWN BY:	DSGN. BY:		DWG NO.:
TB	L.A.M.		A-204



PLAN



PROFILE

NOTES:

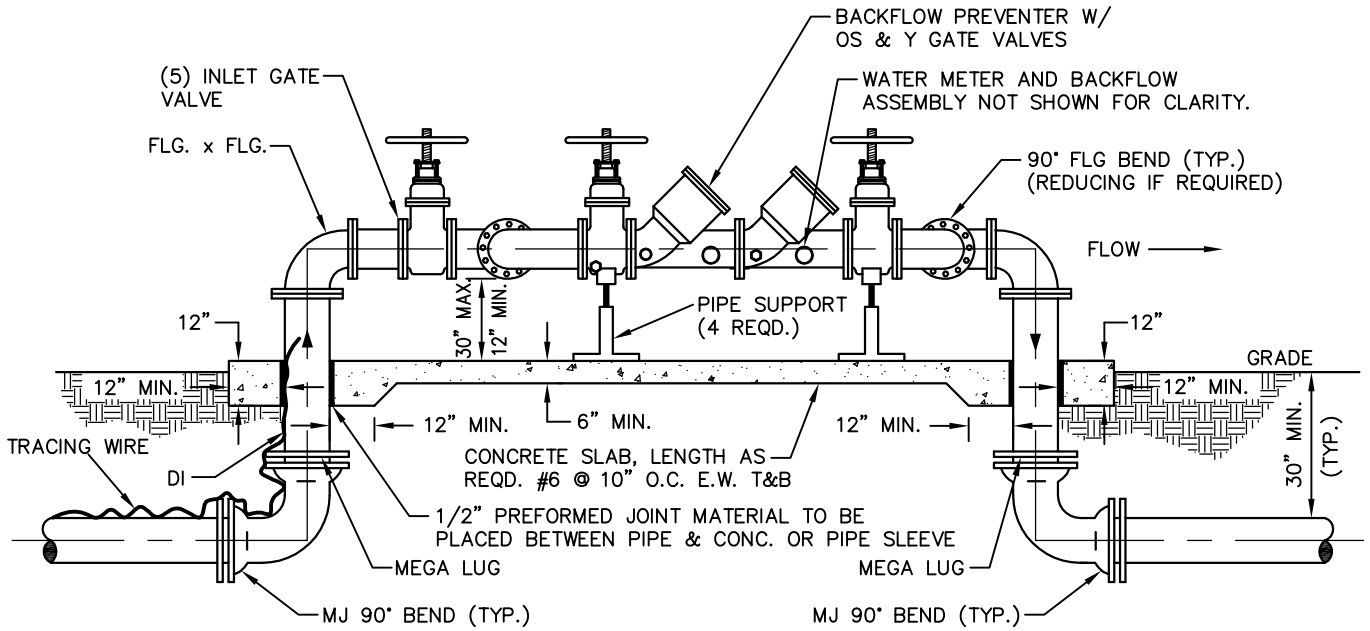
1. IF N-STYLE DDC USED, 12" CLEARANCE SHALL BE MEASURED FROM VALVE BONNET TO CONCRETE PAD.
2. FOR 3" ASSEMBLY, 4" X 3" REDUCERS REQUIRED.

FIRELINE CONNECTION DOUBLE DETECTOR CHECK VALVE ASSEMBLY

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DATE:	DATE:		DWG	NO.
DRAWN	DSGN.			
BY:	BY:			
TB			A-205	

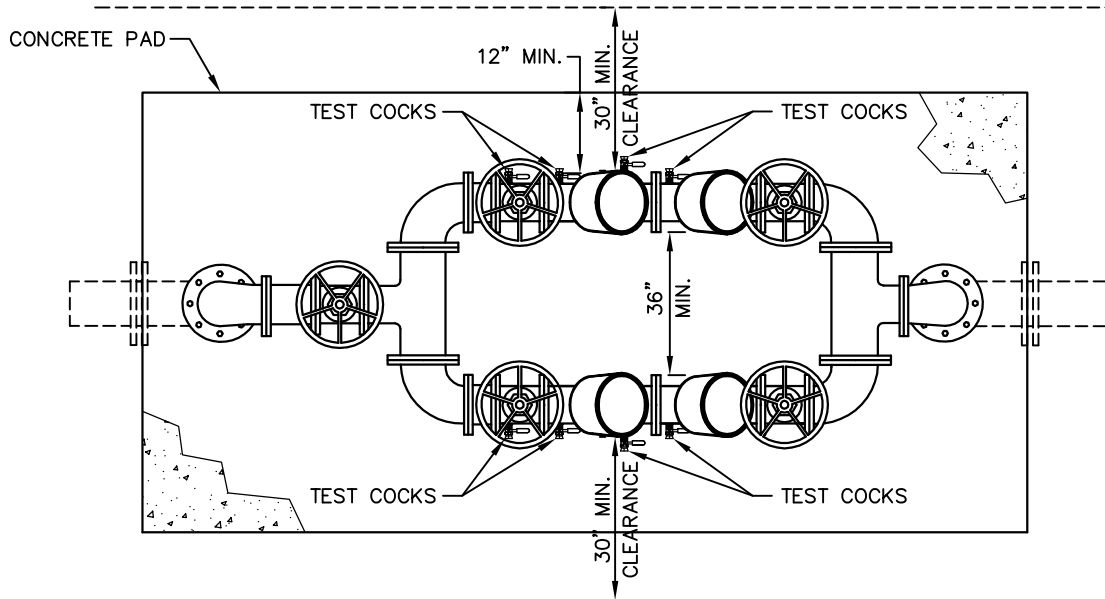
ALL ABOVE GROUND PIPING SHALL BE FLANGED DUCTILE IRON. FIELD FABRICATED FLANGES ARE UNACCEPTABLE

ASSEMBLY TO BE PRIMED AND PAINTED BLUE. SEE APPROVED PRODUCTS LIST FOR APPROVED PAINT.



DEVICE TO BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.

PROFILE



TYPE OF BACKFLOW PREVENTER TO BE BASED ON DEGREE OF HAZARD. THIS IS TO BE DETERMINED BY THE CITY OF MELBOURNE UTILITIES OPERATIONS.

PLAN

DUAL BACKFLOW DETECTION DEVICES

REV:	REV: BY	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DATE: 7/1/16	JOB NO.:		DWG NO.: A-206
DRAWN BY: J.R.P.	DSGN. BY: L.A.M.		

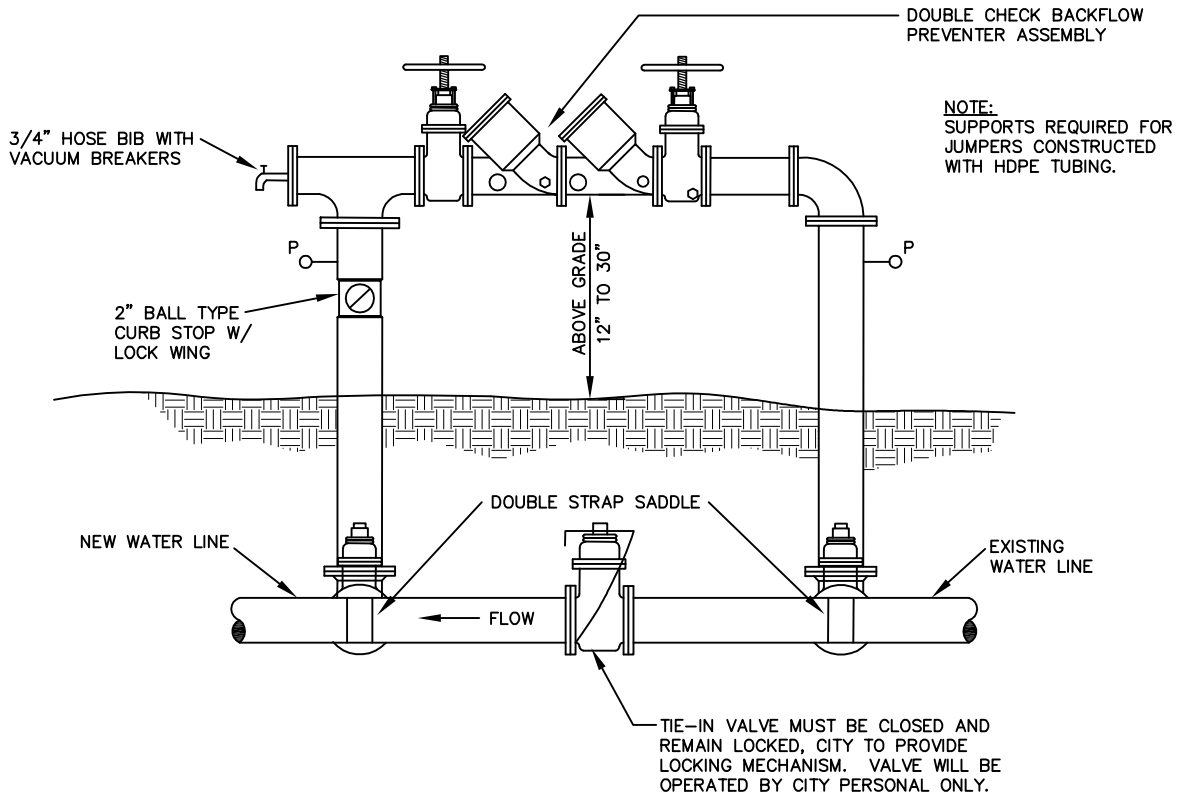
NOTES:

1. A TEMPORARY JUMPER CONNECTION IS REQUIRED AT ALL CONNECTIONS BETWEEN EXISTING ACTIVE WATER MAINS AND PROPOSED WATER MAIN IMPROVEMENTS.
2. THIS DETAIL IS TO BE USED FOR FILLING ANY NEW WATER MAIN OF ANY SIZE FROM EXISTING ACTIVE WATER MAINS AND FOR FLUSHING OF NEW MAINS UP TO 8" DIAMETER (2.5 FPS MIN. VELOCITY), AND FOR OBTAINING BACTERIOLOGICAL SAMPLES FROM ANY NEW WATER MAIN OF ANY SIZE. THE JUMPER CONNECTIONS SHALL BE MAINTAINED UNTIL AFTER FILLING, FLUSHING, TESTING AND DISINFECTION OF THE NEW MAIN HAS BEEN SUCCESSFULLY COMPLETED AND CLEARANCE FOR USE HAS BEEN RECEIVED FROM FDEP.
3. FLUSHING OF 10" AND LARGER WATER MAINS MAY BE DONE THROUGH THE TIE-IN VALVES UNDER CONTROLLED CONDITIONS AS FOLLOWS:
 - A. THE TIE-IN VALVES SHALL BE OPERATED AND PRESSURE TESTED IN THE PRESENCE OF THE UTILITY AND/OR ENGINEER TO VERIFY WATER TIGHTNESS PRIOR TO TIE-IN. VALVES WHICH ARE NOT WATERTIGHT SHALL BE REPLACED OR A NEW VALVE INSTALLED IMMEDIATELY ADJACENT TO THE LEAKING VALVE.
 - B. THE TEMPORARY JUMPER SHALL BE CONSTRUCTED AS DETAILED, THE JUMPER CONNECTION SHALL BE USED TO FILL NEW WATER MAINS, AND DURING BACTERIOLOGICAL TESTING AS REQUIRED BY THE FDEP PERMIT.
 - (1) FLUSHING SHALL NOT BE ATTEMPTED DURING PEAK DEMAND HOURS OF THE EXISTING WATER MAINS.
 - (2) ALL DOWNSTREAM VALVES IN THE NEW SYSTEM SHALL BE OPEN PRIOR TO OPENING THE TIE-IN VALVE.
 - (3) PROVIDE FOR AND MONITOR THE PRESSURE AT THE TIE-IN POINT. THE PRESSURE IN THE EXISTING MAIN MUST NOT DROP BELOW 50 P.S.I..
 - (4) TIE-IN VALVE SHALL ONLY BE OPEN A FEW TURNS, THEREBY ENSURING A PRESSURE DROP ACROSS THE VALVE OF LESS THAN 10 P.S.I..
 - C. THE TIE-IN VALVE SHALL BE LOCKED CLOSED BY THE UTILITY UNTIL FLUSHING BEGINS.
 - D. THE TIE-IN VALVE SHALL BE OPENED ONLY FOR FLUSHING OF THE NEW MAIN. THE PROCEDURE SHALL BE DIRECTED BY THE UTILITY AND OBSERVED BY THE ENGINEER.
 - E. AFTER FLUSHING THE TIE-IN VALVE SHALL BE CLOSED AND LOCKED BY THE UTILITY.
4. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION DEMONSTRATING THAT THE DOUBLE CHECK BACKFLOW PREVENTION DEVICE HAS BEEN TESTED AND IS IN GOOD WORKING ORDER AT THE TIME OF INSTALLATION.
5. EXCEPT AS REQUIRED TO FLUSH LINES GREATER THAN 8" IN DIAMETER THE TIE-IN VALVE SHALL REMAIN LOCKED CLOSED UNTIL THE NEW SYSTEM HAS BEEN CLEARED FOR USE BY FDEP.
6. UPON RECEIPT OF CLEARANCE FOR USE FROM FDEP, THE CONTRACTOR SHALL REMOVE THE TEMPORARY JUMPER CONNECTION. STOPS ARE TO BE CLOSED AND PLUGGED WITH 2" BRASS PLUGS.
7. INSTALLATION AND MAINTENANCE OF THE TEMPORARY JUMPER CONNECTION AND ASSOCIATED BACKFLOW PREVENTION DEVICE FITTINGS, VALVES, ETC. SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
8. SUPPORTS REQUIRED FOR JUMPERS CONSTRUCTED OF HDPE.
9. TAP FOR JUMPER CONNECTION SHALL BE MADE AT THE 3 O'CLOCK OR 9 O'CLOCK POSITION.

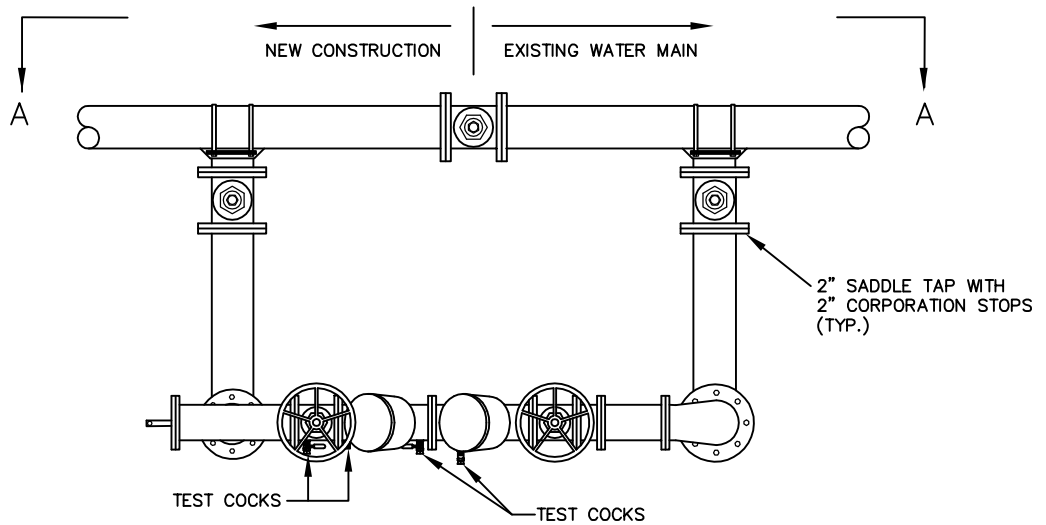
SEE "DETAIL" FOR MAKING JUMPER CONNECTIONS

"NOTES" – TEMPORARY JUMPER CONNECTIONS

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION		SCALE:	N.T.S.
DATE:	BY			JOB NO.:	DWG NO.:
7/1/16				L.A.M.	A-207
DRAWN BY:	DSGN. BY				
J.R.P.	L.A.M.				



PROFILE A-A



PLAN VIEW

APPROVED METHODS OF MAKING JUMPER CONNECTIONS FOR NEW OR IMPROVED WATER MAINS

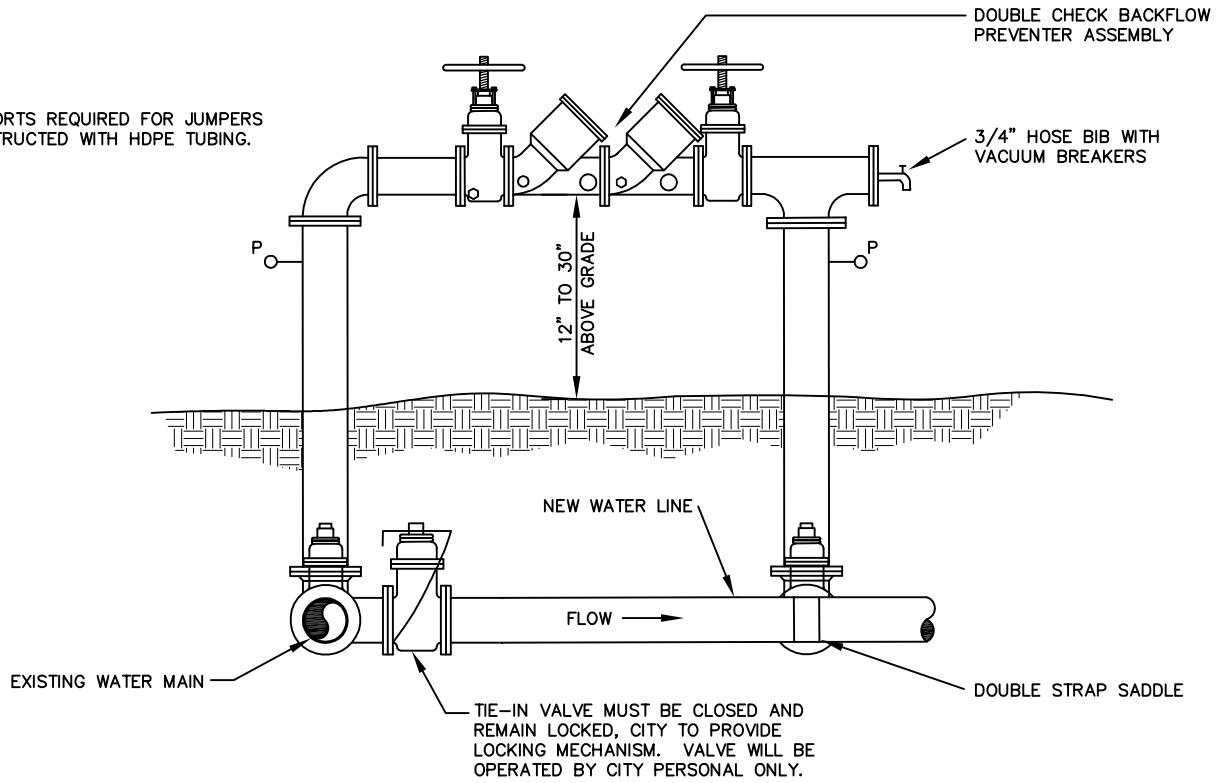
SEE "NOTES" FOR MAKING JUMPER CONNECTION FOR ADDITIONAL DETAILS

P = PRESSURE GAGE

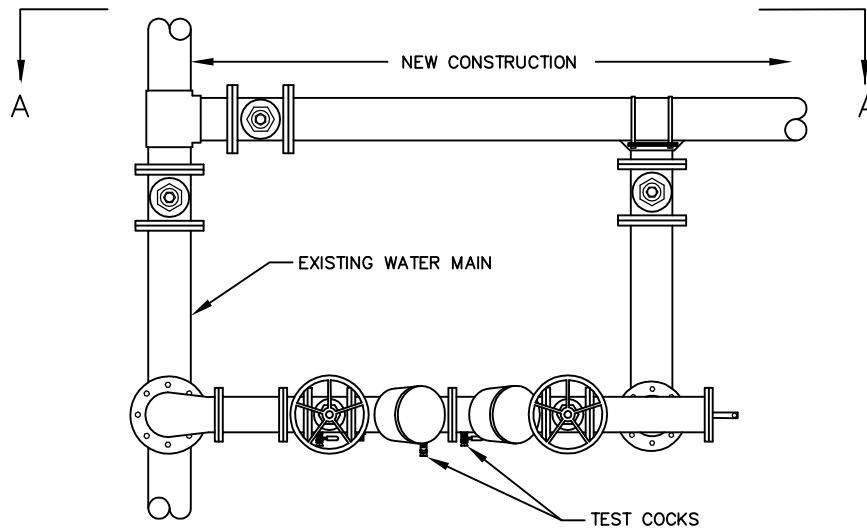
"DETAILS" – TEMPORARY JUMPER CONNECTION, ALTERNATE "A"

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY	L.A.M.	A-208
J.R.P.			

NOTE:
SUPPORTS REQUIRED FOR JUMPERS
CONSTRUCTED WITH HDPE TUBING.



PROFILE A-A



PLAN VIEW

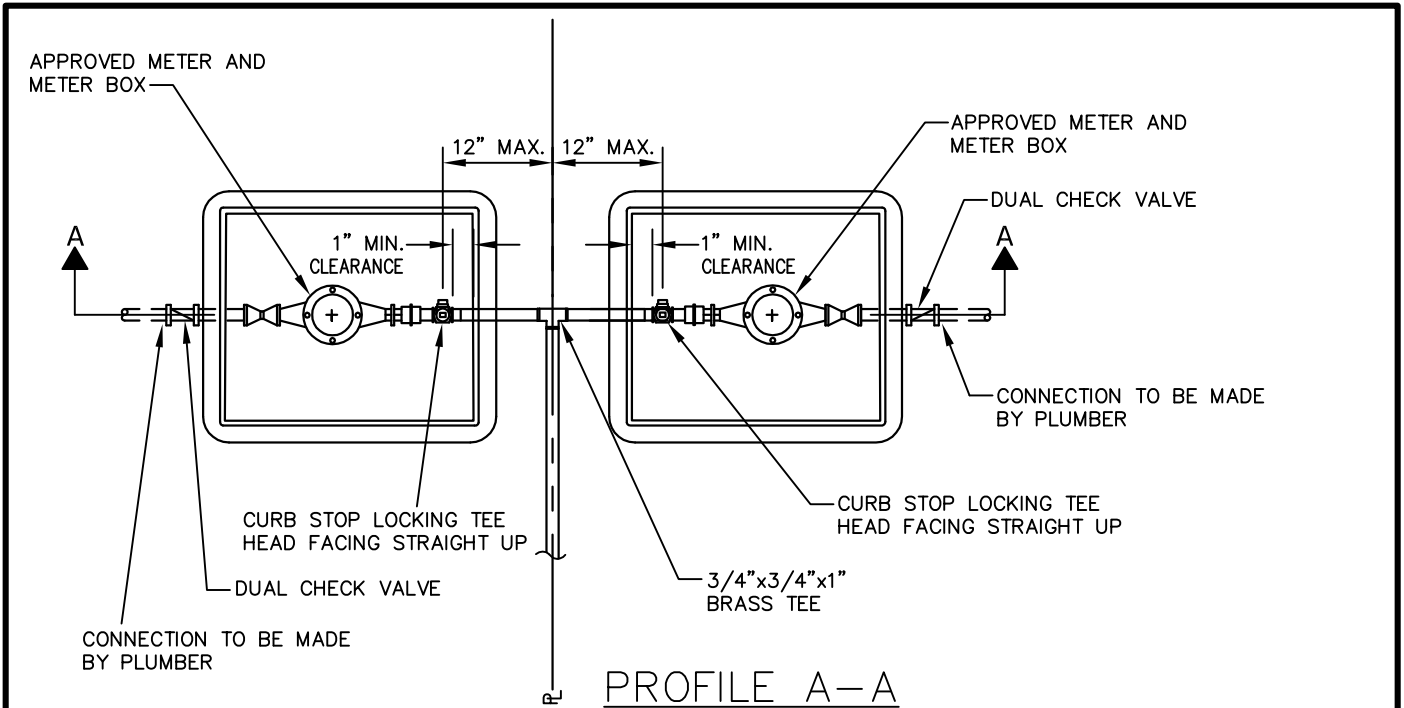
APPROVED METHODS OF MAKING JUMPER CONNECTIONS
FOR NEW OR IMPROVED WATER MAINS

SEE "NOTES" FOR MAKING JUMPER CONNECTION FOR ADDITIONAL DETAILS

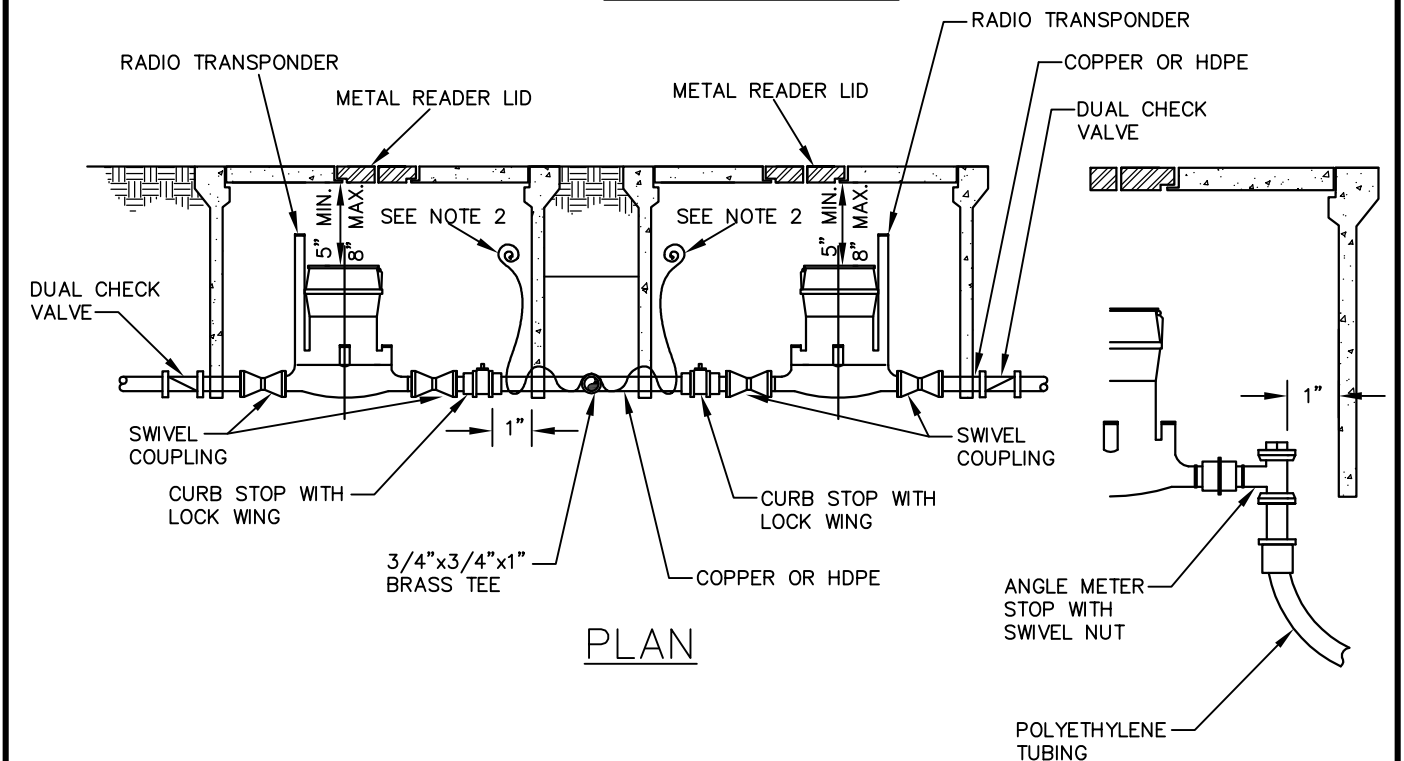
P = PRESSURE GAGE

"DETAILS" – TEMPORARY JUMPER CONNECTION, ALTERNATE "B"

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY	L.A.M.	A-209
J.R.P.			



PROFILE A-A



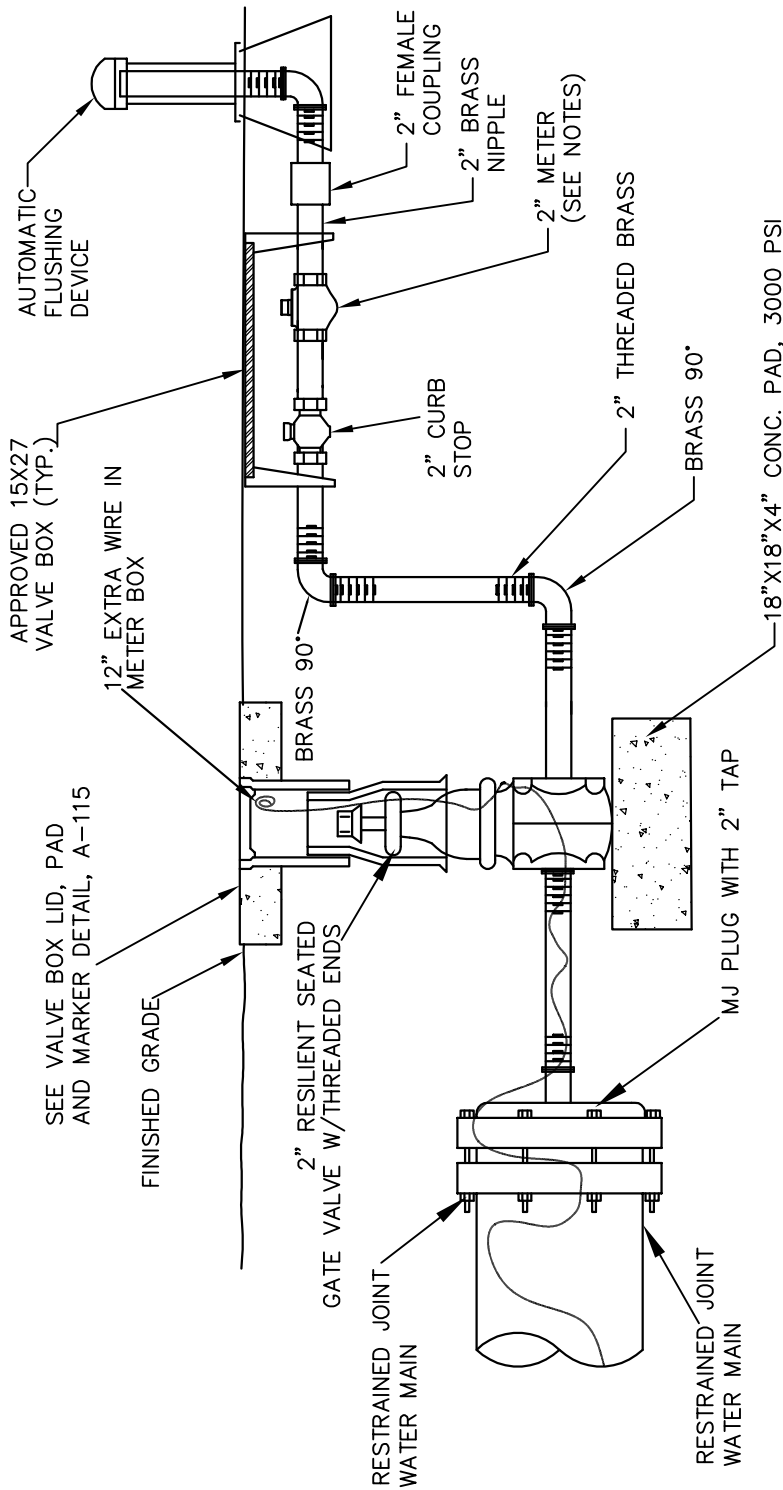
PLAN

NOTES:

1. NO SERVICE LINE SHALL TERMINATE UNDER A DRIVEWAY OR SIDEWALK.
2. TRACING WIRE FOR HDPE SERVICE LINES TO BE COILED UP INSIDE BOX SO IT CAN EXTEND A MINIMUM OF 12" OUTSIDE OF METER BOX.

RESIDENTIAL POTABLE WATER METER AND METER BOX

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY:		N.T.S.
DRAWN BY:	DSGN. BY:		DWG NO.:
7/1/16	L.A.M.	A-210	



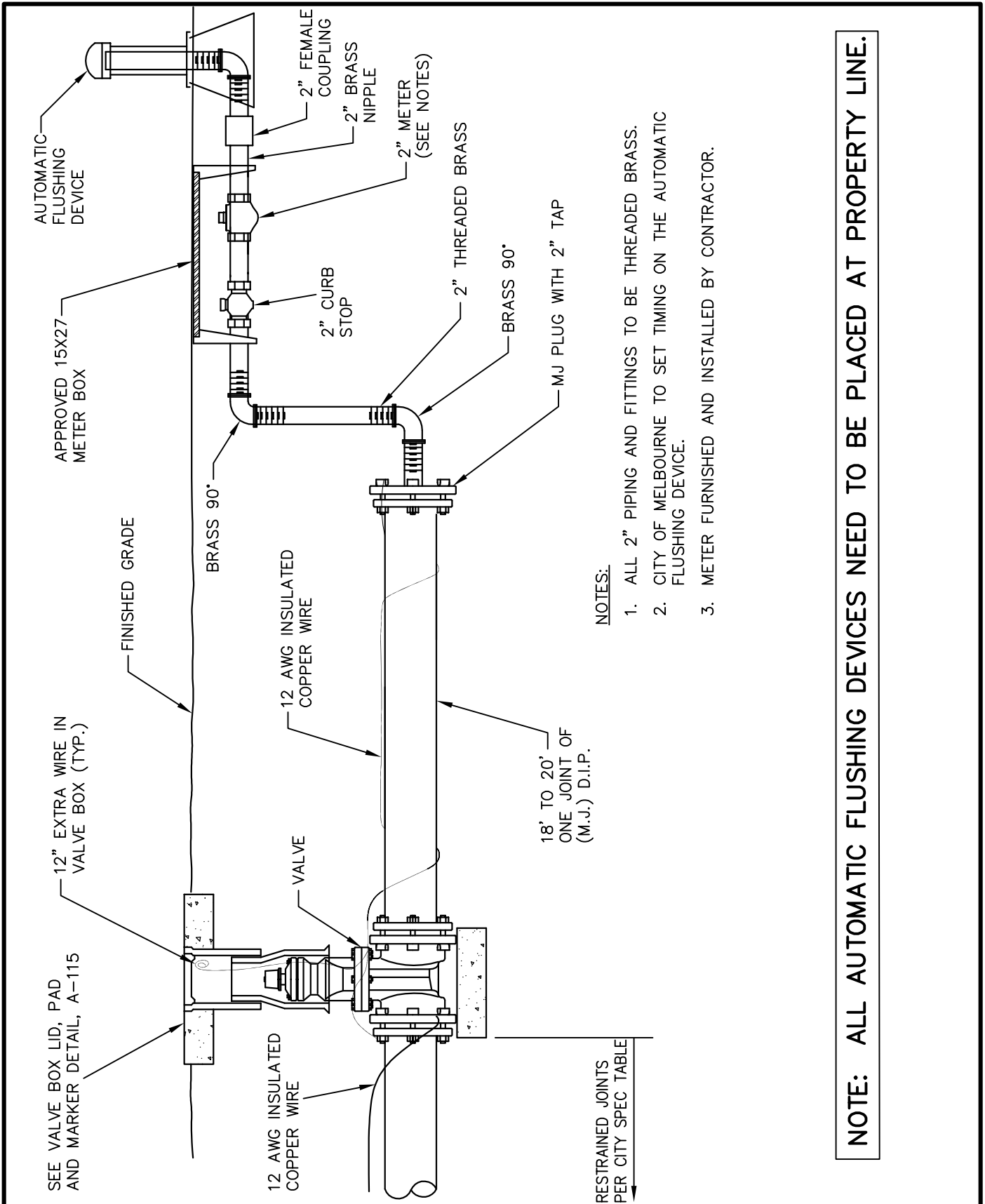
NOTES:

1. ALL 2" PIPING AND FITTINGS TO BE THREADED BRASS.
2. CITY OF MELBOURNE TO SET TIMING ON THE AUTOMATIC FLUSHING DEVICE.
3. METER FURNISHED AND INSTALLED BY CONTRACTOR.

NOTE: ALL AUTOMATIC FLUSHING DEVICES NEED TO BE PLACED AT PROPERTY LINE.

PERMANENT AUTOMATIC FLUSHING DEVICE ASSEMBLY DETAIL

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY:		N.T.S.
DRAWN BY:	DSGN. BY:		DWG NO.:
7/1/16	L.A.M.	A-211	



NOTE: ALL AUTOMATIC FLUSHING DEVICES NEED TO BE PLACED AT PROPERTY LINE.

TEMPORARY AUTOMATIC FLUSHING DEVICE ASSEMBLY DETAIL

REV:	REV:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:
DATE:	BY		N.T.S.
7/1/16	JOB NO.:		DWG NO.:
DRAWN BY:	DSGN. BY:		A-212
C.S.	L.A.M.		

Technical Specifications and Standards Appendix B- Approved Products List

Water Distribution, Reclaimed Water Distribution and
Wastewater Collection Systems



Water, Reclaimed Water, and Wastewater Collections			
Item	Manufacturer	Model No.	Comments
ARV Enclosures, Vaults, Frames and Covers			
1.	Dura-Stress		
2.	CDR		
3.	Oldcastle		
4.	US Foundry	USF 7665 Frame-HH/HJ covers	Lid stamped for appropriate utility
5.	Water Plus	131632- with pin allen bolt lock	Above ground installations - blue for potable, green for reclaimed water
Automatic Flushing Devices (potable water only)			
1.	Hydroguard	HG-1 Signature Series	
2.	Hydroguard	HG-2 Signature Series	Direct discharge
3.	Kupferle	Eclipse 9400WC	
4.	Kupferle	Eclipse 9800WC	Direct discharge
Backflow Preventer- Double Check Detector Assembly- lead free			
1	Ames		
2.	Febco		
3.	Watts		
4.	Wilkins		
Backflow Preventer- Double Check Valve/Reduced Pressure Zone Valve- lead free			
1.	Ames		
2.	Febco		
3.	Watts		
4.	Wilkins		
Backflow Preventer- Dual Check Valves (residential 3/4" potable water meter sets only)			
1.	Watts	Model LF7R10-U3	
Backflow Preventer- Swing Check Valve (for commercial reclaimed water only)			
1.	Nibco	918-B	3" and 4" meter assemblies
2.	AFC	52-SC	≥ 6" and/or mag meter assemblies
3.	Kennedy Clow	1106	≥ 6" and/or mag meter assemblies
Brass Fittings (domestic-based manufacturers only)-lead free			
1.	Ford		
2.	Lee		
3.	Merit		
Casing End Seal (shall be from same manufacturer as casing spacers)			
1.	Advanced Products	Model AC	
2.	BWM	BWM-PO	
3.	CCI Pipeline Systems Inc.	Model ESC	
4.	Cascade Water Works	Model CCES	
5.	Pipeline Seal and Insulator	Model C and S	
Casing Spacers			
1.	Advanced Products and Systems Inc.	Series SS	



2.	BWM	BWM-SS	
3.	CCI Pipeline Systems Inc.		
4.	Cascade Water Works	Series CCS	
5.	Pipeline Seal and Insulator	Series S-G-2	
Clean Out Box Lid (Traffic Area) "S" stamped on cover			
1.	US Foundry	7610	
2.	East Jordan Iron Works	HD Monument Box # 1574	
Corp Stops (ball corp stop)			
1.	Ford	FB1000 Series	CC x Compression for CTS poly tubing or copper (3/4" up to 2")
2.	Ford	FB600	CC x Flare for copper
3.	Mueller	B-25008, P-25008	CC x Compression for CTS poly tubing or copper
4.	Mueller	B-25000	CC x Flare for copper
5.	Ford	FB1700-7	MIP x FIPT, 2 inch for ARV saddle connections
Curb Markers- Manholes outside of pavement for hydrants and manholes			
1.	Apex Universal, Inc.	Model 921- Two Way	BB (Blue for hydrants) GG (Green for manholes) Installed with Bituminous Pavement Marker Adhesive
Curb Stops (ball valve curb stop with lock wing) 1" curb stops for RW must have handle			
1.	Ford	B11-xxxW-NL	FPT x FPT for brass service line
2.	Ford	B41-xxxW-NL	Compression x FPT for CTS poly tubing or copper
3.	Ford	BA11-444W-NL	1" angle ball meter valve for commercial meter assemblies
4.	Ford	BFA13-777W-NL	2" angle ball meter valve for commercial meter assemblies
Curb Stop Handle (1" reclaimed water curb stops only)			
1.	Ford	HB-34-RW	
2.	Mueller	B-20298-99001	
Ductile Iron Fittings (AWWA C-110/C-153 cement or epoxy lined)			
1.	Sigma		
2.	Star		
3.	Tyler/Union		
4.	US Pipe		
5.	Custom Fab		
Electronic Marking Balls			
1.	3-M Electronic Marking Systems (EMS)	1400-XR Series	Blue for Potable Water; Purple for Reclaimed; Green for Wastewater
Expansion Joints			
1.	EBAA Iron		
2.	Proco		
Field Coatings- Interior for Existing Manholes with Complete Rehabilitation			
1.	SuperCoat,		Cementitious
2.	Quadex		Cementitious
3.	Raven	405	Epoxy Spray-on coating
4.	Quadex	Structure Guard	Epoxy Spray-on coating
5.	SpectraShield		Epoxy Spray-on coating
6..	Monster	MB	Epoxy Spray-on coating
Field Coatings- Interior for New Manholes; joints, chimneys, channels, shelves and touch ups			
1.	Pro-Tech Coatings	EW-1 Aquapoxy	Gray color



Appendix B- Approved Products List

July 1, 2016

2.	Richards Paint	2100 Series Garage Shield Part A & B	Gray color
3.	Sherwin Williams	B70 Part A; B60V25 Part B Semi-gloss	Gray color
Fire Hydrants			
1.	American Darling	B-84-B	No lead, with epoxy coated break away coupling
2.	Clow	Medallion 2545	No lead, with SS break away coupling
3.	Mueller	Super Centurion 250 A-423	No lead, with SS break away coupling
Line Stop Saddle			
1.	JCM	440- Type 1 & 3	
2.	JCM	445	for concrete pipe only
Manhole Access Castings			
1.	U.S. Foundry	170-E-ORS	24" opening
2.	U.S. Foundry	225-AS-ORS	24" opening in FDOT ROW
3.	U.S. Foundry	230-AA-ORS	30" opening
Meter- Automatic Meter Reading System (potable water and reclaimed water meters)			
1.	Orion		
Meter- Residential/Commercial/Fire Series/Master Meter Assembly			
1.	Badger		Reclaimed Water meters must have color designation
Meter- Meter Box (10x15) (potable water and reclaimed water)			
1.	CDR	B00-1015-12	without lid
2.	Glass Master	S101512F2N08-1/ S101512SN08-1	without lid
Meter- Meter Box Lids (10x15) (potable water and reclaimed water)			
1.	Carson	1419	with metal reader; reclaimed water lids must be purple
Meter- Meter Box & Lids (15x27) For use with automatic flushing device meter and 1 ½" and 2" reclaimed water meters			
1.	CDR	WA03-1527-12	
MJ Adapter for HDPE			
1.	Central		
2.	Integrity		
3.	Orion		
4.	Performance		
Pipe- Ductile Iron Pipe (potable and reclaimed water- cement lined ; wastewater- epoxy lined)			
1.	American		
2.	McWane		
3.	U.S. Pipe		
4.	Custom Fab		
Pipe- High Density Polyethylene Pipe (potable water-blue striped; reclaimed water-purple striped)			
1.	Performance Pipe	Drisco Plex	4710
2.	J-M Manufacturing	J-MM HDPE	4710
3.	National Pipe		4710
4.	Dura-line		4710
5.	GF/Central/Independent		4710



Pipe- Pre-Stressed Concrete Pipe			
1.	Hanson		
Pipe- Polyethylene Tubing for Services (AWWA C-901, ASTM D2737, PE 4710, SDR-9, CTS, UV protection, potable water-blue, reclaimed water-purple)			
1.	Endot	Endopure, EndoTrace, Endocore	
2.	Charter Plastics	Blue Ice- CTS Lavender Ice-CTS	Natural Core, blue shell Natural Core, lavender shell
Pipe- 2" PVC Pipe (SDR-21, potable water-blue)			
1.	Accord		
2.	Charlotte		
3.	J-M Manufacturing		
4.	National Pipe	Dura-Flow	
Pipe- PVC Pipe (AWWA C-900, SDR-18, SDR-25, potable water-blue, reclaimed water-purple)			
1.	Certainteed 4"- 12"	Certa-Lok	Used only in specific applications-contact Utilities Operations Division for details
2.	Diamond Plastic		
3.	J-M Manufacturing	Blue Brute	
4.	National Pipe	Dura-Blue	
5.	North American Pipe Co.		
Paint (primer and finish coat for 4" and larger potable water meters and backflow assemblies, DDCs, hydrants and aerial crossings) Bare metal assemblies require primer coat.			
1.	Richard's Paint	1120 (primer) 2400 Gloss (finish)	Safety Blue, Safety Red, RP-369 (yellow)
2.	Tnemec	Endura Shield Series 73 (primer and finish)	Safety Red, Safety Blue, Safety Yellow
Paint (primer and finish coat for 3" and smaller commercial potable water meter and backflow assemblies) Bare metal assemblies require primer coat.			
1.	Rustoleum	C740 DTM Alkyd Enamel (primer) C740 DTM Alkyd Enamel Gloss (finish)	Safety Blue
2.	Rustoleum	V2100 Enamel (primer and finish)	Safety Blue- Aerosol
3.	Richard's Paint	1120 (primer) 2400 Gloss (finish)	Safety Blue
4.	Tnemec	Endura Shield Series 73 (primer and finish)	Safety Blue
Paint (primer and finish coat for 3" and larger reclaimed water meters) Bare metal assemblies require primer coat.			
1.	Tnemec	Endura Shield Series 73 (primer and finish)	Reclaimed Water Purple 16SF
2.	Sherwin Williams	Macropoxy 646 (primer) Acrolon 218 HS (finish) or Acrolon 100 (finish)	For reclaimed water applications only- see City for color code



Appendix B- Approved Products List

July 1, 2016

3.	Richard's Paint	XIM (primer) 1001/G (paint)	"Reclaimed Purple" color designation
Paint (potable water valve box lids and curb etchings; meter paint permissible in this application)			
1.	Richard's Paint	Rust Shield 1003-A	Paint code C-3 E-8417 KX-436
Paint (reclaimed water valve box lids and curb etchings- meter paint permissible in this application)			
1.	Rustoleum	V2100 High Performance Enamel	Safety Purple V2167838
2.	Aerovoe	212	
Point Repair Coupling			
1.	Fernco	Series 1002	For repair to Clay
2.	Multi Fittings	Injection Molded Repair Coupling (GxG) No pipe Stop	For repair to PVC
3.	Fernco	Series 1056	For repair to CIPP
Restrains- Bell Harness Restraint (new and existing)			
1.	EBBA	1100, 1500 & 1600 Series	
2.	Ford	Uni-Flange 1350 & 1390	
3.	Sigma	PV Lok	
Restrains- Mechanical Restraint Joints (ductile iron pipe)			
1.	American	Fast Grip Gasket	Pipe joints painted with high quality red enamel
2.	EBBA Iron Sales	Megalug Series 1100	
3.	Sigma	One-Lok	
4.	U.S. Pipe	Field-Lok	Pipe joints painted with high quality red enamel
5.	Ford	Uni-Flange	
Restrains- Mechanical Restraint Joints (PVC pipe)			
1.	EBAA Iron Sales	Megalug® Series 2000PV	
2.	Sigma	One-Lok-SLC	
3.	Ford	Uni-Flange	
Saddle Wyes for Lateral Connections to CIPP			
1.	Multi Fittings	Trench Tough Plus Gasketed SDR35 Injection Molded Saddle Wye GHxGS w/SS bands	OR City approved equal
Tapping Service Saddles			
1" taps on 2" mains			
1.	Mueller	H-13420	
2.	Ford	SB-70-204	
3.	Ford	FC-202	for 2" HDPE IPS pipe
1" taps on 4" and 6" mains			
1.	Ford	101B	Single strap
2.	Mueller	B-R1B	Single strap
1" taps on 8" or larger mains and 2" taps on >= 4" mains			
1.	Ford	202B	Double strap
2.	Mueller	B-R2B	Double strap



Tapping Sleeves (Body and Flange 304 Stainless Steel)			
1.	JCM	432,452	432 cannot be used on HDPE or thin wall pipe; 452 cannot be used on Cast Iron and Cement Asbestos pipe
2.	Ford	FTSS, FTSAS	FTSS cannot be used on HDPE or thin wall pipe; FTSAS cannot be used on Cast Iron and Cement
Tapping Valve			
1.	American Flow Control	2500	
2.	AVK	45	
3.	Clow	2638/2639/2640	
4.	Kennedy/M&H	KS-RW/KS-FW	
5.	Mueller	T-2360/A-2361	
Tracing Wire (for directional drill- potable water-blue, reclaimed water-purple, wastewater-green)			
1.	Copperhead	SoloShot Extra High Strength	12-gauge
Valve- Air Release Valves			
1.	ARI	D-040, S-050, S-010,	Potable water only
2.	ARI	D-021	Reclaimed water only
3.	ARI	D-025	Wastewater only
4.	H-Tec	986	Wastewater only-Stainless steel or DI
5.	Val-Matic	VM-38, VM-45	Potable water only
6.	Val-Matic	VM-200C	Reclaimed water only
Valve- Butterfly Valves (30" and larger)			
1.	Clow	1450	
2.	Dezurik	BAW	
3.	M&H	1450	
4.	Milliken	500 series	
5.	Mueller/Pratt	Linseal III/Groundhog	
Valve- AWWA Gate Valves- 2" (FIPT x FIPT)			
1.	AFC		
2.	Clow	2639	
3.	Mueller	2360	
Valve- Gate Valves 4" – 12" (MJ x MJ)			
1.	American Flow Control	2500 Series	
2.	American R/D	2638/2639/2640	
3.	AVK	45	
4.	Clow	2638/2639/2640	
5.	Kennedy/M&H	KS-RW/ KS-FW	
6.	Mueller	2360/2361 Series	
Valve- Insert Valves			
1.	Team Valve	4"-12" InsertValve	
2.	Advance Valve Tech.	EZ ₂ Valve	
Valve- Pressure Sustaining Valves			
1.	Bermad		
2.	Flowmatic		
Valve Box			
1.	Tyler Pipe	Series 6850	
2.	Sigma	VB 261X; 261	261X for DOT roadways, 261 series for all other roadways
3.	Star	VB0001; VB0002	VB0002 for DOT roadways, Series VB0001 for all other roadways

