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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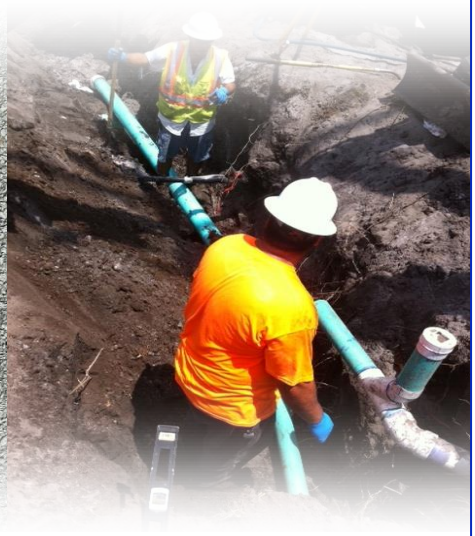
City of Melbourne
On Florida's SpaceCoast

Technical Specifications and Standards for Wastewater Collection Systems



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S1000 GENERAL INFORMATION

These specifications and standards cover the design, drawings, specifications, installation, inspection, testing and acceptance of wastewater collection systems 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 wastewater collection systems in residential subdivisions and commercial developments, off-site force main and gravity sewer extensions to development sites and on-site requirements.

The construction of wastewater collection systems shall be in accordance with the most current edition of Chapter 62-604 Collection Systems and Transmission Facilities, Florida Administrative Code (F.A.C.), Florida Building Code, City of Melbourne Code of Ordinances, Florida Department of Environmental Protection (FDEP) Water Reclamation Facility Operating Permits, and City Technical Specifications and Standards for Wastewater Collection Systems, Latest Edition (referenced herein as technical specifications). In case of conflict, Chapter 62-604, F.A.C. shall prevail.

Additionally, the criteria set forth in "Ten State Standards-Recommended Standards for Sewage Work," may generally be used as a design guide, if not in conflict with State, County or other regulatory agency requirements.

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 and standards are to be latest revision.

S1001 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.

S1002 CONTRACTOR SCOPE OF WORK

The Contractor shall install all Public and Private wastewater collection systems 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 preconstruction 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 operate any force main valve nor remove any thrust block/restraining joint from City owned force mains except under direct supervision of a representative from the City.

The Contractor shall not backfill any fitting, thrust block, restrainer gland, valve, and/or any sanitary structures 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.

All referenced AWWA specifications are to be latest revision.

S1100 PLAN SPECIFICATIONS AND SUBMITTALS

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

- Calculations showing the force mains having sufficient hydraulic capacity to transport all design flows
- 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 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.
- Manholes labeled with appropriate City-issued UID numbers provided by the City's Engineering Division prior to plan submittal.
- Where applicable, note indicating proposed system is private and point of acceptance between City system and private systems clearly identified.
- Approved manhole ring and cover model numbers.
- Proposed sewer main sizes, types, material, lengths and proper slopes.
- Location of all force mains, gravity sewers and service laterals within ten (10) feet of all buildings and structures including wall, fences, etc.
- All easements, property lines, right-of-ways, and structures. Location of mains and gravity lines from property or easement lines at fifty (50) foot intervals.
- Clean outs shall be installed on all four (4) inch and six (6) inch sewer service lines every seventy-five (75) feet or less.
- All valves, including in-line valves and air release/combination valves.
- Show a profile of all conflicts between the sewer lines and other water utilities, including potable water, reclaimed water and stormwater piping.

- Any existing sewer service lateral that needs to be removed or relocated must be removed completely from the main. The main shall be repaired, cleaned and televised to insure the repair was done properly. If a new sewer service lateral is being installed in a new location, a camera inspection will also be required.
- Separation between wastewater collection piping and other utilities, including stormwater piping, potable water mains and service lines, and reclaimed water mains and service lines, if they exist within ten (10) feet of wastewater collection system piping.
- Statement: 'All wastewater collection system construction shall be in accordance with City of Melbourne Technical Specifications and Standards for Wastewater
- Collection Systems, Latest Edition'.
- Statement: 'Contractor is to verify the location of all existing utilities including depth and material prior to commencement of construction.'
- Where applicable- Statement: 'Manholes must be core drilled. A core drill inspection form must be faxed to the City of Melbourne Wastewater Collection Division two (2) working days prior to core drilling the manhole. A Wastewater Collection Division representative must be present. The Contractor must re-construct the manhole flow channel for proper flow width and direction.'
- Where applicable- Statement: 'Gravity mains must have a televised inspection. A video inspection form must be faxed to the City of Melbourne Wastewater Collection Division two (2) working days prior to video inspection. A Wastewater Collection Division representative must be present.'
- Where applicable- Statement: 'Tapping saddles must be pressure tested. A saddle pressure test inspection form must be faxed to the City of Melbourne Wastewater Collection Division two (2) working days prior to pressure testing. A representative from the City's Utilities Department must be present.'
- Where applicable- Statement: 'Force main must be pressure tested. A pressure test inspection form must be faxed to the City of Melbourne Wastewater Collection Division two (2) working days prior to pressure testing. A representative from the City's Utilities Department must be present.'
- Where applicable- Statement: 'Adjust existing manholes, valves, ARV vaults, etc. to finish grade.'

S1200 TECHNICAL DESIGN CRITERIA

S1201 DESIGN CRITERIA

Wastewater collection systems shall be designed for the estimated ultimate tributary population, as delineated in the most recent revision of the approved Wastewater Collection System Master Plan, except in considering parts of the systems that can be readily increased in capacity.

All wastewater force mains and gravity systems shall be designed and installed to the

furthest point of the proposed project. When a force main or gravity system will serve existing or future developments beyond the borders of the proposed site, the City may request over sizing.

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

S1202 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.

At the City's discretion, flow calculations may be needed for gravity systems. City Lift stations may be adversely affected by additional flows. The City will determine if lift station upgrades will be required.

S1203 TYPES OF SEWERS

The City will approve plans for new sewer systems and extensions only when designed as separate systems in which stormwater, surface water, ground water, artesian well water, roof runoff, subsurface drainage, swimming pool drainage, condensate, deionized water, noncontact cooling water, or other substances, specifically prohibited by City of Melbourne Code of Ordinances Section 58-281 are excluded.

Carwash stations and dumpster pads shall not have pad drains connected to the Department's Wastewater collection system unless drainage pads are designed to minimize surface runoff. The entire pad shall be covered and consist of a small-elevated area preventing surface area run-off from entering the collections system.

S1204 GENERAL LOCATION

Wastewater collection and transmission systems shall be located in dedicated right-of-way or utility easements.

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

Whenever possible, gravity sewers shall be located under pavement in dedicated rights-of-way. All gravity sewers located outside of dedicated rights-of-way shall be constructed of C900 pipe, green in color.

When installed in rights-of-way, force mains shall be designed to maintain a minimum two (2) foot clearance away from back of curb or edge of pavement. No force main shall be designed to run under pavement except where crossing intersections or tying into manholes. All such force mains shall maintain a consistent alignment with respect to the centerline of the road.

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

Gravity sewers and force 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. 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, gravity sewers, force mains, and manholes shall not be located along side or rear lot lines or along/under storm water retention pond berms. Placement of a gravity sewers, force mains or manholes along side or rear lot lines may be allowed if such sewer configuration results in efficient placement and utilization of the sewer system. The determination for such placement shall be made by the City on a case-by-case basis.

Laterals shall not be designed through retention ponds or swale areas. If a lateral must go through these areas, then thirty-six (36) inches of cover must be maintained. If thirty-six (36) inches of cover cannot be maintained, then install C900 pipe green in color.

In such cases where minimum cover cannot be maintained and/or placement of gravity sewer and/or force main so dictates, concrete cover may be required for additional protection of wastewater piping. In addition, restraint joint piping may be required for force main installations that do not meet minimum cover requirements.

Subaqueous crossings and appropriate signage shall be constructed in accordance with 62.604 F.A.C. Reference Technical Detail A-108.

S1205 UTILITY SEPARATION

Separation of potable water, reclaimed water, wastewater collection and storm systems shall comply with FDEP regulations outlined in 62-555.314 and 62-604, F.A.C. Variances from the FDEP requirements must be approved individually by both FDEP and City of Melbourne. Reference Technical Detail A-103 and A-104.

Wastewater collection piping shall be independent of all potable water, reclaimed water and stormwater systems. Potable water and reclaimed water pipes shall not pass through or come into contact with, any part of a sanitary sewer manhole

Wastewater collection piping shall be installed above stormwater piping and below potable water and reclaimed water mains and service lines. Where wastewater collection piping must cross over other utilities a minimum of twenty (20) inches of cover from top of finish grade shall be maintained. In such cases C900 PVC piping is to be used on those portions of wastewater collection piping with less than thirty (30) inches of cover from top of finish grade or with less than eighteen (18) inches of vertical clearance. In addition, steel casing

and/or concrete cover may be required for additional protection of wastewater collection piping.

Where wastewater force mains cross under potable water, reclaimed water and stormwater piping in order to maintain minimum separation requirements, mechanically restrained fittings shall be utilized as per Technical Detail A-105. Omission of fittings by deflection of wastewater force main will not be acceptable.

In cases where the wastewater collection pipe 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 wastewater collection pipe are to be wrapped in a soil tight filter fabric. The crossing shall be arranged so that the wastewater collection pipe joints will be equidistant and as far as possible from center of crossing.

No part of wastewater collection piping shall pass through or come into contact with stormwater piping unless pre-approved, engineer designed conflict structure is utilized.

S1206 SLOPES

Gravity Sewer- Minimum gravity sewer slopes shall be designed and constructed as follows:

Pipe Size	Design	Constructed
8”	0.36%	0.33%
10”	0.28%	0.25%
12”	0.22%	0.20%
15”	0.17%	0.15%
18”	0.11%	0.09%

The minimum design slope for an eight (8) inch sewer main at the upper run of a system shall be 0.44 percent. The minimum constructed slope for an eight (8) inch sewer main at the upper run of a system shall be 0.40 percent.

The maximum slope for gravity sewer mains shall be such that velocities created under either average daily or maximum daily flow conditions will not exceed ten (10) feet per second.

The minimum slope for gravity sewer mains shall be such that velocities created under either average daily or maximum daily flow shall be no less than two (2) feet per second.

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

S1207 PRESSURE AND FRICTION LOSS

Force Mains- Friction losses through force mains shall be based on the Hazen and Williams formula. In the use of Hazen and Williams formula, the value for “C” shall be one hundred twenty (120) for ductile iron pipe and 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.

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

S1208 DIAMETER

Gravity Sewer- No gravity sewer main conveying wastewater shall be less than eight (8) inches in diameter. Size conversion between manholes shall not be allowed. All sewers shall be laid with straight alignments between manholes.

Service Lateral - All City accepted service laterals and fittings shall be a minimum of four (4) inches in diameter. Six (6) inch or larger service laterals may be required at the discretion of the City.

Force Mains- The minimum force main diameter shall be four (4) inches. Force mains that are determined "private" shall be a minimum of two (2) inches in diameter and be green in color from the factory.

S1209 DEPTH OF COVER

Gravity Sewers- The minimum cover over gravity sewers shall be no less than thirty-six (36) inches measured from the finished grade. Exceptions to this requirement may be made for a short length of pipe where structural considerations are incorporated in the design.

Service Laterals- The minimum cover over service lateral pipe shall be no less than thirty-six (36) inches measured from the finished grade. The stub out terminus of all laterals shall have a minimum of thirty (30) inches and maximum of forty-two (42) inches of ground cover from top of lateral. This ground cover shall be measured from crown of road or finished grade, whichever is higher. Particular attention shall be given to the depth of the lateral termination stub out, and its locational relationship to the property/right-of-way line.

Laterals shall not be designed through retention ponds or swale areas. If a lateral must go through these areas, then thirty-six (36) inches of cover must be maintained. If thirty-six (36) inches of cover cannot be maintained, then install C900 pipe green in color.

Force Mains- Force Main 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 as indicated on the plans. The ground can not be mounded to obtain proper cover.

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

S1210 PRESSURE AND RESTRAINT

Force Main- The force mains and fittings, including all restrained joint fittings, shall be designed to withstand pump operating pressures and pressure surges, of not less than one hundred (100) psi.

Restrained joints shall be provided at all changes in direction, 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 Technical Detail A-112. Where internal restrained joints are used, the entire bell shall be painted red with high quality enamel paint.

S1211 VELOCITY

Force Main- At design pumping rates, a cleansing velocity of at least two (2) feet per second should be maintained. Maximum velocity at design pumping rates should not exceed eight (8) feet per second for ductile iron pipe and five (5) feet per second for PVC pipe.

S1212 PIPE MATERIAL

The standard pipe material used in the construction of wastewater collection systems shall be polyvinyl chloride (PVC) and High Density Polyethylene Pipe. Ductile iron pipe (DIP) for force main installations may be allowed if justification is provided and prior approval is obtained from the City.

S1213 FORCE MAIN TERMINATION

Force main shall not terminate directly into a gravity sewer line. Force mains should enter at point on manhole one hundred eighty (180) degrees opposite of manhole gravity outfall. Force main shall enter at flow line of the receiving manhole.

S1214 SERVICE LATERAL CONNECTION

In general, service laterals shall not be allowed to discharge into sanitary manholes, except at terminal manholes. A case-by-case exception to this requirement may be allowed if the lateral discharges at the same elevation as the manhole invert.

All service laterals shall be less than one hundred (100) feet in length from property/right-of-way line to sewer main. In no case shall a sewer lateral be more than seventy-five (75) feet in length without the installation of an additional clean out.

Unless otherwise specified, wye branches shall be provided in the gravity sewer main for service lateral connection. Wyes shall be four (4) inches inside diameter or greater, unless otherwise approved by the City.

S1215 VALVES

Sufficient valves shall be provided on force main systems to facilitate effective isolation of the pipe system for repairs and maintenance. Force main valve spacing shall not exceed one thousand (1,000) feet.

Additional valves may be required at intersections with force mains, or at other locations as determined by the City.

S1216 AIR VALVES

Air release valves or combination air valves, shall be provided on force mains, as necessary, to prevent air locking and vacuum formation. All such valves shall be clearly delineated on the force main profile in the Construction Plan Drawings.

The Engineer of Record shall submit calculations to the City justifying the valve type, sizing and location. Reference Technical Detail A-122 and A-123.

S1217 GREASE INTERCEPTORS

Grease interceptors are not required for a residence. However, one or more grease interceptors are required where grease waste is produced in quantities that could otherwise cause line stoppage or hinder sewage disposal. These shall be determined by the City of Melbourne Building Department and City Code of Ordinances.

S1300 MATERIAL SPECIFICATIONS

These specifications cover the pipes, fittings, appurtenances used for wastewater collection 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.

S1301 PIPE

S1301-1 PVC PIPE

PVC Gravity Sewer Pipe (4 inch-15 inch), ASTM D3034, SDR 35. Uniform minimum "pipe stiffness" at five (5) percent deflection shall be forty-six (46) psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477.

PVC Gravity Sewer Pipe (18 inch-27 inch), ASTM F679, SDR 35. Uniform minimum "pipe stiffness" at five (5) percent deflection shall be forty-six (46) psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477. The minimum standard length of pipe shall be thirteen (13) feet.

PVC Force Main Pipe Force main pipe shall be PVC DR-18 manufactured in accordance with AWWA Specification C900 or latest revision

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 force main systems shall be green in color having been impregnated into the structural resin at the pipe manufacturing plant.

S1301-2 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 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 above referenced AWWA latest editions. 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 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. Additionally, all ductile iron pipe used in wastewater collection systems shall have epoxy lining applied at factory as integral part of pipe production.

City may require use of polyethylene wrap around ductile iron pipe installations where conditions necessitate additional exterior protection. Polyethylene wrap shall be green 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.

S1301-3 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

Reference Section S1600 for HDPE material specifications.

S1302 PIPE MARKINGS

All pipes shall have a homing mark on the spigot provided by the manufacturer. On field cut pipe, Contractor shall provide homing mark on the spigot in accordance with

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

S1303 FITTINGS

All fittings shall be ductile iron mechanical joint for use with previously specified ductile iron, C900 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 pounds. All fittings shall be cast and machined allowing the boltholes 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 ductile iron fittings shall have a City approved interior epoxy lining applied at factory as integral part of pipe production.

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 fitting manufacturers shall furnish to the engineer certifications that all fittings comply with the following requirements: All fittings shall be capable to withstanding, without bursting, hydrostatic tests of three times the rated water working pressure. The results of the specified tests (AWWA Standards) shall be retained for one year, and shall be available at 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 and the number of degrees or fraction of circle of all bends.

S1304 JOINTS FOR DISSIMILAR PIPE

Joints between pipes of different materials shall be made by using a dissimilar sewer pipe connector with heavy wall one piece construction with smooth I.D. Bell end of dissimilar pipe shall be cut off and beveled prior to installation to accept stated sewer adapter. Reference Technical Detail A-400.

S1305 VALVES

Ductile iron resilient seat gate valve as described shall be used on all force 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.

S1306 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 “Sewer”.

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.

S1307 AIR VALVE VAULTS

Air valves shall be installed in traffic bearing pre-cast concrete boxes with gravel bottoms

Concrete vault cover shall have a minimum thirty-four (34) inch clear access opening and state City of Melbourne Sanitary Sewer in raised capital letters.

A full port, stainless steel ball valve with handle must be installed in between tapping saddle and air valve. Tapping saddle shall meet the requirements of Section S1308

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

S1308 TAPPING SADDLES FOR AIR VALVES

Service saddles for installation of air valves on force mains shall be full-circle style, 18-8 type 304 all stainless steel body with all 304 stainless steel hardware.

S1309 MANHOLES- Reference Section S1500

S1310 LATERAL STUB OUT PLUG MATERIAL

Plugs for lateral stub outs shall be of the same material as the pipe, and gasketed with the same gasket material as the pipe joint, or be of material approved by the City. The plug shall be secured to withstand test pressures specified in these technical specifications. No universal or temporary type plug will be accepted. Plugs for laterals installed under pavement shall have a raised nut. Plugs for laterals installed outside of pavement shall have a recessed nut.

S1311 CURED- IN- PLACE PIPE

Each cured-in-place pipe (CIPP) shall be designed to withstand internal and/or external loads as dictated by the site and pipe conditions. Unless specified differently by the City in the contract documents, the design thickness of the CIPP shall be derived at using standard engineering methodology as found in ASTM F1216, Appendix X1. The long term flexural modulus shall not exceed 50 percent of the short term value for the CIPP resin system and shall be substantiated through third-party testing. The thickness calculations, signed and sealed by a registered professional engineer, shall be submitted to the City prior to CIPP installation.

The layers of the finished CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or such that the knife blade moves freely between layers. If separation of the

layers occurs during testing of the field samples, new samples will be cut from the work.

Any reoccurrence may be cause for rejection of the work.

The enhancement factor "K" to be used in the CIPP design shall be an assigned a value of 7.

Long-term testing in general accordance with ASTM D2290 must have been performed for flexural creep of the CIPP pipe material to be installed. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (CIPP Tube and Resin) and general workmanship of the installation and curing as defined within the relevant ASTM standard. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.

The CIPP shall meet the following minimum strength requirements.

MINIMUM PHYSICAL PROPERTIES				
Property	ASTM Test Method	Polyester System	Filled Polyester System	Vinyl Ester System
Flexural Strength	D790	4,500 psi	4,500 psi	5,000 psi
Flexural Modulus (initial)	D790	250,000 psi	400,000 psi	300,000 psi
Flexural Modulus (50-year)	D790	125,000 psi	200,000 psi	150,000 psi

S1311-1 CIPP TUBE

The CIPP tube shall consist of one or more layers of a flexible needled felt or an equivalent nonwoven material, or a combination of nonwoven and woven materials, capable or carrying resin, withstanding installation pressures and curing temperatures. The CIPP tube should be compatible with the resin system to be used on this project. The material should be able to stretch to fit irregular pipe sections and negotiate bends.

The CIPP tube should be fabricated under controlled conditions to a size that, when installed, will tightly fit the circumference and the length of the original conduit. Allowances should be made for the longitudinal and circumferential stretching that occurs during placement of the tube. Maximum stretching allowances shall be as defined in ASTM F1216 or ASTM F1743. The installation Contractor shall verify lengths in the field before cutting the liner to length. Continuous individual liners can be made over one or more manhole to manhole sections.

The CIPP tube shall be uniform in thickness and when subjected to the installation pressures shall meet or exceed the designed wall thickness.

Any plastic film applied to the tube on what will become the interior wall of the finished CIPP shall be compatible with the resin system used, translucent enough that the resin is clearly visible, and shall be firmly bonded to the felt material.

At time of manufacture, each lot of CIPP tube shall be inspected and certified to be free of defects. The tube shall be marked for distance at regular intervals along its entire length, not to exceed five feet. Such markings shall also include the CIPP tube Manufacture's name or identifying symbol.

The CIPP tube may be made of single or multiple layer construction where any layer must not be less than 1.5 mm thick. A suitable mechanical strengthener membrane or strip may be placed in between layers where required to control longitudinal stretching.

S1311-2 RESIN COMPOUND

The resin system shall be a corrosion resistant polyester or vinyl ester, along with a compatible catalyst system.

The resin used shall not contain non-strength enhancing fillers.

When combined with the CIPP tube, the resin system shall provide a CIPP that meets the structural requirements of ASTM F1216 or ASTM F1743, the minimum physical properties specified in Section 1.3.E, and those properties which are to be utilized in the design of the lining system for this project.

When combined with the CIPP tube, the resin system shall provide a CIPP that complies with the chemical resistance requirements specified in ASTM F1216 or ASTM F1743.

S1312 INSPECTION OF MATERIALS

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

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

When the specimens tested conform to applicable standards, all pipe represented by such specimens shall be considered acceptable based on the test parameters measured. Copies of test reports shall be available before the pipe is installed in the project.

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

Pipe, which has been rejected by the City, shall be removed from the site of the work by the Contractor and replaced with pipe that meets these specifications.

S1400 CONSTRUCTION

S1401 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.

S1402 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.

S1403 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.

S1404 DAMAGED MATERIALS

If in the process of transportation, unloading or handling, any pipe or fitting is damaged, it shall be rejected and immediately removed from the site.

S1405 STORAGE

All pipe and fittings shall be stored in a manner which will assure the protection of the material from physical damage including UV rays and kept clean.

S1406 SURVEY LINE AND GRADE

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

S1407 TRENCH PREPARATION

S1407-1 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 Revision.

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. In no case shall the open trench ahead of the sewer pipe exceed twenty-five (25) feet.

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.

S1407-2 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 Revision, 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.

S1407-3 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 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.

The Contractor shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, and shall have available at all times competent workmen for the operation of the pumping equipment. The dewatering systems shall not be shut down between shifts, on holidays or on weekends, or during work stoppages.

The control of ground water shall be such that softening of the bottom of excavations, or formation of "quick" conditions or "boils" shall be prevented. Dewatering systems shall be designed and operated so as to prevent the removal of the natural soils.

The static water level shall be drawn down below the bottom of the excavation so as to maintain the undisturbed state of the natural soils and allow the placement of backfill to the required density. The dewatering system shall be installed and operated so that the ground water level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property.

S1408 BEDDING GRADE

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

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

Contractor shall excavate bell holes at each joint to permit proper assembly and inspection of the entire joint.

S1409 PIPE LINE CONSTRUCTION

All gravity sewer, force mains 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.

Gravity Sewer- Laying of gravity sewer pipe shall be accomplished to line and grade in the trench only after it has been dewatered and the trench has been properly prepared. Pipe laying shall proceed upgrade with the spigot ends of the pipe pointing in the direction of flow. Each pipe shall be laid true to line and grade with a laser beam system. All pipe shall be joined in a workmanlike manner and in accordance with the manufacturer's instructions. When pipe laying is not in progress, the open end of the pipe shall be kept tightly closed with mechanical wing nut type pipe plug or a push in plug of same size.

All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall

be laid to conform to the line and grade shown on the Plans.

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

Service Lateral Service lateral stub out to have "electronic" location marker securely attached to the wye fitting by way of heavy-duty nylon type strap. Termination of all new construction lateral stub outs shall be indicated with a four (4) inch x four (4) inch x eight (8) foot pressure treated post. This post shall be placed directly in front and up against lateral stub out terminus. This post is to be buried a minimum of one (1) foot below bottom of lateral stub out terminus and extend a minimum of three (3) feet above finish grade. Upper most one (1) foot of post shall be completely painted with industrial type green enamel paint. Prior to setting wooden marker post and backfilling, all service laterals shall be inspected by City representative.

Right angle lateral location in relation to sewer main shall be indicated by etched "S" in the curb one-fourth (¼) inch deep, four (4) inches wide and six (6) inches long

All clean outs installed under roadway pavement shall be installed in traffic rated box and 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 4 sections of # 5 reinforced rod located at right angles to each other). The traffic rated box cover shall have an "S" or "Sewer" cast into the top and painted green. Plugs used for clean outs installed in traffic rated boxes shall have a raised nut.

Additionally, all clean outs, for commercial property, installed outside of roadway pavement shall have a three thousand (3,000) psi concrete pad poured around the clean out at finish grade level (24 inch x 24 inch x 8 inch with a minimum of 4 sections of # 5 reinforced rod located at right angles to each other). Plugs used for clean outs installed outside of pavement shall have a recessed nut.

Service Lateral Wye Installation on Existing Clay or PVC- Installation of lateral wyes on existing clay or PVC gravity sewers shall be in accordance with Technical Details A-403.

Service Lateral Wye Installation on CIPP– When installing a saddle wye on a CIPP gravity main the procedure is:

Remove the clay or host pipe from around the CIPP. (Don't break away more than is needed to install the wye). Installation is generally done at a forty-five (45) degree angle above the spring line of the CIPP. (Under no circumstances shall to wye be installed on the top of the pipe).

Set the wye on the CIPP for a dry fit (make sure wye is going with the flow). If everything lines up mark the oval hole on the CIPP from inside of the wye hub. Cut the hole out of the CIPP about three-eighths (3/8) inch larger than the marked oval if the saddle has a raised edge around the inside hub opening or flush if there isn't a raised edge. Once the hole is cut, dry fit the wye to make sure the hole works for your saddle. Using one hundred (100) percent silicone caulk seal the wye to the CIPP. Then install and tighten the two stainless steel clamps around the saddle and CIPP. Wipe excess caulk from inside of the hub if needed. (The rubber gasket provided isn't used with this type of installation) The final step

is to seal around the host pipe and the CIPP with one hundred (100) percent silicone caulk. Reference Technical Detail A-410.

Force Main- 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 green tracing wire shall be placed directly on top of pipe (two (2) strands if pipe 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 force mains 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 as determined by the Wastewater Collection Division, soft-digs shall be provided and an electronic ball marker shall be placed on portions of the pipe where sounding cannot be reestablished 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 "Sewage Collection". 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 wastewater force main. Marking devices shall be placed directly on top of main and Contractor shall ensure device remains in place during backfill operations. 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 force main within casings or those portions that go over or under storm drains, potable water mains or other utilities as shown on plans. In all such cases, force 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-112. 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 a 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 green 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 layers of polyethylene or vinyl. There shall be a minimum of three (3) colored stripes per length of pipe for pipe twenty-four (24) inches and larger. These bands shall be placed at least sixty (60) degrees apart on the pipe and shall be two (2) inches in width. For piping smaller than twenty-four (24) inches in diameter, a single colored strip along the top of the pipe may be used. All pipes shall be laid so that the center stripe is on the top as viewed from above.

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

S1410 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, gutter and shoulders; 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 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 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 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.

S1411 VALVES

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. Utility 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 shall have the word “SEWER” 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 4 sections of # 5 reinforced rod located at right angles to each other). All wastewater system valve box tops shall be painted green with approved paint. In addition, all valve locations shall be scored with a “V”, one-fourth (¼) inch deep, four (4) inches wide and six (6) inches long, in nearest curb with point of "V" facing valve and the “V” painted green.

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.

S1411-1 AIR VALVES

Air valves shall be installed below grade in traffic bearing pre-cast concrete vaults with gravel bottoms.

A full-port stainless steel ball valve with handle must be installed in between tapping saddle and air valve. Tapping saddle shall meet the requirements of Section S1308.

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

S1412 CONFLICT STRUCTURES

Any lateral passing through a conflict structure shall utilize a steel or ductile iron casing. The casing shall be just large enough for the PVC lateral passing through the casing. In no case shall the casing be more than two (2) pipe sizes larger than the pipe passing through it. Casings shall extend at least one (1) foot past the outside of the conflict structure. Casing must be sealed on each end with a rubber boot or cement may be used.

S1413 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:

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

Wastewater 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 shall be constructed of PVC pipe and shall terminate below grade in approved meter box outside of pavement.

S1500 MANHOLES

S1501 MANHOLE LOCATION

Manholes shall be installed at the end of each gravity sewer; at all changes in grade, size or alignment; at all sewer intersections; and at distances not greater than four hundred (400) feet.

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

All manholes located outside of pavement shall be marked by a green reflective marker permanently attached to nearest curb with the use of a bituminous pavement marker adhesive.

Manholes with sewer force main discharging into them and other manholes that, if in the opinion of the City, are to be adversely affected by corrosive gases shall be lined. Reference Appendix B: Approved Products List for acceptable manufacturers.

S1502 MANHOLE DIAMETER

For sewers fifteen (15) inches in diameter and smaller, the minimum inside diameter of manholes shall be forty-eight (48) inches. For sewers between sixteen (16) inches and thirty-six (36) inches, the minimum inside diameter shall be sixty (60) inches. For sewers larger than thirty-six (36) inches in diameter, a seventy-two (72) inch inside diameter manhole shall be required. In all cases, manholes deeper than twelve (12) feet from finished grade shall have minimum inside diameter of sixty (60) inches.

A minimum access cover diameter of twenty-four (24) inches shall be provided for sewers up to fifteen (15) inches. Access covers for sewers larger than sixteen (16) inches or manholes deeper than twelve (12) feet shall have an access cover with minimum of thirty (30) inch clear opening diameter, or larger if specified by City.

S1503 MANHOLE FLOW CHANNEL

The flow channel through manholes shall be made to conform in shape and slope to that of the sewers. Flow direction changes in excess of ninety (90) degrees will not be permitted. When directional changes exceeding forty-five (45) degrees occur, an additional flow line

elevation drop of 0.1 foot across manholes shall be provided. Benching shall be provided which shall have a minimum slope of two (2) inches per foot.

An outside drop pipe shall be provided for a sewer entering a manhole where its invert elevation is twenty-four (24) inches or more above the manhole invert. Any pipe entering the manhole above the manhole invert and does not require an outside drop, shall have a channel constructed from pipe invert to the manhole invert.

S1504 MANHOLE STRUCTURE MATERIALS

Manholes shall be constructed of pre-cast units. Brick manholes shall not be permitted. Cast-in-place manholes may be accepted on a case-by-case basis for conflict resolution.

A maximum of twelve (12) inches and a minimum of six (6) inches of brick course shall be allowed for height adjustments on existing manholes.

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

The minimum wall thickness shall be five (5) inches for manholes twelve (12) feet or less in depth and six (6) inches for manholes deeper than twelve (12) feet. Pre-cast manholes shall be constructed with a pre-cast monolithic base structure as shown on the Technical Detail A-404. The minimum base thickness shall be eight (8) inches.

Concrete for manholes shall be Type II, 4000 psi at twenty-eight (28) days. Barrel, top and base section shall have tongue and groove joints. All jointing material shall be a cold adhesive preformed plastic gasket, conforming to FDOT Article 942-2.

The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section. Sections shall be cured by an approved method for at least twenty-eight (28) days prior to painting and shall not be shipped until at least two (2) days after having been painted.

Pre-cast concrete top slabs shall be used where depth of manhole is four (4) feet or less. In such cases, access hole shall be offset from center. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast manhole section. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the manhole sections.

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

Interior surfaces of manholes shall have a protective epoxy coating with a minimum dry mil thickness of 16-mils. Exterior surfaces shall have a protective epoxy coating with a minimum dry mil thickness of 9-mils. Coatings shall be applied in a minimum of two (2) applications black over red by the manhole manufacturer in strict accordance with the paint manufacturer's recommendations. Coal tar epoxy may be used directly following pre-casting at factory.

S1505 MANHOLE STRUCTURE INSPECTION

The quality of all materials, the process of manufacture, and the finished sections shall be

subject to inspection and approval by the City.

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

At the time of inspection, the sections will be carefully examined for compliance with the specified ASTM designation, and with the approved manufacturer's drawings. All sections shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks, roughness, soundness, etc. The surface shall be uniformly supported by the base structure, and shall not bear directly on any of the pipes.

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

S1506 MANHOLE ACCESS CASTINGS

Gray iron castings for manhole frames, covers, adjustment rings and other items shall conform to the ASTM Designation A 48, Class 35. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects that would impair their strength, or otherwise make them unfit for the service intended.

The seating surfaces between frames and covers shall be machined to fit true with "O" ring seal manufactured into lid at factory. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting patterns shall conform to those shown or indicated in the Technical Details A-407, A-408 and A-409. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings.

Frames shall be suitable for the future addition of a cast iron ring for upward adjustment of top elevation.

Manhole adjustment rings will not be permitted on new construction. Said adjustment rings will only be allowed on existing structures that require pavement overlay and only in local, residential roads.

A standard twenty-four (24) inch clear opening ring and cover shall be model #170-E-ORS as manufactured by U.S. Foundry, Inc., or City approved substitute.

A standard thirty (30) inch clear opening ring and cover shall be model #230-AA-ORS as manufactured by U.S. Foundry, Inc. or City approved substitute.

For all F.D.O.T. right-of-way projects a standard twenty-four (24) inch clear opening ring and cover shall be model #225-AS-ORS as manufactured by U.S. Foundry, Inc. or City approved substitute.

S1507 BEDDING

Base sections shall be placed on bedding that has been firmly tamped and made smooth and level to assure uniform contact and support of the pre-cast structure. At the City's discretion, bedding rock and filter cloth may be required where field conditions warrant.

S1508 CAST IN PLACE BASES

Cast in place bases shall be utilized only when specifically approved by the City. Unless otherwise specified, cast-in-place bases shall be at least eight (8) inches in thickness and shall extend at least six (6) inches radially outside of the outside dimension of the manholes section.

Reinforcement and connection to the riser sections shall be designed by the Engineer of Record and submitted to the City for approval.

S1509 PRE-CAST MANHOLES

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

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

The first pre-cast section shall be placed and carefully adjusted to true grade and alignment. All inlet pipes shall be properly installed so as to form an integral watertight unit.

The sections shall be uniformly supported by the base structure and shall not bear directly on any of the pipes.

Pre-cast sections shall be placed and aligned to provide vertical alignment with a one-fourth (¼) inch maximum tolerance per five (5) feet of depth. The completed manhole shall be rigid, true to dimensions, and water tight. Refer to Section S1510 for final sealing specifications.

S1510 MANHOLE ENCAPSULATION AND SEALING

S1510-1 SEALING SYSTEM

All new manholes shall be completely sealed at all the joints and risers by the use of heat shrinkable wraparound sleeve. All manholes that are to be rehabilitated, or having the rings and covers raised or replaced, shall be completely sealed around the top crown section of the manhole with this same wraparound sleeve.

This sleeve shall consist of a two (2) piece sleeve (backing and adhesive) with a closure system and a G-type primer. It shall consist of irradiated cross-linked polyolefin sheeting, pre-coated with a layer of anti-corrosion adhesive and shall be designed to provide excellent resistance against mechanical damage during construction and in service. The backing shall have a minimum recovery of thirty-nine (39) percent for irregular or cone

shapes. For symmetrical cylindrical shapes, a minimum backing recovery of twenty-two (22) percent is required. The sleeve shall have a mastic-type adhesive, specially formulated to become fluid at temperatures achieved during installation and maintain flexibility in cold climates. Upon cooling, the adhesive shall form a tough, elastomeric protective layer, which will effectively prevent the ingress of ground water into the joints.

The sleeve shall be applied with a high intensity propane torch and shall be made from materials that provide high electrical resistivity, resistance to corrosive environments, low water absorption, low moisture permeability, and effective bond to steel surfaces, concrete and to common factory applied coatings. The overall thickness of the applied sleeve shall have a nominally two and five-tenths (2.5) mm finish. Reference Appendix B: Approved Products List.

S1510-2 INSTALLATION

The entire surface to be wrapped shall be cleaned free of dirt, sharp points, and preheated to remove moisture. Apply the primer over all areas to be covered and let dry for five (5) to fifteen (15) minutes. Cut a length of sleeve to fit the area to be covered. After the primer has had time to dry, wrap the sleeve around the manhole, or structure, and position the self-adhering closure seal at the overlap. Heat the overlap area and pat down with a gloved hand to ensure bonding, and then heat the sleeve, evenly, until the entire sleeve has recovered. Smooth out any and all wrinkles, then quench with water or allow cooling prior to backfilling for the adhesive to set. Installation of sleeve shall be in strict accordance with manufacturer's recommendations.

S1511 EXCAVATION AND BACKFILLING OF MANHOLE STRUCTURE

Reference Sections S1507-3, S1508 and S1510

S1512 PLACING CASTINGS Castings shall be fully bedded in mortar with adjustment brick courses placed between the frame and manhole. Brick courses shall be a minimum six (6) inches and a maximum of twelve (12) inches. Mortar shall conform to ASTM C-270, type M, and the bricks shall be clay and conform to ASTM C-216, grade SW, size three and one-half (3 ½) inches (w) x eight (8) inches (l) x two and one-fourth (2 ¼) inches (h).

Top of manhole castings located in pavement, shouldered areas, and sidewalks shall be set flush with grade. Top of manhole castings located outside these areas shall be placed two (2) inches above grade. All adjustment brick courses shall be plaster coated with a non-shrink grout prior to application of protective epoxy coating. Reference Appendix B: Approved Products List.

After manhole base and all sections have been permanently set in place all joints shall be trimmed of excess "ram-nek" prior to application of protective epoxy coating.

S1513 CHANNELS

Manhole flow channels shall be as shown in the Technical Detail A-405, with smooth and carefully shaped bottoms, built up sides and benching constructed using cement and brick

with no voids.

Channels shall conform to the dimension of the adjacent pipe and provide changes in size, grade and alignment evenly. Cement shall be Portland Cement Type II only. All channels and benches are to have finish application of protective epoxy coating. Coating is to cover entire manhole interior from rings to channels. Reference Appendix B: Approved Products List.

S1514 PIPE CONNECTIONS

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

S1515 EXISTING MANHOLE CONNECTIONS

All existing manholes shall be core drilled and resilient connectors used between manhole structure and pipe. City of Melbourne Wastewater Collection representative must be notified two (2) working days in advance and be on-site at time of core.

All joints shall be sealed with non-shrinking grout prior to re-application of protective manhole coating or liner. Re-application of protective coating shall match existing manhole coating or liner.

Invert and bench of existing manhole shall be removed and reconstructed to accommodate both existing flow channels as well as new flow channel. Reconstructed inverts and benches shall have protective coating applied to match existing manhole coating or liner.

Re-application of protective coating shall cover entire manhole interior from rings to channels.

S1516 DROP MANHOLE CONNECTIONS

Drop manhole connections shall conform in all respects to details shown on Technical Detail A-405.

S1517 MANHOLE CLEANING

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

S1518 MANHOLES WITH FORCE MAIN DISCHARGE

Manholes that are affected by sewer force main discharge, as determined by the City, shall be epoxy lined. The protective epoxy lining shall be installed on clean surfaces, free of all oil, dust and any and all leakage. Final liner thickness shall be in accordance with Manufacturer's specifications. Reference Appendix B: Approved Products List.

Cementitious liner build up may also be necessary to regain structural integrity if connecting to an existing manhole.

S1600 HORIZONTAL DIRECTIONAL DRILL

S1601 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 force mains. Trenchless installation of gravity sewers shall be approved by the City on a case-by-case basis.

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.

S1602 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 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 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 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.

S1603 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.

S1604 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.

S1605 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

S1606 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 should 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 borehole
- 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 City Engineering Inspector.

S1607 PERMITS

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

S1608 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.
- 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.

S1609 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 drilling operations, with the exception of delivery, shall be conducted while City Inspector is present.

S1610 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.

S1611 DRILLING OPERATIONS

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 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 min/max depth noted on approved construction plans. Where depth or shallower installations are required, Contractor shall make adjustments without additional cost to 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 HDD 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.

S1612 REAMING AND PULLING

Contractor shall obtain 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 maybe 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 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 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 green. Locate wire shall be brought to grade at all 'entry point' and 'exit point' locations. At Contractor's discretion, additional wires may be pulled. 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 place 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 for all horizontal directional drills shall terminate to accommodate connection to ductile iron pipe, C900 pipe, other City-approved piping material 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.

S1613 HDD MATERIAL

S1613-1 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 green stripes. Carrier pipe sized two (2) inch and thirty (30) inch and larger may be IPS size, DR11, black in color with three (3) equally spaced, longitudinal green stripes. Minimum cell classification shall 3608 with 4710 preferred.

Pipe shall be marked with the following:

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

S1613-2 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.

S1613-3 END FITTINGS

Both ends of HDPE for all directional drills shall be terminated to accommodate connection to ductile iron pipe, C900 pipe, other City approved piping material 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.

S1613-4 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.

S1613-5 TRACING WIRE

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

S1614 HDD PRESSURE TESTING

All carrier piping, two (2) inches and larger, installed via horizontal directional drilling methods shall be pressure tested in accordance with Section S1703 of these technical specifications.

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.

S1615 PIPE ABANDONMENT

In the event the borehole operations fail, Contractor shall completely fill borehole 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.

S1616 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 horizontal directional drilling operation, the roadway shall be reconstructed, milled and repaved at a one hundred (100) foot distance centered on-site.

S1617 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.

S1700 CLEANING, INSPECTION, AND TESTING

S1701 GRAVITY SEWER INSPECTION AND TESTING

The City may require at its own discretion that all gravity sewer lines and manholes shall be leak tested by the exfiltration method. The test shall be conducted by and at the expense of the Contractor in the presence of a City Wastewater Collection Division representative.

Allowable leakage shall be thirty (30) gallons per twenty-four (24) hours per inch diameter

of pipe per mile of pipe maximum. If leakage exceeds this amount, the Contractor shall make the necessary repairs and schedule a retest. Only acceptable method of repairing leaks is excavation. Pressure grouting by a City approved Contractor may be allowed on a case-by-case basis at the discretion of the City if leak is shown to be at manhole section joint.

At the City's discretion, all gravity sewer lines may be subject to deflection testing. Deflection testing shall be performed after backfilling and compaction is completed and placing of base material is completed. The City will supply to the Contractor a mandrel allowing a maximum deflection of seven and one-half (7-1/2) percent.

If requested, the Contractor shall supply rope and shall pass the mandrel through all sections of pipe in the presence of a City Wastewater Collection Division representative. If the mandrel does not pass through a section of pipe, deflection shall be corrected and the line shall be re-tested after backfilling and compaction.

S1701-1 VISIBLE LEAKS

All visible leaks shall be eliminated regardless of amount of flow.

S1701-2 TELEVISION INSPECTION

Television inspection is mandatory and required on all gravity sewer mains and shall be provided by the Contractor. Only pan and tilt type cameras, equipped with depth gauge in one-half (½) inch increments, will be allowed for sewer main inspection. Camera shall stop at each lateral connection and give full radial view of part of inspection. A written report and a DVD of the inspection with audible description of run, direction, location and description of any defect or abnormality shall be provided to the City at the time of inspection. The video shall incorporate City-issued manhole UID numbers provided to Engineer during plan review process. An inspection video that does not reference the City-issued manhole UID numbers will not be accepted. This shall be a color video with good clarity. No black and white or poor quality videos will be accepted. A leakage and/or deflection test may be waived by the City on runs which have been televised and show no defects. It is required that television inspection be completed after road base stabilization and prior to rock base and/or asphalt for gravity mains installed under pavement. Television inspections can be completed after final compacted grade for gravity mains installed within easements.

All benches and inverts shall be installed prior to the televised inspection. Television inspection is to be scheduled minimum two (2) working days in advance so City of Melbourne Wastewater Collection Division representative can be present. Otherwise television inspection will be invalid.

Prior to televised work all main lines must be cleaned with a high velocity sewer cleaner. The down stream line must be plugged. A vacuum system must be in use while cleaning is in progress. All debris must be removed prior to plug release. In the presence of a Wastewater Collection Division representative, the gravity mains to be televised shall be flow charged with twenty (20) gallons of fresh water and allowed to gravity drain past the point of inspection for a period of five (5) minutes. Televising of gravity main shall

commence immediately after the five (5) minute period allowed for draining. Maximum depth of any water left in gravity sewer main shall not exceed a one-half (½) inch.

S1702 FORCE MAIN CLEANING AND FLUSHING

All new force mains, four (4) inches in diameter and larger, shall be flushed and cleaned to remove all dirt, sand and other foreign matter in conjunction with the initial filling.

The force main shall be cleaned with a polyurethane foam swabbing device, of an appropriate density (2 lbs/ft^3) for the pipeline to be cleaned, so as not to damage the interior lining of the pipeline. Swabbing access and egress points shall be installed by the Contractor and left in place; and are subject to same pressure and restraint requirements as force main pipe.

The Contractor shall insert swab complete with rear polyurethane drive seal, into the first section of pipe through the access point. The swab shall remain there until the pipeline construction is completed.

Cleaning shall be accomplished by propelling the swab down the pipeline to the egress 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

S1703 FORCE MAIN TESTING

All newly installed force main pipe which has been backfilled shall be cleared and hydrostatically tested at a gauge pressure of one hundred fifty (150) psi a minimum of two (2) hours as per Section S1703-1. A leakage test shall be conducted during the hydrostatic test.

S1703-1 HYDROSTATIC TEST PROCEDURE

Construction of all connections involving restrained joints 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 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 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 Operation Division or 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 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 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.

S1703-2 LEAKAGE TEST

The test procedures of ANSI/AWWA C600-93, Section 4, shall be observed. Leakage for D.I.P. during the test shall not exceed the allowable leakage specified in ANSI/AWWA C600-93, Section 4, 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 Pipe (in.)

P = Average test pressure (psi) during leak test

S1704 MANHOLE INSPECTION AND TESTING

No visible leakage in the manhole or at pipe connections will be permitted. All benches and inverts shall be installed prior to the televised inspection. All manholes shall be inspected by the City prior to acceptance.

Manholes may also be vacuum tested at the discretion of the City if a potential and/or real problem is noted by the City but is not addressed by the Contractor. The vacuum test shall pass if the vacuum remains at 10" Hg. Or drops to 9" Hg. In a time greater than one minute. If the manhole fails the initial test, the Contractor shall locate the leak and make proper repairs.

A spark test shall be conducted on protective coating to determine appropriate thickness and coating integrity.

All manholes failing to meet specifications, whether through visual inspection, vacuum or spark test shall be reconstructed or replaced by the Contractor.

Pressure grouting of manholes may be allowed on a case-by-case basis at the discretion of the City.

S1800 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.

S1900 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 Dawings 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) horizontal ties and one (1) vertical tie to all manholes, sewer lateral/main wyes, sewer lateral terminations, force main valves, and all force main fittings that delineate change of either horizontal and or vertical direction. These ties are to be from permanent point such as property corners, curbs, pavement intersections etc. An acceptable station and offset system may also be utilized.
- 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 wastewater main at lowest point of crossing and whether wastewater main crosses over or under utility in conflict.
- Type of wastewater 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 wastewater main.
- Distance from manhole to manhole and distance from downstream manhole to each sewer lateral/main wye. Finished invert and manhole rim elevations in addition to sewer lateral terminating end elevations.
- Manholes labeled with City-issued GIS number.
- 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.

S2000 REQUIREMENTS FOR SCHEDULING PRE-FINAL INSPECTION

There are several criteria that projects must meet prior to the City scheduling a pre-final inspection for any development project or wastewater collection system 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 pressure test on new sewer force main lines. If the lines do not pass the test, the project is not ready for an inspection. In addition, the video inspection of the gravity sewer must be received and approved by the Wastewater Collection Division.
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 S2000-1 will be checked.

TABLE S2000-1		
WASTEWATER COLLECTION PRE-FINAL PUNCH LIST		√
Service Laterals		
1	Electronic 3M ball markers strapped to pipe as specified. (This will be spot-checked.)	
2	4 inch x 4 inch x 8 foot pressure treated post at end of lateral	
3	Depth of lateral	
4	"S" etched on curb and painted green	
5	Lateral termination at property/R.O.W. line	

6	Proper plug used for clean outs and set flush with grade	
7	Clean outs under pavement installed in proper box identified with a “S” stamped on lid with 24 inch x 24 inch x 8 inch concrete pad	
Manholes		
8	Ring and lid specified O.R.S. type with proper labeling	
9	Manhole must not show any leakage	
10	Epoxy coating, where required, properly installed	
11	Manhole interior properly coated	
12	Invert constructed at proper grade	
13	Adjustment brick grouted and coated	
14	Manhole ring and cover even with grade of asphalt	
Force Mains		
15	All valve boxes clear of debris and centered over operating nut. Operating nut will be checked for proper depth.	
16	All valves operate smoothly and have correct direction of opening.	
17	All valves constructed outside of asphalt have properly constructed 24 inch x 24 inch x 8 inch concrete valve box pad	
18	All valve box lids identified as "sewer" and painted green.	
19	All valves identified with a "V" etched on nearest curb with the point facing valve and “V” painted green.	
20	All boxes two-piece telescopic and adjustable. (No "riser" pipes will be acceptable).	
21	Bronze marking disc with appropriate nomenclature installed on concrete pad on valves 2 inch and larger.	
22	Discharge end at manhole at 180° of invert outfall pipe	
23	Electronic markers installed every 100 feet and on all valves, fittings and directional changes.	
24	Tracing wire properly terminated in valve boxes, capable of extending 12 inches above grade and tested for continuity	
25	Air valves properly installed per construction detail	

City Wastewater Collection Division shall inspect private sanitary sewer systems from building clean out to City’s point-of-acceptance during pre-final inspection.

S2100 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 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 S2100-1		
WASTEWATER COLLECTION MAINTENANCE BOND PUNCH LIST		√
1	Broken or missing cleanout plugs	
2	Broken or missing concrete cleanout pads	
3	Broken or missing valve box covers	
4	Broken or missing concrete valve box pads	
5	Settling over pipes and around manholes or cleanouts	
6	Missing O-Ring seals in manhole covers	
7	Broken or loose manhole rings	
8	Manhole leaks and deteriorated shelves	
9	Trim manhole seams	
10	Manhole interior liner or coating peeling, cracking or fading	
11	Large amounts of dirt in manholes or pipes	
12	Holding water in manholes or pipes	

Technical Specifications and Standards for Wastewater Collections Appendix A- Technical Detail Drawings

Latest Revision 07/01/2016

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

Wastewater Collection Details

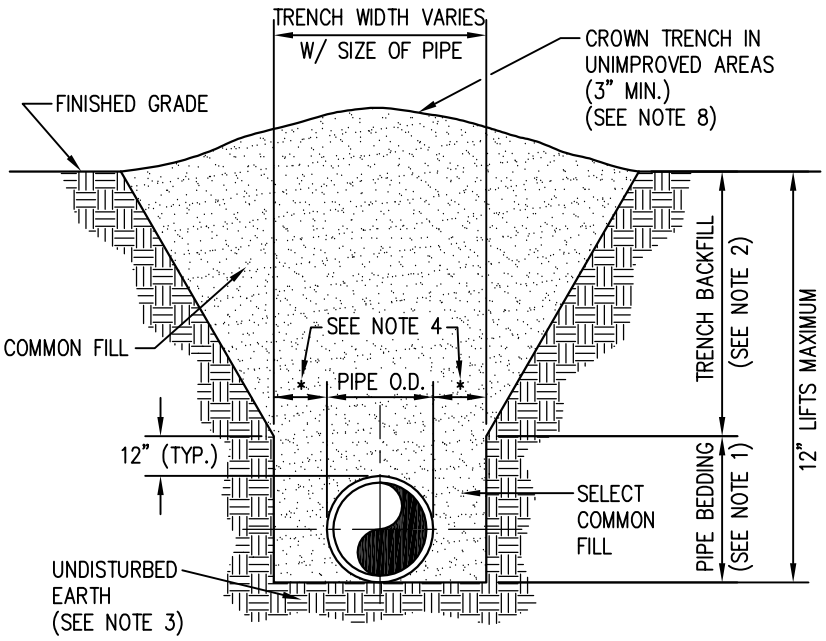
A-400 Dissimilar Pipe Connector (Typical)
A-401 Sewer Cleanout-Traffic
A-402 Sewer Cleanout-Non-Traffic
A-403 Sanitary Service Connection Detail
A-404 Standard Sanitary Manhole Detail
A-405 Manhole Connection Details
A-406 Shallow Sanitary Manhole Details
A-407 Large Manhole Ring & Cover Details
A-408 FDOT Manhole Ring & Cover Details
A-409 Residential Manhole Ring & Cover Details
A-410 Sanitary Sewer Lateral Saddle Connection to Existing C.I.P.P.
A-411 Standard Sewer Excavated Point Repair for Clay and PVC
A-412 Standard Sewer Excavated Point Repair for C.I.P.P.

General Details

PIPE BEDDING DETAILS TYPE "A" & "B"

CITY OF MELBOURNE
UTILITIES ADMINISTRATION

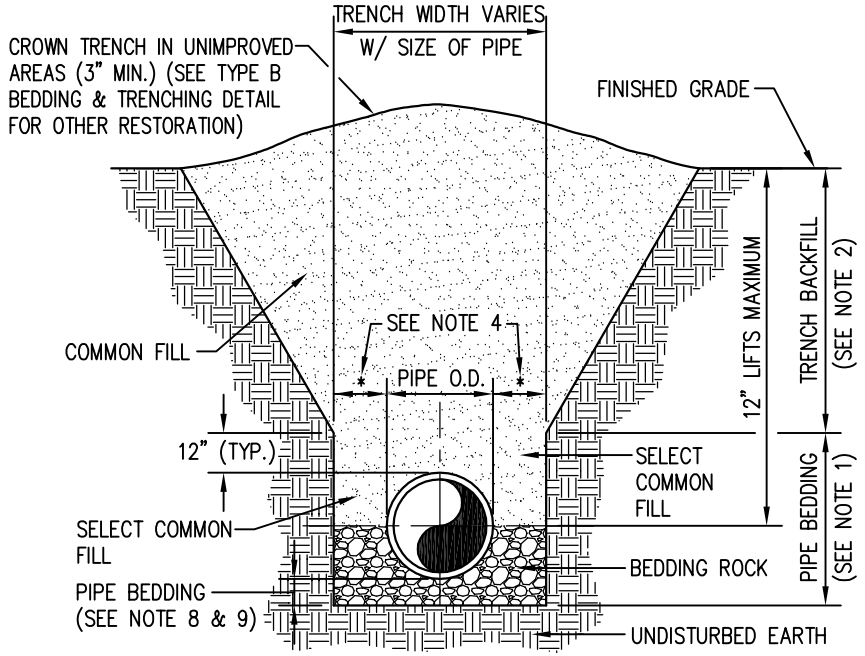
REV:	DATE:	DRAWN BY:
	7/1/16	J.R.P.
REV: BY	JOB NO.:	DSGN. BY
		L.A.M.
SCALE:	DWG NO.:	
N.T.S.	A-100	



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 AS DIRECTED BY THE ENGINEER.
4. (*): 15" MAX. FOR PIPE DIAMETER LESS THAN 24", AND 24" MAX. FOR PIPE DIAMETER 24" AND LARGER.
5. WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
6. ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF THE FLOW FOR SEWERS.
7. REFER TO SPECIFICATIONS FOR SHEETING AND BRACING IN EXCAVATIONS.
8. FINAL RESTORATION IN IMPROVED AREAS SHALL BE IN COMPLIANCE WITH SPECIFICATIONS. ROAD SURFACE RESTORATION SHALL COMPLY WITH SPECIFICATIONS.

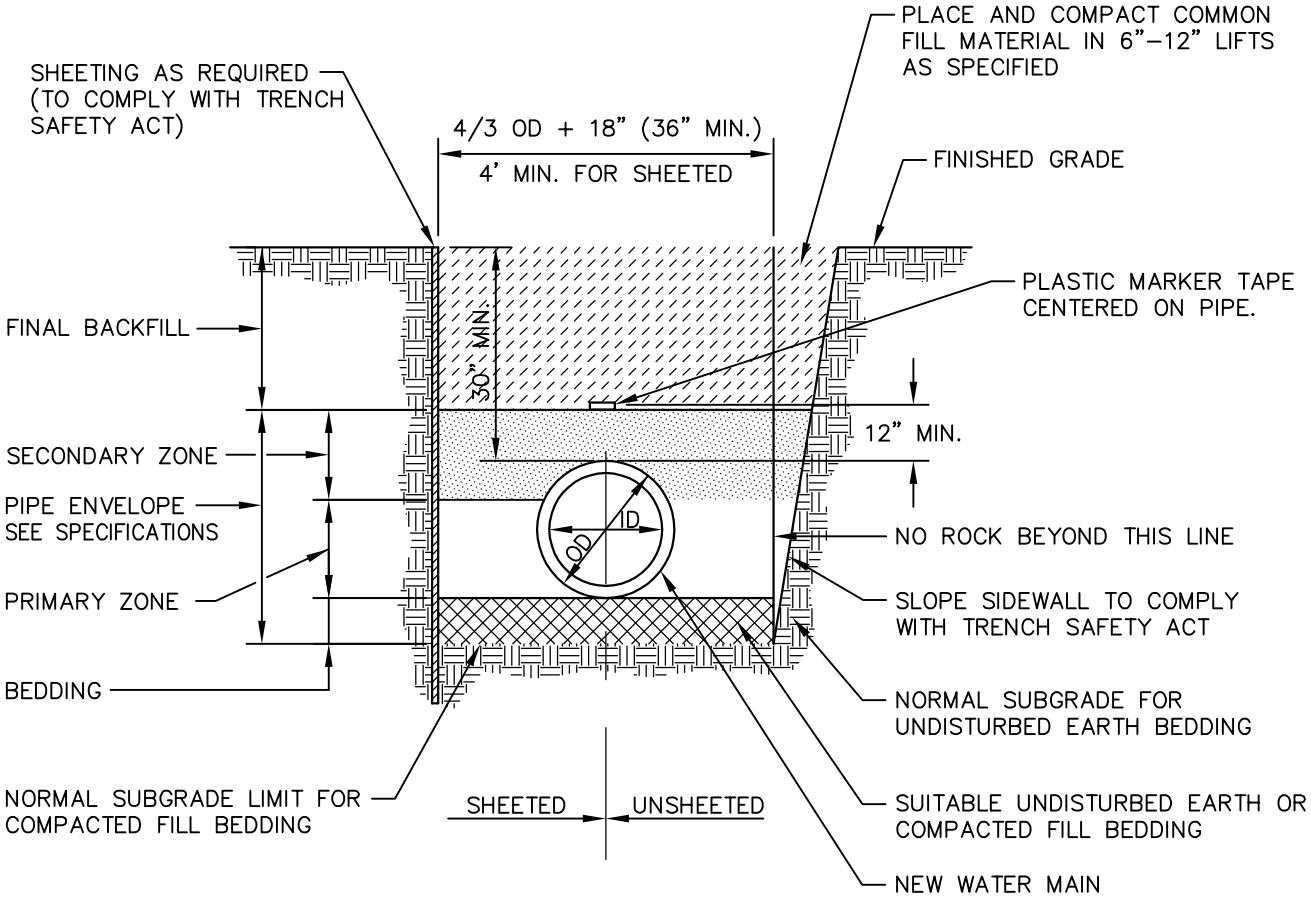
DETAIL – TYPE B



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. USE TYPE "A" BEDDING TO BE DETERMINED IN THE FIELD AS DIRECTED BY THE ENGINEER.
4. (*): 15" MAX. FOR PIPE DIAMETER LESS THAN 24", AND 24" MAX. FOR PIPE DIAMETER 24" AND LARGER.
5. WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
6. ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF FLOW FOR SEWERS.
7. REFER TO SPECIFICATIONS FOR SHEETING AND BRACING IN EXCAVATIONS.
8. 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.
9. 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.

DETAIL – TYPE A



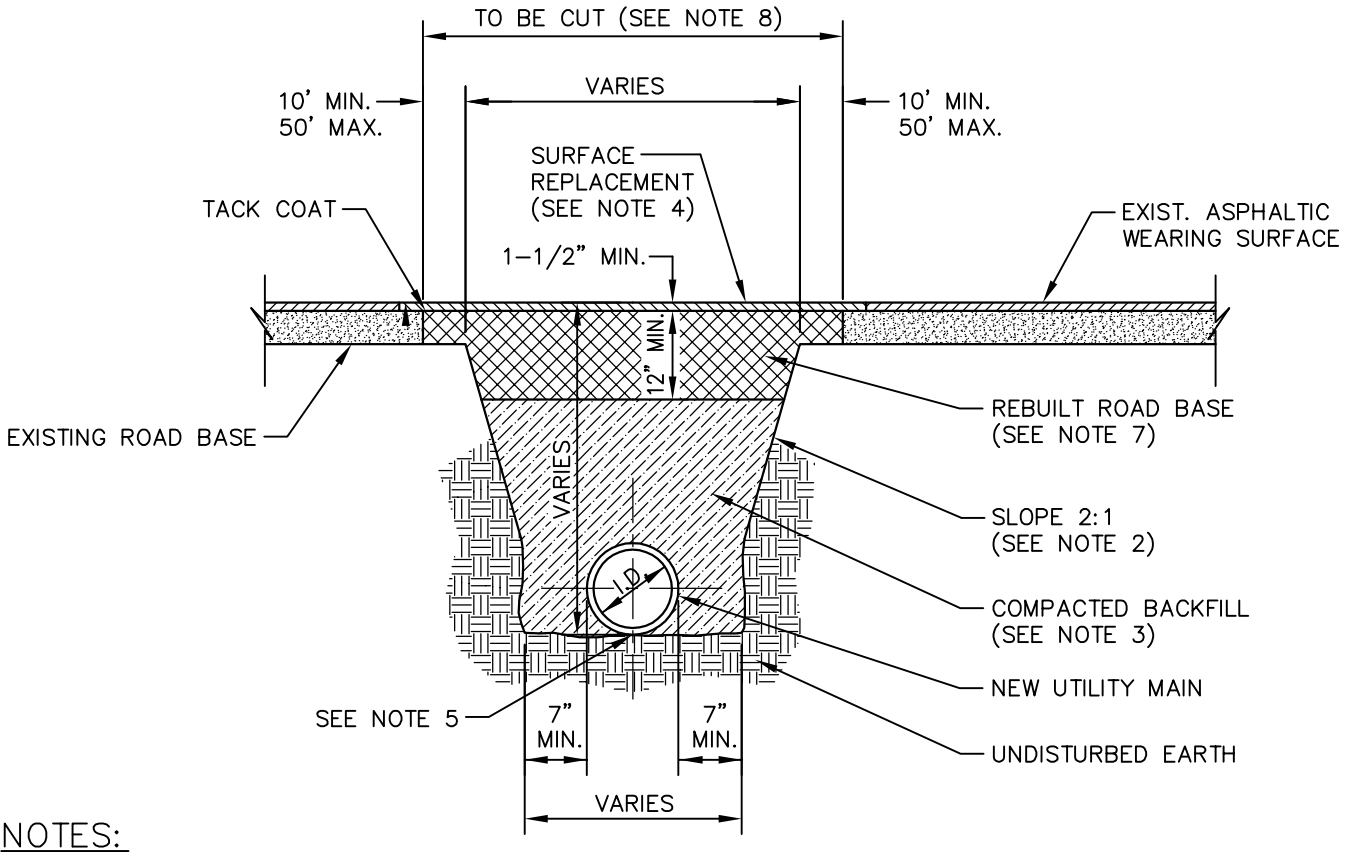
NOTES:

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



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

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.

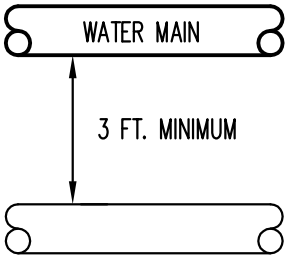
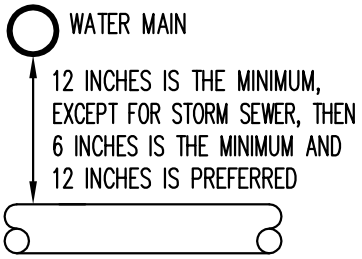
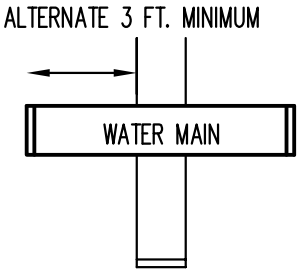
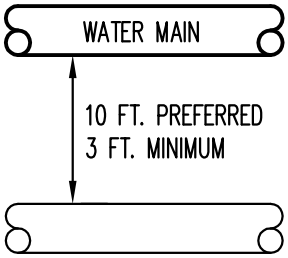
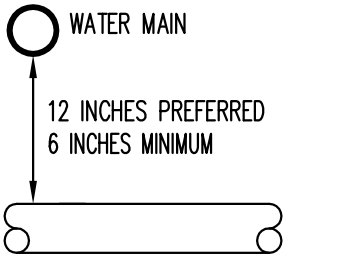
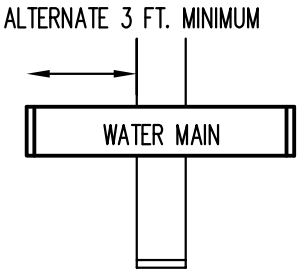
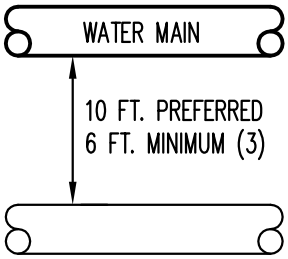
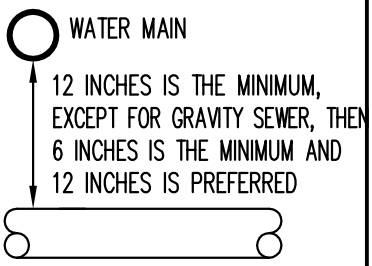
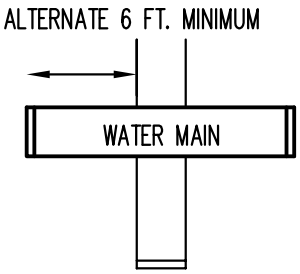
4. WHERE POTABLE WATER MAINS CROSS OVER WASTEWATER GRAVITY SEWER OR STORM SEWER, 6 INCH MINIMUM SEPARATION IS ACCEPTABLE, HOWEVER, 12 INCHES OF SEPARATION IS PREFERRED.

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		
DATE: 7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DRAWN BY: J.R.P.	DSGN. BY L.A.M.		DWG NO.: A-103

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)			
VACUUM SANITARY SEWER			
GRAVITY OR PRESSURE SANITARY SEWER, SANITARY SEWER FORCE MAIN RECLAIMED WATER (4)			
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.

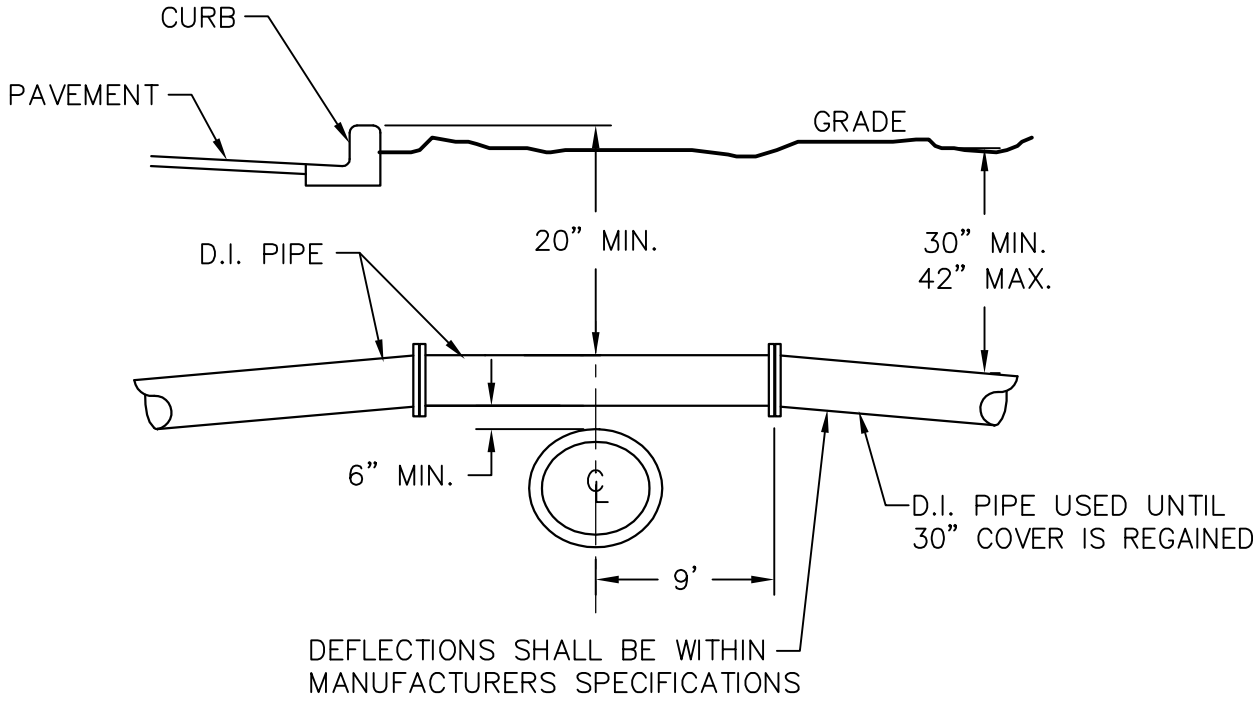
(2) RECLAIMED WATER REGULATED UNDER PART III OF CHAPTER 62-610, F.A.C.

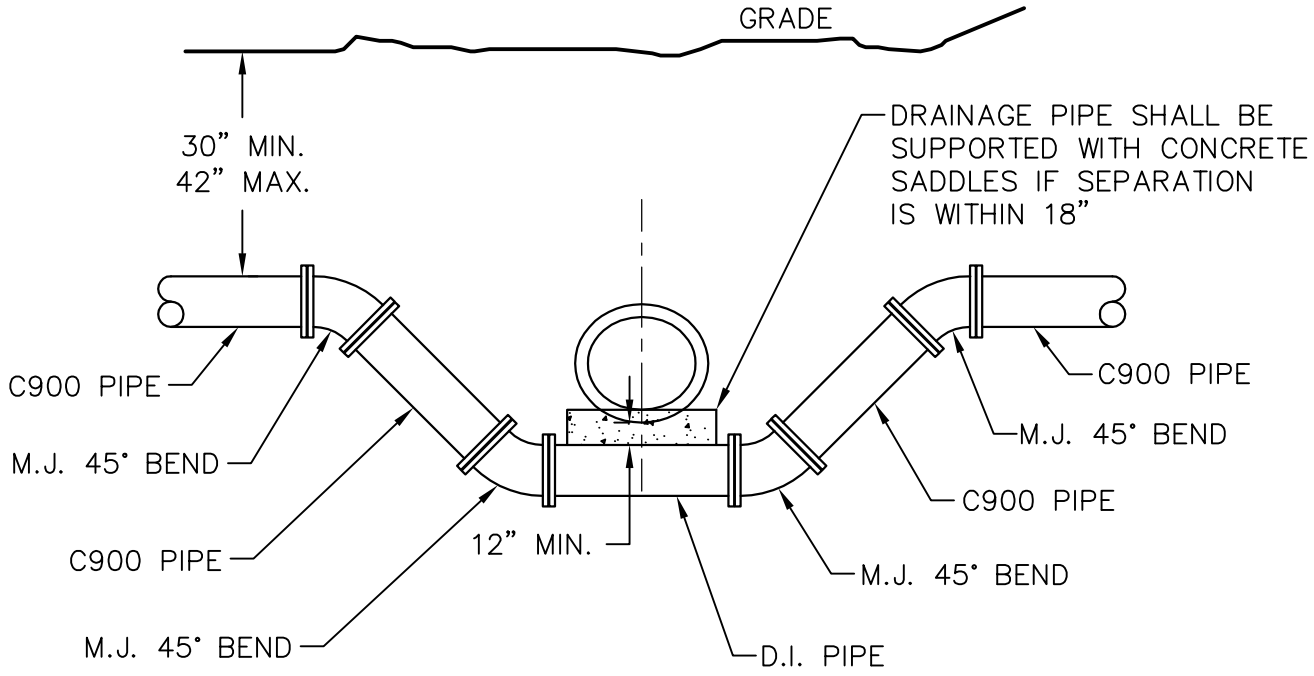
(3) 3 FT. FOR GRAVITY SANITARY SEWER WHERE THE BOTTOM OF THE WATER MAIN IS LAID AT LEAST 6 INCHES ABOVE THE TOP OF THE GRAVITY SANITARY SEWER

(4) RECLAIMED WATER NOT REGULATED UNDER PART III OF CHAPTER 62-610, F.A.C.

UTILITY PIPE MINIMUM SEPARATION REQUIREMENTS FIGURE

REV:	REV: BY		
DATE: 7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DRAWN BY: J.R.P.	DSGN. BY L.A.M.		DWG NO.: A-104



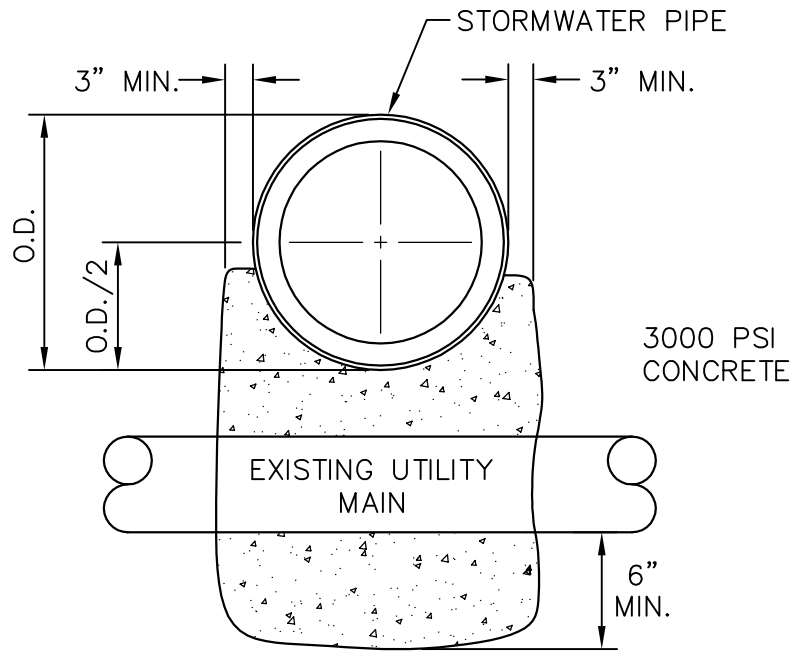


NOTE:

ALL JOINTS MECHANICALLY RESTRAINED

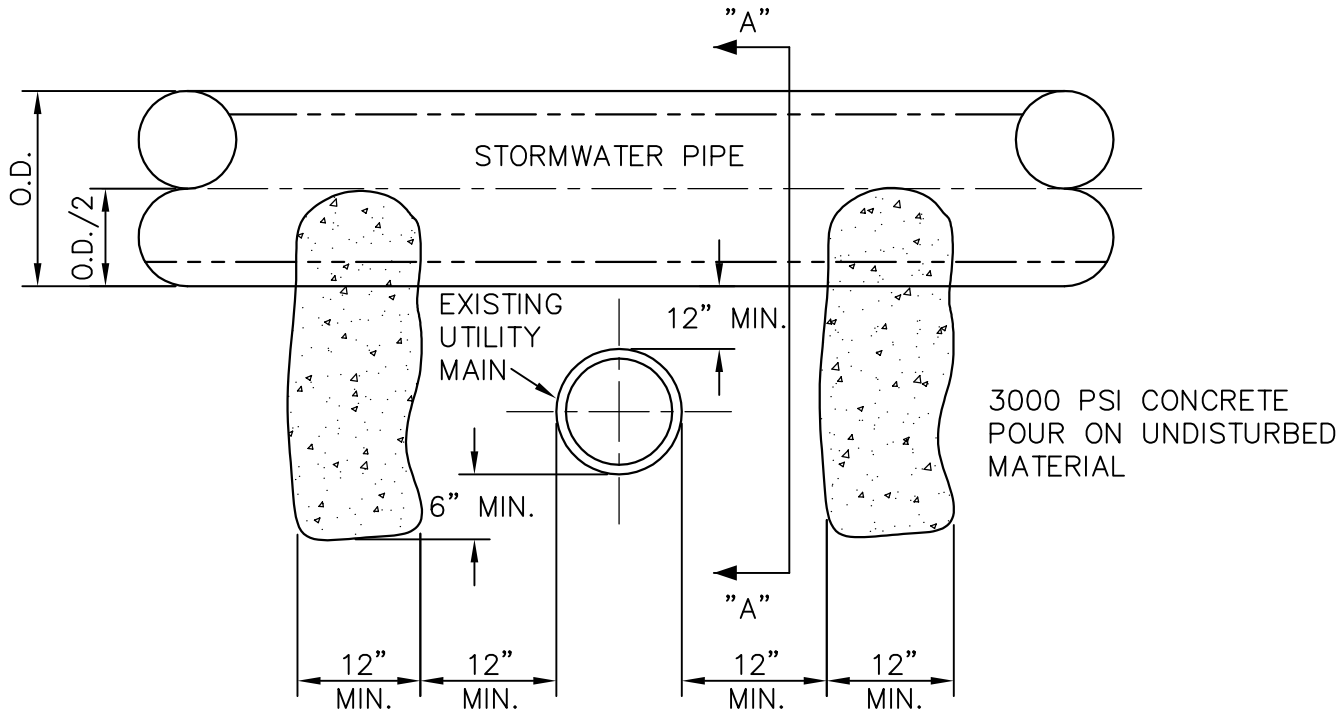
UTILITY CROSSINGS

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



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

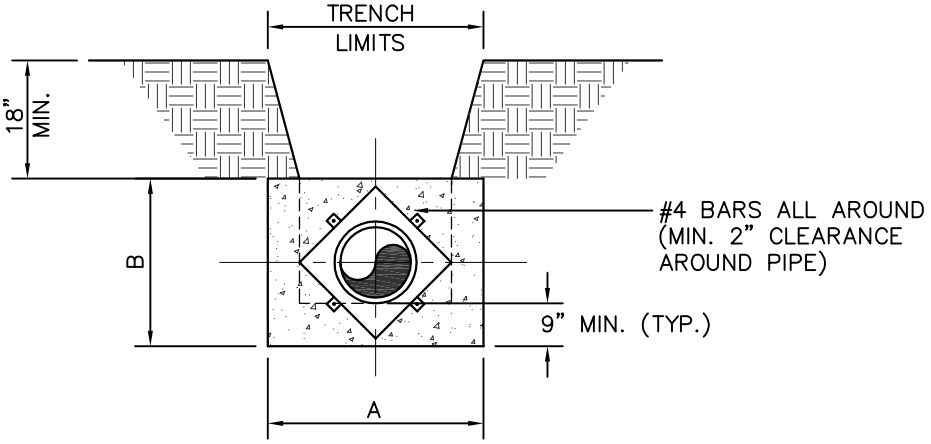
SECTION "A'

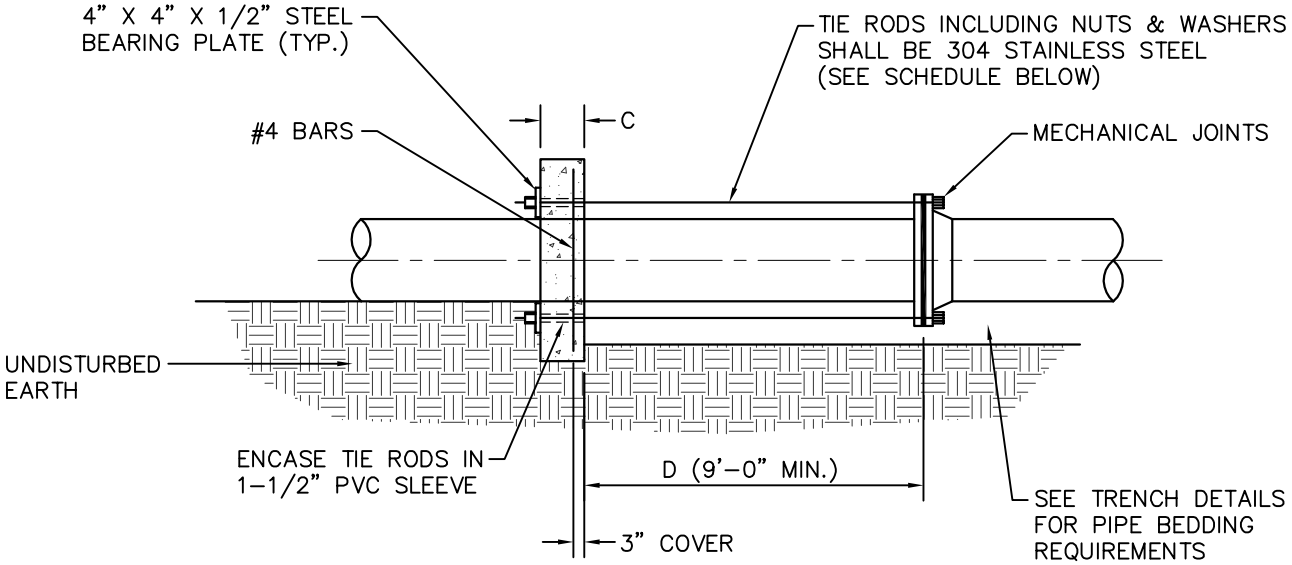


CONCRETE SADDLE SHALL NOT COME IN CONTACT WITH UTILITY MAIN.

TYPICAL CONCRETE SADDLE DETAIL

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





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.

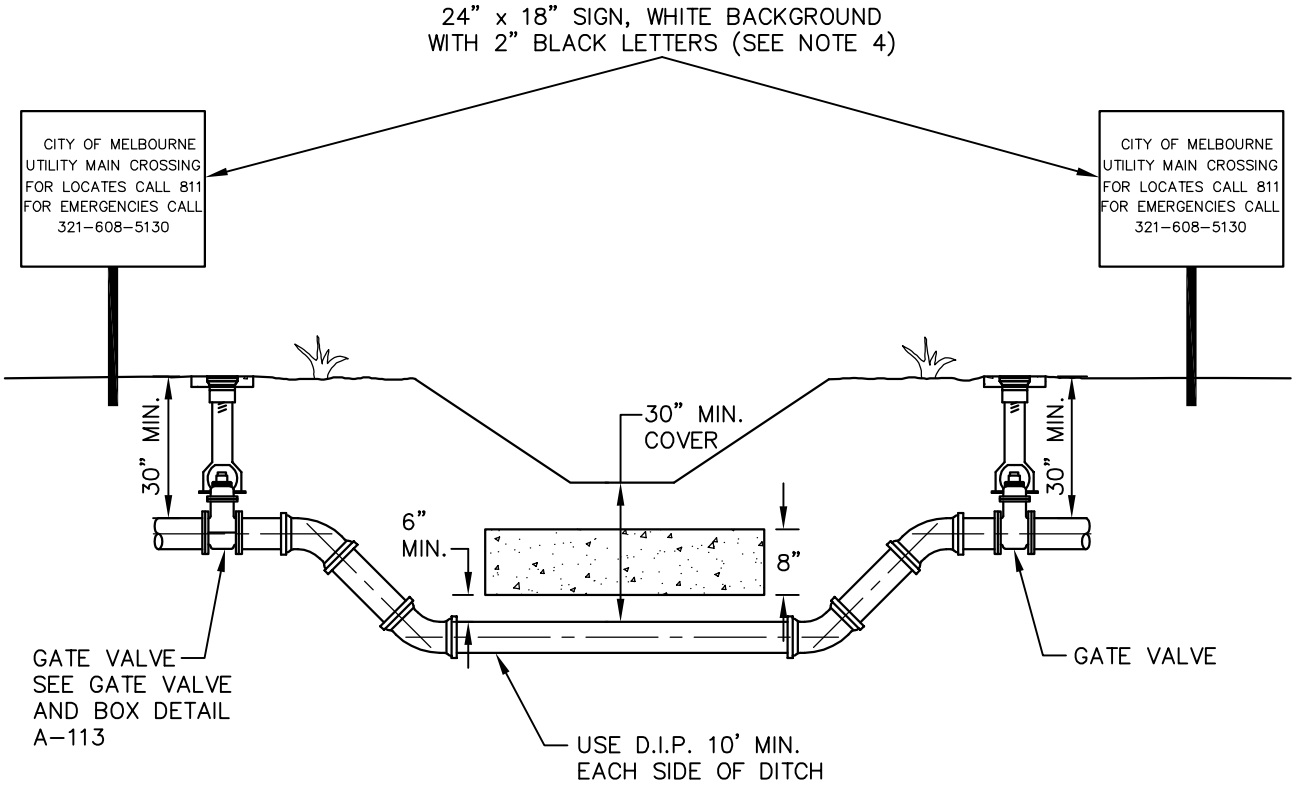
SCHEDULE OF DIMENSIONS AND MATERIALS

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



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..

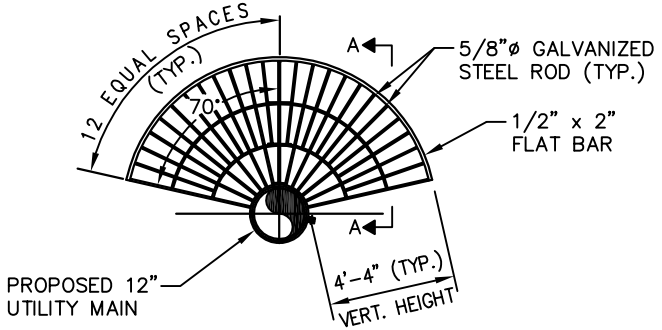
DITCH CROSSINGS

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

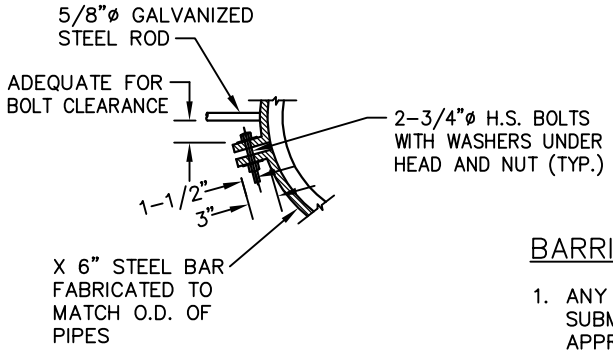
AERIAL PIPE CROSSING AND BARRICADE

CITY OF MELBOURNE
UTILITIES ADMINISTRATION

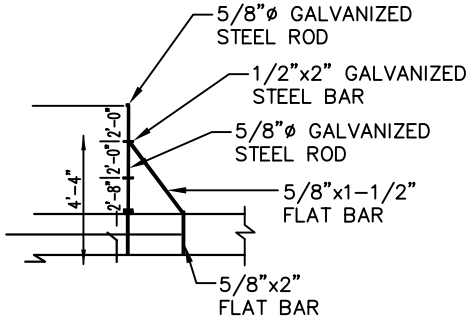
DRAWN BY:	DATE:	REV:
J.R.P.	7/1/16	
DSGN. BY	JOB NO.:	REV: BY
L.A.M.		
DWG NO.:	SCALE:	
A-109	N.T.S.	



PIPE BARRICADE



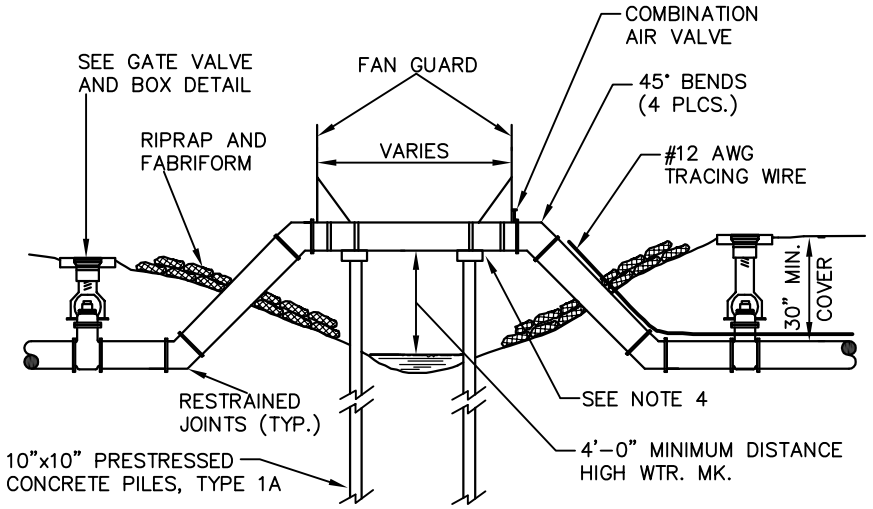
TIE DOWN



SECTION A-A

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.



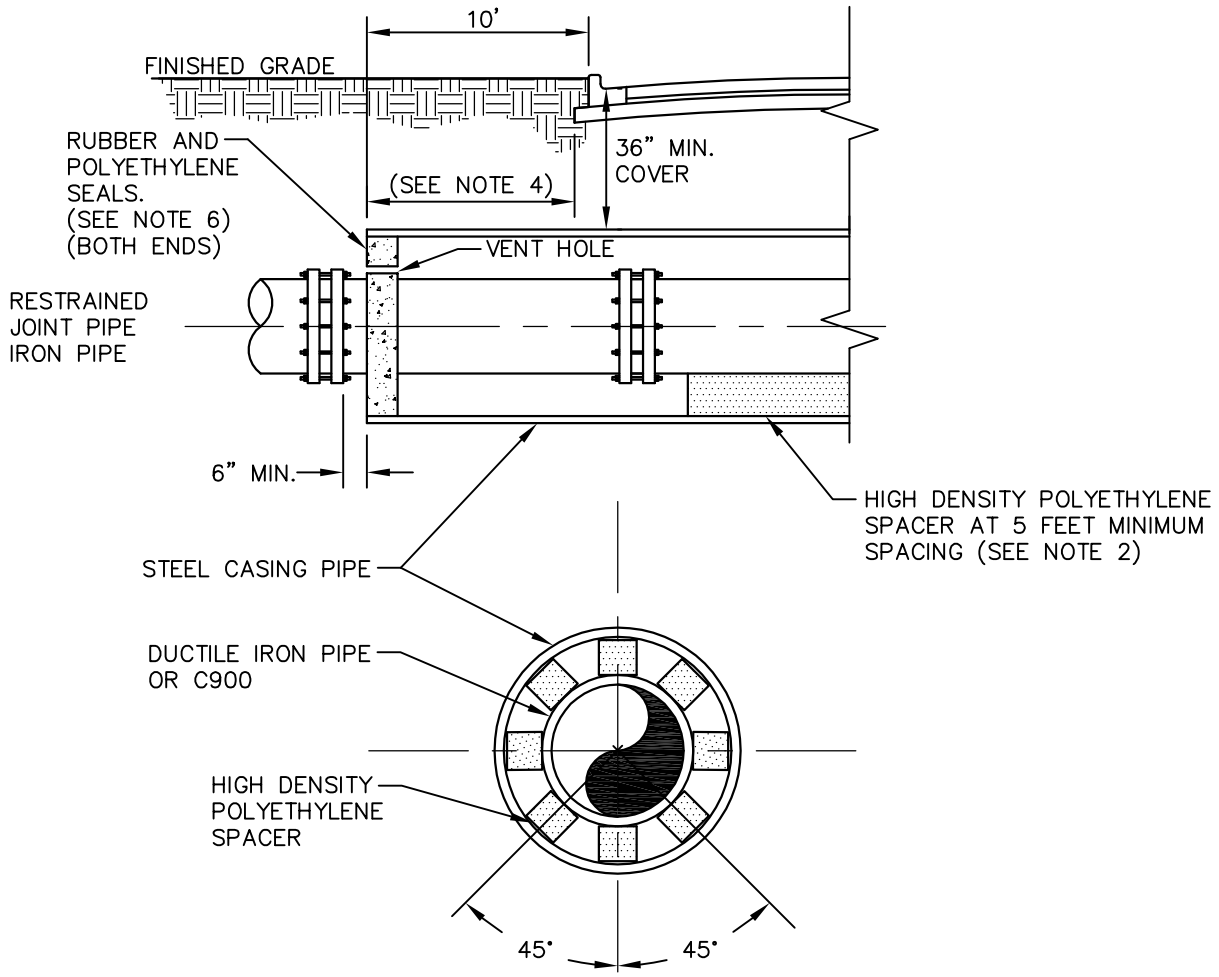
CROSSING NOTES:

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

PERSONNEL BARRICADE-FAN GUARD

NOT TO SCALE



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

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:

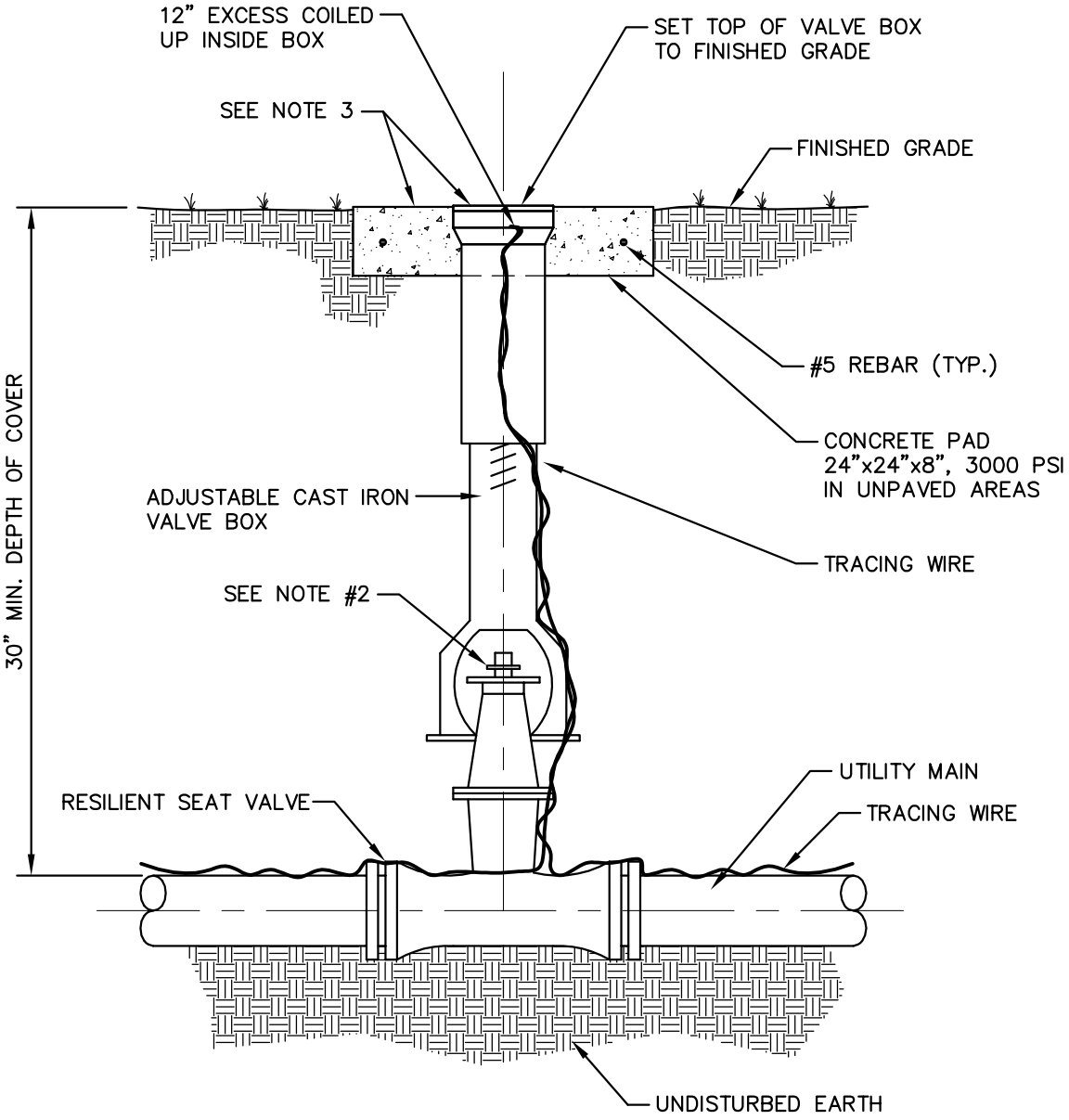
1. ALL FITTINGS SHALL BE RESTRAINED JOINT TYPE UNLESS OTHERWISE INDICATED.
2. INSTALL FULL LENGTH JOINTS WITH TOTAL LENGTH EQUAL TO, OR GREATER THAN THE LENGTH SHOWN IN THE TABLE.
3. WHERE TWO OR MORE FITTINGS ARE TOGETHER, USE FITTING WHICH YIELDS, GREATEST LENGTH OF RESTRAINED PIPE.
4. IN-LINE VALVES 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		
DATE: 7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DRAWN BY: J.R.P.	DSGN. BY L.A.M.		DWG NO.: A-112



PROFILE

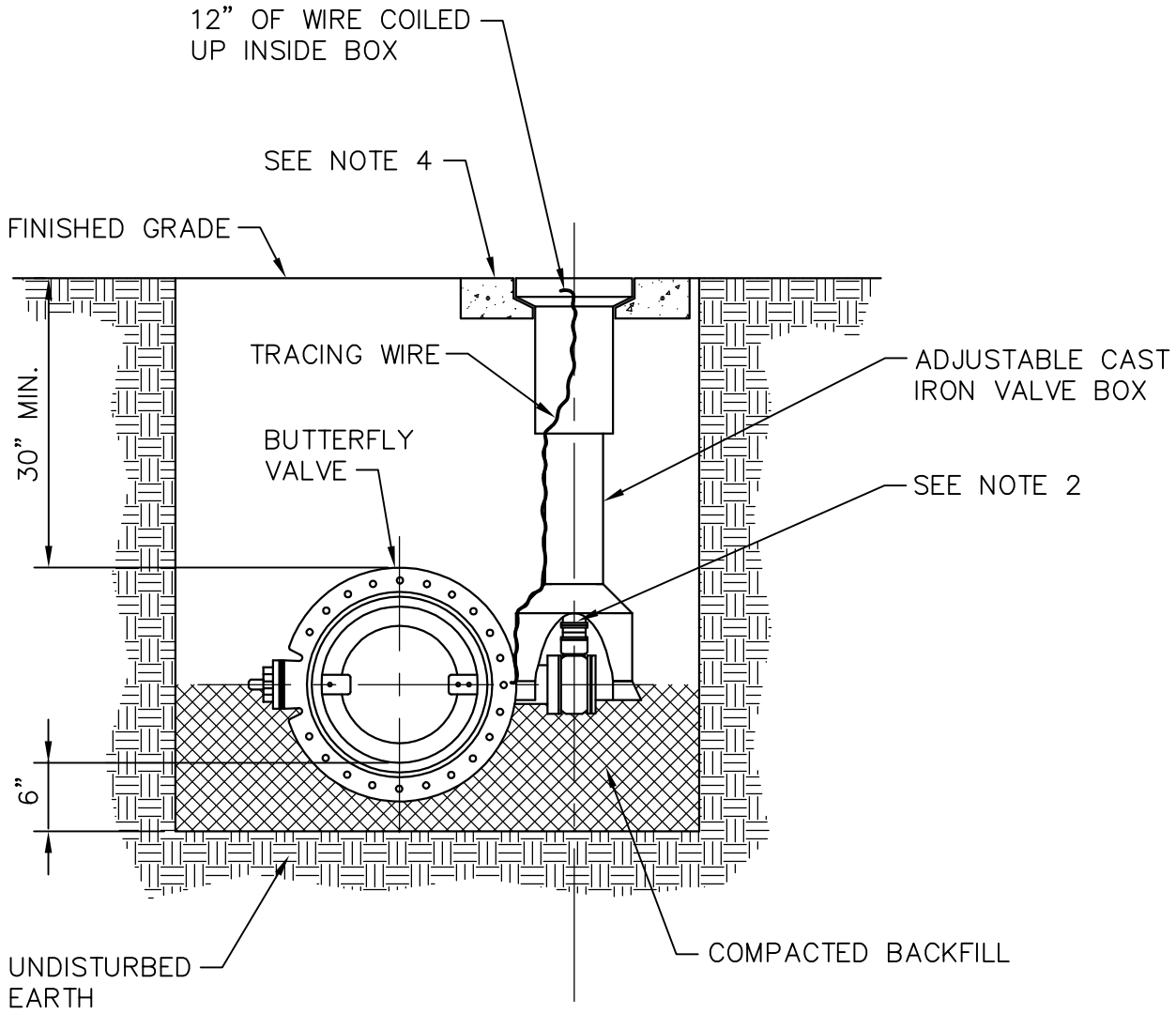
NOT TO SCALE

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

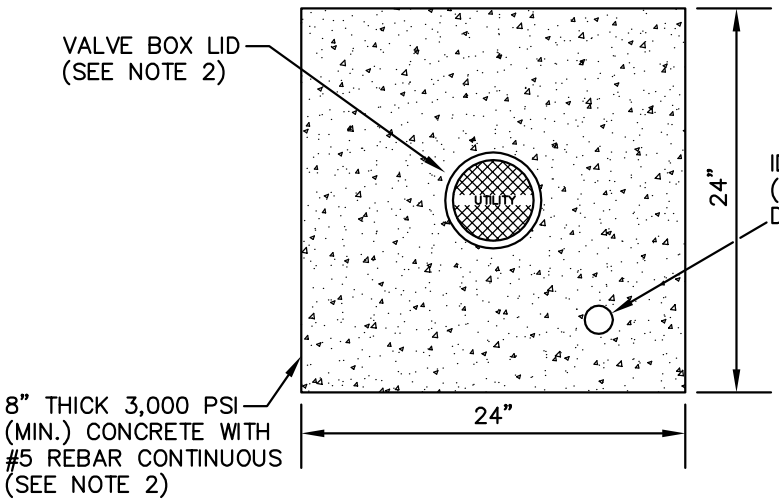


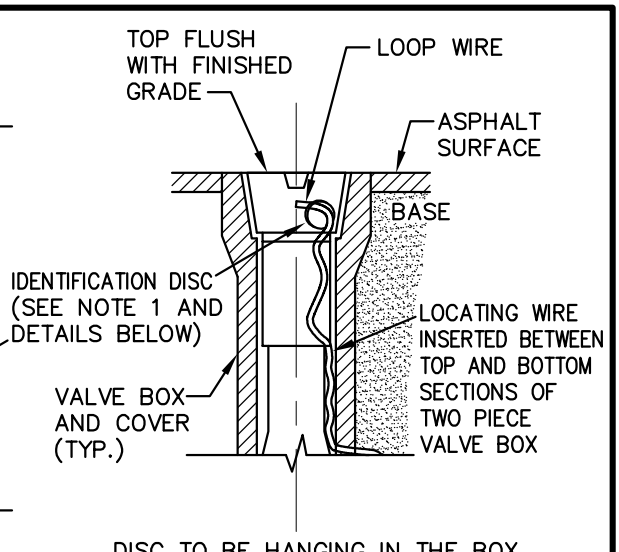
NOTES:

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: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	J.R.P.	DSGN. BY	L.A.M.	DWG NO.:	A–114



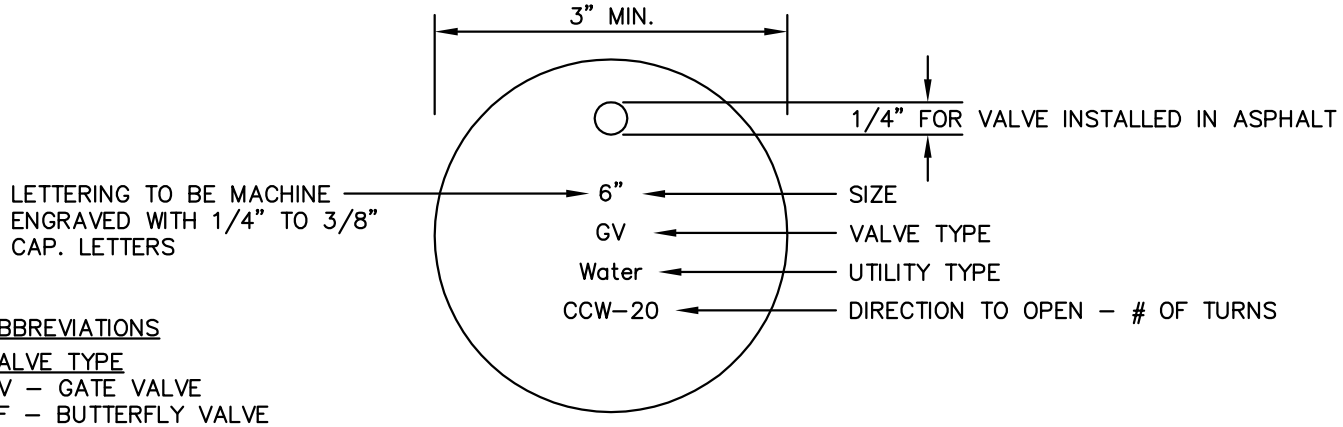


INSIDE PAVEMENT

NOT TO SCALE

OUTSIDE PAVEMENT

NOT TO SCALE



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

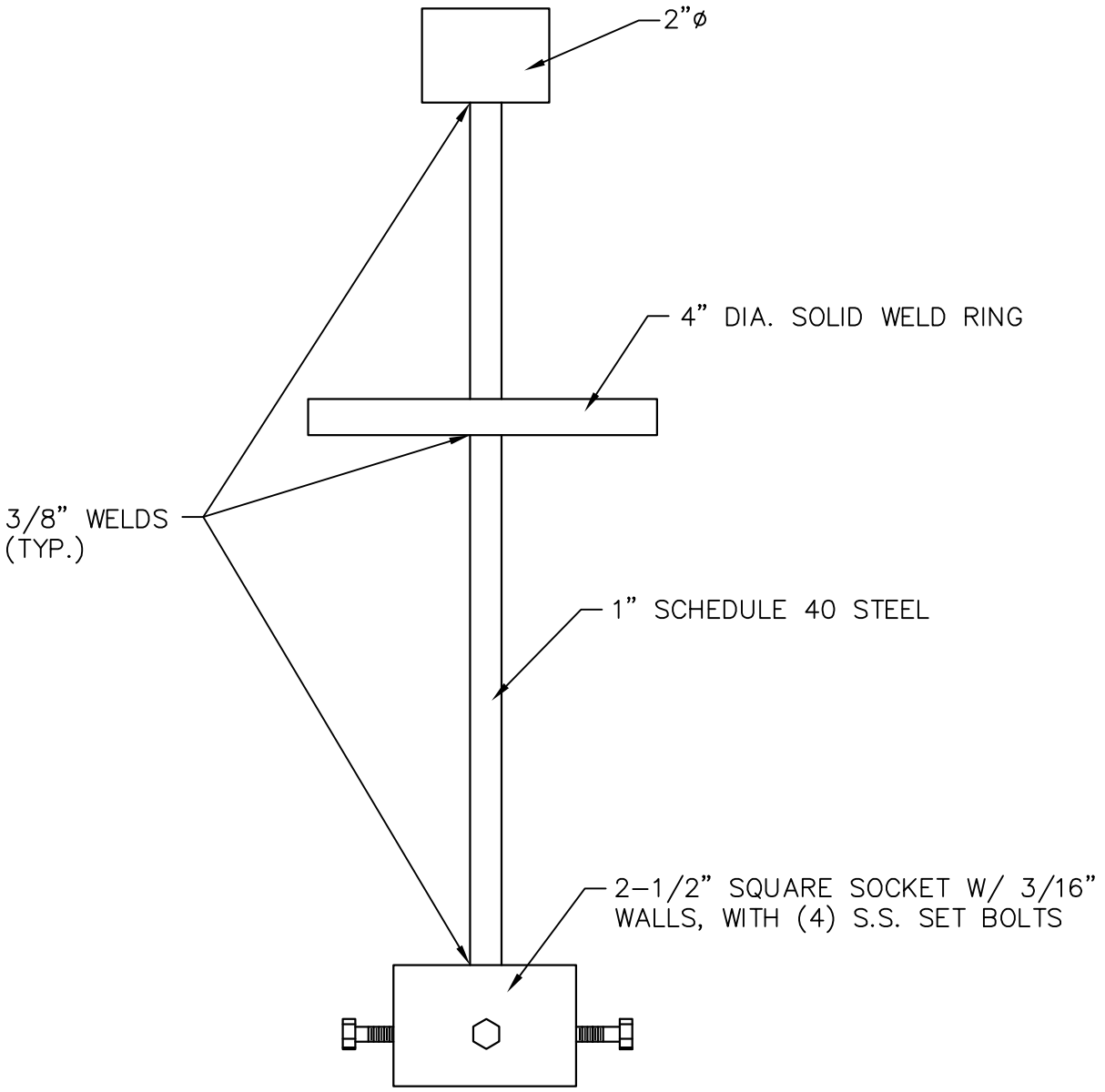
NOTES:

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

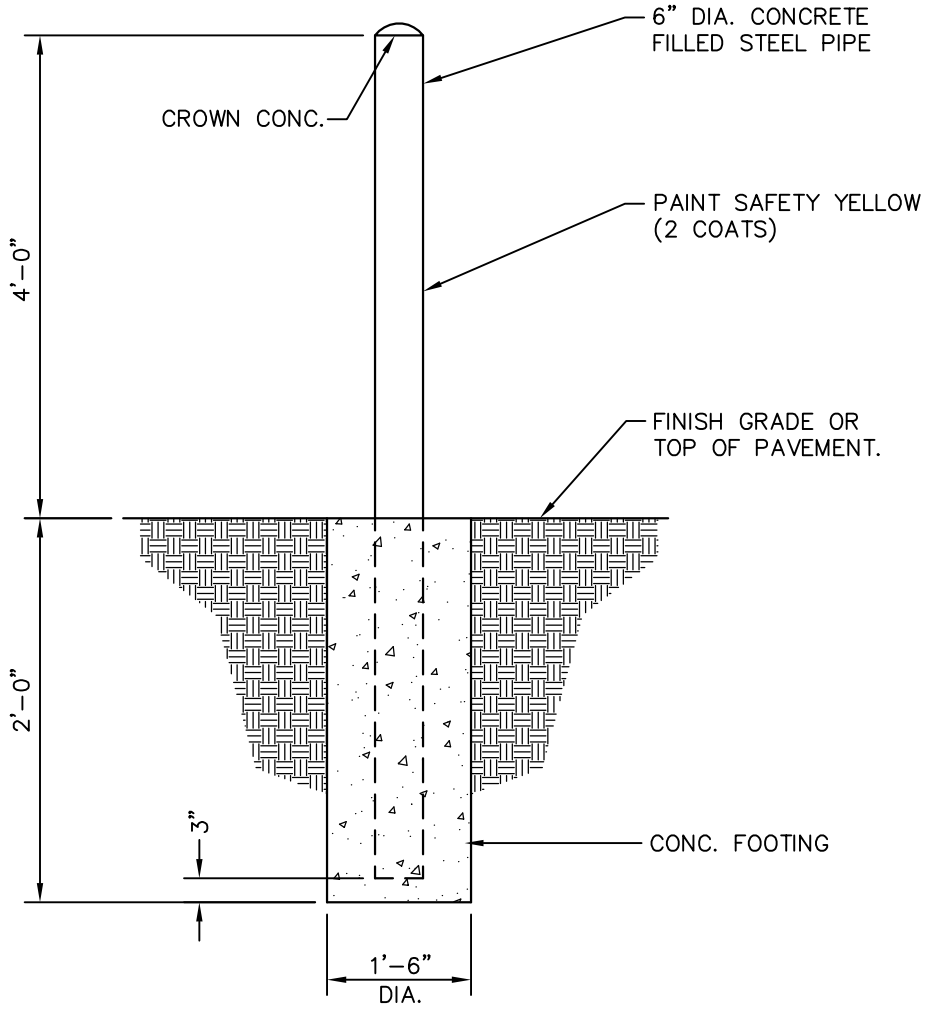
REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	J.R.P.	DSGN. BY	L.A.M.	DWG NO.:	A–115

VALVE EXTENSION



VALVE EXTENSION

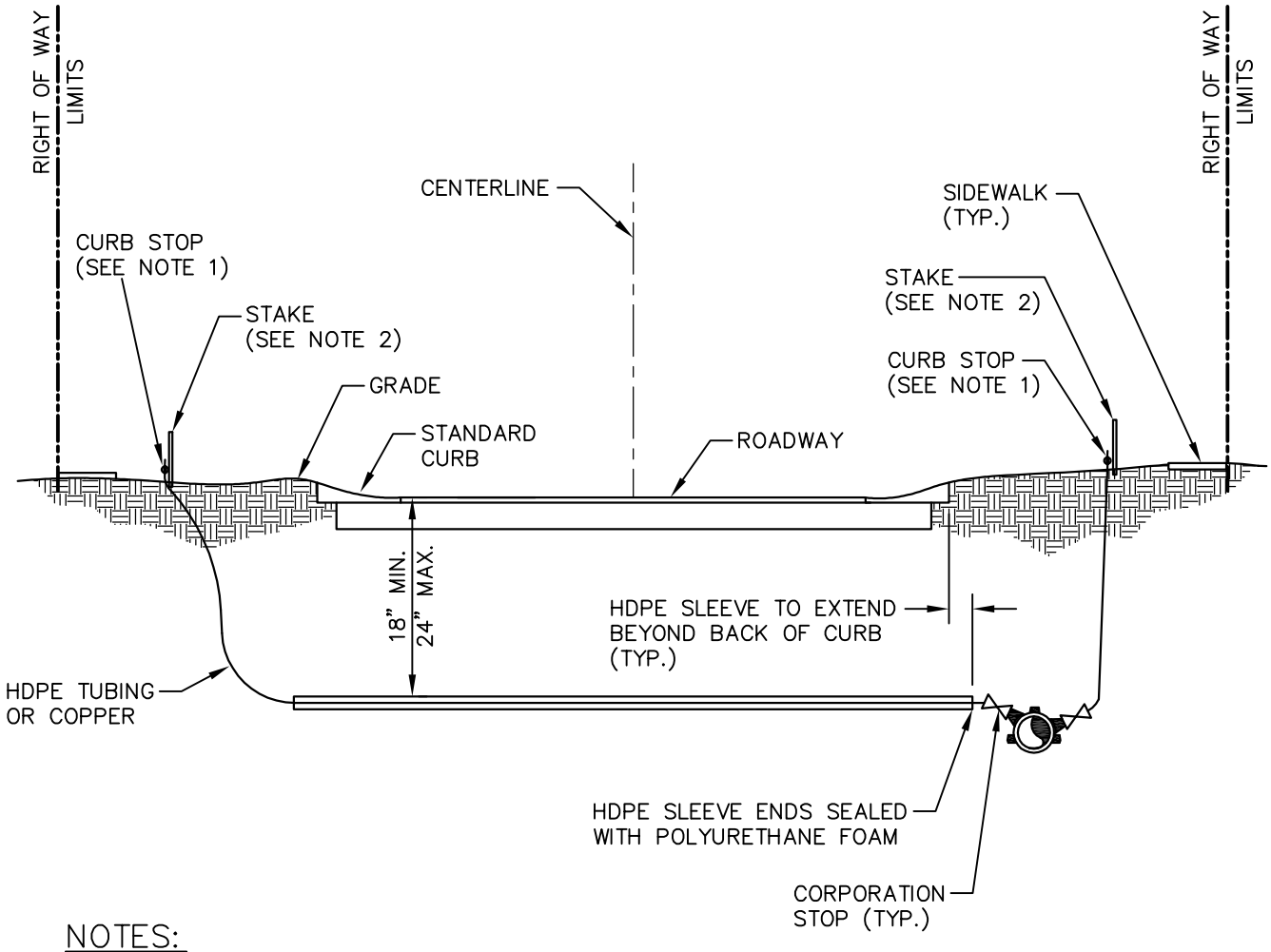
REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	J.R.P.	DSGN. BY	L.A.M.	DWG NO.:	A-116



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

BOLLARD DETAIL

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



NOTES:

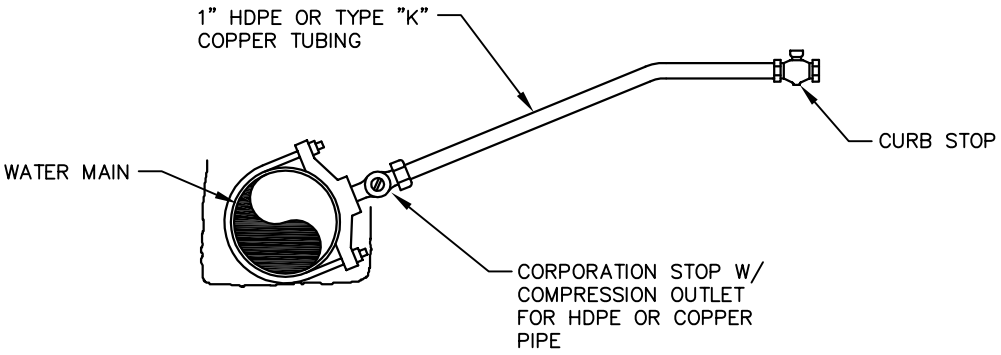
1. CURB STOP SHALL BE INSTALLED ON STREET SIDE OF THE SIDEWALK BETWEEN SIDEWALK AND CURB.
2. TEMPORARY MARKING OF SERVICE – ALL SERVICE LINE CURB STOP TERMINATIONS SHALL BE EXPOSED TO VIEW PRIOR TO AND DURING PRE–FINAL AND FINAL INSPECTION. SERVICE LINE SHALL BE ATTACHED BY MEANS OF TAPE TO A 2 INCH 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: BY		
DATE: 7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DRAWN BY: J.R.P.	DSGN. BY L.A.M.		DWG NO.: A–118

1" SERVICE TAP

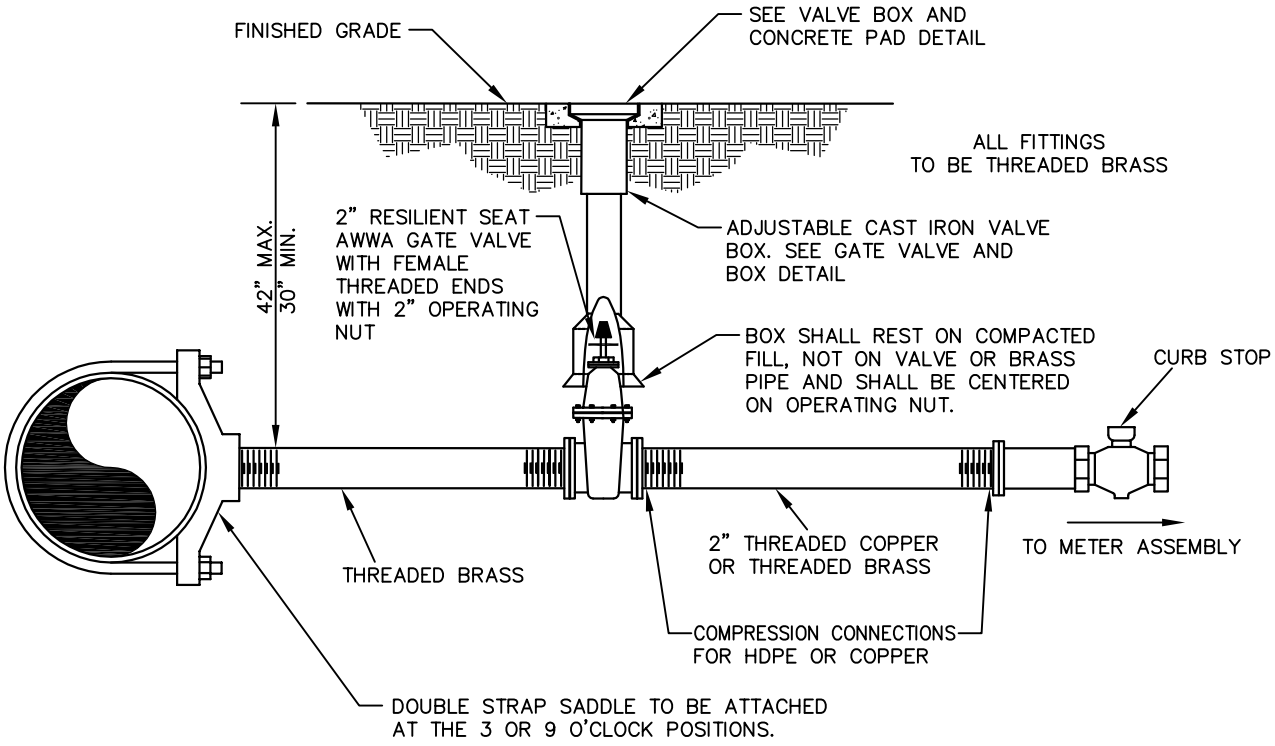


MAIN SIZE	OUTLET SIZE	SERVICE SADDLE
4"	1"	SINGLE STRAP
	2"	DOUBLE STRAP
6"	1"	SINGLE STRAP
	2"	DOUBLE STRAP
8" & LARGER	1"	SINGLE STRAP
	2"	DOUBLE STRAP

MAXIMUM SIZE OUTLET FOR USE WITH DOUBLE STRAP SERVICE CLAMP

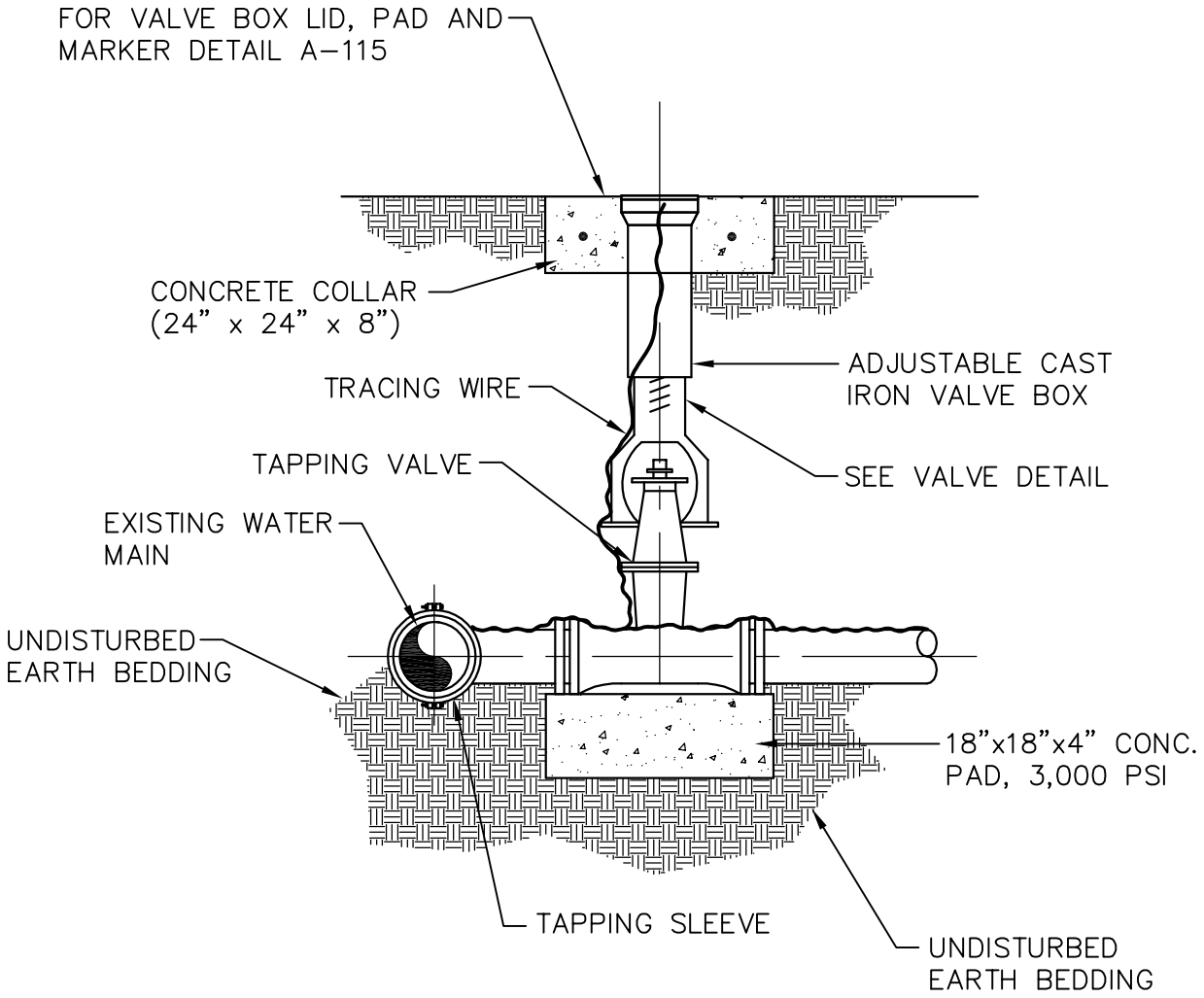
PIPE SIZE	OUTLET SIZE
4"	2"
6"	2"
8"	2"
10"	2"
12" & GREATER	2"

2" SERVICE TAP



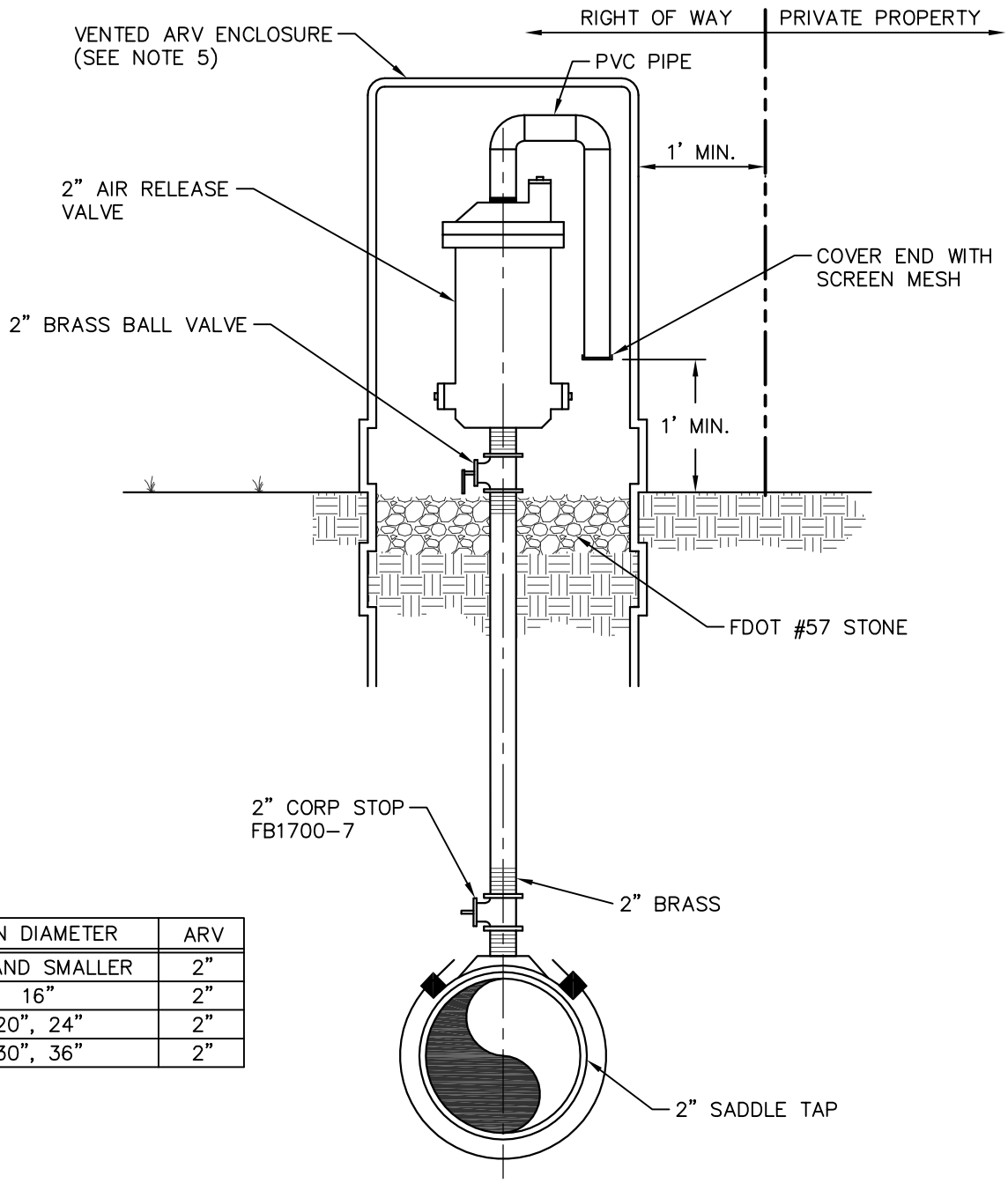
TYPICAL SERVICE SADDLE CONNECTION – POTABLE AND RECLAIMED

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



TYPICAL TAPPING SLEEVE SERVICE CONNECTION – POTABLE AND RECLAIMED

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



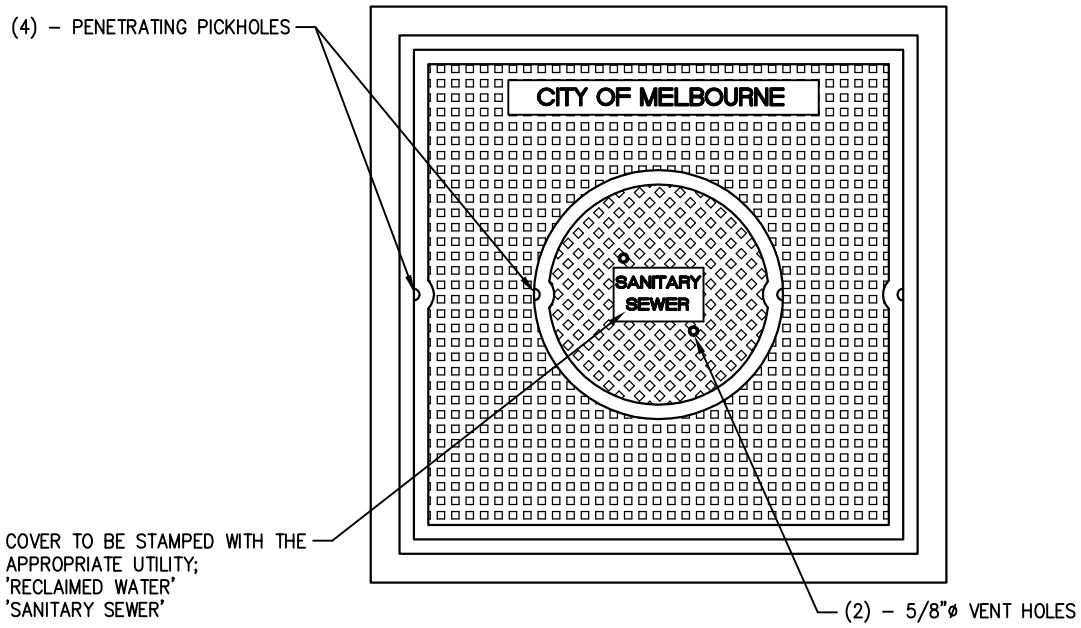
MAIN DIAMETER	ARV
12" AND SMALLER	2"
16"	2"
20", 24"	2"
30", 36"	2"

NOTES:

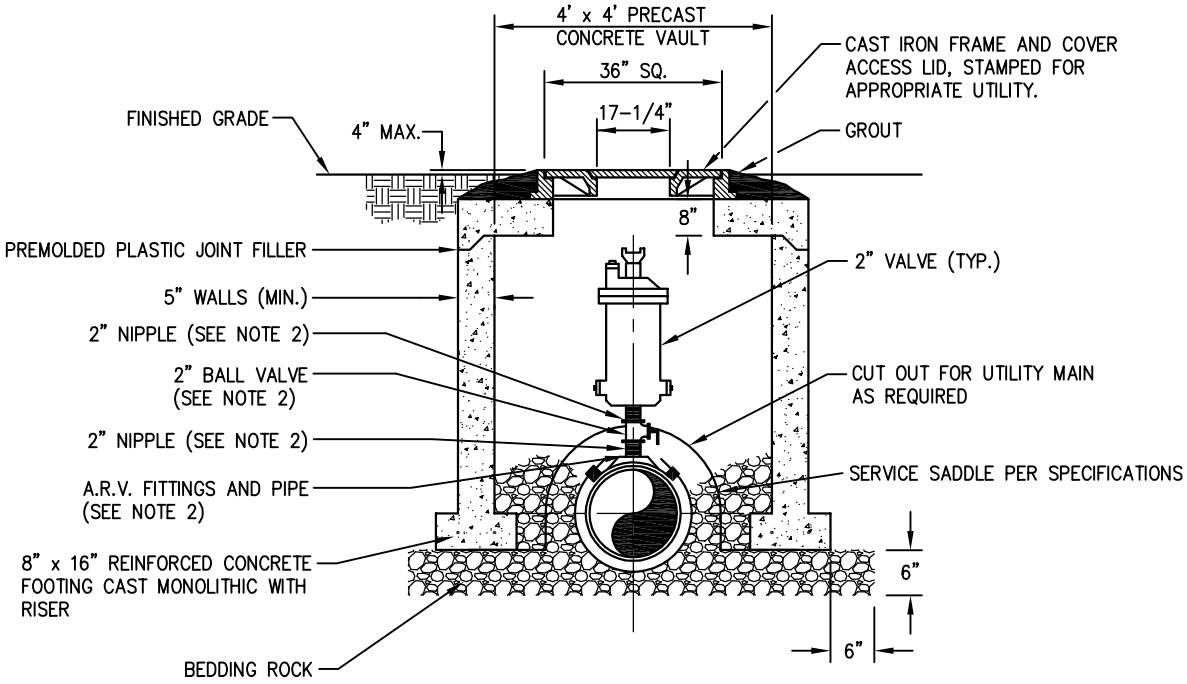
1. APPROVED FOR POTABLE AND RECLAIMED SYSTEMS ONLY.
2. ABOVE DETAIL APPLIES TO A 2" ARV. FOR LARGER ARVS, PIPE DIAMETER AND VALVES SHALL BE EQUAL TO THE SIZE OF THE ARV.
3. ALL PIPING, VALVES AND APPURTENANCES TO BE BRASS OR 316 S.S. EXCEPT WHERE SPECIFIED OTHERWISE.
4. THE ENCLOSURE VENTS MUST BE CAPABLE 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: BY		
DATE: 7/1/16		JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DRAWN BY: J.R.P.		DSGN. BY L.A.M.		DWG NO.: A-121



FRAME AND COVER DETAIL

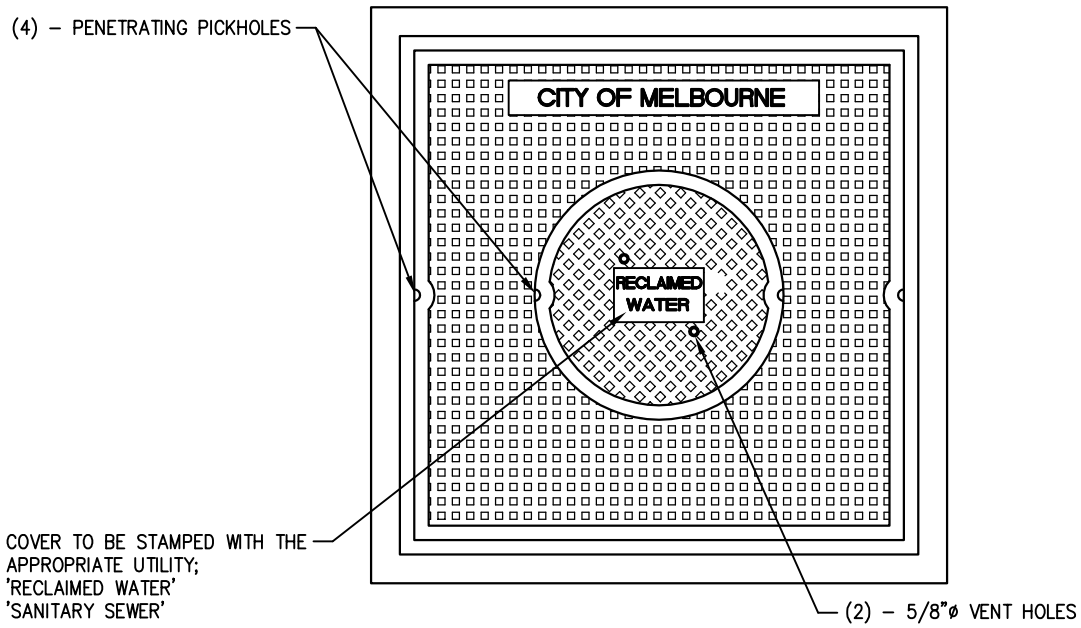


NOTES:

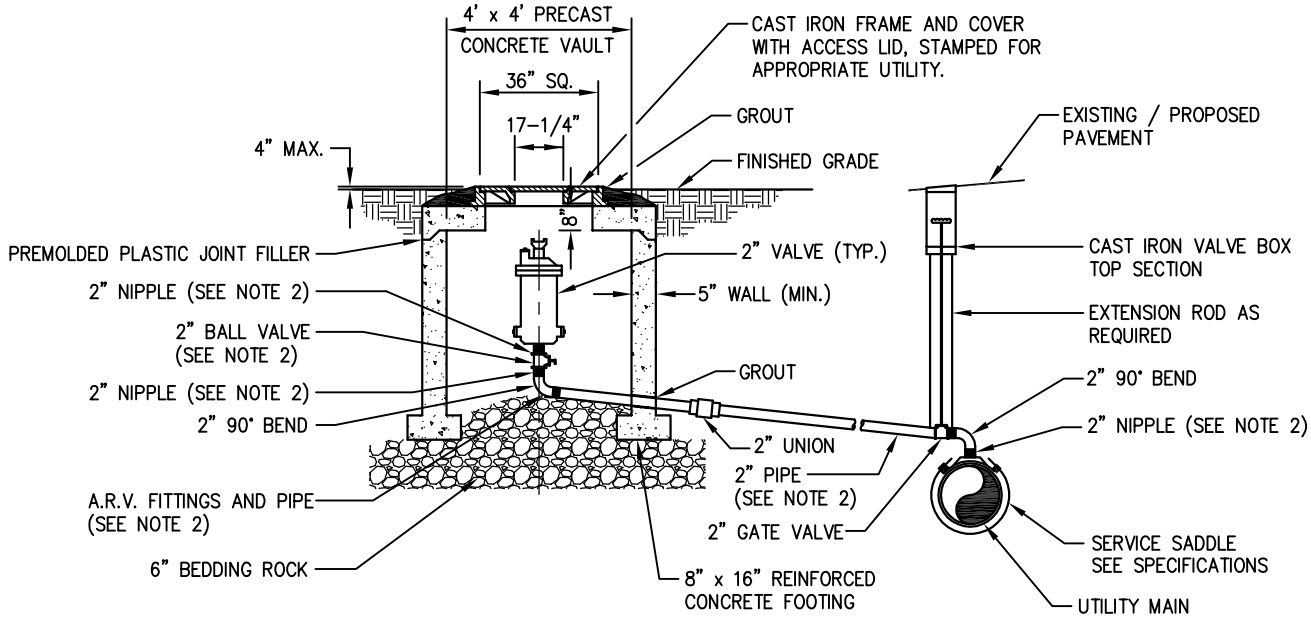
1. ABOVE DETAIL IS BASED ON 2" COMBINATION AIR/VACUUM RELEASE VALVE. CHANGE PIPE AND FITTINGS ACCORDINGLY FOR OTHER VALVE SIZES AND TYPES. VALVE SIZES TO BE DETERMINED BY THE ENGINEER AND APPROVED BY THE CITY PRIOR TO INSTALLATION.
2. MATERIAL USED FOR RECLAIMED WATER SHALL BE MADE OF BRASS; MATERIAL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

AIR VALVES IN VAULT – RECLAIMED AND WASTEWATER

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



FRAME AND COVER DETAIL

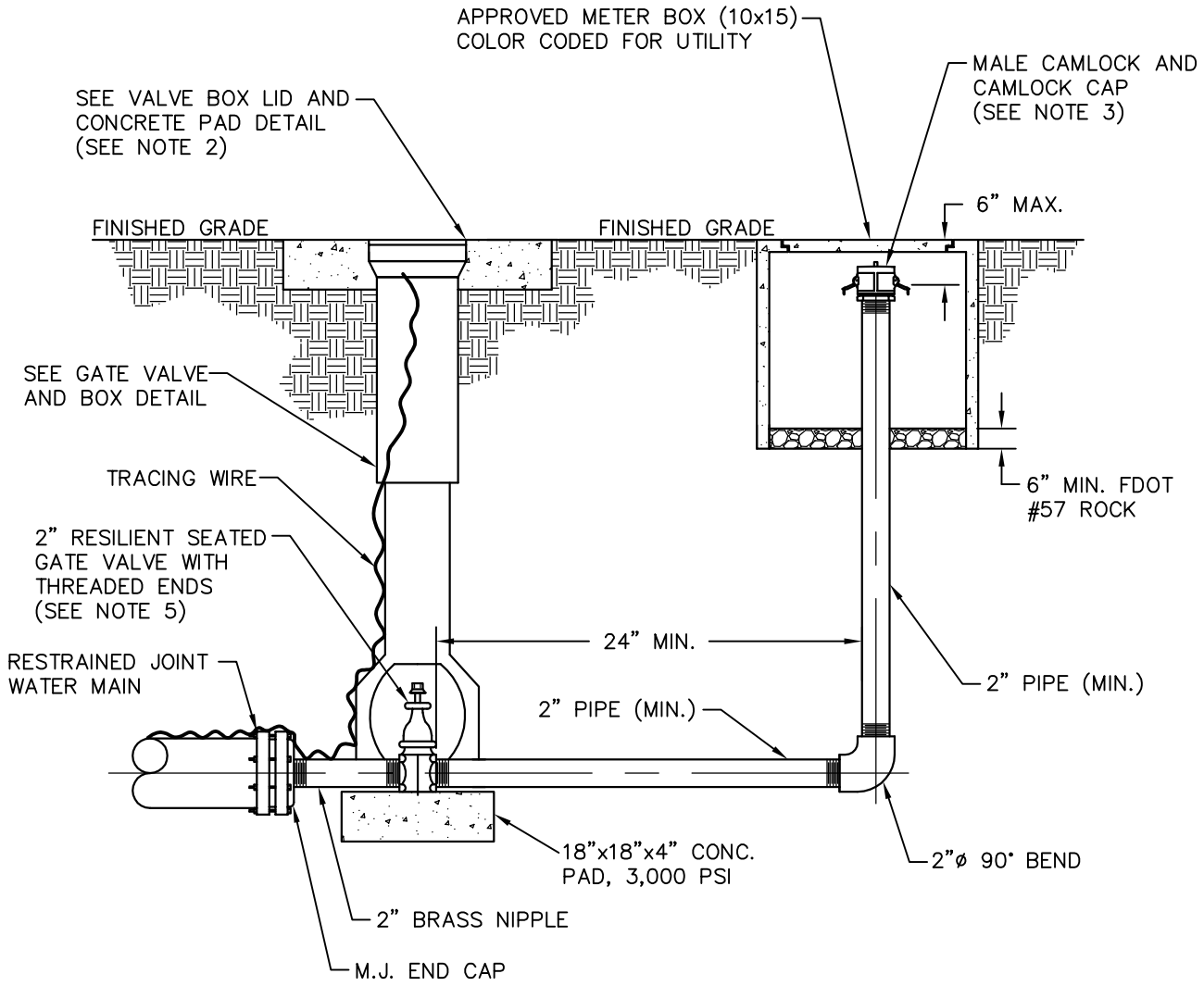


NOTES:

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: BY		
DATE: 7/1/16		JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DRAWN BY: J.R.P.		DSGN. BY L.A.M.		DWG NO.: A–123



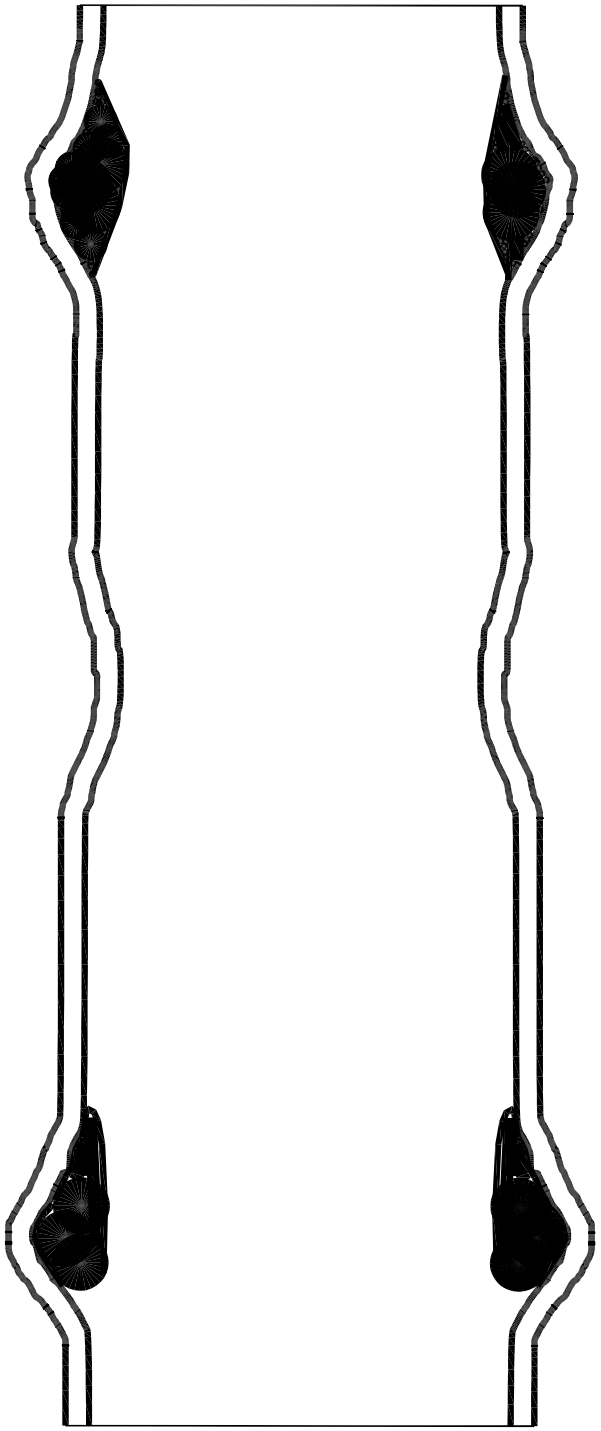
NOTES:

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

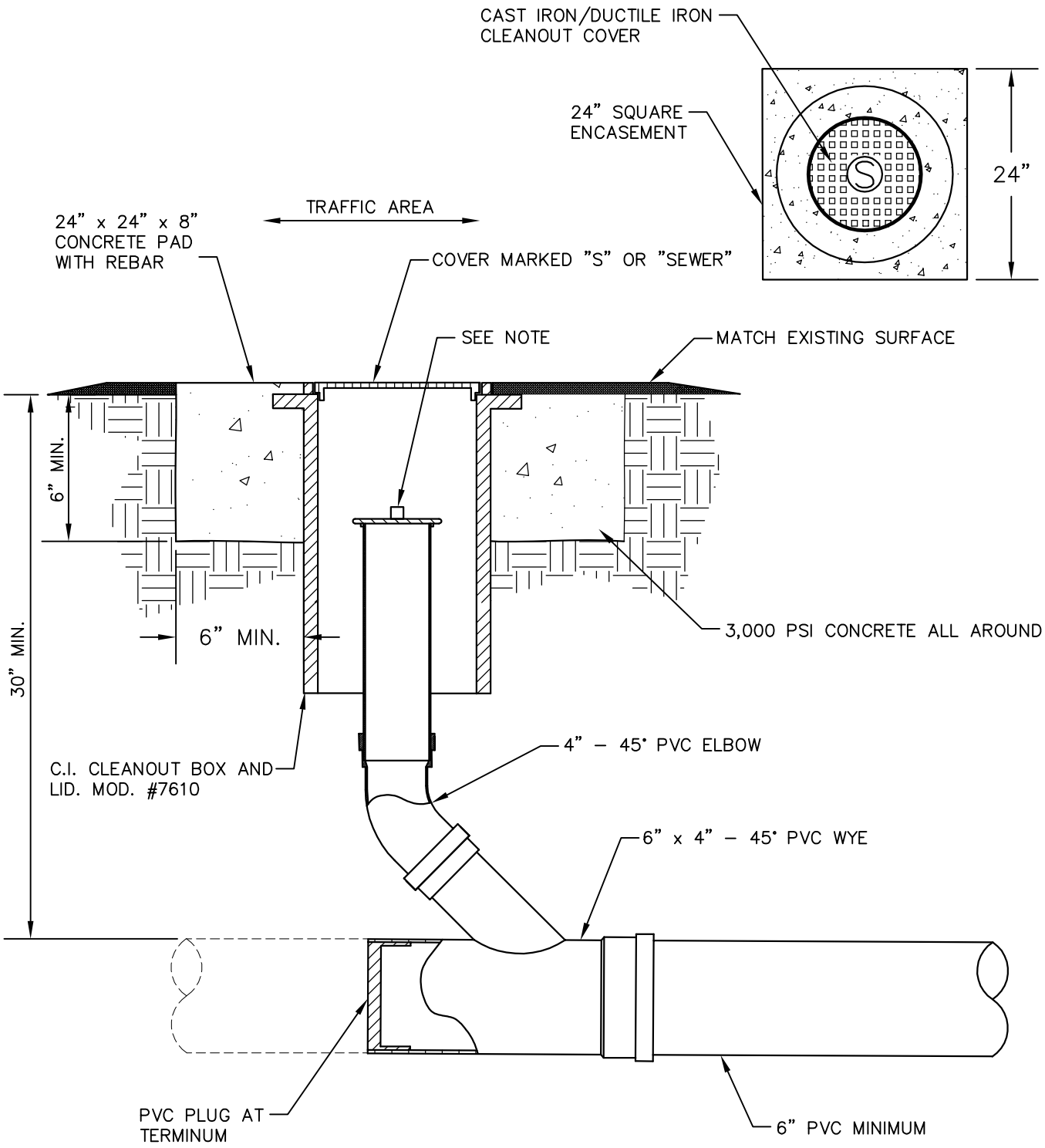
REV:		REV: BY			
DATE: 7/1/16		JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.	
DRAWN BY: J.R.P.		DSGN. BY L.A.M.		DWG NO.: A-124	

Wastewater Collection Details



DISSIMILAR PIPE CONNECTOR (TYPICAL)

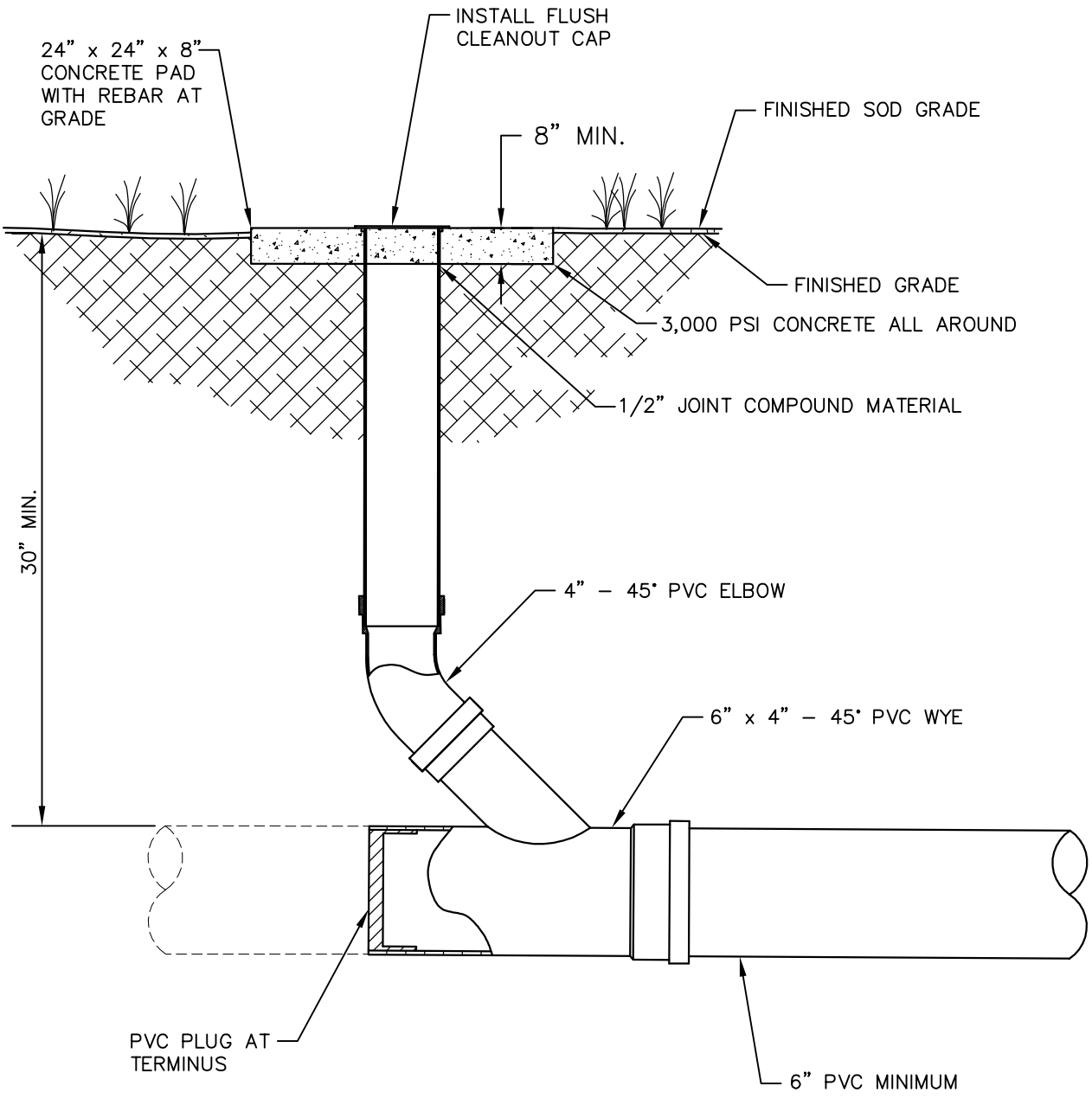
REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	R.Z.O.	DSGN. BY	T.H.	DWG NO.:	A-400



NOTE:
CLEANOUT CAPS MUST HAVE RAISED NUT

SEWER CLEANOUT – TRAFFIC

REV:	REV: BY			
DATE: 7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.	
DRAWN BY: R.Z.O.	DSGN. BY T.H.		DWG NO.: A–401	



NOTE:

FLUSH CLEANOUT PLUG TO BE USED ONLY

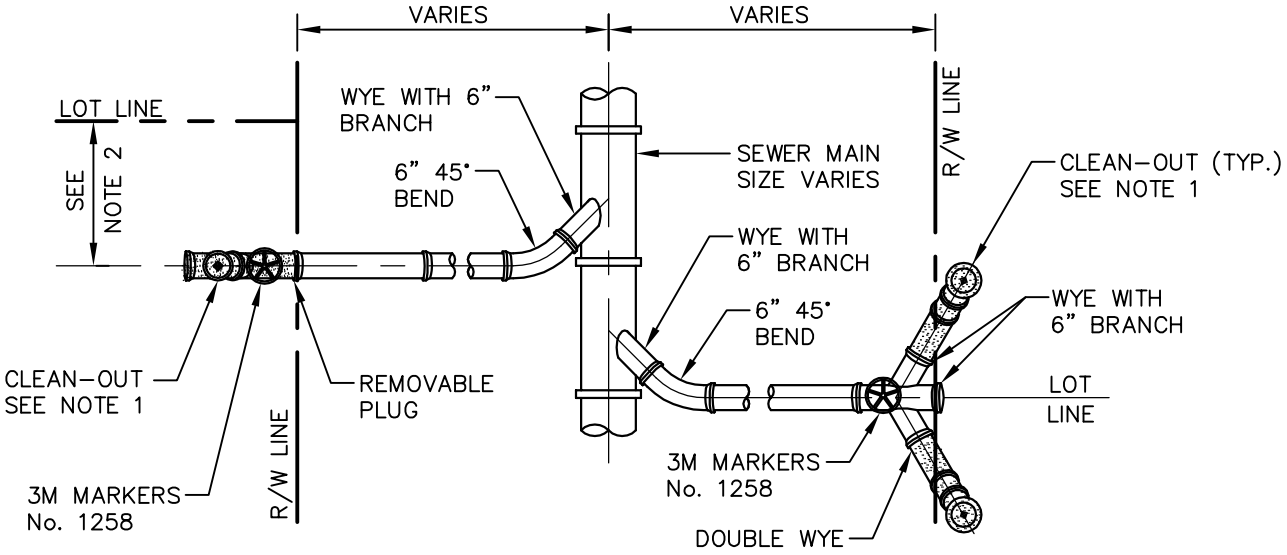
SEWER CLEANOUT NON–TRAFFIC

REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	R.Z.O.	DSGN. BY	T.H.	DWG NO.:	A–402

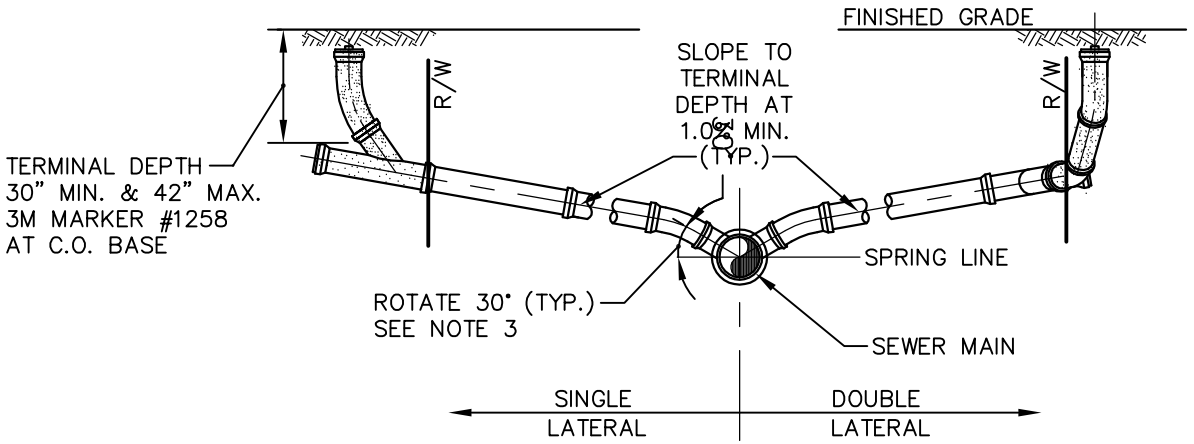
SANITARY SERVICE CONNECTION DETAIL

CITY OF MELBOURNE
UTILITIES ADMINISTRATION

REV:	DATE:	DRAWN BY:
	7/1/16	R.Z.O.
REV'D BY	JOB NO.:	DSGN. BY
		T.H.
SCALE:	DWG NO.:	
N.T.S.	A-403	



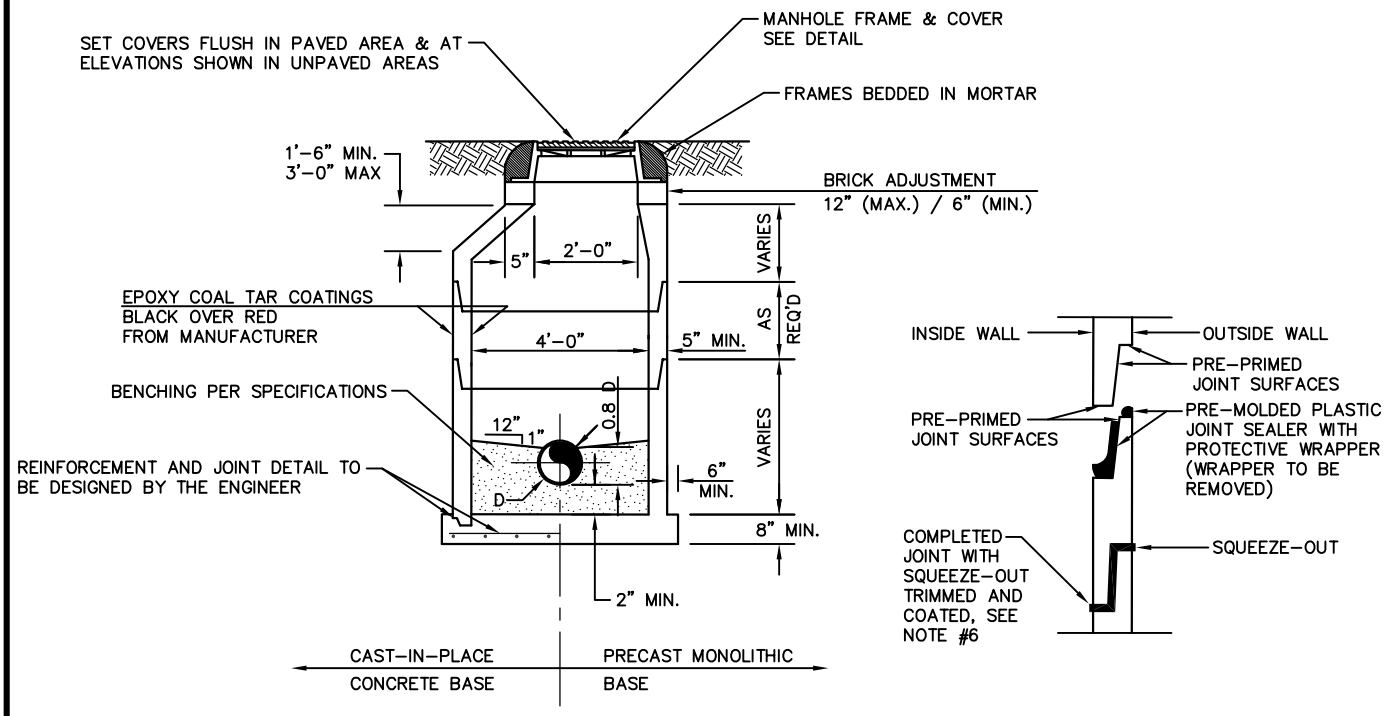
PLAN:



PROFILE:

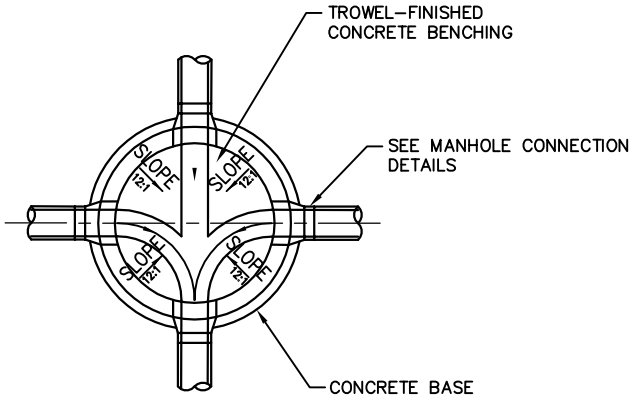
NOTES:

1. CLEAN-OUT (SHOWN SHADED) SHALL BE INSTALLED BY THE BUILDER IN ACCORDANCE WITH STANDARD PLUMBING CODE.
2. LOCATE SINGLE LATERAL AS CLOSE TO LOT LINE AS POSSIBLE, 25' MAXIMUM.
3. INVERT OF SERVICE LATERAL SHALL NOT ENTER SEWER MAIN BELOW THE SPRING LINE



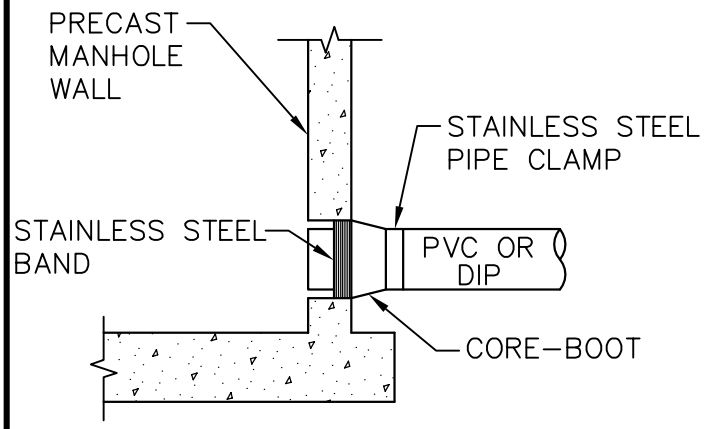
NOTES:

1. MANHOLE SHOWN IS FOR SEWER SIZE 8" THRU 24"
2. DROP CONNECTIONS ARE REQUIRED WHENEVER INVERT OF INFLUENT SEWER IS 24" OR MORE ABOVE THE INVERT OF THE MANHOLE. SEE MANHOLE CONNECTION DETAILS.
3. APPROVED CONCENTRIC CONE DESIGN MAY BE USED AS A ALTERNATIVE
4. MANHOLE WALL THICKNESS, INSIDE DIAMETER AND ACCESS OPENING SIZE WILL VARY DEPENDING ON MANHOLE DEPTH AND THE SIZE OF THE ACCOMPANYING PIPE. MINIMUM WALL THICKNESS OF 5" ON ALL MANHOLES WITH DEPTH OF 12' OR LESS, AND 6" ON ALL MANHOLE WITH DEPTH GREATER THAN 12'. DEPTH IS MEASURED FROM FINISHED GRADE.
5. ROCK AND FILTER CLOTH INSTALLED WHERE FIELD CONDITIONS WARRANT.
6. EXCESS "RAM-NEK" TO BE TRIMMED PRIOR TO APPLICATION OF PROTECTIVE COATING OR LINER.

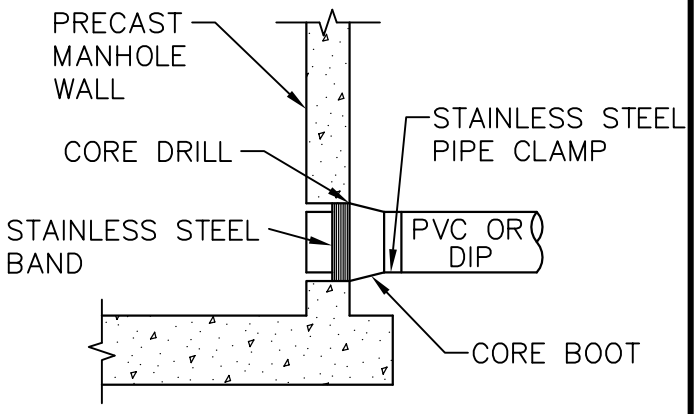


STANDARD SANITARY MANHOLE DETAIL

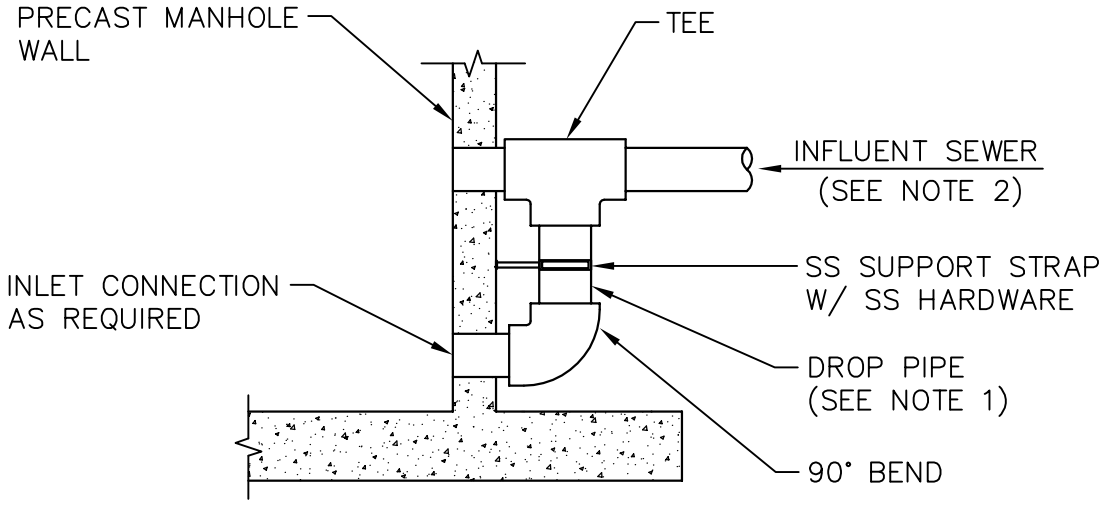
REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	R.Z.O.	DSGN. BY	T.H.	DWG NO.:	A-404



STANDARD PRECAST MANHOLE PIPE CONNECTION



EXISTING MANHOLE PIPE CONNECTION



STANDARD DROP DETAIL

NOTES:

1. DROP PIPE AND FITTINGS SHALL BE OF EQUAL SIZE AND MATERIAL AS THE INFLUENT SEWER.
2. AN OUTSIDE DROP CONNECTION SHALL BE REQUIRED FOR ALL INFLUENT WHICH HAVE AND INVERT TWO FEET OR MORE ABOVE THE MANHOLE INVERT.

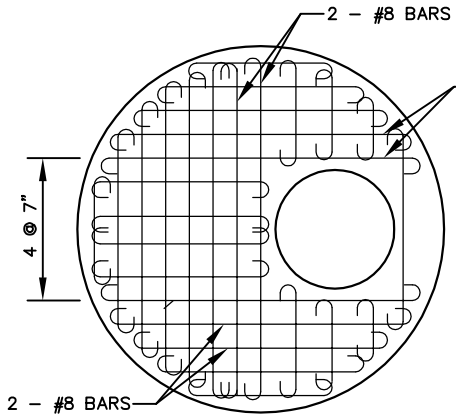
MANHOLE CONNECTION DETAILS

REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	R.Z.O.	DSGN. BY	T.H.	DWG NO.:	A-405

SHALLOW SANITARY MANHOLE DETAILS

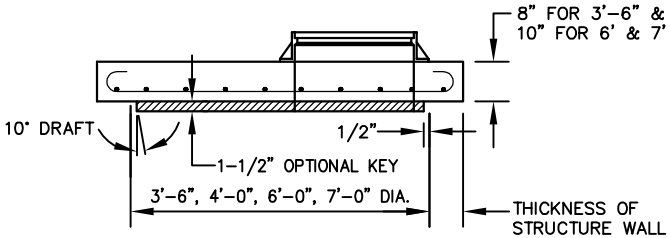
CITY OF MELBOURNE
UTILITIES ADMINISTRATION

REV:	DATE: 7/1/16	DRAWN BY: N.D.W.
REV'D BY	JOB NO.:	DSGN. BY T.H.
SCALE: N.T.S.	DWG NO.: A-406	



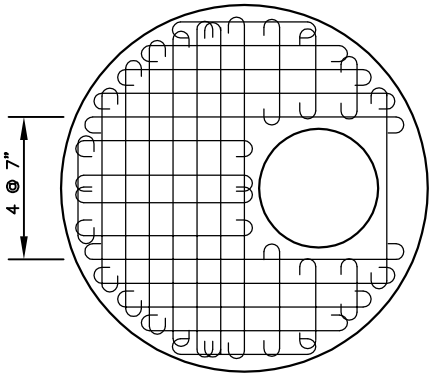
ALL REINFORCEMENT NO. 6 BARS EXCEPT 6 – #8 BARS SHOWN. BARS SPACED @ 6" CENTERS BOTH WAYS EXCEPT MIDDLE BARS SHOWN @ 7" CENTERS. ALL BARS WITH ACI STANDARD HOOKS CANTED APPROX. 45°, OR EMBEDDED IN ACCORDANCE WITH THE SLAB REINFORCEMENT DETAIL SHOWN UNDER OPTIONAL CONSTRUCTION JOINTS, SHEET NO. 3 OF 6 IN INDEX 201, EXCEPT ALL #8 BARS AND #6 BARS AROUND MANHOLE OPENING SHALL BE HOOKED.

REINFORCEMENT PLAN



SECTION

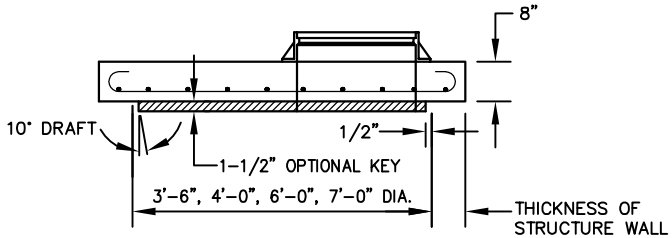
TYPE 7 – T (TRAFFIC) (H –20)



REINFORCING BARS @ 6" CENTERS BOTH WAYS EXCEPT MIDDLE BARS SHOWN @ 7" CENTERS ALL BARS WITH ACI STANDARD HOOKS CANTED APPROX. 45° OR EMBEDDED IN ACCORDANCE WITH THE SLAB REINFORCEMENT DETAIL SHOWN UNDER OPTIONAL CONSTRUCTION JOINTS SHEET NO. 3 OF 6 IN INDEX 201, EXCEPT BARS AROUND MANHOLE OPENING SHALL BE HOOKED.

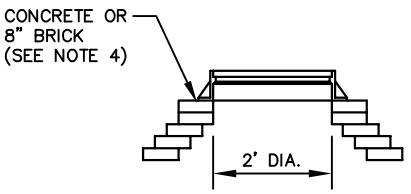
BAR SIZE	TOP DIAMETER
NO. 4	3'–6" & 4'
NO. 5	6'
NO. 6	7'

REINFORCEMENT PLAN



SECTION

TYPE 7 – NT (NON–TRAFFIC)



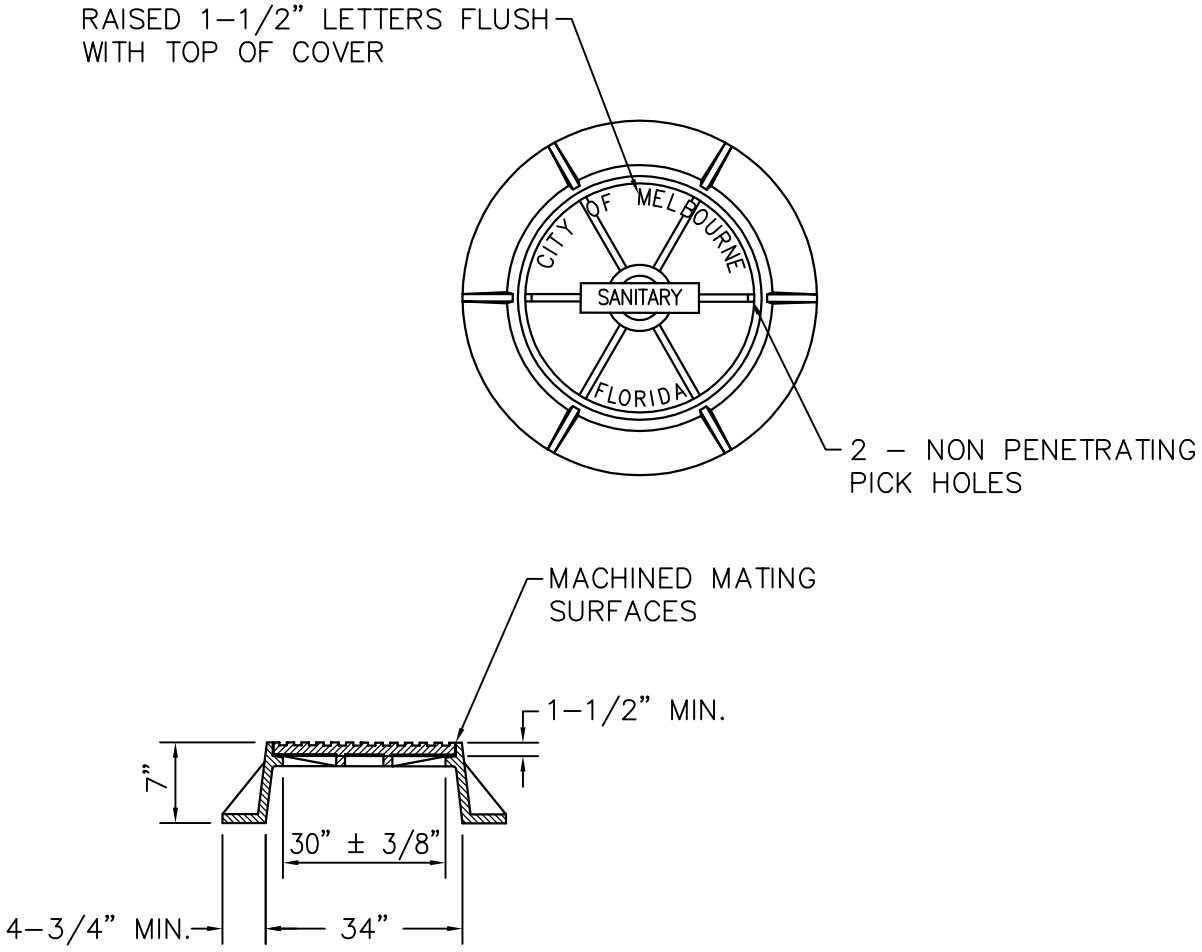
SECTION

TYPE 8

NOTES (TOPS, FRAMES, AND COVERS)

1. ALL STEEL BARS SHALL HAVE 1–1/4" MINIMUM COVER UNLESS OTHERWISE SHOWN AND SHALL BE HOOKED WHERE INDICATED.
2. MANHOLE TOP TYPE 7 SLABS SHALL BE OF CLASS II CONCRETE. CONCRETE AS SPECIFIED IN ASTM C–478 MAY BE USED FOR PRECAST UNITS. SEE GENERAL NOTE No. 2.
3. MANHOLE TOP TYPE 7 SLABS MAY BE OF CAST–IN–PLACE OR PRECAST CONSTRUCTION. THE OPTIONAL KEY IS FOR PRECAST TOPS AND IN LIEU OF DOWELS. FRAME AND SLAB OPENINGS ARE TO BE OMITTED WHEN TOP IS USED OVER A JUNCTION BOX. FRAMES CAN BE ADJUSTED WITH FROM ONE TO FOUR COURSES OF BRICK.
4. MANHOLE TOP TYPE 8 MAY BE OF CAST–IN–PLACE OR PRECAST CONCRETE CONSTRUCTION OR BRICK CONSTRUCTION. FOR CONCRETE CONSTRUCTION, THE CONCRETE AND STEEL REINFORCEMENT SHALL BE THE SAME AS THE SUPPORTING WALL UNIT. AN ECCENTRIC CONE MAY BE USED.
5. MANHOLE TOPS SHALL BE SECURED TO STRUCTURES BY OPTIONAL CONSTRUCTION JOINTS.
6. THE 212 LB. COVER IS TO BE USED FOR ALL FRAME TYPES I, II & III, AND IS THE REPLACEMENT COVER FOR ALL PREVIOUS FRAMES WITH 1–1/2" DEEP SEATS (TRAFFIC TYPE). THE 185 LB. COVER (NON–TRAFFIC TYPE), 1984 ROADWAY & TRAFFIC DESIGN STANDARDS INDEX No. 201, IS THE REPLACEMENT COVER FOR ALL EXISTING FRAMES WITH 1/2" DEEP SEATS. INSTALLATION OF FRAMES WITH 1/2" DEEP SEATS IS NOT PERMITTED. THE 185 LB. COVERS ARE TO BE PLACED IN EXISTING 1/2" DEEP SEATED FRAMES ONLY WHEN SPECIFICALLY CALLED FOR IN THE PLANS OR AS SPECIFICALLY DIRECTED BY THE ENGINEER.

NOTE: "CITY OF MELBOURNE" TO BE PRINTED ON THE MANHOLE LID WHEN THE CITY IS ACCEPTING THE MANHOLE. IF THE CITY IS NOT ACCEPTING THE MANHOLE, THEN ONLY THE WORD "SANITARY" WILL BE ON THE LID.



ELEVATION 'A' 30" CLEARANCE RING & COVER

NOTES:

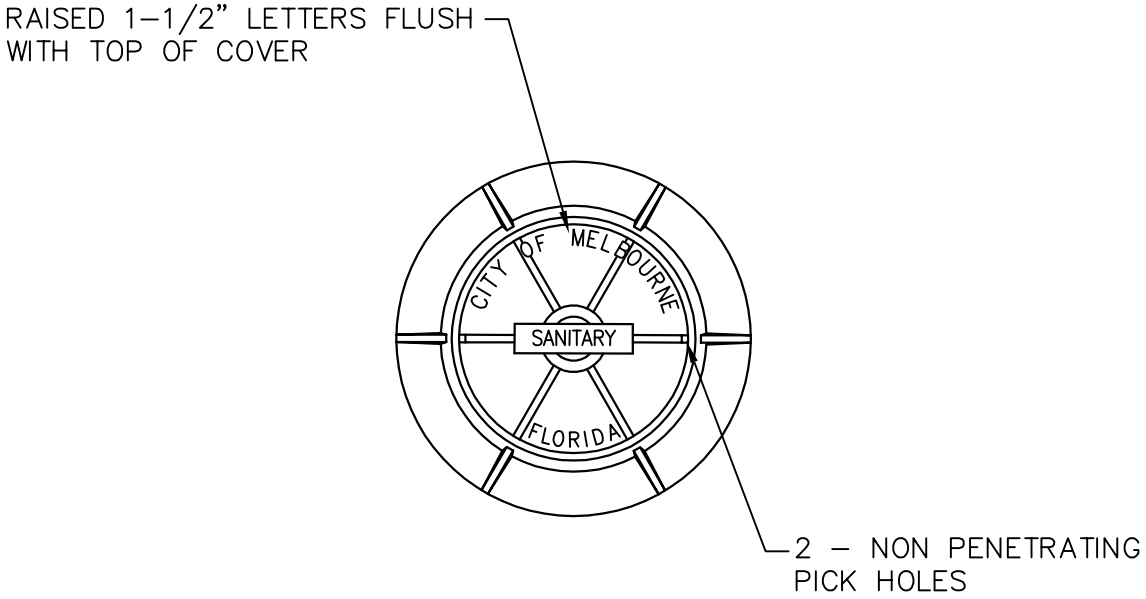
1. A MANHOLE RING & COVER TO HAVE 30" CLEAR OPENING AND "O" RING TYPE SEAL, MANUFACTURED AT THE FOUNDRY.
2. A MANHOLE RING & COVER TO BE U.S. FOUNDRY & MANUFACTURING Co. MODEL #230 – AA –ORS OR APPROVED EQUAL.

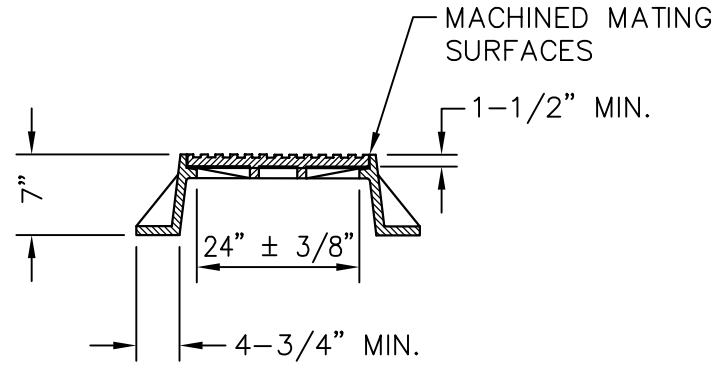
MODEL #230 – AA – ORS OR APPROVED EQUAL

LARGE MANHOLE RING & COVER DETAILS

REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	R.Z.O.	DSGN. BY	T.H.	DWG NO.:	A–407

NOTE: "CITY OF MELBOURNE" TO BE PRINTED ON THE MANHOLE LID WHEN THE CITY IS ACCEPTING THE MANHOLE. IF THE CITY IS NOT ACCEPTING THE MANHOLE, THEN ONLY THE WORD "SANITARY" WILL BE ON THE LID.





ELEVATION 'B' F.D.O.T. RING & COVER

NOTES:

1.B MANHOLE RING & COVER TO HAVE 24" CLEAR OPENING AND "O" RING TYPE SEAL, MANUFACTURED AT THE FOUNDRY

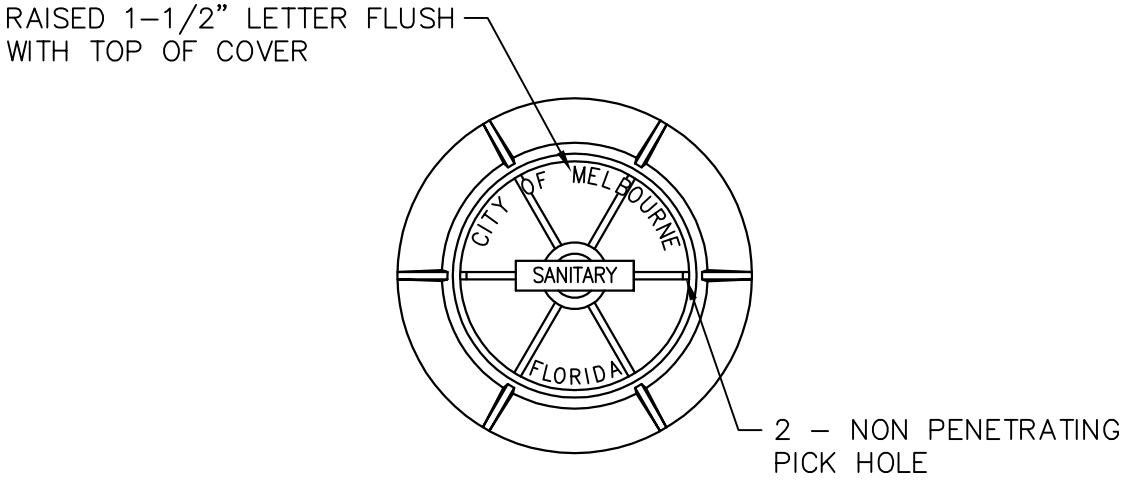
2.B MANHOLE RING & COVER TO BE U.S. FOUNDRY & MANUFACTURING Co. MODEL #225 – AS – OSR OR APPROVED EQUAL.

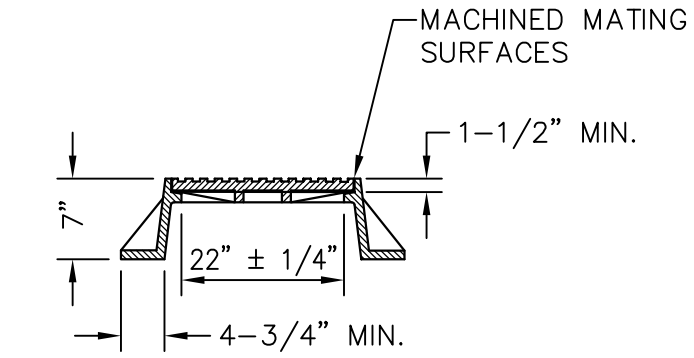
MODEL #225 – AS – OSR OR APPROVED EQUAL

FDOT MANHOLE RING & COVER DETAILS

REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	R.Z.O.	DSGN. BY	T.H.	DWG NO.:	A–408

NOTE: "CITY OF MELBOURNE" TO BE PRINTED ON THE MANHOLE LID WHEN THE CITY IS ACCEPTING THE MANHOLE. IF THE CITY IS NOT ACCEPTING THE MANHOLE, THEN ONLY THE WORD "SANITARY" WILL BE ON THE LID.





ELEVATION 'C' RESIDENTIAL RING & COVER

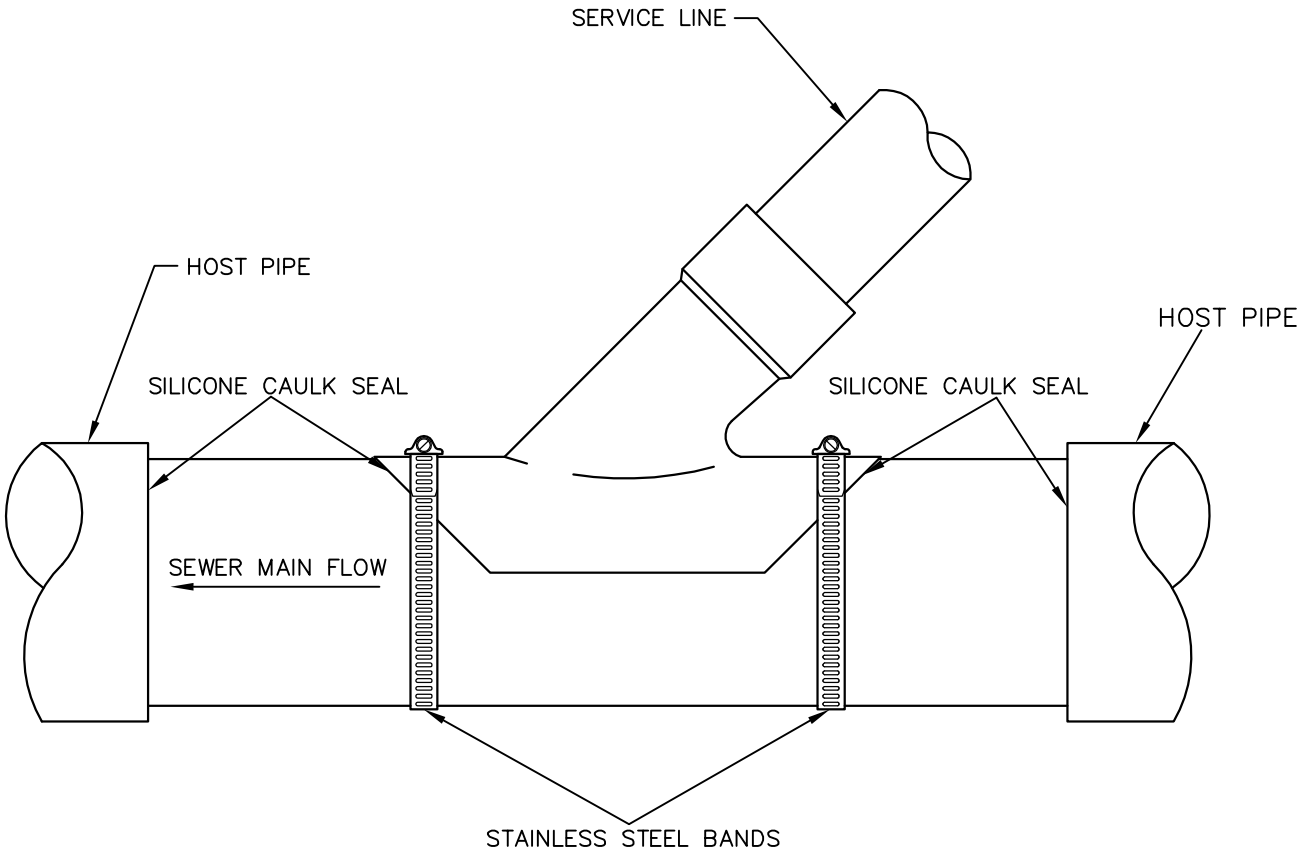
NOTES:

1.C MANHOLE RING & COVER TO HAVE 24" CLEAR OPENING AND "O" RING TYPE SEAL, MANUFACTURED AT THE FOUNDRY.
2.C MANHOLE RING & COVER TO BE U.S. FOUNDRY MD MANUFACTURING Co. MODEL #170 – E – ORS OR APPROVED EQUAL.

MODEL #170 – E –ORS OR APPROVED EQUAL

RESIDENTIAL MANHOLE RING & COVER DETAILS

REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	R.Z.O.	DSGN. BY	T.H.	DWG NO.:	A–409



PLAN

NOTES:
1. INSTALL LATERAL AS CLOSE TO THE LOT LINE AS POSSIBLE

2. INVERT OF SERVICE LATERAL SHALL NOT ENTER SEWER MAIN BELOW THE SPRING LINE (SEE DETAIL A-403).

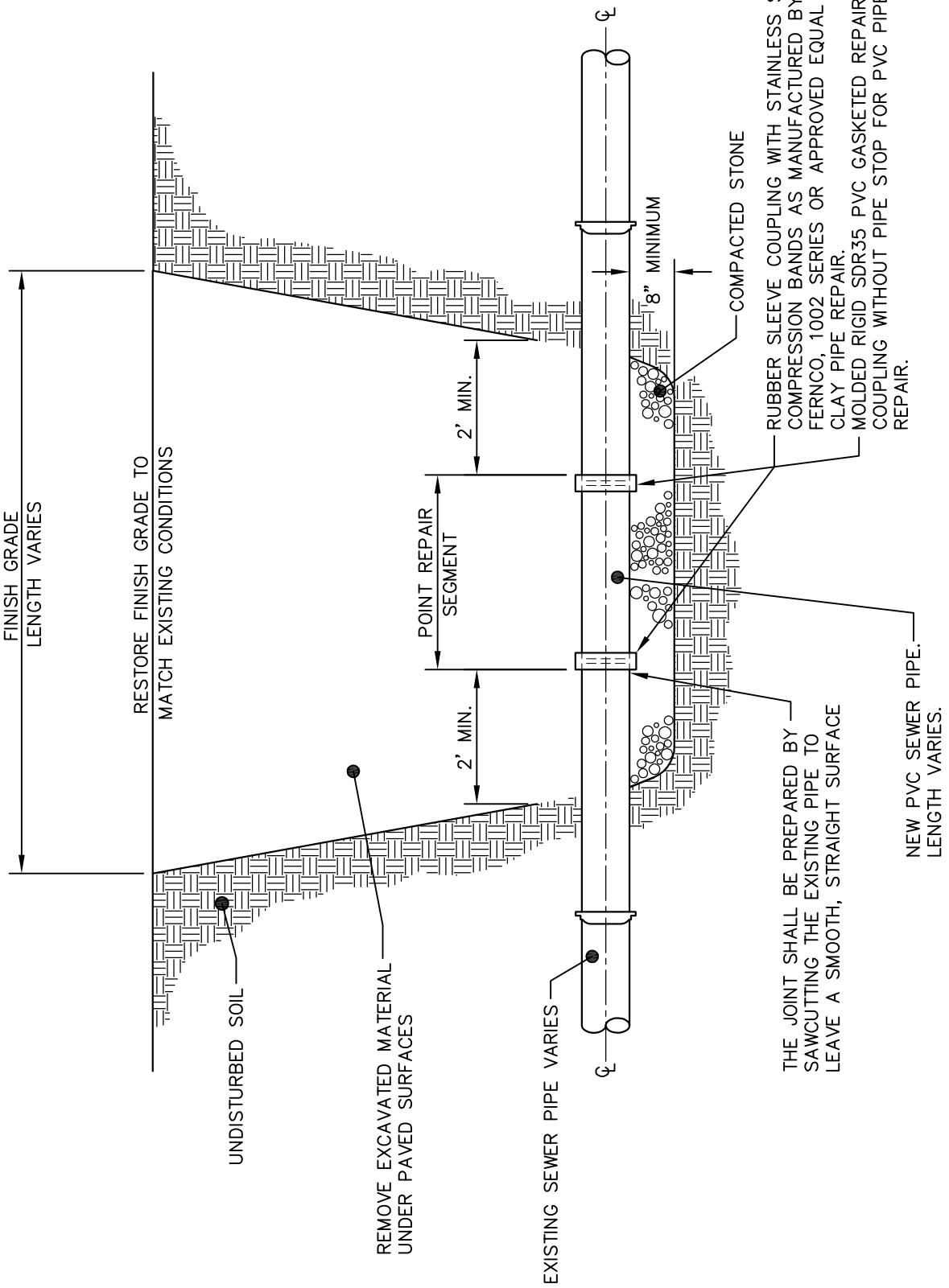
3. PVC SADDLE WYE GASKET HUB X GASKET SKIRT W/STAINLESS STEAL BANDS.

4. SILICONE CAULK SEAL BETWEEN SADDLE & CIP PIPE.

5. SILICONE CAULK SEAL AROUND HOST PIPE & CIP PIPE.

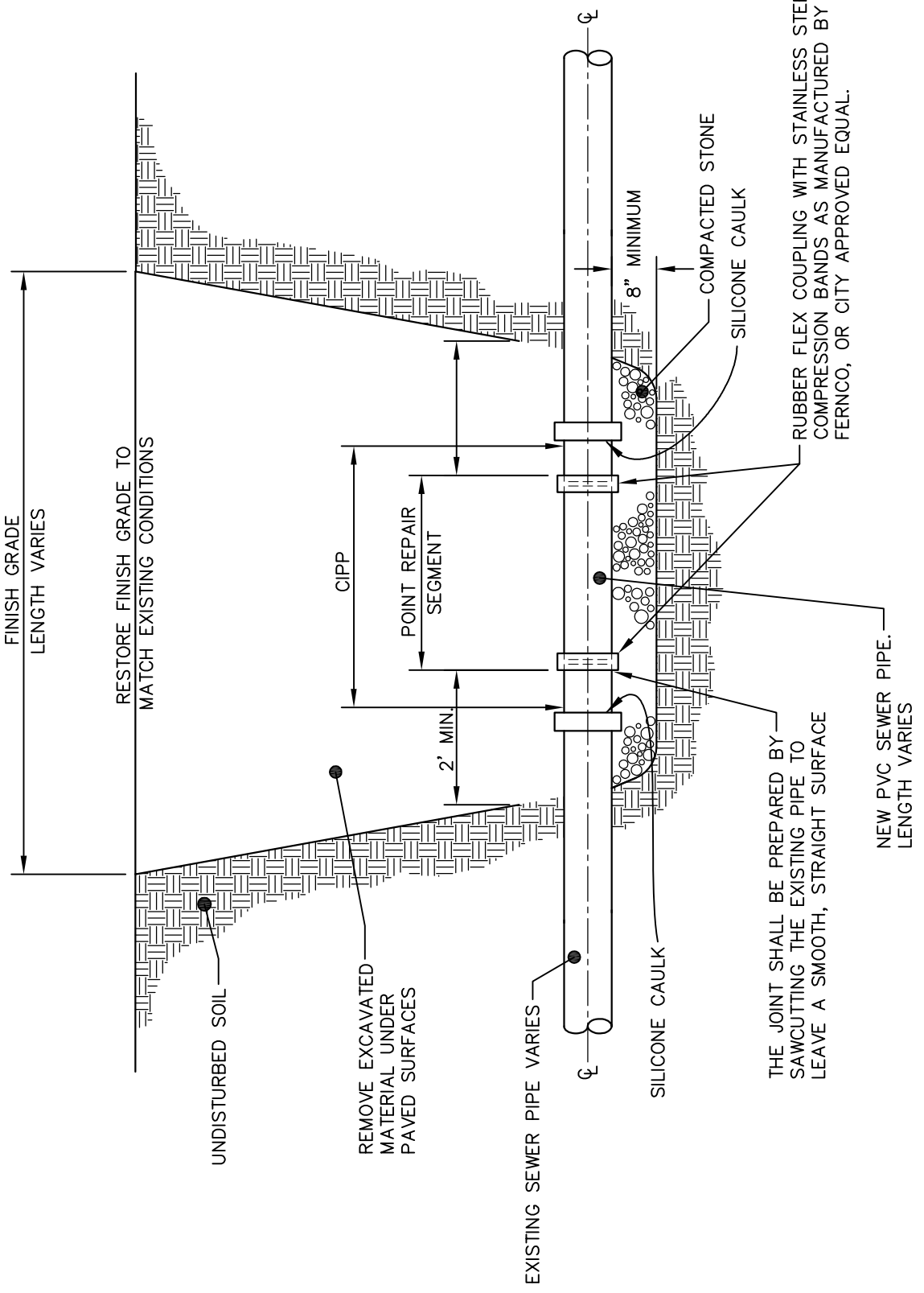
SANITARY SEWER LATERAL SADDLE CONNECTION TO EXISTING C.I.P.P.

REV:		REV: BY			
DATE:	7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE:	N.T.S.
DRAWN BY:	R.Z.O.	DSGN. BY	T.H.	DWG NO.:	A-410



STANDARD SEWER EXCAVATED POINT REPAIR FOR CLAY AND PVC

REV:	REV: BY		
DATE: 7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DRAWN BY: R,Z,O,	DSGN. BY T.H.		DWG NO.: A-411



STANDARD SEWER EXCAVATED POINT REPAIR FOR C.I.P.P.

REV:	REV: BY		
DATE: 7/1/16	JOB NO.:	CITY OF MELBOURNE UTILITIES ADMINISTRATION	SCALE: N.T.S.
DRAWN BY: R.Z.O.	DSGN. BY T.H.		DWG NO.: A-412