



Water & Sanitary Sewer Systems-Guidelines

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Table 1: Engineering Design Parameters
Table 2: Minimum slope per Representative Pipe Size



These specifications shall be used in the design and construction of Augusta water and wastewater systems. The standards and specifications presented herein are subject to revisions, typically in February of every year. Minor modifications will be made throughout the year using an errata page, which will spell out changes since the last revision of the document. In case of conflicts, the following precedence will apply: State and local ordinance, Augusta, GA government resolutions, Augusta, GA government approved contracts, GA DNR regulations, these design standards, drawings, and specifications. Conflicts should be brought to the immediate attention of the Augusta Utilities Director.

The listing of a product by its trade name does not imply an endorsement, and signifies only that the technical capabilities of the product are acceptable to Augusta, and that an equivalent product can be used in its place.

14.1 PERMITS/ENGINEERING SUBMITTAL REQUIREMENTS

14.1.1 Inspections and Fees

14.1.2 Easements

14.1.3 Plan Submittal Requirements

Augusta Utilities Department (AUD) shall supply a standard layout with standard details and symbols archived as blocks in AutoCAD™ format. This standard layout should be used in all plan submittals to AUD. This standard layout should be submitted on an ANSI D size sheet, or other at the approval of AUD. Submitted drawings using a color legend shall comply with the APWA Color Code requirements.

14.1.3.1 Water Distribution System Construction Plans

Water Construction Plans submitted to AUD for review must contain the following minimum information, on the standard AUD layout:

- 14.1.3.1.a Project name.
- 14.1.3.1.b Location/Vicinity Map with a North arrow.
- 14.1.3.1.c Scale showing drawing units to real units, minimum 1" = 20' to a maximum of 1" = 100'. Metric system scales and measurements are not allowed.
- 14.1.3.1.d Show subject property and adjacent property information including subdivision name, lot numbers, block letters, property owners, etc.
- 14.1.3.1.e Show existing conditions, including structures, pavement widths, right-of-way widths, temporary and adjoining easements, adjoining roads, road names, etc.
- 14.1.3.1.f Label type and size of all easements.
- 14.1.3.1.g Shade easements to be dedicated to AUD for water lines installed outside proposed rights-of-way.
- 14.1.3.1.h Show the location, size and material of existing water mains along with other appurtenances. Existing water lines shall be shown as dashed lines with a 'W' every one inch.
- 14.1.3.1.i Show the location, size and material of proposed water mains, valves, hydrants and service lines along with all other water appurtenances involved with the proposed project. Proposed water lines shall be shown as solid lines.
- 14.1.3.1.j A profile shall be included on the plans.
- 14.1.3.1.k Number all fire hydrants sequentially starting at 1.
- 14.1.3.1.l Show locations, type and size of all proposed backflow prevention devices.



- 14.1.3.1.m Owner's name and property address as it appears on easement plats, e.g.- N.F. Smith, 180 Bay St.
- 14.1.3.1.n Match lines should be included on the plan and profile views along the water line where the plan sheets overlap, showing page numbers on the appropriate side of the match line.
- 14.1.3.1.o Station numbers should be included on the plan and profile views of the water line.
- 14.1.3.1.p Developer's name, address, and phone number, if applicable.
- 14.1.3.1.q Professional Engineer's name, address, fax & phone number and e-mail address.
- 14.1.3.1.r Professional Engineer's signed seal.

14.1.3.2 Wastewater Collection System Construction Plans

Wastewater Construction Plans submitted to the AUD for review must contain the following minimum information, on the standard AUD layout:

- 14.1.3.2.a Project name.
- 14.1.3.2.b Location/Vicinity Map with a North arrow.
- 14.1.3.2.c Scale showing drawing units to real units, minimum 1" = 20' to a maximum of 1" = 100'. Metric scales and measurements will not be allowed.
- 14.1.3.2.d Show subject property and adjacent property information including subdivision name, lot numbers, block letters, property owners, etc.
- 14.1.3.2.e Show existing conditions, including structures, pavement widths, right-of-way widths, temporary and adjoining easements, adjoining roads, road names, storm sewers, etc.
- 14.1.3.2.f Label type and size of all easements.
- 14.1.3.2.g Shade easements to be dedicated to AUD for wastewater lines installed outside proposed rights-of-way.
- 14.1.3.2.h Show easements dedicated to the AUD for wastewater lines to serve adjacent properties.
- 14.1.3.2.i Show the location, size and material of existing wastewater lines and force mains along with other appurtenances. Existing sewer lines shall be shown as dashed lines.
- 14.1.3.2.j Show the proposed location, size and material of sewer mains, force mains, sewer manholes, service lines with clean-outs and sewerage lift stations involved with the proposed project. Proposed sewer lines shall be shown as solid lines.
- 14.1.3.2.k Show the limits of the 100 year flood plain with a dashed line, if applicable.
- 14.1.3.2.l Show the location of hydric soils and wetlands, with an appropriate shading or hatch, if applicable.
- 14.1.3.2.m Show the location of existing bodies of water, including streams, lakes, ponds, marshes, etc.
- 14.1.3.2.n Creek crossings require full scale details at 1" = 20' scale minimum, including, but not limited to, piers and all other appurtenances.
- 14.1.3.2.o All sanitary manholes marked on the plans should be identified with a state plane coordinate number.
- 14.1.3.2.p Owner's name and the property's physical address as it appears on easement plats, e.g.- N/F Smith, 180 Bay St.



- 14.1.3.2.q Match lines should be included on the plan and profile views along the sewer line where the plan sheets overlap, showing page numbers on the appropriate side of the match line.
- 14.1.3.2.r Station numbers on the plan and profile views.
- 14.1.3.2.s Line of existing and proposed ground surface.
- 14.1.3.2.t The grade of the sewer between each two adjacent manholes to hundredths place if in percent (0.00%)
- 14.1.3.2.u Invert of sewer in and out of each manhole, with flow direction labels if more than 2 pipes connect to a manhole.
- 14.1.3.2.v Surface elevation of each manhole, based on a specified datum.
- 14.1.3.2.w All sanitary manholes shall be numbered on the plan and correspondingly numbered on the profile. The station number shall be shown for each manhole, as well as coordinates in state plane feet, Georgia Eastern zone, on NAD 83. The vertical datum system shall be NAVD 88.
- 14.1.3.2.x The location and elevation of adjacent parallel stream beds and of adjacent water surfaces shall be shown on the plan and profile.
- 14.1.3.2.y Sizes, locations and inverts of all special features such as, but not limited to, connections to existing sewers, wet wells, concrete encasement, collar walls, elevated sewers, piers, special manhole covers such as vented outfall or sealed covers, etc.
- 14.1.3.2.z All structures, both above and below ground, which might interfere with the proposed construction, particularly water mains, gas mains, storm drains, utility conduits, etc., shall be shown on the plan and the profile. Refer to sections 14.2.2.1.2 and 14.3.2.1.2 for horizontal separation requirements for water and wastewater, respectively.
- 14.1.3.2.aa Identify pipe crossings with letter, or other, designation on the plan and profile. Specify top of pipe and bottom of pipe elevations at crossings to verify there is no conflict. See sections 14.2.2.1.3 and 14.3.2.1.3 for vertical separation requirements for water and wastewater, respectively.
- 14.1.3.2.ab All existing waterworks units, including basins, wells, and treatment units, located within 200 feet of a proposed sewer shall be shown on the engineering plans. Soil conditions within this 200 feet between the sewer line and waterworks units shall be determined and shown on the plans.
- 14.1.3.2.ac All pipes crossing proposed wastewater lines shall be shown as conflicts in plan and profile views on the wastewater plan sheets (not on detail sheets). Crossings shall be designated by a letter (A, B, C, etc...) and include information regarding top of pipe and bottom of pipe elevations. Contact AUD for an example. The design engineer is responsible for identifying all conflicts.
- 14.1.3.2.ad Developer's name, address, and phone number, if applicable.
- 14.1.3.2.ae Professional Engineer's name, address, and phone number.
- 14.1.3.2.af Professional Engineer's signed seal.

14.1.3.3 General Notes

Notes to be shown on both water and wastewater plans include:

- 14.1.3.3.a The Developer and/or Developer's Contractor is responsible for verifying the exact location, size and material of any existing water or sewer facility proposed for connection or use by this project.



- 14.1.3.3.b All construction of water distribution system and wastewater collection system lines shall be in accordance with AUD's Standards and Specifications.
- 14.1.3.3.c All PVC water lines shall be class 200 PVC meeting AWWA C-900, unless otherwise shown.
- 14.1.3.3.d All DIP water lines shall be class 350 for lines under 16", and class 300 for lines 18" through 24"
- 14.1.3.3.e All water lines shall be tested, chlorinated, and checked for bacteria per section 14.2.3.5 thru 14.2.3.8.
- 14.1.3.3.f AUD Engineering Division shall be notified 48 hours (two working days) prior to any construction, tie-ins, or testing of water or wastewater lines. (706-312-4132) No work shall commence until contact is made with AUD.
- 14.1.3.3.g Copper Wire (12 gauge, Single Strand) shall be attached along top of all buried PVC water lines, wrapped around service corporations and stubbed up into all valve boxes for locating purposes. This wire shall be properly spliced for electrical connectivity and then insulated to protect against corrosion.
- 14.1.3.3.h Per AUD Specifications for backflow installations for non-residential development, a minimum "double check" backflow-prevention device shall be installed on the customer's side of all service. Fire lines require a "Detector Type" backflow device. Backflow Devices shall be tested by a certified person within 5 working days of installation and the results furnished to the AUD Engineering Division within 10 working days of installation prior to any water use. AUD shall be notified prior to testing.
- 14.1.3.3.i Per AUD Specifications for backflow installations residential development shall install a "Dual Check" Backflow Device on the customer's side of service line at the point of tie-in to the water meter.
- 14.1.3.3.j All water valves on the main lines, including hydrant laterals, shall be **open-left** if installed south of Gordon Highway (S.R.-10), or **open-right** if installed north of Gordon Highway.
- 14.1.3.3.k The Developer and/or Contractor shall furnish, install, and maintain a Rome type 10" x 19" x 10" cast iron or approved equal meter box at the termination point of all water services until such time the meter is installed.
- 14.1.3.3.l The Developer/Contractor shall etch a "W" in the curb, or in the pavement if no curb is available, and highlight the etching with blue paint per the APWA uniform color code (APWA, 2000).
- 14.1.3.3.m All water meters shall be purchased from AUD.
- 14.1.3.3.o All tie-ins to existing manholes shall be cored. All manholes require "K or N Seal" or equal rubber boots.
- 14.1.3.3.p No connection shall be made to existing wastewater lines until the proposed line is inspected and approved by AUD's Engineering Division.
- 14.1.3.3.q The Developer/Contractor shall etch an "S" in the curb, or in the pavement if no curb is available, and highlight the etching with green paint per the APWA uniform color code (APWA, 2000).
- 14.1.3.3.r Wastewater clean-outs shall be installed at all individual services as shown in AUD-Detail 6, and shall not be installed under driveways or any paved areas without prior approval from AUD.
- 14.1.3.3.s Finished floor elevations of all proposed buildings shall be a minimum of five (5) feet above the invert elevation of the wastewater main or manhole at the



point of tie-in. In instances where this is not possible, a backwater valve shall be installed in the sewer service.

- 14.1.3.3.t All wastewater manholes shall have an elevation drop of 0.1 foot across the inlet and outlet inverts.
- 14.1.3.3.u Sewer force main shall be PVC C-900, class 200 or D.I.P., class 350, exopy lined. If the main is PVC, then 12 gauge bare single strand wire shall be attached along the top of the main, or detectable tape if approved by AUD engineering staff.
- 14.1.3.3.v A minimum 15' Utility Easement centered over all water lines and a minimum 20' Utility Easement centered over all wastewater lines shall be deeded to the Augusta, Georgia at completion and acceptance of said lines. Easements containing both water and sewer shall total 30' in width, while maintaining minimum separation requirements listed in sections 14.2.2.1 and 14.3.2.1.
- 14.1.3.3.w Disturbance of any Survey Markers or Monuments requires re-establishment by a registered land surveyor at the Contractor's expense.
- 14.1.3.3.x For private developments, AUD shall not be responsible for pavement patching and/or replacement and the site restoration whenever AUD performs repair, replacement, or installation work.
- 14.1.3.3.y If AUD must repair or replace utilities on the property, then the developer shall arrange for access by AUD as required to repair or replace the utility.
- 14.1.3.3.z Contractor shall contact the Utilities Protection Inc. "Call Before You Dig" service in order to locate utilities prior to starting any excavation or construction.
- 14.1.3.3.aa If a conflict arises between the new work and the existing water and sewer facilities during the course of construction, it will be the responsibility of the Owner/Developer/Contractor, at his expense and not AUD's, to correct the discrepancy as directed by a representative of AUD.
- 14.1.3.3.ab A right-of-way encroachment permit shall be obtained from the Public Works Department prior to commencing work within an Augusta, Georgia right-of-way.
- 14.1.3.3.ac An AUD inspector shall be present when a tap or tie-in occurs.
- 14.1.3.3.ad A reduced pressure zone (RPZ) backflow device will be required for high hazard locations. A written request shall be submitted to AUD for the required backflow prevention device for a specific site.
- 14.1.3.3.ae Augusta Utilities shall not be responsible for pavement repair or site restoration associated with repair/replacement of a water or sewer line in private property.
- 14.1.3.3.af Existing fire hydrants and meters that are removed shall be turned over to AUD.

14.1.3.4 Detail Drawings

All standard AUD detail drawings shall be included in the plans for all AUD projects, even if the use of the details is not anticipated. The standard details are part of the appendices.

14.1.3.5 Record Drawings

The Contractor shall record, on a weekly basis, on one set of utility drawings all changes and deviations from the contract drawings in sizes, lines or grade. Record also the exact final location of water lines by offset distances to surface improvements such as edge of existing pavement or to property markers, etc. at a maximum interval of 200 feet. Make sufficient measurements to definitely locate all water lines to permanent points. The drawings will show



references to all valves, fittings, pipe brand changes, etc., and shall use the approved Augusta, GA edge of pavement layer as a reference. Transfer accurately all such records in red pen or pencil to white prints of the utility drawings and deliver them to the Engineer or Inspector with the monthly payment estimate.

At the completion of the water and/or wastewater construction and prior to recording the final plat, the Contractor shall furnish AUD's Inspector with red-line drawings of the project. The drawings must show all field changes made to the approved drawings. Record Drawings shall be prepared from these red-line drawings by the Design Engineer's firm and submitted in digital format, as well as on 2 paper copies on the AUD standard layout. Acceptable digital formats include Arc/Info, Arc/Info export file, or a DXF file generated by AutoCAD from the DWG file and including all relevant software "blocks" and references. Contact AUD for the proper software revision number prior to submission. Digital drawings shall be saved with a layout view for each sheet. All digital record drawings submitted must conform to Georgia State Plane East projection, on North American Datum (NAD) 83, in units of feet, with a defined vertical datum. A Data Dictionary should be included with each file defining individual layers or attribute fields.

Water distribution system record drawings shall be a separate plan from the wastewater collection system record drawings. Maximum plan size shall be 24" x 36". Scale shall be no larger than 1" = 20' and no smaller than 1" = 100' horizontally and no smaller than 1"=10' vertically. No hand-drawn or marked up construction plans will be accepted as record drawings. "RECORD DRAWING" shall be stamped in large print on the plan. If the project is a phase of a subdivision, a location sketch of the entire subdivision with subject phase outlined shall appear on drawings.

Record drawings shall contain the following information:

- 14.1.3.5.a Developer's name, address, and phone number.
- 14.1.3.5.b Contractor's name, address, and phone number.
- 14.1.3.5.c Lot numbers.
- 14.1.3.5.d Road names and rights-of-way widths.
- 14.1.3.5.e Water and sanitary easements.
- 14.1.3.5.f All water service locations and distances from both front property corners of serviced lot for new development construction.
- 14.1.3.5.g All wastewater services with clean-outs and distances from both property corners of serviced lot and from nearest manhole for new development construction.
- 14.1.3.5.h Invert and top elevations of all manholes as well as state-plane coordinates as supplied by red-lined drawings. See standard AUD plan layout located at <http://www.augustaga.gov/departments/utilities/>.
- 14.1.3.5.i Label all sewer services as to distance from a specified manhole, i.e.-Manhole A5+56'. Standard AUD plan layout (<http://augustaga.gov/departments/utilities/>).
- 14.1.3.5.j Label all water services as to distance from a specified valve, i.e.- Valve 5+56'. See standard AUD layout (<http://www.augustaga.gov/departments/utilities/>). Valve numbering shall be sequential to the degree possible.
- 14.1.3.5.k All valves, nodes and fittings for water line construction shall be labeled with state plane coordinates and depths as provided by AUD on red-lined drawings.



See standard AUD plan layout (<http://www.augustaga.gov/departments/utilities/>).

14.1.3.6 Acceptance of Work

Once an approved Record Drawing is received, final inspection is completed, and (a) final plat(s) with maintenance agreement is recorded, AUD will accept the newly constructed system. The Developer/Contractor shall be responsible for any defects in materials or workmanship within the subject system for a period of twelve (12) months from the date of the maintenance agreement.

IMPORTANT: A note stating that “Augusta Utilities shall not be responsible for pavement repair or site restoration associated with repair/replacement of a water or sewer line” shall be included on all final plats for private developments.

14.2 WATER DISTRIBUTION SYSTEMS DESIGN AND CONSTRUCTION

14.2.1 General Design Guidelines

All water distribution system designs shall conform to the requirements as set forth in “Minimum Standards for Public Water” (GA EPD, 2000) as published by the Georgia Environmental Protection Division (<http://www.dnr.state.ga.us/dnr>). A Professional Engineer registered in the State of Georgia must prepare the plans and specifications.

There shall be no physical connection between a potable water supply and a questionable water supply which would allow unsafe (contaminated) water to enter the potable water system by direct pressure, vacuum, gravity or any other means.

Hydraulic designs shall be based upon pressure data applicable to the portion of the service area that will serve the proposed facility. Air release valves in vaults shall be provided in the water main. All water distribution systems shall be looped to the greatest extent possible.

Design engineers shall utilize Augusta Utilities Standards and Specifications to develop specifications to be utilized in AUD projects.

14.2.2 Design and Construction Specifications

14.2.2.1 Spatial Guidelines

14.2.2.1.1 Cover

Standard cover requirements are as follows:

- 14.2.2.1.1.a Standard depth of cover is 4 feet below **existing and proposed road surface** (and areas designed for normal traffic loading) unless otherwise approved by AUD.
- 14.2.2.1.1.b Minimum cover to finished grade over water mains shall be 36 inches. Minimum cover under ditch bottoms shall be 24 inches. Any variance in minimum cover must be approved by AUD on a case-by-case basis.
- 14.2.2.1.1.c In the event the shoulder of the road should rise above the roadway level, the water main shall be placed at a depth to maintain 4 feet below the road surface in order to keep a four foot depth for future driveway cuts.



14.2.2.1.2 Horizontal Separation

Unless otherwise specified, horizontal spacing should conform to the following rules, where all separation distances listed are **edge to edge**:

- 14.2.2.1.2.a Ten (10) feet to any existing or proposed wastewater lines or force main, storm sewer or sewer manhole. Horizontal separation of less than 10 feet requires pipe material to be DIP for water mains, wastewater lines or force mains.
- 14.2.2.1.2.b Fifteen (15) feet to buildings, top of bank of lakes, streams, creeks or other structures. Ten (10) feet is considered the absolute minimum, and will only be considered by AUD when unavoidable. If separation distance is less than ten (10) feet, the pipe material is required to be DIP.
- 14.2.2.1.2.c Where horizontal separations between water and sewer cannot be met, water and sewer lines shall be DIP, and joints staggered such that maximum separation exists between joints AS APPROVED BY AUD.
- 14.2.2.1.2.d Ten (10) feet minimum separation to gas mains.
- 14.2.2.1.2.e Ten (10) feet minimum to underground electric cable.
- 14.2.2.1.2.f Current Georgia EPD separation requirements.

14.2.2.1.3 Vertical Separation

Unless otherwise specified, vertical spacing should conform to the following rules, where all separation distances listed are **edge to edge**:

- 14.2.2.1.3.a Water mains shall cross over and not under other pipes.
- 14.2.2.1.3.b Eighteen (18) inch minimum separation between all pipes and cables shall be maintained, with six (6) inch absolute minimum separation with DIP, when conforming to Georgia EPD separation requirements.
- 14.2.2.1.3.c When water mains cross under sewers, additional measures shall be taken. At least 18 inches of separation between the bottom of the sewer and the top of the water main shall be provided. Adequate structural support for the sewer shall be provided to prevent deflection or settling on the water main. No joint shall be encased under the crossing. Encasement of the water pipe in concrete or flowable fill will also be considered.
- 14.2.2.1.3.d Where vertical separations between water and sewer cannot be met, water and sewer lines shall be DIP, and joints staggered such that maximum separation exists between joints AS APPROVED BY AN AUD ENGINEER.

14.2.2.1.4 Layout

Spatial layout shall observe the following guidelines:

- 14.2.2.1.4.a Normal location of proposed water lines is on the north side of east-west streets, and the east side of north-south streets.
- 14.2.2.1.4.b For existing County roads, the proposed water line will generally be located five (5) feet inside the right-of-way. For existing State roads, the proposed water line must be located five (5) feet inside the right-of-way. Unusual circumstances may warrant deviation. The location of the water line will also be determined by the location of the existing lines to be tied into at the beginning and end of the project.
- 14.2.2.1.4.c For subdivisions, the proposed water line shall be located four (4) feet from the back of the curb. Where ditches are present beside the curb, refer to the Rights-of-Way Encroachment Guidelines (latest version).



For water mains 6” through 16”, DIP Pressure Class 350 shall be allowed. For water mains 18” through 24”, DIP Pressure Class 300 shall be allowed. PVC C900 (most current date), Class 200, SDR-14 with cast iron equivalent O.D.s, gasket bell end with elastomeric gaskets shall be allowed for water mains 6” through 10” (solvent weld joints are not permitted). Flanged DIP shall have threaded ductile iron flanges and shall conform to the requirements of AWWA C115/ANSI 21.15 (latest version). All flanges shall be ductile iron class 150 with a minimum working pressure of 350 psi for diameters 3”-12”, and 250 psi for 14”-48” diameter pipe., and conform to ANSI B16.5 (latest version). Flanges shall be flat faced and all joints shall use 1/8 inch black neoprene full-faced gaskets.

Ductile iron pipe and fittings shall have bituminous coating outside and shall be cement lined in accordance with AWWA C104/ANSI A21.4 (latest version). DIP shall have 1/16” cement mortar lining with rubber gasket push-on joints, restrained joint, or mechanical joints. Mechanical joint glands shall be ductile iron. Tee bolts and nuts shall be Cor-Ten steel. Rubber gasket joints shall conform to AWWA C111/ANSI A21.11 (latest version), and shall be furnished by the pipe manufacturer with the pipe. A non-toxic vegetable soap lubricant shall be supplied with the pipe in sufficient quantities for installing the pipe. The lubricant shall be approved by NSF for use with potable water mains.

Pipe classes designated previously in this standard are minimum allowed. Actual pipe class shall be determined based upon the installation and the use intended. Pipe shall be appropriately labeled on the drawings. All PVC pipe for potable water service shall bear the approved stamp of the National Sanitation Foundation. Copper wire (12 gauge) shall be attached along the top of all buried PVC water lines, wrapped around service corporations and stubbed up into all valves boxes for locating purposes. This wire shall be mechanically spliced so as to be electrically conductive, then insulated to protect against corrosion of the bare wire.

Any pipe, solder and flux used during installation of the water lines and services must be “lead-free” with not more than 8% lead in pipe and fittings, and not more than 0.2% lead in solders and flux.

14.2.2.2.3.2 Applications That Require DIP

DIP shall be required as carrier pipe in the following circumstances:

- 14.2.2.2.3.2.a Within 10 feet of sanitary and storm pipes.
- 14.2.2.2.3.2.b Within 15 feet of structures (near side of concrete footing), or top of bank of lakes/streams/creeks.
- 14.2.2.2.3.2.c Crossings over or under sewers and storm pipes with less than 18 inches separation, with no joint allowed within 10 feet of crossing.
- 14.2.2.2.3.2.e Within project boundaries of subdivisions with private roads where the Utilities Department will take over the line for operations and maintenance while the roads will not be deeded to Augusta.
- 14.2.2.2.3.2.f Along all state rights-of-way.
- 14.2.2.2.3.2.g The Utilities Director may mandate DIP in any instances of off-site or on-site construction where future abuse to the line is possible due to location or circumstances.



14.2.2.2.4 Boring and Jacking Water Lines

Where required by the drawings, the water line will be installed in a steel casing, placed by boring and jacking. Where boring is required under highways or city/county roads, the materials and workmanship will be in accordance with the standards of the Georgia Department of Transportation or local authority. Boring and jacking under railroads will be governed by the latest A.R.E.A. Standards, Part 5, "Pipelines" and those of the railroad involved. The following guidelines apply to jack and bore installations:

14.2.2.2.4.a Casing Pipe

The casing pipe shall conform to the materials standard of ASTM Designation A252, with minimum wall thickness of 0.219 inch. Steel pipe will have a minimum yield strength of 35,000 psi. Casing pipe shall be joined together with welded joints, and work shall be performed by a certified welder.

14.2.2.2.4.b Carrier Pipe

The carrier pipe shall be ductile iron as specified herein.

14.2.2.2.4.c Installation

The steel casing shall be installed by the "Dry Bore and Jack" method. If voids develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately 1 inch, remedial measures will be taken as approved by an AUD Engineer.

When installing water line through casing, Contractor shall use mechanical joint pipe with retainer glands through length of casing or field-lok gaskets. The water main shall be equipped with locking gaskets placed throughout length of casing to adequately restrain the pipe. The ends of the casing shall be sealed with brick and mortar, or a manufactured collar. The pipe shall be supported by with a minimum of two casing spacers per twenty (20) feet of pipe, with one spacer approximately 1 foot from the bell of the pipe.

14.2.2.2.5 Restrained Joints

The method used to restrain joints shall be suitable for the pipe size thickness and test pressure as required for the specified design case. The plans shall indicate the restrained length of pipe on each side of the fittings in both the plan and profile views. Calculations for restrained joints shall be provided by the design engineer. Retainer Glands/Mega-Lug shall be considered a restrained fitting.

Restrained Joints shall be DIP as follows:

14.2.2.2.5.a For 12-inch and Smaller – Restrained joint shall be U.S. Pipe Field Lok, American Ductile Iron Pipe Lok-Fast, EBAA Iron Mega-Lug, or an equivalent product.

14.2.2.2.5.b For 14-inch Diameter and Larger – Restrained joint shall be U.S. Pipe TR Flex, American Ductile Iron Pipe Lok-Ring, or equivalent product, or EBAA Iron Mega-Lug.

14.2.2.2.5.c If inserting in older cast iron pipe, the restrained joint shall be as approved by AUD.

14.2.2.2.6 Reaction Blocking

In lieu of restrained joints, all plugs, caps, tees, bends and other fittings shall be provided with adequate reaction blocking as shown on AUD-Details 11 & 12. Fittings shall be poly wrapped (6 mil) before pouring reaction blocking. Thrust blocks shall be poured-in-place concrete having a minimum compressive strength of 3,000 psi after 28 days of cure time. Soil bearing



value shall be 2,000 psf maximum, and reaction blocking shall be made to bear directly against the undisturbed trench wall. Lower soil bearing values shall be used when soil is poor quality. Where trench conditions are, in the opinion of the Engineer, unsuitable for reaction blocking, the Contractor shall provide tied joints to adequately anchor the piping as shown on the drawings. All the rods and clamps shall be given a bituminous protective coating. All materials, fittings and appurtenances intended for use in pressure pipe systems shall be designed and constructed for a minimum working pressure of 200 psi unless the specific application dictates a higher working pressure requirement.

14.2.2.2.7 Material Transitions

When transitioning water lines, materials shall be indicated and specified and must be approved by AUD. Asbestos-cement transitions shall follow the AUD asbestos-cement water line crossing detail (AUD- Detail 20). Unspecified transitions from DIP to PVC are not allowed. When transitioning, all construction material shall be first quality, not previously used. Repair clamps are not acceptable. Damaged or faulty pipe and materials must be properly replaced. All gaskets shall be new. When connecting to existing valves or fittings, gaskets shall be replaced, not reused.

14.2.2.2.8 Main Taps

Mains may be tapped as long as the tapping line is smaller than the tapped line unless otherwise approved by AUD. See Section 14.2.2.2.9 for service tap requirements. Equal size line connections approved by AUD shall require that a tee be cut into the main where possible. Tees are also required at locations dictated by the Utilities Director. Tapped connections in pipe and fittings shall be made in such a manner as to provide a watertight joint and adequate strength against pull-out. In addition, the following guidelines shall be met:

14.2.2.2.8.a Tapping Sleeves and tapping crosses shall be of a heavy body ductile iron, mechanical joint suitable for a working pressure of 200 psi for sleeves and crosses larger than 14-inch, or a working pressure of 250 psi for sleeves and crosses equal to or less than 14-inch, or as approved by AUD. Tapping sleeves and valves are required for all taps 4 inches and greater. Taps less than 4 inches shall be provided with a service saddle meeting the requirements of Section 14.2.2.2.9. Valves shall be provided on all taps. Tapping sleeves shall be a minimum of 6 feet from pipe joints.

14.2.2.2.8.b Schedule 40 PVC shall only be used as a sleeve for the installation of service line tubing under pavement areas. Use in the water distribution system or other areas is not acceptable.

14.2.2.2.9 Water Service Lines and Taps

For 2" service lines: Galvanized pipe shall be seamless, American made, Schedule 80 and shall conform to the ASTM Specifications.

Where water service lines connect to DIP or any pressure-rated pipe, service saddles must be used. No direct service taps shall be allowed. Brass double strap tapping saddles shall be used. U-bolt type straps are not acceptable. All water service taps on the main shall be spaced at a minimum distance of 18 inches apart and a minimum of 18 inches from a bell or fitting. If two or more taps are required at a minimum spacing, they shall be offset 45° alternatively. Services greater than one (1) inch shall be seamless galvanized. Two-inch (2") services shall



have three 2", 90-degree galvanized, non-malleable elbows per Augusta Utilities' two-inch Water Service detail.

All service line taps shall be supplied with corporation stops (AUD-Detail16). General requirements for corporation stops are as follows: for 1" services, a Ford FB-600-4 or equivalent with a taper thread inlet and flared copper outlet. For 1" water service lines, eighth bend shall be the Ford LA02-44 or equivalent or the Ford LA04-44 or equivalent for compression fittings.

Service line tubing shall be rolled of soft continuous and seamless copper Type K conforming to AWWA C800 and ASTM B-88 (latest version). The minimum diameter for residential use shall be one (1) inch. The service line shall be laid in a straight line and be of a continuous piece of pipe from corporation to curb cock (AUD-Detail 16), and shall not exceed 100 feet in length from the main to the meter. No service line fittings shall be placed under the roadway. For wide roadways, it may be considered placing fittings in the median. The curb cock shall be located 6 inches behind and 8 inches below the top of new curb or edge of asphalt.

14.2.2.2.10 Meter Installation

The Contractor/Developer shall furnish and install an approved meter box at the termination point of all water services, and maintain the box until such time as a meter is installed. Meter boxes for one and one-half inch (1½") and smaller meters are standard, while two-inch (2") can be installed in a Rome oversized 2" cast-iron box. Meters three-inches (3") and larger shall be installed in a meter vault. Meter boxes shall be Rome type, 10" x 19" x 10" cast iron box and lid. The top shall have cast ribs on the bottom side with four (4) legs to prevent sliding movement. The box shall have a minimum weight of 37 lbs., for meters one and one-half inch (1½") or smaller. Meter and curb stop shall be fully encased by the meter box. Meter vaults for meters two-inch (2") and larger shall be pre-cast reinforced concrete using 3,000 psi concrete and #4 rebar (AUD-Detail 15). No site built vaults are permitted. The access hatch shall be made of heavy-duty aluminum, and shall be hinged and lockable. The hatch shall be large enough for removal of the meter but no smaller than 36" x 36". For commercial applications, the meter lid shall have a notch to accommodate automated meter reading technology. Wall dimensions shall allow 2 feet of working clearance. Vault floors shall be no less than four inches (4") thick with 3,000 psi concrete and #4 rebar, with the meter located no less than 18 inches off the floor. In addition, all commercial meters shall have a bypass piping arrangement approximately one size smaller than the meter to facilitate meter removal. This bypass valving shall bypass the meter, but not the backflow prevention device. If a bypass device is installed on the backflow prevention device, then a separate backflow prevention device should be installed on that bypass.

Meter boxes should generally be placed eighteen inches (18") inside the adjacent utility easement that parallels the right-of-way. Where sidewalk is installed, two feet (2') of clearance is required between the customer's side of the sidewalk edge and the meter box. In developments where the property line is not clearly defined (e.g., condominiums) the meter box should be placed for ready access as approved by AUD. Meter boxes and control valves shall be accessible and unobstructed for four feet (4') in all directions. This shall include but not be limited to transformers, telephone junction boxes, walls, trees, etc. Meters boxes shall not be placed in areas that can be fenced, such as a backyard, and shall not be placed in any asphalt or concrete surfaced areas unless approved in writing by AUD. For shopping centers,



the developer's engineer should give special consideration to meter layout so as to satisfy these requirements. When no alternative is available but to locate in asphalt, the top of box shall be flush with the asphalt surface. Meter boxes shall not be located in low areas that normally receive storm water. The box shall also be located outside of parking stalls. The box and lid should be traffic bearing, but located outside of a commonly trafficked area. Valves shall have concrete donuts when not in asphalt or sidewalk.

Meters will be installed by AUD at the time service is required at the stub-out, and will remain the property of AUD. Areas that are privately owned where AUD does not own water or sewer utilities may be master metered. Each unit within a residential building (i.e., duplex, triplex, etc.) shall have a separate meter, unless prior approval is received from the Utilities Director. The proper sizing of service lines is the responsibility of the design engineer, and AUD takes no responsibility for improperly sized meters or the problems associated with them. Meters will be available in the following sizes: $\frac{5}{8} \times \frac{3}{4}$, 1, 1½, 2, 3, 4 -inch, and larger standard sizes as necessary. AUD reserves the right to request historical data for meter sizing.

14.2.2.2.11 Valves, Fittings, and Appurtenances

Valving of all water distribution systems shall be designed to facilitate the isolation of each section of pipeline between intersections of the network. In high density areas (25 dwelling units), valves shall be installed as necessary to minimize the number of persons affected by a water main break. Gate valves, 4 inches to 18 inches, shall be U.S. Pipe Metro-Seal 250 resilient seated gate valve, or equivalent, and must conform to AWWA C509 (latest version). Valves larger than 18 inches shall be gear operated butterfly valves, conforming to AWWA C504 (latest version). Wafer valves will not be accepted. Valves shall generally be installed at intervals of not more than 3,000 LF on transmission mains and on all primary branches connected to these mains. Placing an in-line valve in close proximity to every third fire hydrant is recommended for locating purposes.

The Utilities Director shall determine whether mains are distribution or transmission.

Valves shall **OPEN LEFT** if installed south of Gordon Highway (SR 10), or **OPEN RIGHT** if installed north of Gordon Highway. Valves shall be provided with valve stem extensions to within 6 inches of ground surface, where centerline of pipe to grade is greater than 4 feet.

Valve boxes shall be M&H E-2702, Mueller H10364 or approved equal. Each valve box shall be adjustable for a minimum cover of 3 feet. The flanged base of the valve box shall be at least six (6) inches above the pipe so not to stress water lines 4" and smaller. Extension pieces will be required for additional depth over valves. Extensions shall be M&H E-3120 or Mueller H-10375. Covers shall have "WATER" cast on top.

All valves, bends, tees, crosses and dead ends shall be restrained by retainer glands, restrained gaskets, or by use of a concrete thrust block in those instances that warrant such an installation.

Standard pressure pipe fittings of size four (4) inch ID and larger shall be ductile iron conforming to AWWA C153 (latest version), with mechanical joints unless flanged or restrained joints are required. Gray cast-iron fittings are not allowed. Ductile iron fittings shall be epoxy coated in accordance with AWWA C116 (latest version). Mechanical joint fittings, 24 inches and smaller shall be rated for 350 psi minimum working pressure, while all fittings



between 30 and 48 inches shall be rated for 250 psi minimum working pressure. Mechanical joint fittings 54 through 64 inch shall be rated 150 psi minimum working pressure. Glands for mechanical joint fittings shall be ductile iron. Only bolt systems furnished by the manufacturer for mechanical joints are acceptable; nuts and bolts shall be new, not reused. Pipe gaskets shall be new as supplied by the pipe manufacturer. For sizes less than four (4) inch ID, fittings shall be suitable to the pipe material and application.

For flanged pipe, flanges shall be ductile iron Class 150, ANSI B16.5. Flanged joint fittings 14 inches and smaller shall be rated for 350 psi minimum working pressure, and flanged joint fittings between 14 and 48 inches shall be rated for 250 psi working pressure. All flanges shall be flat faced. Full face, 1/8 inch black neoprene gaskets shall be used on all flanged joints. All joints shall conform to AWWA C115 (latest version). Bolts, nuts and washers for flanges shall be hot dip galvanized, except tee-bolts shall be Cor-Ten steel.

14.2.2.2.12 Fire Hydrants

Fire hydrants shall be provided in all water mains, transmission and distribution systems. Accepted models are Mueller #A-24018, M&H Figure 129T, AWWA Compression-Type Dry-Top Traffic Model, of 150 psi working pressure, and 300 psi testing pressure. Kennedy K-81D will also be accepted. All fire hydrants shall be ordered all yellow. Fire hydrants shall be spaced such that the radius of protection will not be more than 500 feet. In certain areas, closer spacing may be required by the Fire Marshal.

Each hydrant shall be left turn opening and capable of delivering a flow of at least 500 gallons per minute with a residual design pressure of not less than 20 psi during maximum day demand, or a higher flow as required by the Fire Marshal. Multiple fire hydrants with looped mains and/or larger main sizes may be required to provide water for higher flow demand. Flow tests shall be performed to verify the specified fire flow demand.

Fire hydrants shall be of the dry barrel break-away type conforming to AWWA C502 (latest version), with two 2 ½ inches threaded hose nozzles and one 4 ½ inch threaded pumper nozzle. Hose and pumper nozzle threading shall be national standard. Shoe connection shall be 6-inch mechanical joint. The center line of the nozzles shall be 18 inches above the finish grade. Hydrants shall have a 5¼ inch interior valve opening. Hydrants shall be restrained from hydrant to tee at the main and have a concrete thrust block poured behind them. At the discretion of the Utilities Director, additional protection for fire hydrants shall be provided including but not limited to concrete filled ductile iron traffic posts surrounding each hydrant.

Fire hydrant branches (from main to hydrant) shall be a minimum of 6 inches ID. Each branch shall be provided with a resilient seat gate valve located as close as possible to the main. Hydrants shall be located at or near road right-of-way lines with pumper nozzle pointing toward the road. A clear zone around all fire hydrants shall be adhered to, consisting of a 5 foot radius around the hydrant and 7 feet above the top of the hydrant. Maintain 15 feet minimum from hydrant to all structures. Placement of landscaping, fencing, etc. shall be considered in order to meet this clear zone requirement.

14.2.2.2.13 Backflow Prevention Devices



Backflow prevention devices shall be provided, as required by the Utilities Director and as set forth in these Standards. All irrigation systems, water services and fire lines for industrial, office, commercial, schools, mobile home parks, multi-family residences and any other locations as determined by the Utilities Director shall require a minimum of a double-check backflow prevention assembly. In addition, based on the degree of hazard present, AUD may require a reduced pressure (RPZ) backflow prevention assembly on the customer side of service lines (domestic, irrigation, and fire). A certified person shall test backflow devices and the results furnished to AUD prior to any water use. Residential development shall install a “Dual-Check” backflow device on the customer’s side of service line at the point of tie-in to the water meter. Lawn irrigation systems shall have a minimum of a double-check valve backflow prevention device per the 2002 Georgia Plumbing Code (DCA, 2000). The plumber or builder tying service into the set meter will submit the test results for the backflow prevention device to AUD’s Backflow Prevention Section prior to acceptance and any water use.

Backflow prevention device assemblies shall be the latest approved product of a manufacturer regularly engaged in the production of this type equipment. All assemblies shall be as approved by the America Society of Sanitary Engineering (ASSE), The American National Standards Institute (ANSI), The American Water Works Association (AWWA), Foundation for Cross Connection Control and Hydraulic Research of the University of Southern California, and the Georgia State Plumbing Code.

Type and size of all assemblies shall be indicated on the drawings.

Backflow prevention device ownership and maintenance responsibilities shall be as set forth in the appropriate ordinances. The Owner shall document yearly that a qualified technician has tested and inspected the backflow prevention device and that the device has passed inspection. A copy of the technician’s certification must be attached to the test results and submitted to the AUD’s Backflow Prevention Section. The Engineer must comply with AUD Policies and Procedures for Backflow Prevention by Containment (latest version). A copy of this manual is available upon request from AUD.

14.2.2.2.14 Fire Lines

All fire lines shall have a minimum double-detector check valve assembly (detector check valve with a 5/8 inch by-pass meter to detect low flows) within the right-of-way or dedicated easement. No exceptions to the by-pass meter requirement shall be made regardless of sprinkler system type, configuration, etc. Certain types of fire lines will require RPZ check-valve. Please contact AUD’s backflow prevention section to determine actual requirements.

14.2.3 Construction Guidelines for Water Distribution Systems

14.2.3.1 Deviation from Plans

During construction when deviations from approved plans are desired, the AUD’s Inspector shall be notified. Revised plans shall be submitted from the design engineer as soon as possible to the AUD for approval. Minor changes not affecting capacities, flows or operation may be allowed in the field during construction by AUD’s Inspector. The Inspector shall have authority as to what constitutes a minor or major change. An approved set of red-line drawings (section 14.1.3.5) clearly showing any changes shall be submitted to the AUD Inspector at the completion of the work and prior to sign-off of the final plat.



The Contractor/Developer is responsible for verifying the exact location, size and material of any existing water facility proposed for connection or use by the project. No publicly owned water line shall be uncovered without prior coordination with AUD.

14.2.3.2 Erosion and Sedimentation Act Compliance

All phases of construction shall be completed in accordance with the Erosion and Sedimentation Act 12-7-1 et seq.

14.2.3.3 Work Conducted in Rights-of-way

Where a traffic control plan is required, it shall be in accordance with Augusta Public Works Rights of Way Encroachment Guidelines.

14.2.3.4 Water Distribution System Installation

Authorization must be obtained from AUD to construct, alter or modify a water line. Construction of water infrastructure will be authorized by the Utilities Department upon approval of submitted plans and notification of AUD at least 48 hours prior to starting construction (706-312-4132).

Installation of water mains and associated appurtenances shall be in accordance with current AWWA specifications and manufacturer's requirements for the specific product. Loading or unloading and storage of pipe, fittings, valves, etc. shall be done in such manner as to avoid damage. The interior of all pipe, fittings, valves, etc. shall be kept free of dirt and foreign matter at all times. All piping shall be placed in a dry trench with a stable bottom. Wet trench installation shall be allowed only upon approval of AUD.

Restrained joints shall be required at each fitting involving a change of direction and on surrounding pipe, as specified in the approved plans. Concrete thrust blocks can be allowed in lieu of mechanical restraint systems, as approved by AUD.

Backfill shall be free of boulders and debris, and shall conform to Georgia Department of Transportation Specifications. Sharp or rocky material encountered in the base shall be replaced with proper bedding. Pipe shall be laid on line and grade as designed. Pipe joints, gravity blocks, service connections, and conflicts shall be left exposed until visually inspected and approved by the AUD's Inspector.

Fire hydrants shall be installed true and plumb with the center of the pumper nozzle facing toward the road according to Section 14.2.2.12. Hydrants shall not be placed in the sidewalk.

All valves shall be placed according to plans. Valve stems shall be installed plumb. Valve stem extensions are required as described in Section 14.2.2.11. Air relief valves shall be installed at all high points in the water main where air can collect, as shown on the plans or as directed by Augusta Utilities.

The following guidelines shall be followed during the construction of water mains:

14.2.3.4.a Handling and Storing of Materials: Unload pipe so as to avoid deformation or other injury thereto. Place no pipe within pipe of a larger size. Store pipe and



fittings on sills above storm drainage level and deliver for laying after the trench is excavated. Valves shall be drained and stored to protect them from freezing.

14.2.3.4.b

Pipe Laying (General): The interior of the pipe shall be clean and joint surfaces wiped clean and dry when the pipe is lowered into trench. Lower each pipe, fitting and valve into the trench carefully and lay true to line and without objectionable breaks in grade. The depth of cover below finished grade shall be not less than 3 feet, or as shown on the drawings. Give all pipes a uniform bearing on the trench bottom. Allow no trench water or dirt to enter the pipe after laying. Insert a watertight plug in the open end of the piping when pipe laying is not in progress. Water pipe shall be bedded when required by poor soil conditions (AUD-Detail 8).

14.2.3.5 Pressurization and Leakage Testing

After installation, all water mains shall be leak tested, in accordance with AWWA C-600, Section 4.1 (latest version) for DIP, and C605, Section 7 for PVC. The Contractor/Developer shall provide all equipment, materials and labor necessary for pressure and leak testing. This test must be observed by an Augusta Utilities Department representative. A pumping pressure of 200 psi, or 1.5 times the working pressure at the point of testing depending on the discretion of an AUD representative, must be supplied at the expense of the Contractor/Developer. The main tested shall either be isolated from active potable lines or protected from leakage by a double valve arrangement. All water used for pressure testing must be potable water with adequate chlorine residual. Water lines shall be tested by valve sections. Maximum allowable leakage shall be as determined in accordance with current AWWA specifications. The standard duration of test is four (4) hours. Testing procedures shall meet or exceed AWWA C600 (latest version) requirements. Any portions of the main which fail the test shall be replaced or adjusted until the entire new main passes the test criteria. Concurrent with the pressure test, and before any work will be accepted for payment, the Contractor shall perform a leakage test. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof necessary to maintain the water pressure to within 5 psi of the test pressure. No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by equation 1 from AWWA C600 for DIP:

$$L = \frac{SD\sqrt{P}}{133200}$$

Where L = allowable leakage in gallons per hour, S = the length of pipe in the section tested, D = the nominal diameter of the pipe in inches, P =the average test pressure during the leakage test in pounds per square inch gauge. For PVC pipe, the following equation shall be used:

$$L = \frac{ND\sqrt{P}}{7400}$$

where N = Number of joints in the pipeline being tested.

14.2.3.6 Connecting to Existing Systems

All connections to existing mains shall be made under the direct supervision of the AUD's Inspector. Valves on existing mains shall be operated by or under direct supervision of AUD personnel. Tapping sleeves and valves shall be pressure tested prior to tapping. If service to existing customers must be interrupted, AUD shall be notified at least three (3) days (72 hours) in advance. The contractor shall make the necessary notifications to the customers. The new line shall be chlorinated for up to three (3) days and then drained and bacteria tested. Only after maintaining the appropriate chlorine residual and passing the bacteriological test shall the line be put into service, at the direction of AUD.



If cut-off of service is required, the Contractor shall be ready to proceed with as much material pre-assembled as possible at the site to minimize the length of service interruption. Augusta Utilities reserves the right to postpone service cut-off if, in the opinion of the Utilities Director, the Contractor is not ready to proceed on schedule. Scheduled interruptions should not exceed four (4) hours. The Contractor/Developer shall arrange for temporary services to Customer(s) if water will be shut off for more than four hours.

Local chlorination will be required for all pipe and fittings used to complete connections with the potable water system. Tapping sleeves and valves shall be chlorinated in accordance with AWWA requirements. All wet taps shall be witnessed by the AUD's Inspector.

14.2.3.7 Cleaning and Flushing

Upon completion of installation, the mains shall be flushed and the water disposed of without creating a nuisance. Flushing must achieve a minimum water velocity of 2.5 fps in all portions of the pipe. The duration of the flushing will be determined by the AUD's Inspector. No flushing or cleaning shall take place without an Augusta Utilities representative present. The existing mains where the new mains connect may require flushing under the direction of AUD when service is restored. The Contractor shall be responsible for the treatment of discharge and disinfection water. All flushing activities shall be in accordance with AWWA C651.

14.2.3.8 Disinfection

Augusta Utilities shall be notified at least 24 hours in advance to schedule bacteriological testing of water mains. The Contractor shall replace or adjust components of the pipeline which fail the test. Clearance is required from the Utilities Department before AUD will allow the main to be put into service.

All piping complete with fittings and appurtenances shall be sterilized as specified in the applicable sections of AWWA Specification C651 (latest version) "Disinfecting Water Mains." Piping and appurtenances shall be thoroughly flushed then chlorinated with not less than fifty parts per million (50 ppm). Calcium hypochlorite can be used. Water from the existing distribution system or other source of supply should be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine. The solution should be retained in the pipeline for not less than 24 hours and the system shall maintain the chlorination level originally introduced into the line, which should not be less than 50 ppm. The system shall then be flushed with potable water and the sampling program started. A minimum chlorine residual of 1.0 ppm should be available in the line after flushing.

Sampling taps and chlorinated water used for disinfection shall be flushed to a location that will not damage property, persons, etc., and shall be provided by the Contractor/Developer at the expense of the Contractor/Developer. The provisions of this paragraph apply equally to new pipe and fittings and to existing pipelines into which connections have been made or which may have been otherwise disturbed to the extent that contamination may have occurred. All requirements of the health authorities shall be observed in executing this work. The disposal of heavily chlorinated water (following disinfection) must be accomplished in accordance with the latest editions of the AWWA Standard C651 and the EPD's Minimum Standards for Public Water Systems. No dry chlorine shall be placed in the pipes while installing.



A minimum of two samples tested by a State approved private lab, shall indicate bacteriologically satisfactory water and the results shall be submitted to the Inspector.

14.2.4 Measurement and Payment

An AUD standard bid schedule and standard payment sheet are available as part of the standard contract documentation. Please contact AUD by phone at 706-312-4132 for copies of this information.



14.3 WASTEWATER COLLECTION SYSTEMS DESIGN AND CONSTRUCTION

14.3.1 Design Guidelines

A Professional Engineer registered in the State of Georgia must prepare the plans and specifications. The design must conform to the requirements set forth in “Recommended Standards for Wastewater Facilities” (latest version) published by the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, and must follow EPD guidelines.

Before a sewer is designed, the area to be served should be studied for the purpose of estimating the type and quantity of flow to be handled. Design should be considered for the ultimate tributary population. Consideration should be given to the maximum anticipated capacity of institutions, industrial parks, etc. Where future relief sewers are planned, economic analysis of alternatives should accompany initial permit application. Design pipe capacity should be based on peak sewage flows plus the anticipated maximum infiltration/inflow levels under normal open channel flow conditions. The average daily flow of the tributary areas must be stated by the design engineer.

The design engineer shall provide the owner with the calculations supporting the recommended design in the form of a written concept report. The report should summarize the work performed to arrive at the peak flow calculations. A “peak flow summary schematic” shall accompany the report. This schematic shall be in the form of a plan layout sheet and include the following at a minimum: surrounding basin and subbasin limits, hydrology including creeks, lakes, swamps, marshes, and roads, railroads, parcels, topography lines, surrounding wetlands, recommended sewer layout, and peak flow amounts at the lower point of each basin.

All food service operations are required to install, operate, clean, and maintain sufficiently sized oil and grease separators (grease traps) to prevent obstruction or interference with the proper operation of the wastewater collection system and treatment plants.

No gravity-fed sewer lines less than eight (8) inches in diameter may be installed. Sanitary laterals with clean-outs shall be installed at ALL service tie-ins to the system.

14.3.2 Design and Construction Specifications

14.3.2.1 Spatial Guidelines

14.3.2.1.1 Cover

Minimum cover to finished grade over wastewater collection lines shall be four (4) feet, and maximum cover shall be twenty (20) feet, unless otherwise approved by AUD. Any exceptions must be approved by AUD engineering prior to construction. AUD reserves the right to reject proposals with less than four (4) feet of cover.

14.3.2.1.2 Horizontal Separation

Horizontal separation distances are as follows, with distances listed from edge to edge of listed items.

14.3.2.1.2.a Ten (10) feet to water lines and storm sewer lines.



- 14.3.2.1.2.b Fifteen (15) feet to buildings, top of bank of lakes/streams/creeks, other structures (10 feet absolute minimum – only when unavoidable, and pipe material is required to be DIP).
- 14.3.2.1.2.c Ten (10) feet minimum separation to gas mains.
- 14.3.2.1.2.d Ten (10) feet minimum to underground electric cable.

14.3.2.1.3 Vertical Separation

Eighteen (18) inch minimum separation (edge to edge) between all pipes and cables shall be maintained, with a six-inch (6”) absolute minimum separation with DIP.

14.3.2.1.4 Layout

Layout of the sanitary system shall follow these guidelines:

- 14.3.2.1.4.a All manholes constructed outside the right of way shall be elevated two feet above the ground surface.
- 14.3.2.1.4.b All manholes constructed within the 100 year flood plain shall be elevated a minimum of 4 feet above the ground surface and include a water-tight ring and cover.
- 14.3.2.1.4.b Wastewater easements shall be a minimum of twenty (20) feet wide with the sewer line centered in the easement.
- 14.3.2.1.4.c Individual sewer services shall be a minimum of six (6) inches in diameter and shall extend from the main and terminate with a clean-out constructed at the edge of right-of-way. If the main is installed outside of the right-of-way, the services with clean-outs shall terminate at the edge of the permanent easement. All lines eight (8) inches in diameter and larger shall terminate in a manhole. The required service lateral with clean-out shall be inspected by the Augusta Utilities Inspector prior to physical tie-in of private service line. The services shall be installed as deep as possible. Tying into the stack pipe of the clean-out is strictly prohibited unless written authorization is obtained from AUD. The use of donuts is required.
- 14.3.2.1.4.d Sewer lines installed parallel to lakes/streams/creeks shall be designed to leave a 25-foot minimum undisturbed buffer along the edge of the bank.
- 14.3.2.1.4.e Under no circumstances shall house sewer services and water services be laid in the same trench.
- 14.3.2.1.4.f Manhole spacing shall not exceed 400 LF for sewers 15 inches in diameter or smaller, and 500 feet for sewers 18 inches to 30 inches.
- 14.3.2.1.4.g Manholes shall be located at the junction of sewers and at changes in grade, pipe size, or alignment. They shall also be installed at all intersections.
- 14.3.2.1.4.h Wastewater manholes should not be located where surface water can drain into the manhole. When this is not possible, a watertight cover shall be specified. For this purpose, and also for assisting in locating manholes across country, the rims shall be set above grade.
- 14.3.2.1.4.i A drop manhole shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches the invert shall be filleted to prevent solids deposition.
- 14.3.2.1.4.j Minimum angle between influent and effluent wastewater lines at a manhole shall be ninety (90) degrees.



- 14.3.2.1.4.k Both vertical and horizontal alignments shall be reviewed with AUD prior to finalization.
- 14.3.2.1.4.l Where indicated on the plans, pipe stub-outs for the connection of future sewers shall be provided during the construction of new manholes. Each stub-out shall be plugged in the bell end of the stub-out with a plug approved by Augusta Utilities.
- 14.3.2.1.4.m The maximum slope for a wastewater line shall be 20%. All 20% sewers shall be DIP with concrete collar walls at every joint or alternate restraining system provided by design engineer. Slopes less than 20% are preferred. If steep slope is necessary, an AUD Engineer must approve the design.
- 14.3.2.1.4.n Buoyancy of sewers shall be considered and flotation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.

14.3.2.2 Design Parameters

Design parameters for wastewater collection systems are included in Table 1:

Table 1: Design parameters for wastewater for Augusta Richmond County.

Parameter	Value
Per Capita Flow, Average	125 gallons per day (gpd)
Minimum velocity in collector sewer	2.0 feet per second (fps)
Maximum velocity in collector sewer	10.0 feet per second (fps)
Minimum collector sewer size	8 inch
Infiltration Allowance	25 gpd/in Dia/mile
Ratio of Peak to Average flow	2.5
Design depth of flow at Peak Flow	0.75 of Full
Design Period	30 Years
Minimum Manning's "n" Factor	0.014

Table 2 contains minimum slope for representative pipe sizes.

Table 2: Minimum Slope per Pipe Size.

Pipe Inside Diameter (inches)	Minimum Slope in Percent (%)
8	0.400
10	0.28
12	0.220
14	0.170
15	0.150
16	0.140
18	0.12
21	0.100
24	0.080
27	0.067
30	0.058
33	0.052



36	0.046
39	0.041
42	0.037

14.3.2.3 Lift Station Design

All lift stations shall be installed underground, unless otherwise directed by the Utilities Director. Wet well size and pump sizing shall be determined by a professional engineer, after a comparative study has been done of the area surrounding the proposed construction. Potential future development of the surrounding area should be incorporated into the design. All potable water services around sewage pumping facilities shall be provided with an approved reduced pressure zone backflow prevention (RPZ) device. Please refer to the Recommended Standards for Wastewater Facilities (latest version) for additional information.

The following guidelines apply to lift station design:

- 14.3.2.3.a Pumps, valves, and pipe sizes shall be designed by a professional engineer, and should be capable of providing a minimum flow rate of 2 fps per AUD specifications. Calculations for the design shall be submitted to AUD for review and approval. Pump specifications shall be provided to Augusta Utilities for review.
- 14.3.2.3.b Valves shall have a minimum of a 18-inch clearance in all directions.
- 14.3.2.3.c All pipes entering the wet well and discharging from the wet well into the valve pit shall be mechanical joint DIP. PVC pipe will not be permitted.
- 14.3.2.3.d For dry wells, the valve pit shall consist of a precast manhole cone section or a precast concrete box. The bottom shall have 2-inch diameter pre-drilled holes filled with gravel for drainage.
- 14.3.2.3.e A cone section shall be set on a minimum 4-inch thick concrete slab with an open bottom and gravel for drainage. For proposed piping, the manhole shall have cored holes fitted with flexible rubber boots. Standard ring and cover shall be installed and grouted to the cone section. The top of the valve pit shall be a minimum of six (6) inches above finished grade.
- 14.3.2.3.f Electrical systems and components (e.g., motor, lights, cables, conduits, switch boxes, control circuits, etc.) in raw wastewater wells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National and the Augusta, Georgia Electrical Code requirements. In addition, equipment located in the wet well shall be suitable for use under corrosive conditions. Each flexible cable shall be provided with a watertight seal and separate strain relief. A fused disconnect switch located above ground shall be provided for the main power feed for all pumping stations. When such equipment is exposed to weather it shall meet the requirements of weatherproof equipment. The control panel shall be duplex NEMA 4X with audible and visible alarms. Lightning and surge protection systems should be considered. A 110 volt power receptacle to facilitate maintenance shall be provided inside the control panel for lift stations that have control panels outdoors. Ground fault interruption protection shall be provided for all outdoor outlets.
- 14.3.2.3.g A location for permanently-installed or portable engine-driven generating equipment must be in the plans for emergency operation of all lift stations.



Generating unit size shall be adequate to provide power for pump motor starting current and for lighting, ventilation, and other auxiliary equipment necessary for safety and proper operation of the lift station. Augusta will approve allowance for the operation of only one pump during periods of auxiliary power supply. Special sequencing controls shall be provided to start pump motors unless the generating equipment has the capacity to start all pumps simultaneously with auxiliary equipment operating. Where portable generating equipment or manual transfer is provided, sufficient storage capacity with an alarm system shall be provided to allow time for detection of pump station failure and transportation and connection of generating equipment. Special electrical connections and double throw switches shall be installed at all lift stations where emergency power will be provided by portable generating equipment. Design engineer and/or contractor shall coordinate type and size of all permanent or portable generators with City of Augusta prior to lift station construction.

- 14.3.2.3.h Wastewater pumping stations and portable equipment shall be supplied with a complete set of operational instructions, including emergency procedures, maintenance schedules, tools and spare parts as may be necessary.
- 14.3.2.3.i A grit separator shall be provided in the design.
- 14.3.2.3.j Gate valves shall be installed to allow for bypass pumping of the facility.

14.3.2.4 Materials and Methods

14.3.2.4.1 Wastewater Collection Pipe Materials

14.3.2.4.1.1 General Requirements

Pipe for wastewaters shall be polyvinyl chloride (PVC) or ductile iron pipe (DIP) as outlined below. However, DIP is considered a required measure for special applications only. Standard pipe lengths not greater than 20 feet shall be used. Force main pipe shall be of approved C900-CL200 PVC water pipe or ductile iron pipe conforming to AWWA C150 & C151 (latest version).

PVC pipe shall be manufactured from virgin resin conforming to ASTM D-3034 (latest version) with minimum classification of SDR-35 for pipes less than 15" diameter and SDR-26 for pipes greater than 15" diameter. PVC shall be jointed with a rubber gasket and shall conform to ASTM F477 (latest version) and manufacturer's recommendations. Solvent weld is prohibited

DIP shall be epoxy-lined and conform to AWWA C151/ANSI A21.51 (latest version). Design methods shall conform to AWWA C150/ANSI A21.50 (latest version). DIP shall be pressure class 350 for 16" and smaller. DIP shall be of the bell and spigot type with push-on joints conforming to ANSI A21.11 (latest version) or with restrained joints where the application requires restraint.

All fittings shall be of the same quality and material as the pipe to be used. Pipe classes shall be determined based upon the installation and the use intended. Pipe shall be appropriately labeled on the drawings. WYE fittings shall be utilized. TEE fittings and saddles shall not be allowed. All DIP fittings shall be ductile iron.

Aerial pipe shall be mechanical joint DIP or continuous weld, wrapped and coated steel pipe. Piers shall be placed at every joint directly behind the bell. Site conditions may dictate



construction utilizing more stringent requirements than indicated in the standard detail. Anchor collars shall be constructed on the pipe whenever pipe grade is 20% or greater. Restrainers may be used in lieu of collars when a particular brand and method are determined equivalent.

14.3.2.4.1.2 Applications that Require DIP

DIP shall be required in the following circumstances:

- 14.3.2.4.1.2.a When wastewater line has less than four (4) feet of cover. Minimum depth of cover for DIP is two (2) feet. Concurrence of the AUD engineering department must be obtained prior to constructing wastewater line with such shallow cover.
- 14.3.2.4.1.2.b When a wastewater line crosses over storm pipe (Must be one joint of DIP centered on the crossing)
- 14.3.2.4.1.2.c When a wastewater line passes laterally within one (1) foot of a storm sewer line (Must be one joint of DIP centered on the crossing).
- 14.3.2.4.1.2.d When a wastewater line is to have in excess of eighteen (18) feet of fill.
- 14.3.2.4.1.2.e When a wastewater line is at the maximum slope of 20%.
- 14.3.2.4.1.2.f For last joint of pipe at all drop manholes greater than three (3) feet.
- 14.3.2.4.1.2.g When a wastewater line is less than six (6) feet under a street.
- 14.3.2.4.1.2.h The Utilities Director may mandate DIP in any instances of off-site or on-site construction where future abuse to the line is possible due to location or circumstances, extensive length under pavement, or in private property away from right-of-way areas.

14.3.2.4.2 Tie-Ins

14.3.2.4.2.1 New Sewer Systems

New sewer mains shall be tied-in to the existing sewers at locations indicated on the plans. No lines smaller than six (6) inches shall be tied to a sewer line or manhole. All tie-ins to existing manholes shall be cored. The Contractor shall be responsible for maintaining uninterrupted service of the wastewater during tie-in operations. No connection to existing wastewater facilities shall be allowed until the proposed sewer line is inspected and approved by AUD's Inspector.

14.3.2.4.3 Wastewater Collection Lines

14.3.2.4.3.1 Wastewater Line Bedding:

Bedding requirements shall apply to wastewater lines only. They are considered minimum bedding requirements and as such, do not relieve the Engineer/Contractor of the responsibility to provide any additional bedding necessary for proper construction.

Bedding shall be carefully placed along the full width of the trench so that the pipe is true to line and grade of the pipe barrel. Bell holes shall be provided so as to relieve pipe bells of all load, but small enough to ensure that support is provided throughout the length of pipe. Crushed stone embedment material shall conform to ASTM C33, Graduation #57 (GA DOT STD 800.1). Bedding material shall be placed underneath and be carried up the sides of the pipe as specified below.

Class B Bedding shall be performed by first undercutting the trench an adequate amount to provide bedding under the pipe bell. The trench shall then be brought to grade with compacted crushed stone as specified above for the full width of the trench. The bedding material shall be



placed in the zone four (4) inches below the pipe and the pipe laid to line and grade and backfilled with compacted crushed stone placed the full width of the trench up to one-half the outside diameter of the pipe. Select backfill placed in six (6) inch layers and compacted shall be the backfill from the springline of pipe to 18 inches above the pipe. A minimum Class B Bedding shall be used for all plastic pipes.

Class C Bedding shall be performed by first undercutting the trench an adequate amount to provide bedding under the pipe bell. The trench shall then be brought to grade with compacted crushed stone as specified above for the full width of the trench. The bedding material shall be placed in the zone four (4) inches below the pipe and the pipe laid to line and grade and backfilled with compacted crushed stone placed the full width of the trench up to one-fourth the outside diameter of the pipe. Select backfill placed in six (6) inch layers and compacted shall be the backfill from the bedding material to 18 inches above the pipe. A minimum Class C Bedding shall be used for all ductile iron pipes when required by AUD.

14.3.2.4.3.2 Laying Belled Pipe

Belled pipe shall be laid with the bell end up grade and in general, all pipe laying shall start and proceed up grade from the point of connection at the sewer line or other starting point. Pipe shall be laid in a straight line at a uniform grade between manholes.

14.3.2.4.3.3 Transitions

Material for transition (e.g., PVC to DIP) shall be indicated and specified. Where offset of DIP is required, restrained joint DIP shall be installed.

14.3.2.4.3.4 Backfilling Around Pipe

As soon as the joint material has set, fine earth shall be carefully tamped around each joint, and around and over the pipe to a depth of at least 2 feet above the top of gravity pipelines. Selected materials for this purpose shall be Class I or II soils as specified in ASTM D2321. Reconstruction of any roadway section or right-of-way shall be in accordance with the Georgia Department of Transportation and Augusta, Georgia Specifications (AUD- Detail 18).

14.3.2.4.3.6 Boring and Jacking

Jacking and boring for water and sewer lines is covered in section 14.2.2.2.4.

14.3.2.4.4 Wastewater Manholes:

14.3.2.4.4.1 General Guidelines

The elevation drop across the manhole inverts shall be 0.1 feet unless otherwise approved by AUD.

Precast manholes shall conform to the latest edition of ASTM C-478 (five inch wall thickness). Use six (6) inch wall thickness if manhole exceeds 20 feet in depth. All holes for incoming and outgoing pipe will, whenever possible, be precast, with pipe tie-in made using PS10 flexible gasket, manufactured by PressSeal Gasket Corporation, or approved equal. In the event of the necessity of cutting new holes, the holes shall be machined cored neatly and carefully so as not to damage the structural integrity of the manhole and large enough to allow the insertion of a flexible rubber boot. Precast holes shall be flexible boot fitted.



Barrel joints shall be tongue and groove with preformed plastic meeting the requirements of Federal Specifications SS-S-00210, "Sealing Compound, Preformed Plastic Pipe Joints" Type I, rope form, also known as "Ram Neck." Eccentric manholes cones are required. Inverts shall be constructed of 3,000 psi plant mix. Manhole steps shall be installed in all sections of each manhole as indicated on the drawings. Frame and covers shall be cast or ductile iron and set in a bed of mortar on the top of the manhole and completely grouted outside and wiped smooth. Offsite rings and covers shall be integrated into the cone. Ring and cover shall be USF-668 or approved equal. Cover shall read "Wastewater." Watertight manhole covers are to be used wherever street runoff or high water may flood the manhole tops. Locked manhole covers may be desirable in isolated easement locations or where vandalism may be a problem.

Additional manhole guidelines are as follows:

- 14.3.2.4.4.1.a Where corrosive conditions due to septicity or other causes is anticipated, consideration shall be given to providing corrosion protection on the interior of the manholes.
- 14.3.2.4.4.1.b The minimum diameter of manholes shall be 48 inches; larger diameters are required for large diameter sewers. A minimum access diameter of 22- ¼ inches shall be provided.
- 14.3.2.4.4.1.f A bench shall be provided on each side of any manhole channel (ref AUD-Detail 2) when the pipe diameter(s) are less than the manhole diameter. The bench should be sloped no less than ½ inch per foot (4 percent). No lateral sewer, service connection, or drop manhole pipe shall discharge onto the surface of the bench.

14.3.2.4.4.2 Manhole Inverts

Manhole flow channels shall be constructed of concrete, sewer pipe, brick or precast, and shall be of semicircular section. Each manhole shall be provided with such channels for all connecting sewers.

The inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts where direction changes shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining sewers.

14.3.2.4.4.3 Drop Manholes

Drop inlets shall be provided into manholes on wastewaters for incoming lines having inverts two (2) feet or more above the inverts of the manhole outlet lines. Drop pipe and fittings shall be encased in masonry integral with the manhole and extending from the manhole base to the top of the incoming sewer. Diameter of drop manholes shall be four feet at a minimum (AUD-Detail1).

14.3.2.4.4.1.c Outside drop manholes shall be precast and constructed for incoming lines having invert 24 inches or more above the invert of the manhole outlet, with DIP and tie rods per AUD-Detail 1. Shallow manholes shall be precast or Type B slab top precast and shall be constructed in accordance with ASTM C-478 (latest version).

14.3.2.4.4.1.d Drop manholes should be constructed with an outside drop connection. Inside drop connection (when necessary) shall be secure to the interior wall of the manhole and provide access for cleaning. Inside drop connections shall be used only when approved by the Utilities Department Engineering Division.



14.3.2.4.4.1.e Due to the unequal earth pressure that may result from the backfilling operation in the vicinity of the manhole, the entire outside drop connection shall be encased in gravel.

14.3.2.4.4.4 Setting Manhole Frames and Covers

Manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around the bottom flange. The mortar shall be smoothly finished to be flush with the top of the flange and have a slight slope to shed water away from the frame. Manhole covers shall be left in place in the frames on completion of other work at the manholes. Offsite manholes shall have rings and covers integrated into the manhole cone, with watertight fittings.

14.3.2.4.4.5 Setting Precast Manhole Sections

Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.

All holes in sections, used for their handling, shall be thoroughly plugged with mortar. The mortar shall be 1 part cement to 12 parts sand; mixed slightly damp to the touch until it is dense and an excess of paste appears on the surface; and then finished smooth and flush with adjoining surfaces. Exterior manhole wraps may be required in corrosive soils.

14.3.2.4.5 Sewer Structures

Appurtenant sewer structures shall be constructed according to one or more of the following methods:

14.3.2.4.5.1 Masonry

Brick for manholes and other sewer structures shall be laid with shove joints completely filled with mortar. Horizontal joints shall not exceed 1/2 inch, vertical joints 1/3 inch on their interior face. In circular structures, all brick shall be laid as header with joints broken between courses. Interior joints shall be struck or wiped smooth with the face of the wall. The exterior of wastewater manholes shall be plastered to a thickness of at least 2 inches.

14.3.2.4.5.2 Laying Brick and Concrete Block Work

Only clean brick or block shall be used. The brick or block shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar, nor so wet as to be slippery when laid.

Each brick or block shall be laid in a full bed and joint of mortar without repairing subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed.

14.3.2.4.5.3 Plastering and Curing Brick or Block Masonry

Outside faces of masonry shall be plastered with mortar from 3 inch to 6 inches thick. If required, the masonry shall be properly moistened prior to application of the mortar. The plaster shall be carefully spread and troweled so that all cracks are thoroughly worked out.



After hardening, the plaster shall be carefully checked by being tapped for bond and soundness. Unbonded or unsound plaster shall be removed and replaced.

Masonry and plaster shall be protected from too rapid drying by the use of burlap kept moist, or by other approved means, and shall be protected from the weather and frost, all as required.

14.3.3 Construction Guidelines

14.3.3.1 Deviation from Plans

During construction when deviations from approved plans are desired, the AUD's Inspector shall be notified. Revised plans shall be submitted to AUD as soon as possible for approval after coordination with AUD, the Engineer, and the Contractor. Budgetary items shall be coordinated with AUD prior to beginning revised work. A minor change is one that does not affect capacities, flows or operation and may be allowed in the field during construction by AUD's Inspector. The Inspector shall have authority as to what constitutes a minor or major change. An approved set of red-line drawings (section 14.1.3.5) clearly showing any changes shall be submitted to the AUD Inspector at the completion of the work and prior to sign-off of the final plat, and prior to final payment.

The Contractor/Developer is responsible for verifying the exact location, size and material of any existing wastewater facility proposed for connection or use by the project. No publicly owned water or wastewater line shall be uncovered without prior coordination with AUD.

14.3.3.2 Erosion and Sedimentation Act Compliance

All phases of construction shall be completed in accordance with the Erosion and Sedimentation Act 12-7-1 et seq.

14.3.3.3 Work Conducted in Rights-of-way

All work that occurs in the public rights-of-way shall comply with the Augusta, Georgia Planning Commission "Development Documents" (latest version) and Public Works Department's Right-of-Way Encroachment Guidelines (latest version), and will require an encroachment permit available from APW. Any field changes that occur in the public rights-of-way and which are not specifically related to water or sewer items shall be coordinated with APW. Any work proposed in an Augusta right-of-way shall require a traffic control plan approved by Augusta Public Works two weeks prior to the beginning of construction.

14.3.3.4 Wastewater Collection System Installation

Authorization must be obtained from AUD to construct, alter or modify a wastewater line. Construction of sewer infrastructure will be authorized by the Utilities Department upon approval of submitted plans and notification of AUD at least 48 hours (two working days) prior to starting construction.

PVC gravity sewer pipe and force main shall be installed in accordance to ASTM D2321, latest version. Ductile iron gravity sewer pipe and force main shall be installed in accordance with AWWA C600, latest version.

Loading or unloading and storage of pipe, fittings, valves, etc. shall be done such that to avoid damage. All pipes shall be carefully examined before it is installed in the trench. Damaged pipe or pipe which does not meet specification requirements shall be rejected and removed



from the work site. The interior of all pipe, fittings, valves, etc. shall be kept free of dirt and foreign matter at all times. All piping shall be placed in a dry trench with a stable bottom. Wet trench installation shall be allowed only upon written approval of the Utilities Director.

Backfill shall be free of boulders and debris, and shall conform to Georgia Department of Transportation Specifications. Sharp or rocky material encountered in the base shall be replaced with proper bedding. Pipe shall be laid on line and grade as designed. Pipe joints, gravity blocks, service connections, and conflicts shall be left exposed until visually inspected and approved by the AUD's Inspector.

All concrete cradles, saddles, or encasements shall be installed as shown on the plans. These structures shall be constructed in strict accordance to the details shown on the plans. Concrete shall have a 28 day compressive strength of 3,000 psi when tested in accordance with ASTM Specification C-39.

All manholes indicated on the plans shall be furnished and installed by the Contractor in strict accordance with the plans. The invert channels shall be smooth and accurately shaped to the semicircular bottom conforming to the inside of the adjacent sewer sections as shown on AUD-Details 1-3). Changes in direction of the sewer and entering branches shall have as long a radius of the true curvature as the size of the manhole will permit.

The top of manholes shall be topped out with brick as indicated on the AUD- Detail 1. The number of courses will depend on the required elevation of the top of the manhole. The maximum number of brick courses allowed shall be three (3).

New sewer lines shall be inspected, with an AUD inspector present, by mandrel-pulling, lamp-lighting, and air testing main lines and services, and vacuum testing manholes. In the event that a problem is found, AUD may require use of a camera inspection with an Augusta Utilities Department Inspector present. The Developer will then provide AUD with a color VHS system videotape of the inside of every reach of wastewater line installed. The tape shall record manhole number to manhole number, date of recording, and distance from start of run. The tape shall include a distance and location description of every service line connection installed. The manhole numbering system shall be the same as shown on the approved development plans.

All construction material shall be first quality, not previously used. Repair clamps are not acceptable. Damaged or faulty pipe and materials must be properly replaced. All gaskets shall be new. When connecting to existing valves or fittings, gaskets shall be replaced, not reused.

14.3.3.4.1 Laying Sewer Pipe

The pipe shall be laid with bell or groove end upgrade. Pipe shall be tested for soundness, clear interior and satisfactory joint surfaces before lowering the pipe into the trench. Pipe shall be laid in straight lines and on uniform grades between points where changes in alignment or grade are shown. The pipe barrel shall be uniformly bedded. The line and invert grade of each pipe shall be checked from a top line carried on batter boards not over 25 feet apart or by use of a laser beam target inserted in each joint. Pipes shall be laid to form a smooth, uniform invert. A stopper shall be installed in the pipe mouth when pipe laying is not in progress.



14.3.3.4.2 Bulkheads for Tying-In and New Line Flushing

The contractor shall build a tight bulkhead in the pipeline where new work enters an existing sewer. The bulkhead shall remain in place until its' removal is authorized by the Engineer.

All wastewater collection lines, except building connections, shall be flushed with water in sufficient volume to obtain free flow through each line. All obstructions shall be removed and all defects corrected. As soon as possible after the pipe and manholes are completed on any line, the Contractor shall flush out the pipeline using a rubber ball ahead of the water. None of the flushing water or debris shall be permitted to enter any existing sewer.

14.3.3.4.3 Temporary Plugs

Care shall be taken to prevent earth, water and other materials from entering the pipe, and when pipe laying operations are suspended, the Contractor shall maintain a suitable stopper in the end of the pipe and also at openings for manholes at all times when pipe laying is not actually in progress. Open ends of pipe and branches shall be closed with premolded gasket joint stoppers which conform with the same requirements as pipe being used. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

14.3.3.4.5 Force Main Installation

In general, sewer force main must be installed in accordance with the AUD specifications for water distribution systems. Force mains shall be tested to 200 psi, or 2 times the operating pressure, whichever is greater.

Polyvinyl chloride (PVC) force main must conform to AWWA C900-L200, latest version.

Ductile iron force main must conform to AWWA C150 & C151, latest version.

High Density Polyethylene (HDPE) must conform to AWWA C906, latest version.

14.3.3.4.6 Removal and Replacement of Existing Pipe and Equipment

Where indicated on the drawings or required to properly place the work under the contract, as approved by the Engineer, the Contractor shall remove and replace such pipe lines and equipment in a manner as approved by the Engineer.

14.3.3.5 Inspection Infiltration/Exfiltration Leakage Tests

Upon completion of a section of the sewer, the Contractor shall dewater it and conduct a satisfactory test to measure infiltration or exfiltration. The testing shall be conducted prior to any connections to buildings or active sewers. The Contractor shall be responsible for the satisfactory water-tightness of the entire section of sewer. All pipe joints shall be made watertight. There shall be no visible leakage at the joints and there shall be no sand, silt, clay, or soil of any description entering the pipelines at the joints. Leaks in the pipelines which cause infiltration or exfiltration to exceed limits specified in section 14.3.2.2 shall be repaired by replacing defective pipe. Grouting and/or caulking to repair pipelines where excessive infiltration or exfiltration is evident will not be permitted.



The Contractor shall construct such weirs and bulkheads as may be required, shall furnish all water, labor, test plugs, power, pumps, meters, and other equipment necessary for the test to be properly made.

The Contractor shall use a low pressure air test whereby the line is plugged and pressurized to 4 psi, and then held at that pressure for five (5) minutes. The low pressure air test shall be performed in accordance with the applicable sections of the Uni-Bell UNI-B-6-90, latest version.

In addition to line testing, manholes shall also be tested using low-pressure vacuum methods according to Uni-Bell UNI-B-6-90.

14.3.4 Measurement and Payment

- An AUD standard bid schedule and standard payment sheet are available as part of the standard contract documentation. Please contact AUD for copies of this information.



14.4 EXCAVATION AND BACKFILLING

14.4.1 Scope

This section covers all excavation, trenching and backfilling for pipelines, complete.

14.4.2 Existing Improvements

The Contractor shall maintain in operating condition and protect from damage all existing improvements including utilities, roads, streets, sidewalks, drives, power and telephone lines, gas lines, water lines, sewers, gutters and other drains encountered, and repair to the satisfaction of the Engineer any aerial, surface or subsurface elements damaged during the course of the work. Where and if shown on the plans, the locations and existence or nonexistence of underground utilities are not guaranteed. The Contractor shall contact the "Call Before You Dig" utilities locate service to determine and/or verify such information prior to proceeding with the work. The Contractor shall make reasonable and satisfactory provisions for the maintenance of traffic on streets, drives, walkways and at street crossings and if necessary to provide temporary walkways and bridges for crossing of the open trench as directed. Work shall not commence within Augusta, Georgia rights-of-way until a Right-of-Way Encroachment Permit is obtained from the Public Works Department.

14.4.3 Excavation

All excavation of every description and of whatever substances encountered shall be performed to the depths indicated on the drawings or as specified herein. Excavation shall be made by the open cut method except as otherwise specified or shown on the drawings. Excavation methods shall generally meet or exceed Occupational Safety and Health Administration (OSHA) construction industry standards.

All excavated materials not required for fill or backfill shall be removed and wasted as directed. The banks of shallow trenches shall be kept as nearly vertical as practicable and where required shall be properly sheeted and braced. Except where otherwise indicated, trench bottoms shall be not less than 12 inches wider nor more than 16 inches wider than the outside diameter of the pipe to be laid therein, and shall be excavated true to line, so that a clear space of not less than 6 inches nor more than 8 inches in width is provided on each side of the pipe.

Wastewater pipe shall be bedded per detail AUD-Detail-5. Excavation for structures and other accessories shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the embankment or timber which may be used to hold the bank and protect them. Where damage is liable to result from withdrawing sheeting, the sheeting will be ordered to be left in place. Except for sewer pipe bedding or at locations where excavation of rock from the bottoms of trenches is required, care shall be taken not to excavate below the depths indicated. Where rock excavation is required, the rock shall be excavated to a maximum overdepth of 4 inches below the normal required trench depth. The overdepth rock excavation and all excess trench excavation shall be backfilled with loose, moist earth, thoroughly tamped or with suitable sewer bedding material as appropriate for the type of pipe service. Rock is defined as materials which are so hard or cemented that the excavation of such material requires blasting. The excavation and removal of isolated boulders or rock fragments larger than one cubic yard in volume encountered in materials of common excavation shall be classified as rock excavation. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe, as determined by the Engineer or indicated on the drawings, is encountered in the trench bottom, such soil shall be removed to a depth required for the lengths



designated by the Engineer, and the trench backfilled to trench bottom grade, as herein specified, with coarse sand, fine gravel, or other suitable material. Backfill with earth under structures will not be permitted and any unauthorized excess excavation below the levels indicated for the foundation of such structures shall be filled with sand, gravel, or concrete, as directed.

For water lines and sewer mains, the bottom of trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for portions of the pipe sections where it is necessary to excavate for bell holes and for the proper sealing of pipe joints. Bell holes shall be dug after the trench bottom has been graded. Bell holes shall be excavated only to an extent sufficient to permit accurate work in the making of the joints and to insure that the pipe, for a maximum of its length will rest upon the prepared bottom of the trench. Depressions for joints other than mechanical shall be made in accordance with the recommendations of the joint manufacturers for the particular joint used.

14.4.3.1 Grading and Stacking

All grading in the vicinity of trench excavation shall be controlled to prevent surface ground water from flowing into the trenches. Any water accumulated in the trenches shall be removed by pumping or by other approved methods. During excavation, material suitable for backfilling shall be stored in an orderly manner a minimum distance of one and one-half times the depth of the excavation back from the edges of trenches to avoid overloading and prevent slides or cave-ins. Material unsuitable for backfilling, as determined by the Engineer, shall be removed from the job site and disposed of by the Contractor in a manner as approved by the Engineer.

14.4.3.2 Shoring and Sheeting

All shoring, sheeting, and bracing required to perform and protect the excavation and to safeguard employees and the public shall be performed. The failure of the Engineer to direct the placing of such protection shall not relieve the Contractor of his responsibility for damage resulting from its omission.

Whenever sheeting is driven to a depth below the elevation of the top of the pipe, that portion of the sheeting below the elevation of the top of the pipe shall not be disturbed or removed. Sheeting left in place shall be cut off not less than 1 foot below finished grade. No sheeting shall be removed until the excavation is substantially backfilled as hereinafter specified.

14.4.3.3 Water Removal

Where water is encountered, it shall be prevented from accumulating in excavated areas by pumping, well-pointing and pumping, or by other means approved by the Engineer as to capacity and effectiveness. Water removed from excavations shall be discharged at points where it will not cause injury to public or private property, or the work completed or in progress. All efforts to prevent sedimentation shall be made. Under no circumstances shall trench bottoms be prepared, pipes laid, or appurtenances installed in water. Water shall not be allowed to rise in unbackfilled excavations after pipe or structures have been placed.

14.4.3.4 Blasting



Explosives are to used only within legal limitations. Before explosives are used, all necessary permits for this work shall be secured and all precautions taken in the blasting operations to prevent damage to private or public property or to persons. The Contractor shall assume full liability for any damage that may occur during the use of explosives. No blast shall be set off within 50 feet of pipe already laid in the trench. Blasting may only be done by an approved, licensed blaster. The excavation shall proceed in a conventional manner with satisfactory effort made to remove hard materials before the Engineer makes a determination of need for blasting. Pre-drilling and blasting will be allowed, if the Contractor can provide evidence for the Engineer's review that boring logs show the material cannot be excavated otherwise. Evidence will be provided for the Engineer's review and approval before pre-drilling and blasting is undertaken.

14.4.3.5 Tree Protection

Care shall be exercised to protect the roots of trees to be left standing. Within the branch spread of the tree, trench shall be opened only when the work can be installed immediately. Injured roots shall be pruned cleanly and backfill placed as soon as possible.

14.4.4 Backfilling

Trenches and other excavations shall not be backfilled until all required tests are performed and the work has been approved by the Engineer. The trenches shall be carefully backfilled with the excavated materials approved for backfilling consisting of earth, loam, sandy clay, sand, or other approved materials. No material shall be used for backfilling that contains mulch, other unstable materials, stones, blasted rock, broken concrete or pavement, or other hard materials having any dimension greater than 4 inches; or large clods of earth, debris, frozen earth or earth with an exceptionally high void content. Backfilling within Augusta right-of-way shall conform to Georgia Department of Transportation and Augusta, Georgia specifications.

For backfill up to a level 2 feet over the top of pressure pipelines and 2 feet above the top of gravity pipelines, only selected materials shall be used. Select materials shall be finely divided material free from debris, organic material and stone, and may be suitable job excavated material or shall be provided by the Contractor from other sources. The backfill shall be placed in uniform layers not exceeding 6 inches in depth. Each layer shall be moistened and carefully and uniformly tamped with mechanical tampers or other suitable tools. Each layer shall be placed and tamped under the pipe haunches with care and thoroughness so as to eliminate the possibility of voids or lateral displacement.

The remainder of the backfill material shall then be placed and compacted above the level specified above. In areas not subject to traffic, the backfill shall be placed in 12 inch layers and each layer moistened and compacted to a density approximating that of the surrounding earth. Under roadways, driveways, paved areas, parking lots, along roadway shoulders and other areas subject to traffic, the backfill shall be placed in 6 inch layers and each layer moistened and compacted to density at least equal to that of the surrounding earth so that traffic can be resumed immediately after backfilling is completed (AUD-Detail 18). Any trenches which are improperly backfilled, or where settlement occurs, shall be reopened to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade compaction. Along all portions of the trenches not located in roadways, the ground shall be graded to a reasonable uniformity and the mounding over the trenches left in a neat condition satisfactory to the Engineer.



Sheeting not specified to be left in place shall be removed as the backfilling progresses. Sheeting shall be removed in such a manner as to avoid caving of the trench. Voids left by the removal of sheeting and shoring shall be carefully filled and compacted. Where, in the opinion of the Engineer, damage is liable to result from withdrawing sheeting, the sheeting will be ordered to be left in place.

14.4.5 Boring and Jacking

Where required by the drawings, the pipeline will be installed in a steel casing, placed by boring and jacking. The size and thickness of the casing shall be determined by the design engineer. Where boring is required under highways, the materials and workmanship will be in accordance with the standards of the Georgia Department of Transportation or local authority. Boring and jacking under railroads will be governed by the latest A.R.E.A. standards and those of the railroad involved. The steel casing shall be in accordance with ASTM A252 to the thicknesses shown on the drawings. See sections 14.2.2.2.4 and 14.3.2.4.3.6 of these specifications for boring and jacking requirements.

14.4.6 Pavement Removal and Replacement

Where necessary existing pavements shall be removed and replaced, the applicable specifications of the Georgia Department of Transportation or local authority shall govern this work. Joints shall be sawed, unless joints equally uniform in the opinion of the Engineer result from other means. Refer to Right-of-Way Encroachment Guidelines for pavement removal and replacement with Augusta right-of-way.

14.4.7 Measurement and Payment

Excavation and backfilling for pipelines and appurtenances, except as hereinafter provided for, will be considered as incidental to the construction of the various elements of the installation it is associated with, and no separate payment will be made therefor.

When made at the direction of Engineer, overcut, rock excavation and backfill to compensate for rock will be made at the unit contract price for rock excavation per cubic yard measured in place.

When made at the direction of the Engineer, overcut and backfill to compensate for inadequate foundation will be paid for at the unit contract price for overcut and clean stone bedding, per ton of stone.

Sheeting ordered to be left in place will be paid for at the unit contract price for sheeting left in place, per board foot.

Joints in pavements will not be paid for separately. Pavement removal and replacement will be paid for at the unit contract price therefor, per square yard.



14.5 REFERENCES

In this reference section, ANSI refers to the American National Standards Institute, 25 West 43rd Street, 4th floor New York, NY 10036. AWWA refers to the American Water Works Association, 6666 West Quincy Avenue, Denver, Colorado, 80235. APWA refers to the American Public Works Society, 2345 Grand Boulevard, Suite 500, Kansas City, MO 64108-2641. All standards are listed as the latest known version. **Any future revision to these standards will supercede the listed standard.**

ANSI/AWWA, C104/A21.4-95. 1995. American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

ANSI/AWWA, C110/A21.10-98. 1998. American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. (75 mm through 1200 mm), for Water.

ANSI/AWWA, C111/A21.11-00. 2000. American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

ANSI/AWWA, C115/A21.15-99. 1999. American National Standard for Flanged Ductile-Iron Pipe With Threaded Flanges.

ANSI/AWWA, C150/A21.50-02. 2002 American National Standard for Thickness Design of Ductile-Iron Pipe.

ANSI/AWWA, C151/A21.51-02. 2002. American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

ANSI/AWWA, C500-02. 2002. Metal-Seated Gate Valves for Water Supply Service.

ANSI/AWWA, C502-94. 1994. Dry-Barrel Fire Hydrants.

ANSI/AWWA, C503-97. 1997. Wet-Barrel Fire Hydrants.

ANSI/AWWA, C504-00. 2000. Rubber-Sealed Butterfly Valves.

ANSI/AWWA, C507-99. 1999. Ball Valves 6 in. through 48 in. (150 mm through 1200 mm).

ANSI/AWWA, C508-01. 2001. Swing-Check Valves for Waterworks Service, 2 in. (50mm) Through 24 in. (600mm) NPS.

ANSI/AWWA, C509-01. 2001. Resilient-Seated Gate Valves for Water-Supply Service.

ANSI/AWWA, C510-97. 1997. Double Check Valve Backflow-Prevention Assembly.

ANSI/AWWA, C511-97. 1997. Reduced-Pressure Principle Backflow-Prevention Assembly.



ANSI/AWWA, C512-99. 1999. Air Release, Air/Vacuum and Combination Air Valves for Water Works Service.

ANSI/AWWA, C550-01. 2001. Protective Epoxy Interior Coating for Valves and Hydrants.

ANSI/AWWA, C600-99. 1999. Installation of Ductile-Iron Water Mains and Their Appurtenances.

ANSI/AWWA, C605-94. 1994. Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

APWA, 2000. Permanent Buried Line Marking.

<http://www.apwa.net/Documents/GovtAffairs/Policies/ROW/permburied.pdf>

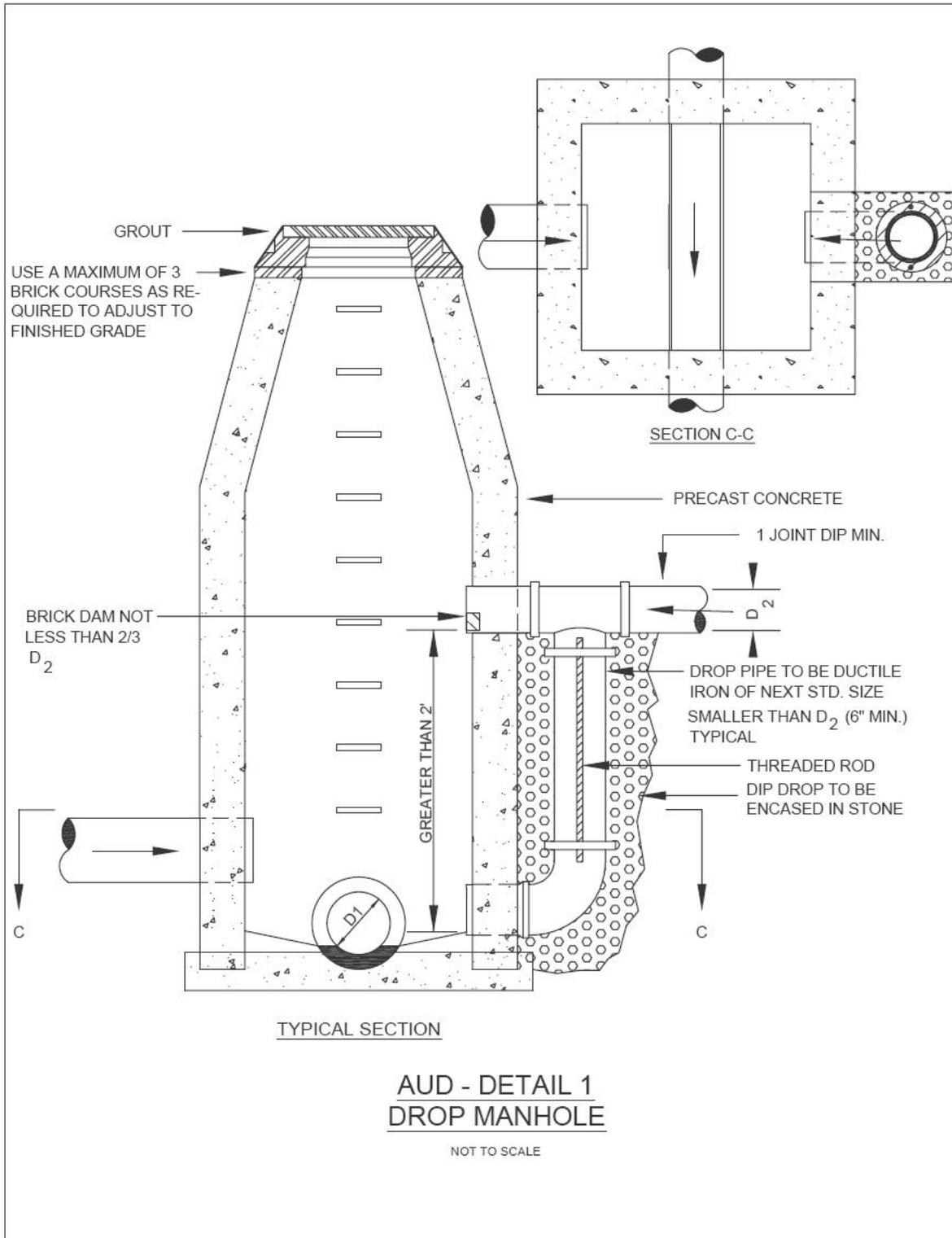
Department of Community Affairs, Office of Coordinated Planning. 2000. Georgia State Amendments to the Standard Plumbing Code (2000 edition).

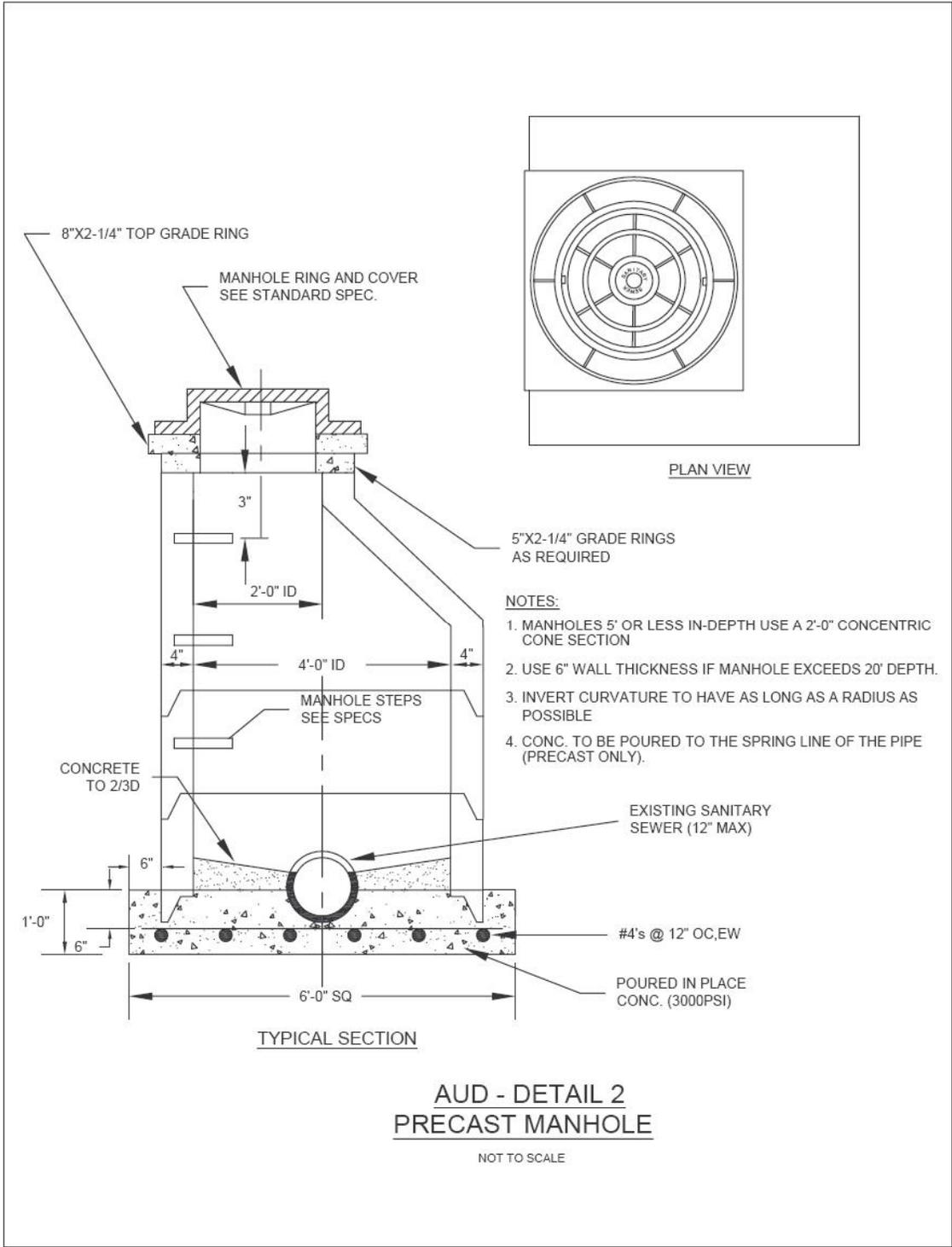
Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers. 1997. Recommended Standards for Wastewater Facilities.

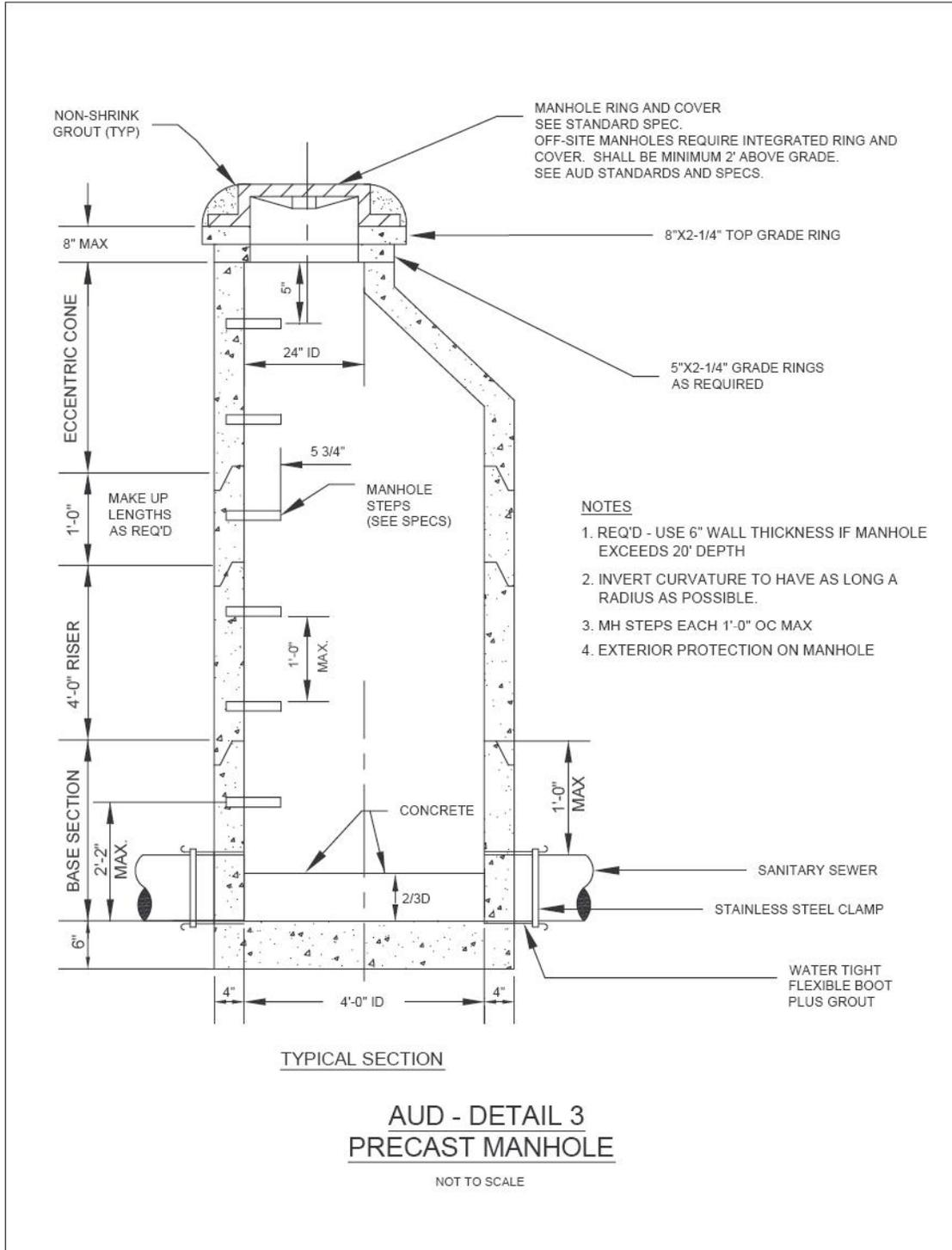
ASTM D2321, 2005. –Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other gravity-flow Applications

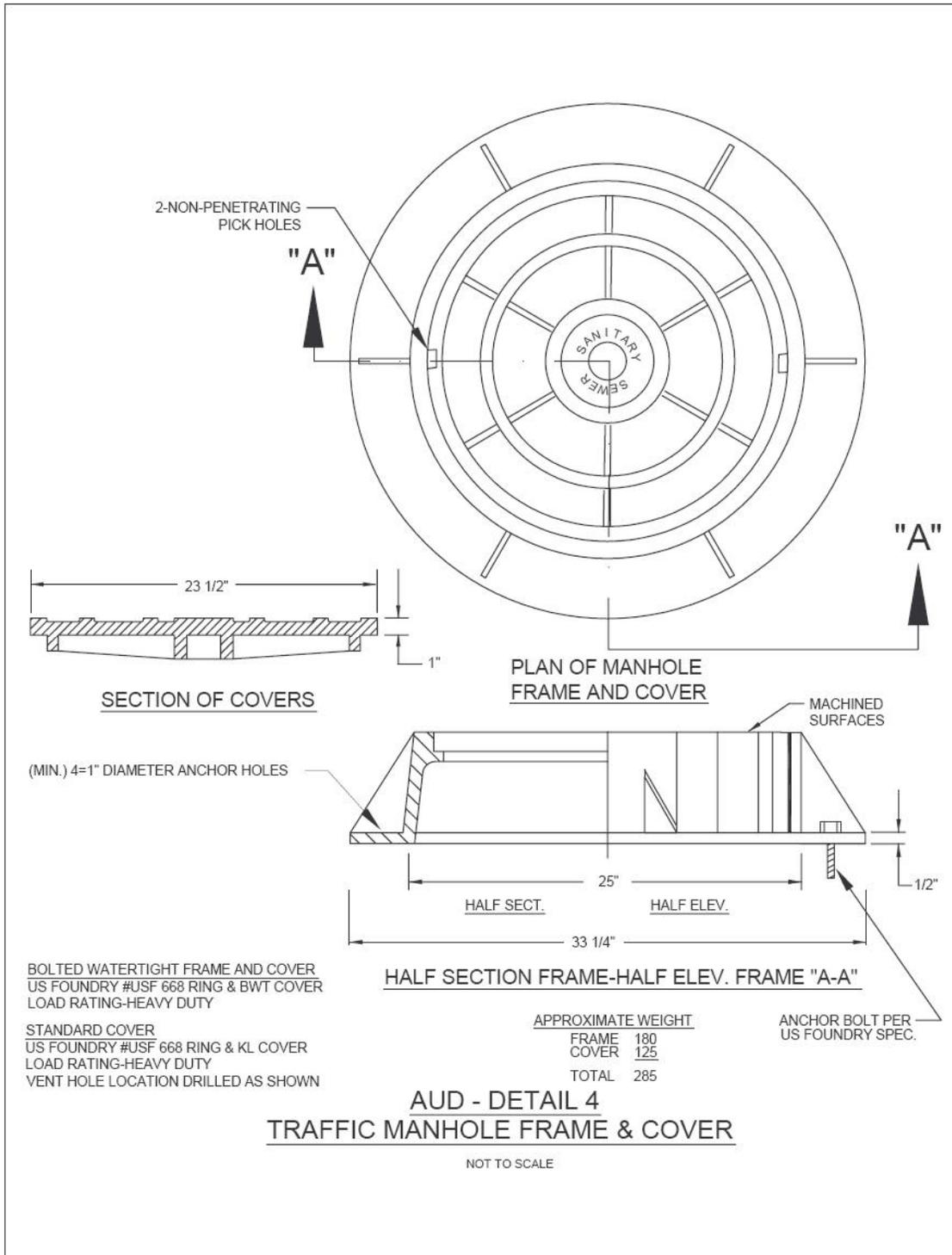
14.6 APPENDICES

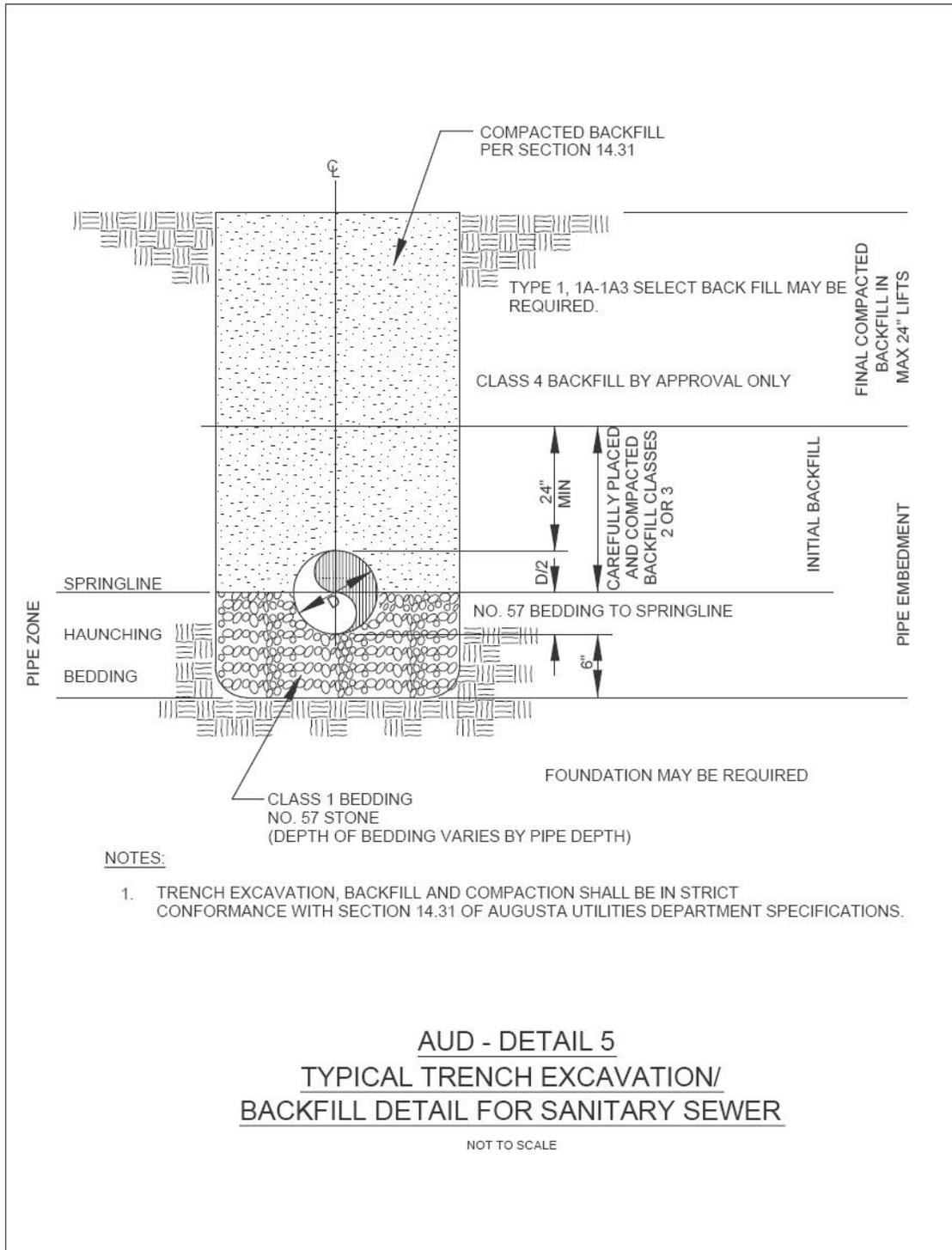
14.6.1 Standard Details

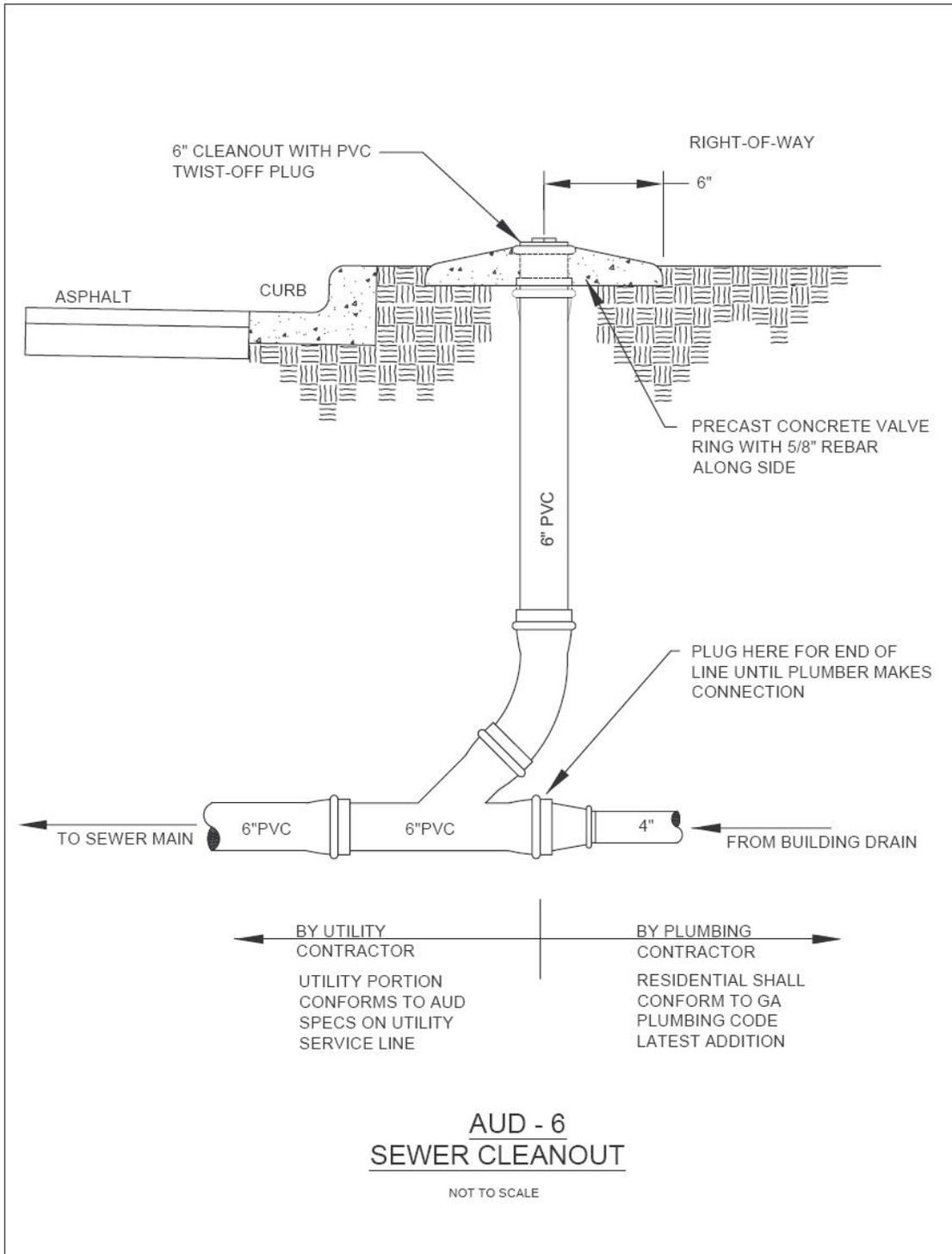


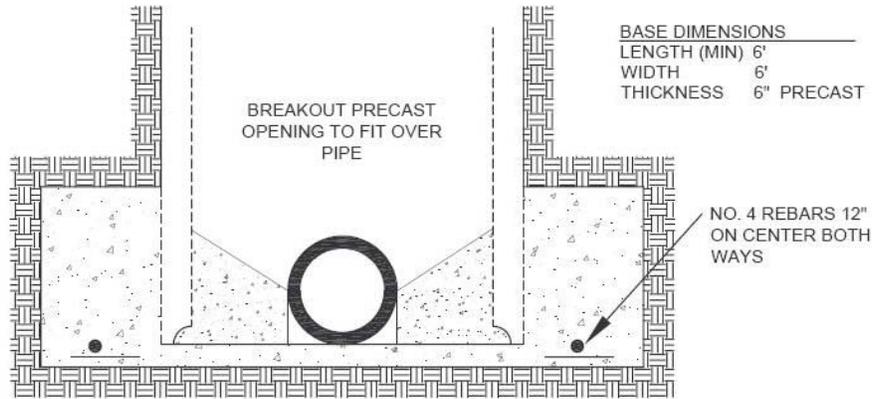




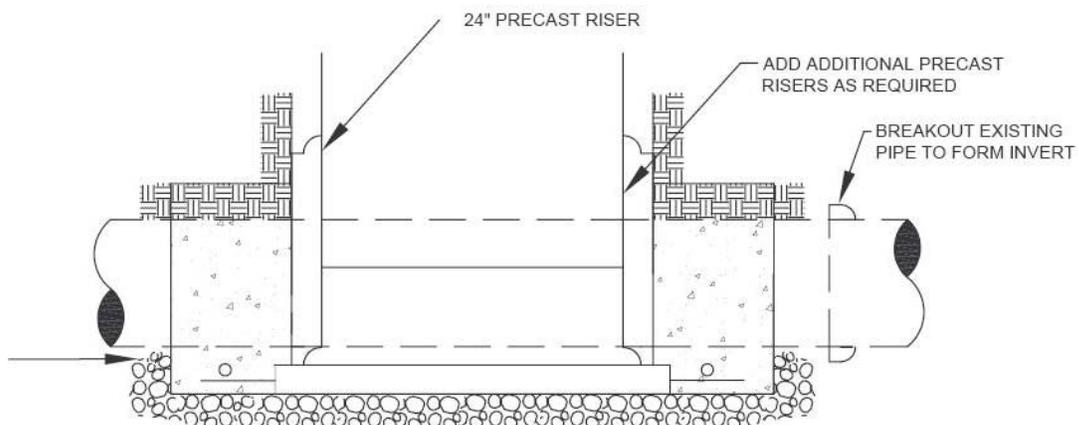








FRONT VIEW



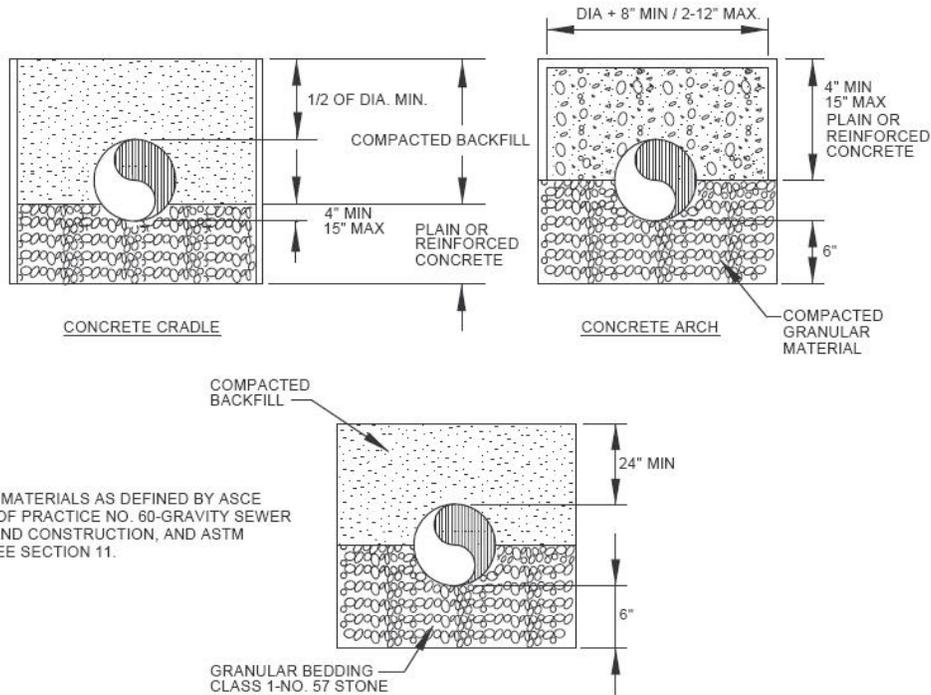
SIDE SECTION

NOTES

1. CONCRETE TO BE POURED AROUND PIPE PENETRATION FOR SEAL ON OUTSIDE
2. CONSTRUCTION SHALL BE IN ACCORDANCE WITH AUGUSTA UTILITY DEPARTMENT STANDARDS, LATEST REVISION.

AUD - DETAIL 7
CONNECTOR MANHOLE

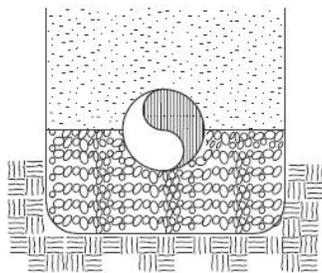
NOT TO SCALE



BEDDING MATERIALS AS DEFINED BY ASCE MANUAL OF PRACTICE NO. 60-GRAVITY SEWER DESIGN AND CONSTRUCTION, AND ASTM D 3839. SEE SECTION 11.

BEDDING CLASSES FOR FLEXIBLE PIPE

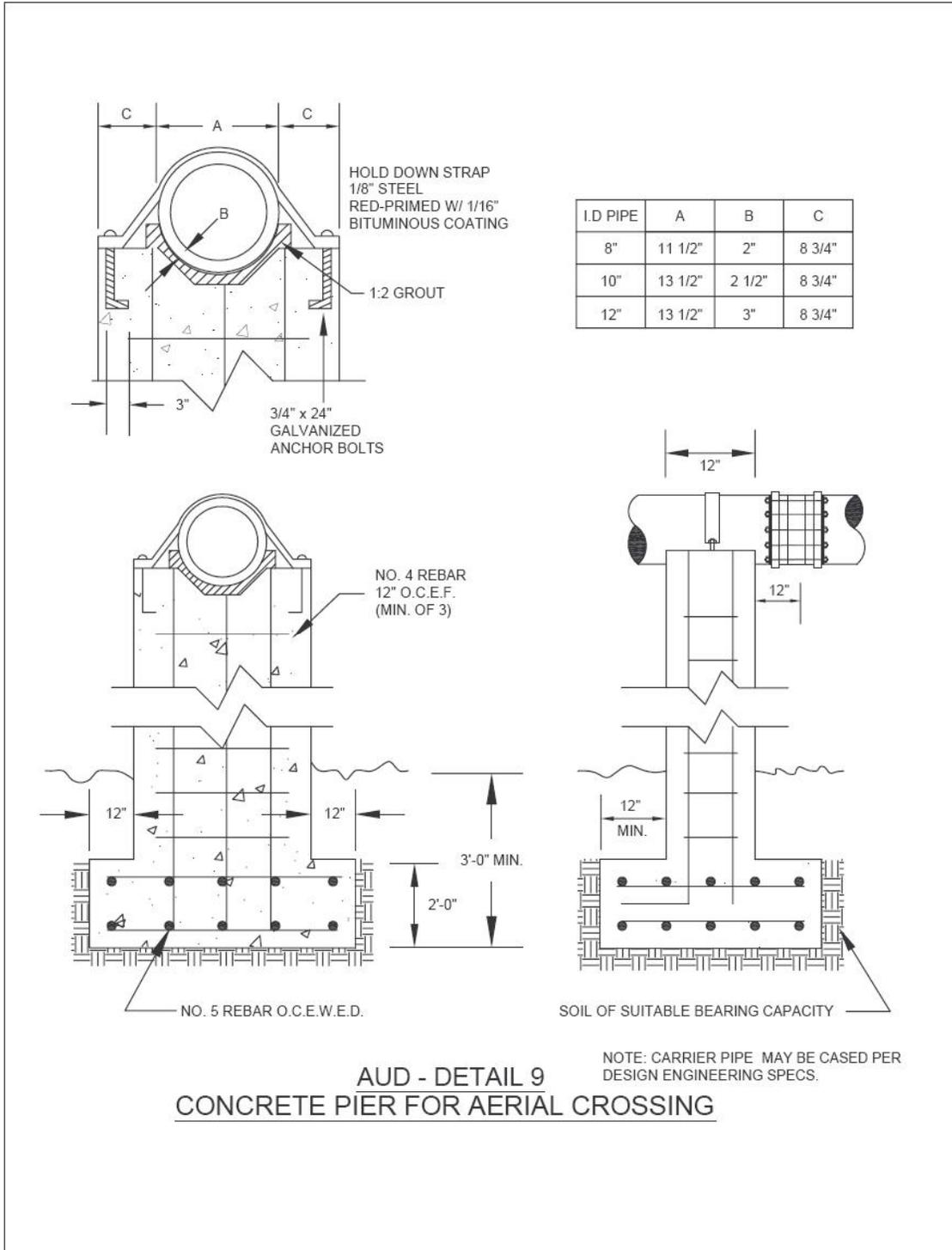
GENERAL BEDDING AND BACKFILLING CONCEPTS DEVELOPED FOR FLEXIBLE SEWER PIPE MAY ALSO BE APPLIED TO RIGID PIPE. REFER TO ANSI AND ASTM SPECIFICATIONS. NO. 57 STONE IS REQUIRED FOR BEDDING WITH PVC PIPE IN AUGUSTA.

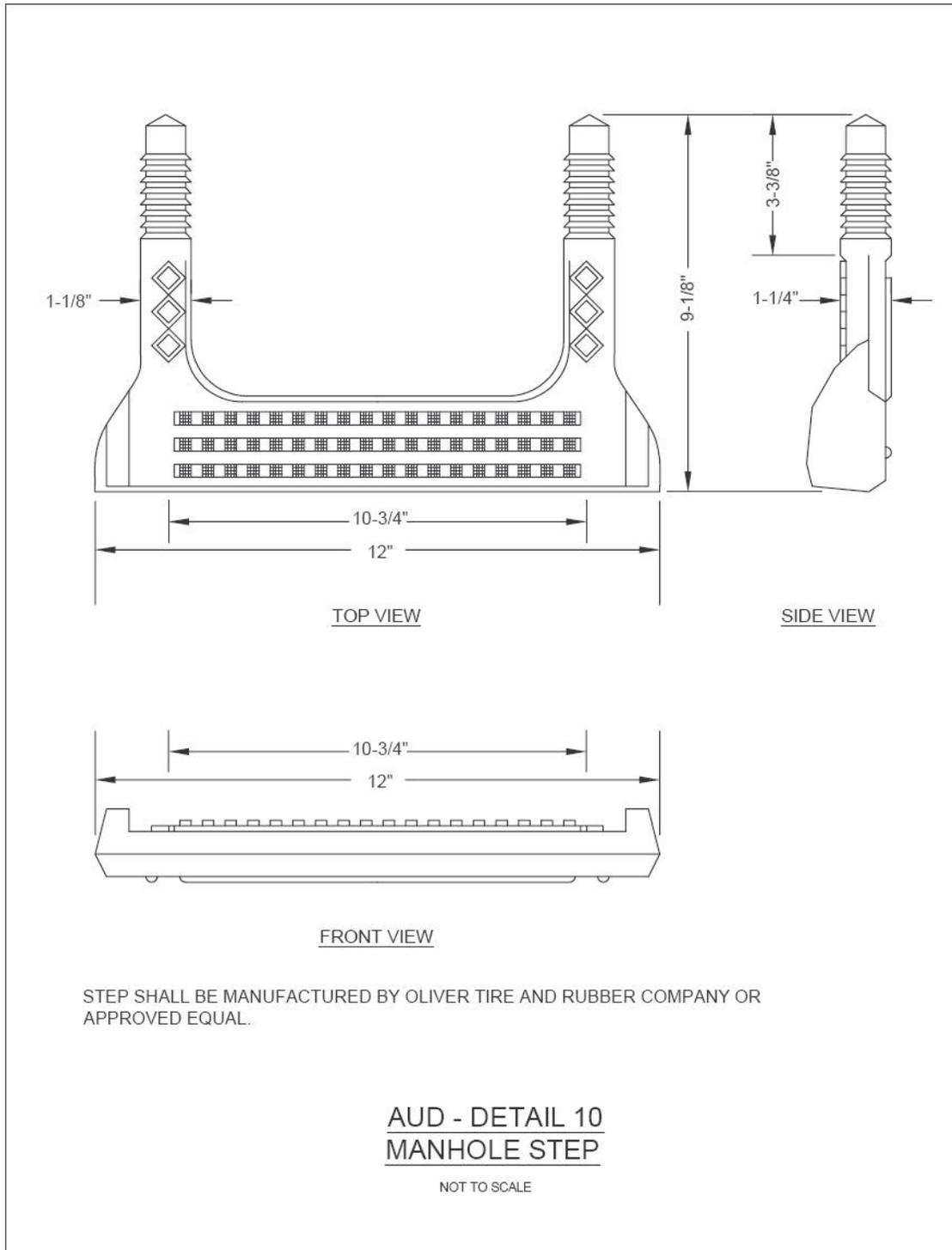


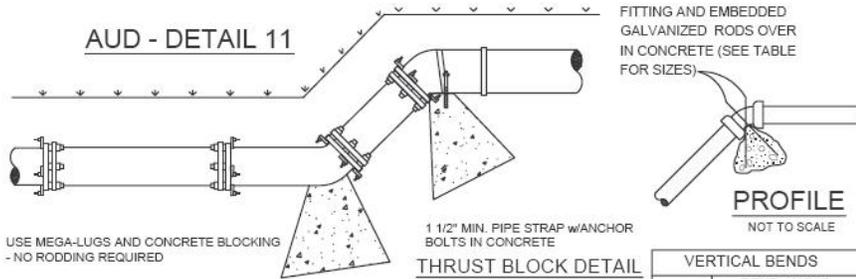
- CLASS 2 TRENCH BACKFILLED WITH COURSE SAND & GRAVELS WITH MAX PARTICLE SIZE OF 1 1/2", INCL VARIOUSLY GRADED SANDS & GRAVELS CONTINUING SMALL PERCENTAGES OF FINES, SOIL TYPES GW, GP, SW & SP ARE INCLUDED.
- CLASS 3 TRENCH BACKFILLED WITH FINE SAND AND CLAYEY GRAVELS, INCL FINE SANDS, SAND-CLAY MIXTURES, AND GRAVEL-CLAY MIXTURES. SOIL TYPES GM, GC, SM, AND SC ARE INCLUDED.
- CLASS 4 THIS TYPE MATERIAL IS TO BE USED WITH APPROVAL ONLY BY THE AUD REPRESENTATIVE.

AUD - DETAIL 8 BACKFILL CLASSES FOR PIPING INSTALLATION

NOT TO SCALE



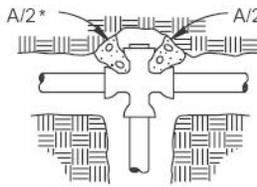




USE MEGA-LUGS AND CONCRETE BLOCKING - NO RODDING REQUIRED

1 1/2" MIN. PIPE STRAP w/ANCHOR BOLTS IN CONCRETE
THRUST BLOCK DETAIL

CLAMPS AND TIE RODS
NOT TO SCALE



PLUGGED CROSS
* EACH AREA (A/2) IS 1/2 OF TABULATED TOTAL AREA

VOLUME OF THRUST BLOCK IN CUBIC YARDS

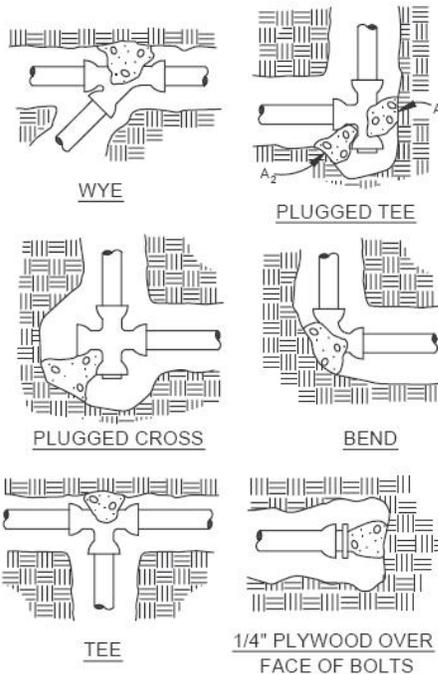
FITTING SIZE	ROD SIZE	EMBEDMENT
12" & LESS	#6	30"
14"-16"	#8	36"

FITTING SIZE	BEND ANGLE		
	45°	22 1/2°	11 1/4°
≤4	1.1	0.4	0.2
6	2.7	1.0	0.4
8	4.0	1.5	0.6
10	6.0	2.3	0.9
12	8.5	3.2	1.3
14	11.5	4.3	1.8
16	14.8	5.6	2.3

FITTING SIZE	BEARING AREA OF THRUST BLOCKS IN SQ. FT. (HORIZONTAL BENDS)						
	TEE, WYE, PLUG OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED RUN		BEND ANGLE		
			A ₁	A ₂	45°	22 1/2°	11 1/4°
≤4	1.0	1.4	1.9	1.4	1.0	—	—
6	2.1	3.0	4.3	3.0	1.6	1.0	—
8	3.8	5.3	7.6	5.4	2.9	1.5	1.0
10	5.9	8.4	11.8	8.4	4.6	2.4	1.2
12	8.5	12.0	17.0	12.0	6.6	3.4	1.7
14	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16	15.0	21.3	30.0	21.3	11.6	6.0	3.0

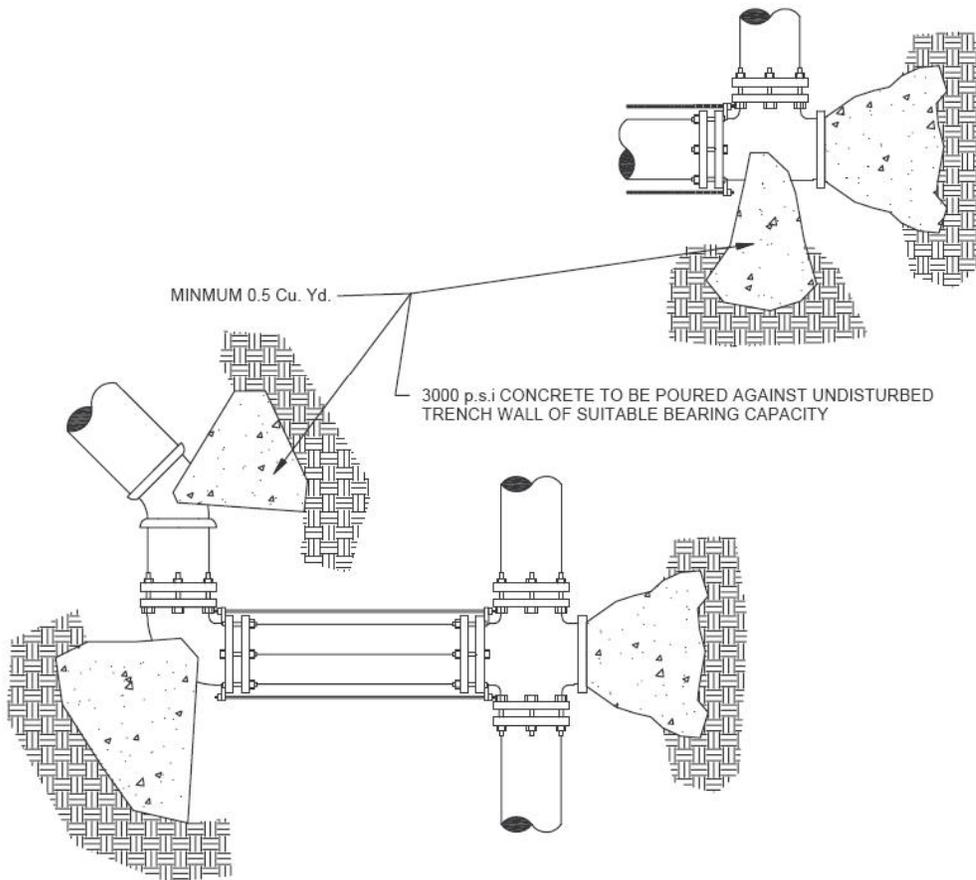
THRUST BLOCK NOTES

- PIPE < 16" DIA CAN BE RESTRAINED USING THRUST BLOCKS OR RESTRAINED JOINTS AT THE CONTRACTORS OPTION. CONTRACTOR SHALL SUBMIT A BURIED PIPING RESTRAINT PLAN TO THE ENGINEER.
- KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES.
- CONCRETE THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH.
- REQUIRED VOLUMES OR BEARING AREAS AT FITTINGS SHALL BE AS INDICATED BELOW, AND ADJUSTED, IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED IN THE SPECIFICATIONS.
- THRUST BLOCK VOLUMES FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS ARE BASED ON TEST PRESSURE OF 150 PSIG AND THE WEIGHT OF CONCRETE = 4050 LBS/CU YD. TO COMPUTE VOLUMES FOR DIFFERENT TEST PRESSURES, USE THE FOLLOWING EQUATION: VOLUME = (TEST PRESS./150) x (TABLE VALUE).
- BEARING AREAS FOR HORIZONTAL BEND THRUST BLOCKS ARE BASED ON TEST PRESSURE OF 150 PSIG AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 LBS/SQ FT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, MULTIPLY TABLE VALUES BY THE FACTOR $(13.33)(P'/S_b)$, WHERE: P' = ACTUAL TEST PRESSURE, PSIG; S_b = ACTUAL SOIL BEARING PRESSURE, PSF.
- THRUST BLOCKS FOR VERTICAL BENDS HAVING DOWNWARD RESULTANT THRUSTS SHALL BE THE SAME AS FOR HORIZONTAL BENDS.
- BEARING AREAS, VOLUMES, AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER THIS STANDARD.
- BEARING AREA OF THRUST BLOCK SHALL NOT BE LESS THAN 1.0 SQ FT.
- VERTICAL BENDS THAT REQUIRE A THRUST BLOCK VOLUME EXCEEDING 5 CUBIC YARDS REQUIRE SPECIAL BLOCKING DETAILS. SEE PLANS FOR VOLUMES SHOWN TO LEFT OF SOLID LINE IN TABLE.
- TEST PRESSURES ARE SHOWN IN THE PIPING SCHEDULE.
- ACTUAL ALLOWABLE SOIL BEARING PRESSURE IS 1500 LBS/SQ FT.



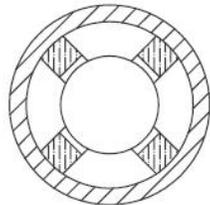
NOTES

1. DO NOT ALLOW CONCRETE TO COVER BOLTS, GLANDS, RINGS OR NUTS.
2. ALL PLUGS, CAPS, TEES, WYES AND AT BENDS MORE THAN 11 1/4" SHALL BE GIVEN REACTION BLOCKING AS SHOWN
3. SUFFICIENT THRUST BLOCK BEARING AREA SHALL BE INSTALLED TO DISTRIBUTE THE THRUST BLOCK BEARING INTO THE UNDISTURBED TRENCH WALL WHERE IT IS DETERMINED THAT THE TRENCH WALL WILL NOT PROVIDE SUITABLE SUPPORT, 3/4" ALL-THREADED RODS WITH APPURTENANCES SHALL BE USED IN LIEU OF BLOCKING
4. MEGA-LUGS MAY BE INSTALLED w/o RODDING AS AN APPROVED EQUAL.

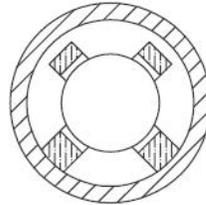


**AUD - DETAIL 12
REACTION BLOCKING**

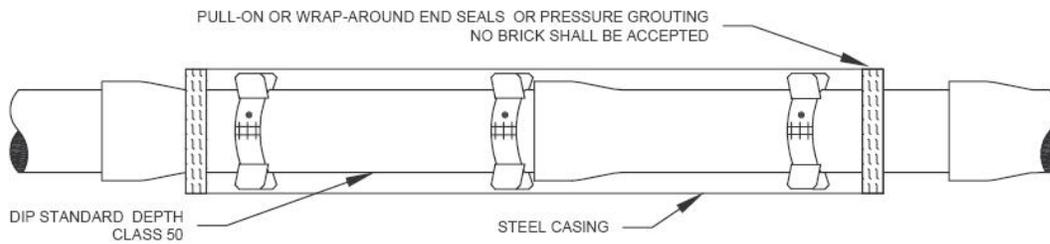
NOT TO SCALE



CENTERED/RESTRAINED POSITIONING FOR WATER MAINS
MECHANICAL JOINT PIPE REQUIRED FOR WATER MAINS.



STANDARD POSITIONING
FOR SANITARY SEWER



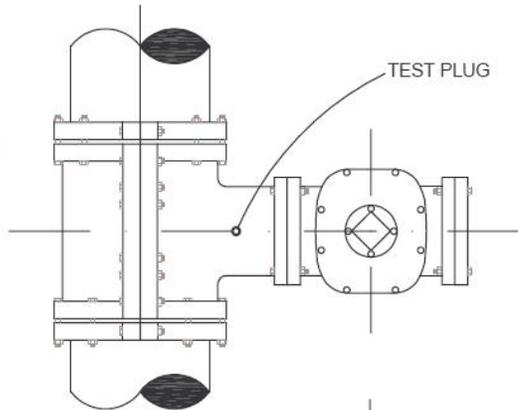
NOTES

1. SPACER OPTIONS: 8" OR 12" WIDE BAND
2. APPROVED TYPES ARE CASCADE OR PSI
3. INSTALLATION SHALL BE IAW THE MANUFACTURES STANDARDS
4. CASING PIPE THICKNESS SHALL BE PER DOT OR RAILWAY SPECIFICATIONS

AUD - DETAIL 13
TYPICAL ROADWAY JACK AND BORE
FOR WATER AND SANITARY SEWER MAINS

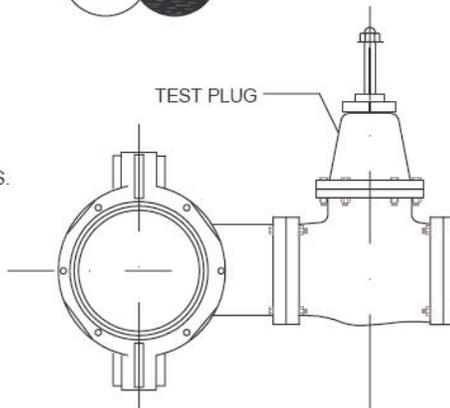
TAPPING VALVE SHALL BE A MUELLER T-2360 RESILIENT WEDGE-FL X MJ ENDS OR APPROVED EQUAL. TAPPING SLEEVE SHALL BE A MUELLER H-615 MJ OR APPROVED EQUAL. NO SS REPAIR CLAMPS OR MJ SPLIT SLEEVES WILL BE ACCEPTED.

TOP VIEW



TAPPING SLEEVE AND VALVE SHALL BE PRESSURE TESTED FOR 1 HOUR PRIOR TO TAPPING THE EXISTING MAIN. AN AUD INSPECTOR SHALL BE PRESENT DURING TESTING. ALL TESTING SHALL BE IN ACCORDANCE WITH AUD SPECIFICATIONS. TESTING PRESSURE SHALL BE 200 p.s.i.

SIDE VIEW



AUD -DETAIL 14
TAPPING VALVE AND SLEEVE

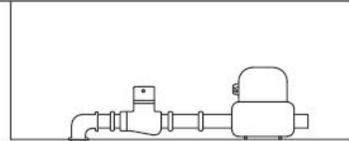
NOT TO SCALE

WATER METER TO BE PURCHASED FROM
AND INSTALLED BY AUGUSTA UTILITIES

ANY COUPLINGS OR REDUCERS REQUIRED ON NEW 1" SERVICES
AFTER CURB STOP SHALL BE INSTALLED BY AUGUSTA UTILITIES

METER BOXES TO BE
INSTALLED AND MAINTAINED
BY DEVELOPER UNTIL
RESIDENCE IS OCCUPIED

METER BOXES ARE TO
BE ROME 10X19X10 CAST
IRON OR APPROVED
EQUAL



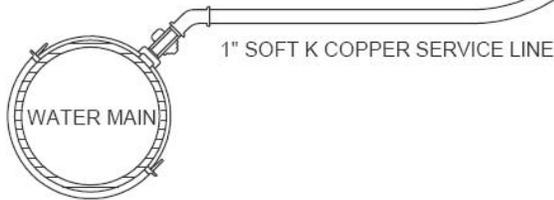
FORD B11-444W OR
APPROVED EQUAL 1"
FULL PORT CURB STOP

HAYES 5628CF OR
APPROVED EQUAL 1"
SERVICE ELBOW

SERVICE LINE TO BE
CAREFULLY BENT TO
ACHIEVE 90 DEGREE
ANGLE AT DESIRED
METER LOCATION

FORD LAO4-44, FORD
LAO2-44 OR APPROVED
EQUAL 1" CORPORATION
STOP COUPLING 1/8 BEND

FORD FB600-4 OR APPROVED
EQUAL 1" BALL CORPORATION
STOP



SMITH BLAIR OR
APPROVED EQUAL
1" DOUBLE
STRAPPED TAPPING
SADDLE

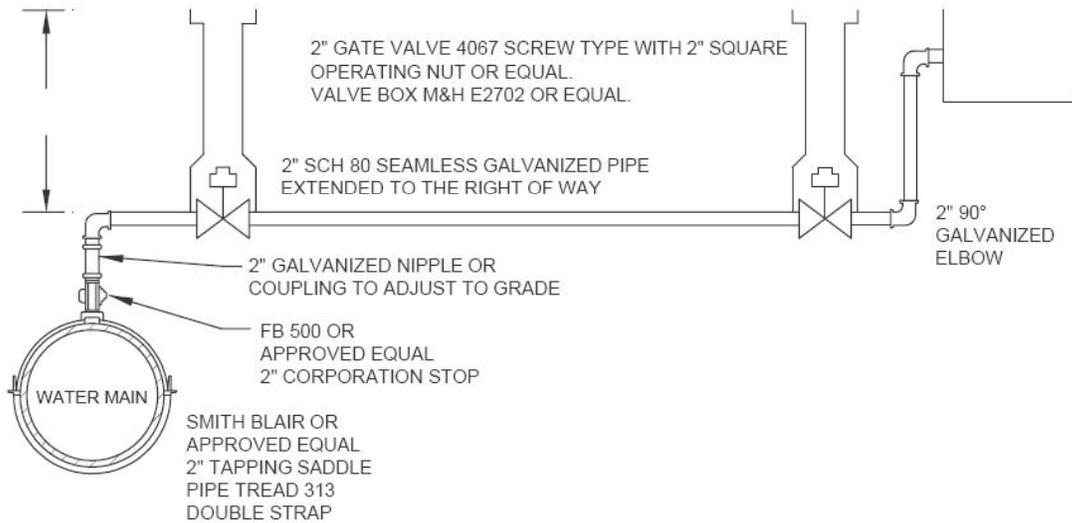
**AUD - DETAIL 16
WATER SERVICE**

NOT TO SCALE

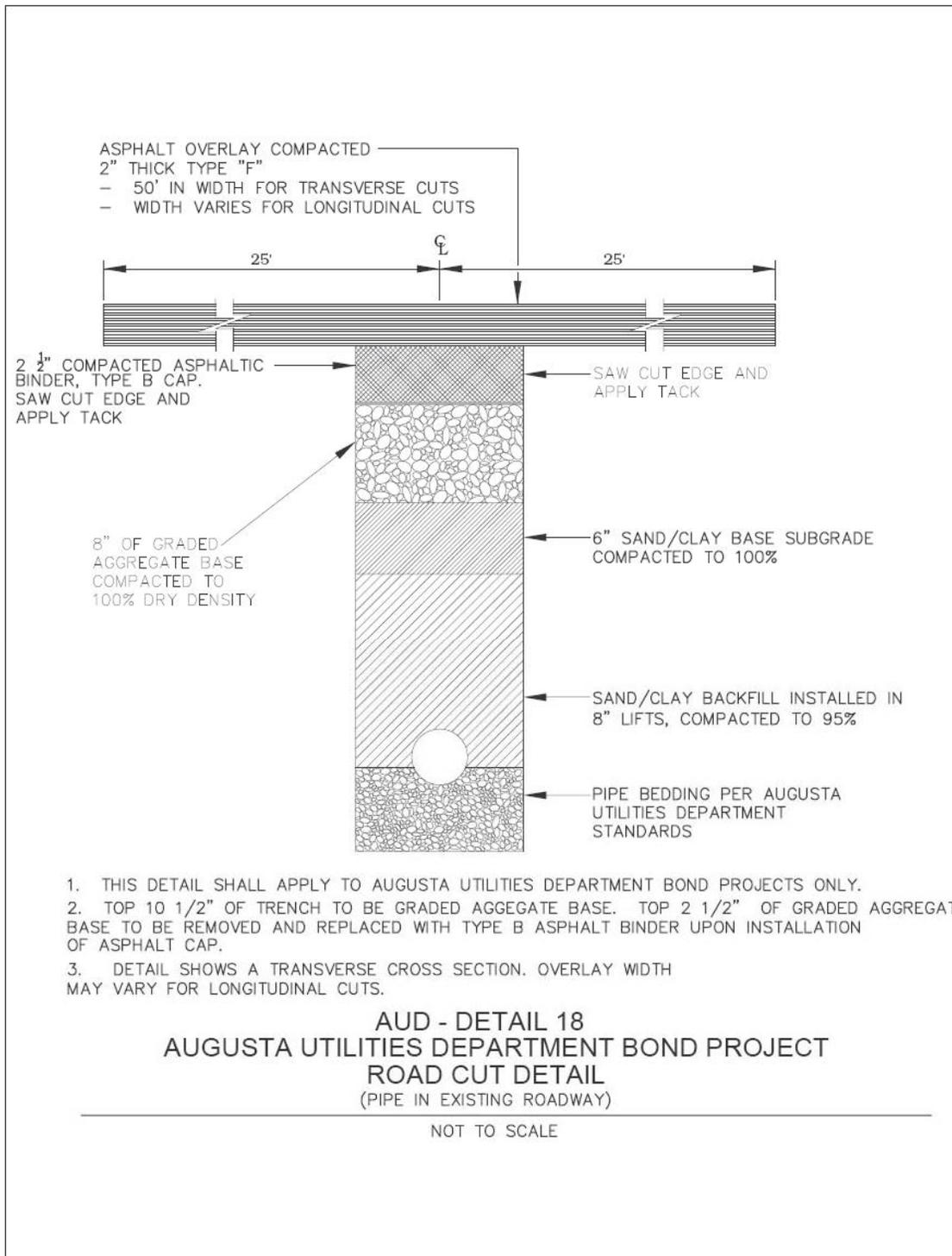
METER BOXES TO BE INSTALLED AND MAINTAINED BY DEVELOPER UNTIL RESIDENCE IS OCCUPIED

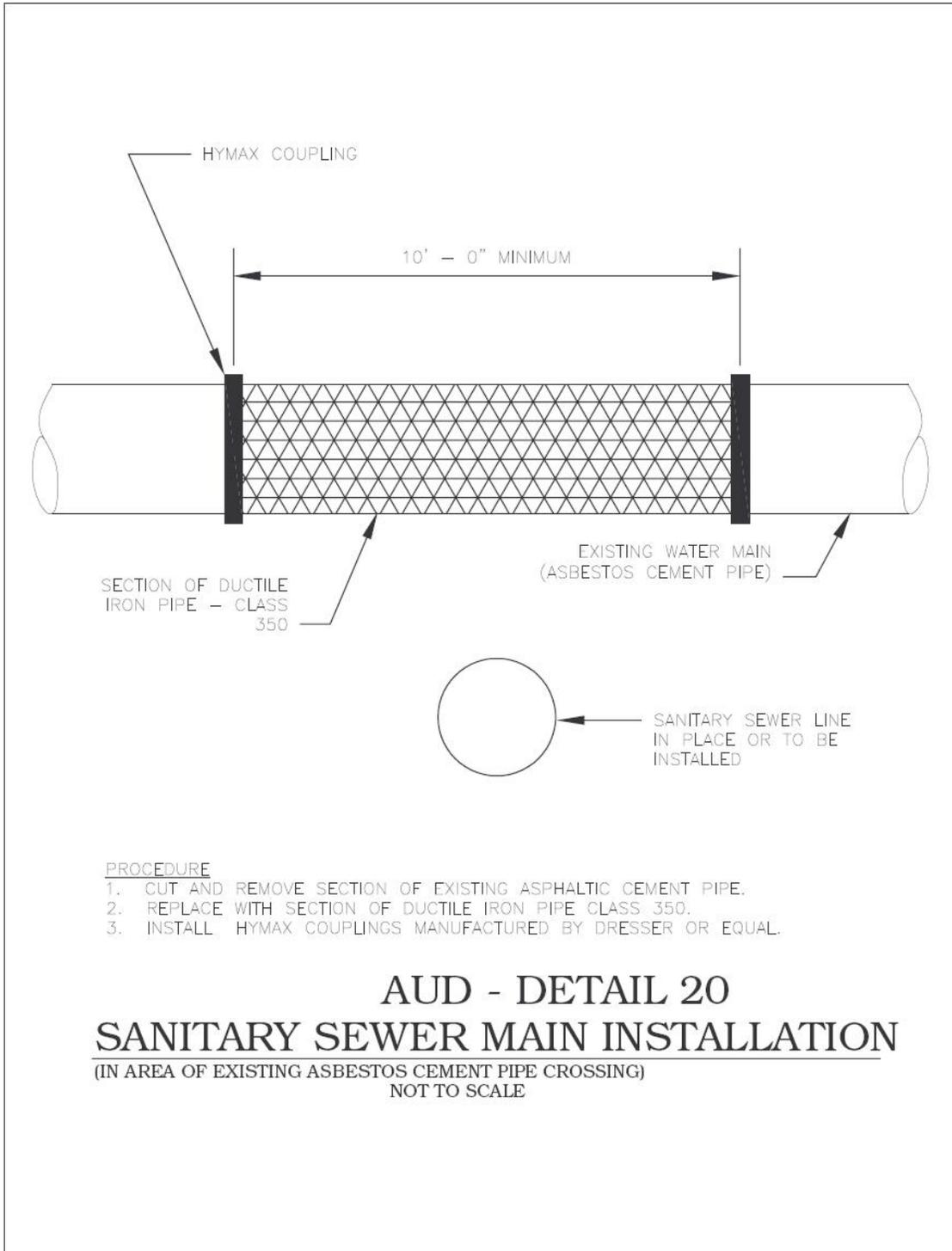
OVERSIZED METER BOXES ARE TO BE ROME 16X22X16 CAST IRON OR APPROVED EQUAL

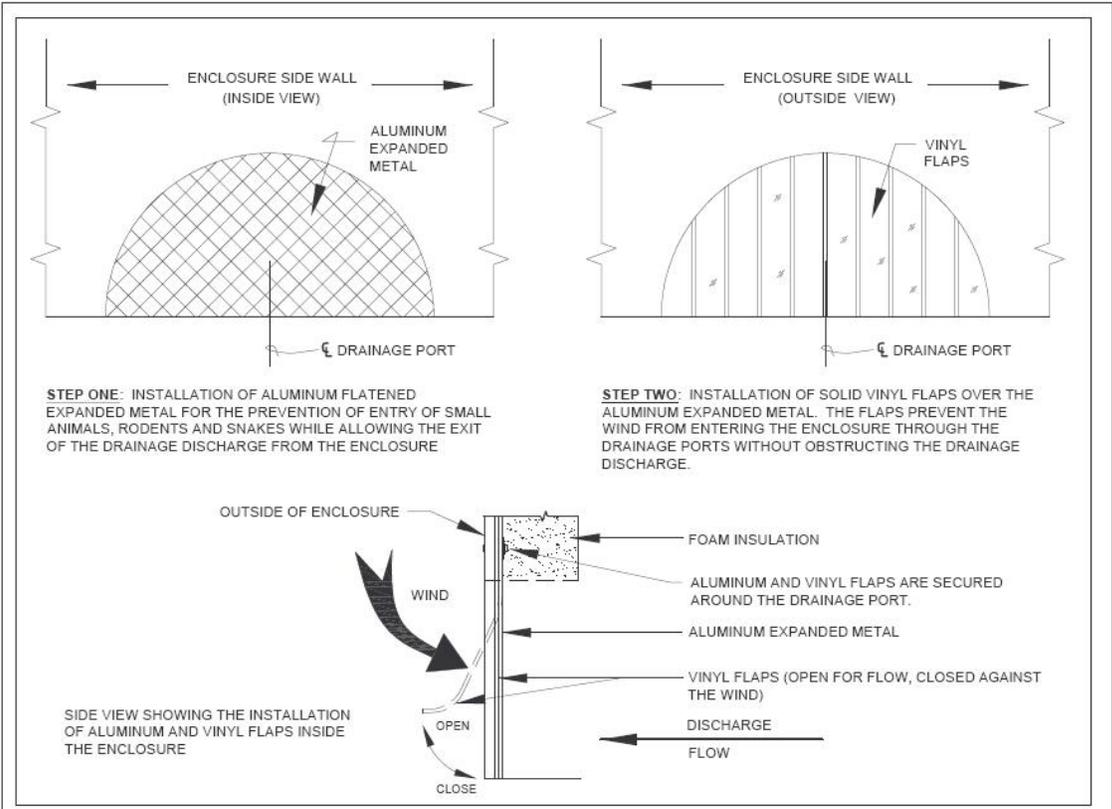
WATER METER TO BE PURCHASED FROM AND INSTALLED BY AUGUSTA UTILITIES



AUD - DETAIL 17
2" WATER SERVICE
 NOT TO SCALE



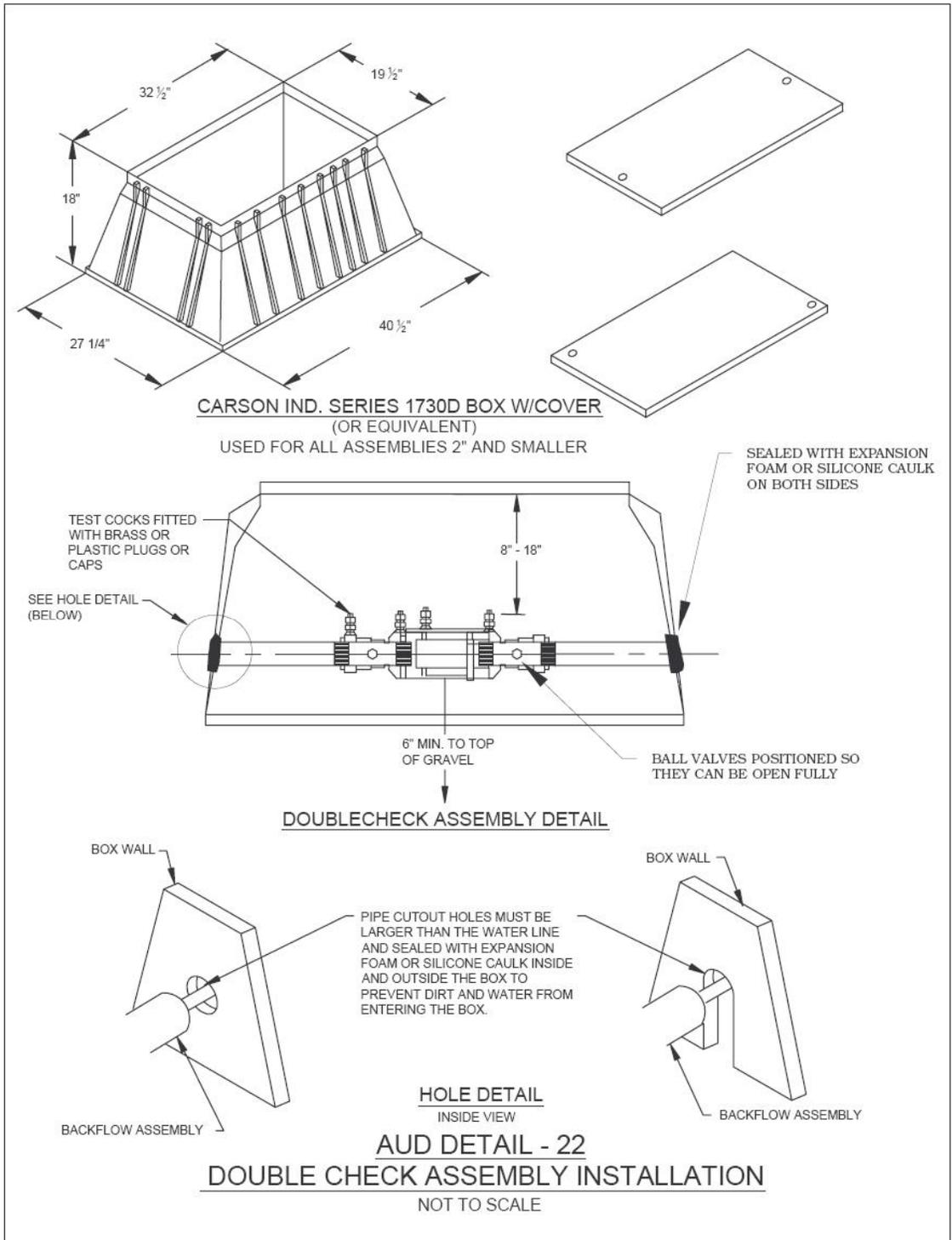


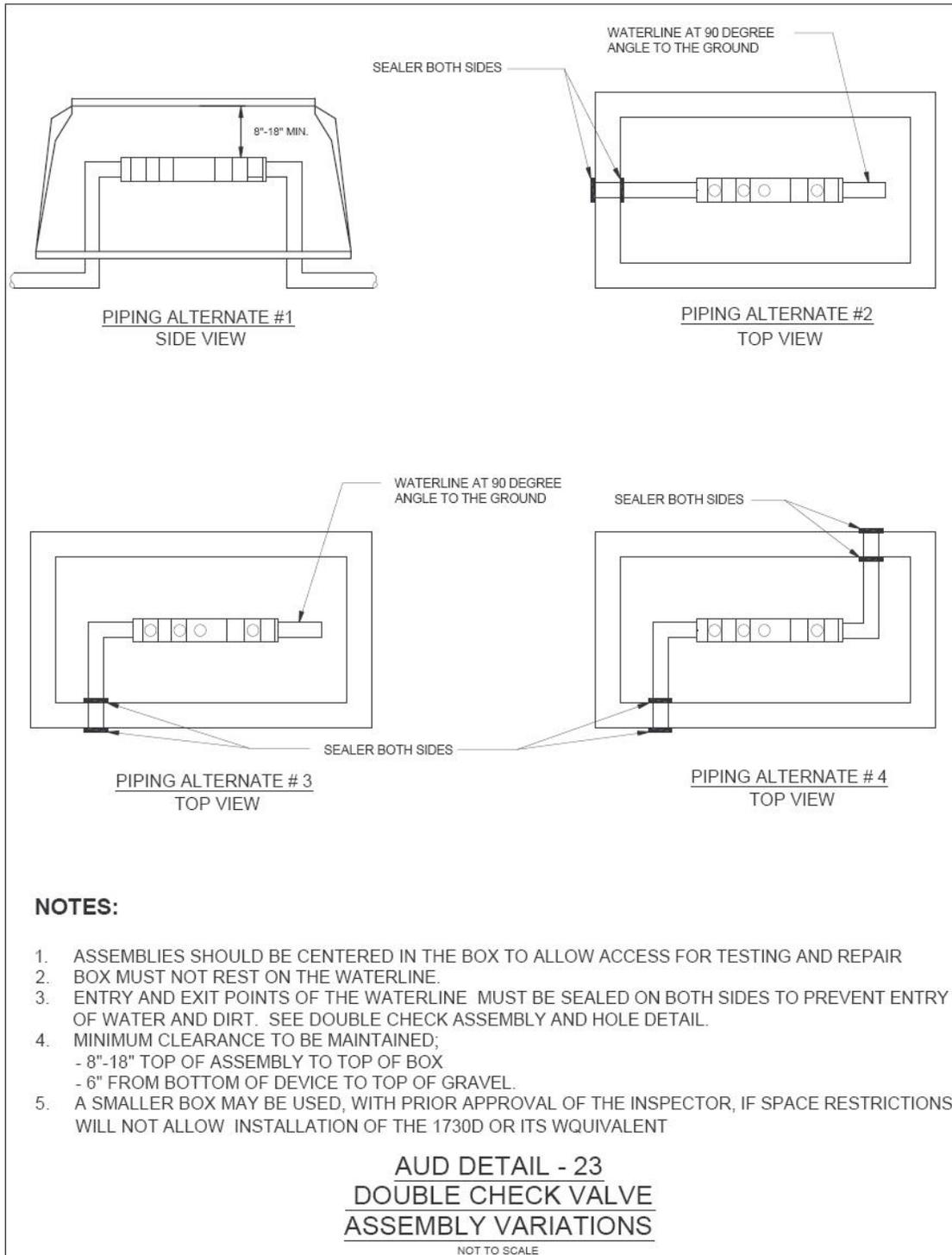


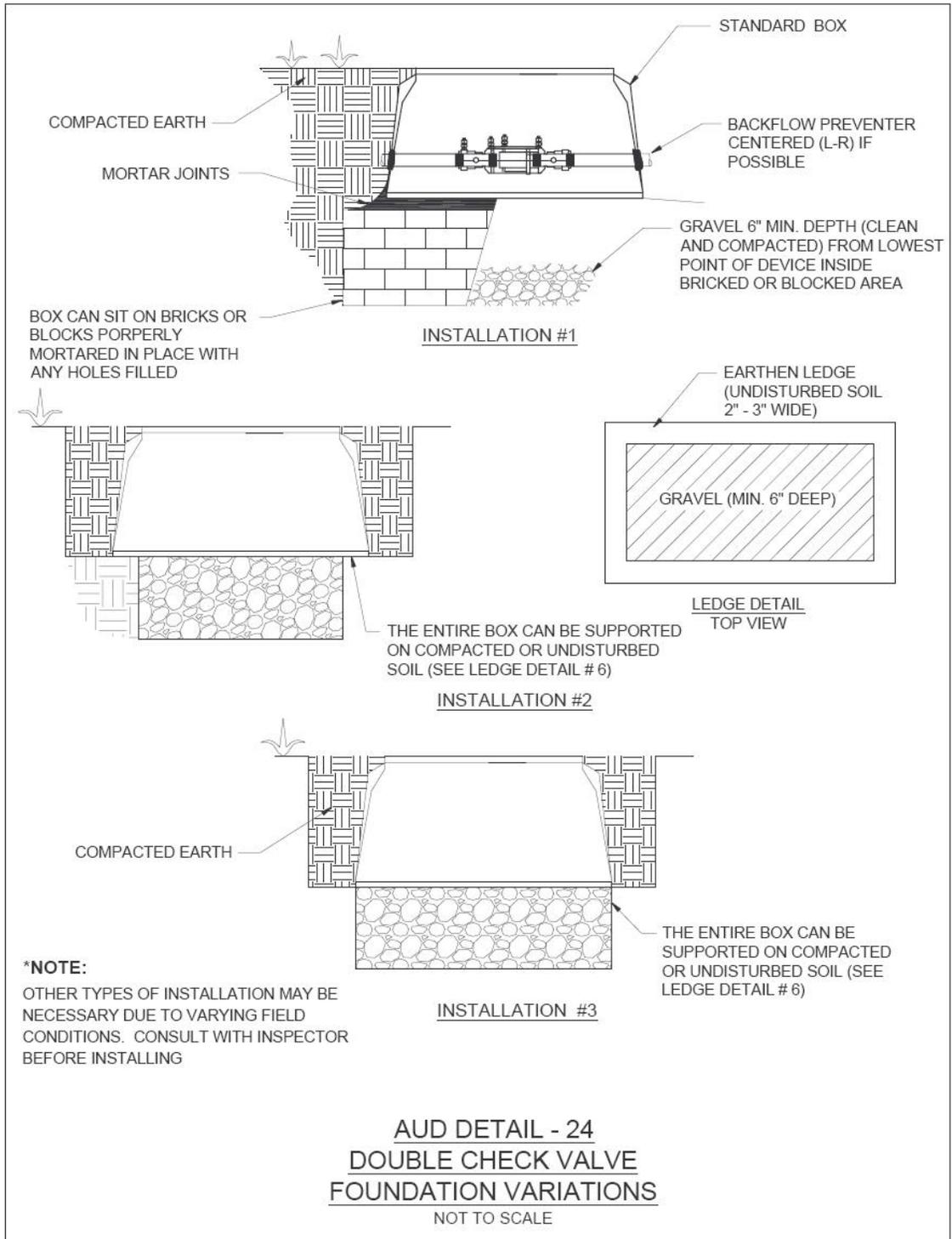
NOTE:

1. ALL REDUCED PRESSURE ZONE ASSEMBLIES (RPZ's) ARE TO BE INSTALLED ABOVE GROUND OR INSIDE THE FACILITY TO PROTECT FROM FREEZING. EXPOSURE TO FREEZING WILL RESULT IN IMPROPER FUNCTIONING OF AN RPZ AND MAY CAUSE UN-REPAIRABLE DAMAGE TO THE ASSEMBLY
2. SOUTHERN BUILDING CODE SECTION 304.4 - FREEZING (1994): A WATER, SOIL OR WASTE PIPE SHALL NOT BE INSTALLED OR PERMITTED OUTSIDE OF A BUILDING OR CONCEALED IN OUTSIDE WALLS OR ANY PLACE WHERE THEY MAY BE SUBJECT TO FREEZING TEMPERATURES, UNLESS ADEQUATE PROVISION IS MADE TO PROTECT THEM FROM FREEZING.
3. FACILITIES REQUIREING AN RPZ MAY BE ALLOWED TO INSTALL IT INSIDE PROVIDED THAT EITHER: THERE ARE NO OTHER CONNECTIONS BETWEEN THE METER AND THE BUILDING AND IT IS UNLIKELY ONE WOULD BE INSTALLED IN THE FUTURE, OR A DOUBLE CHECK IS INSTALLED AT THE METER.
4. ALL ABOVE GROUND ENCLOSURES FOR RPZ's ARE TO BE SIZED TO THE RPZ SIZE OR LARGER PER MANUFACTURER'S SPECIFICATIONS. E.G. A TWO-INCH RPZ MUST GO IN AN ENCLOSURE DESIGNED FOR A TWO-INCH OR LARGER RPZ.
5. IF A PERIMETER FOOTER IS USED THEN CLEAN GRAVEL COVERING THE ENTIRE BOTTOM OF THE ENCLOSURE MUST BE A FULL TWELVE INCHES (12") DEEP.
6. ALL ENCLOSURES ARE TO BE DESIGNED WITH DRAIN OPENINGS LARGE ENOUGH TO ACCOMMODATE A FULL DISCHARGE OF THE ASSEMBLY.

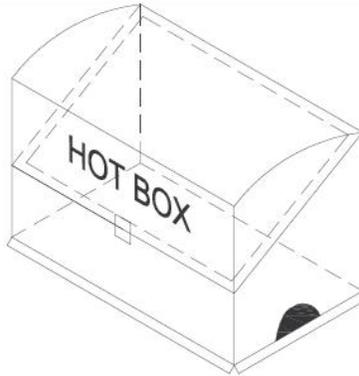
AUD DETAIL - 21
DRAIN DETAIL FOR RPZ BOX ENCLOSURE
 NOT TO SCALE



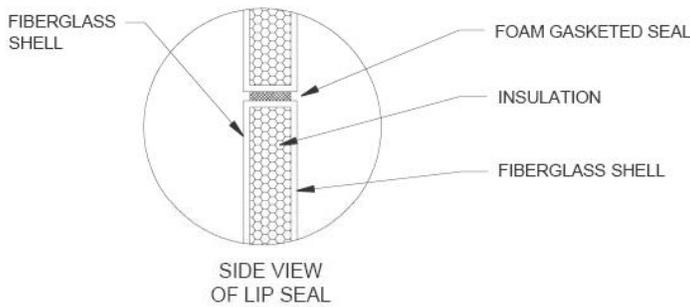




TWO PIECE BOX



NOTE: BOX SHOULD BE HEATED OR INSULATED TO PROTECT FROM FREEZING



STANDARD COLORS:
- WHITE
- BEIGE

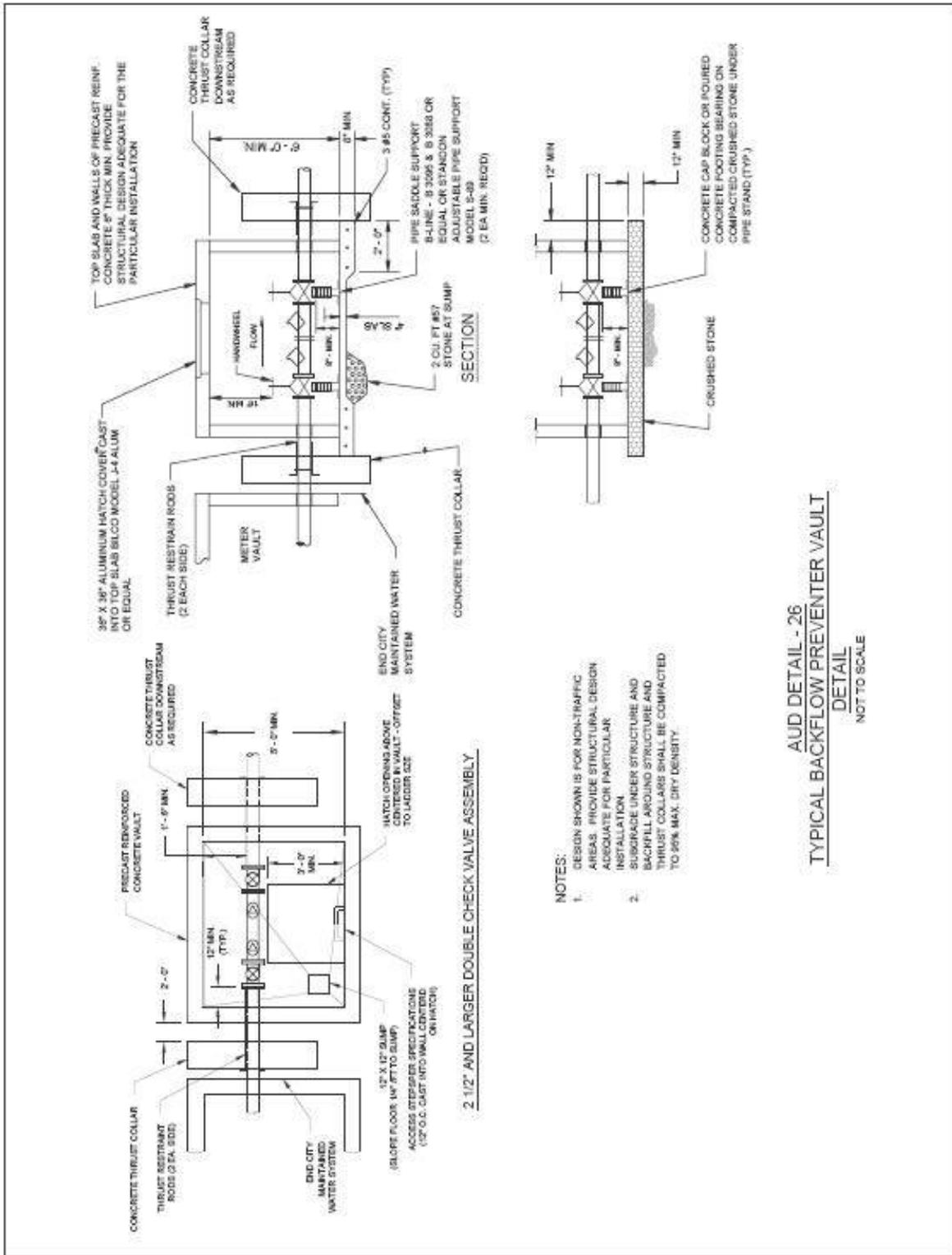
PHYSICAL PROPERTIES						
MODEL NO.	I.P.S.	INSIDE DEPTH	INSIDE WIDTH	INSIDE HEIGHT	INSULATION "R" VALUE	DRAINAGE CAPACITY
.75	3/4" - 1"	11"	19"	22"	8.0	180
1	3/4" - 1"	13"	27"	23"	8.0	180
1.5	3/4" - 1 1/2"	21"	33"	23"	8.0	575 GPM
2	1 1/4" - 2"	13"	39"	35"	8.0	575 GPM

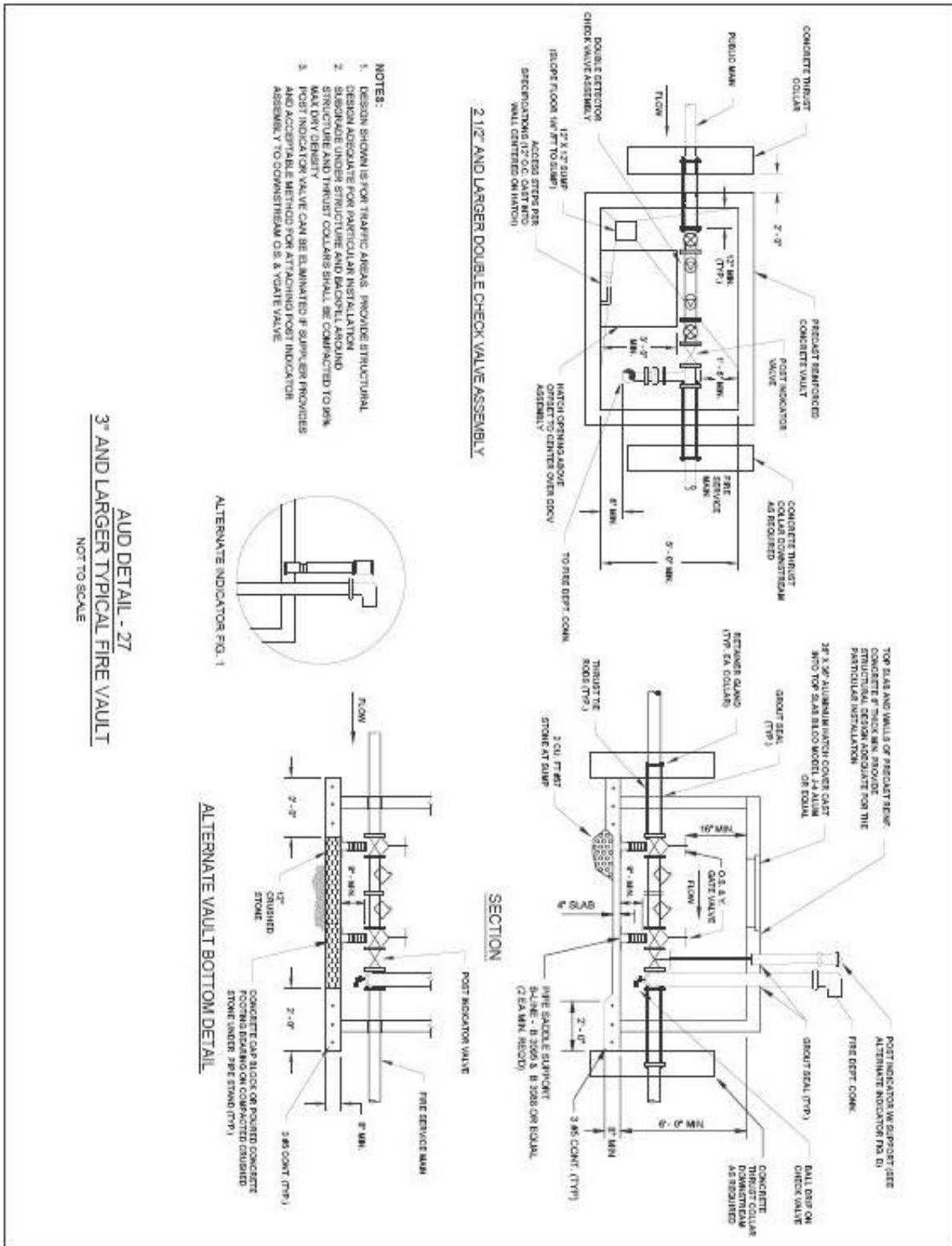
FEATURES
FIBERGLASS CONSTRUCTION, DRAINAGE CAPACITY (RPZ) DEVICES, ENGINEERED HEATER SIZING (PROTECTION FOR -30°F), TESTING / MAINTENANCE ACCESS, GROUND ANCHOR CAPABILITIES AND LOCKABLE LID.

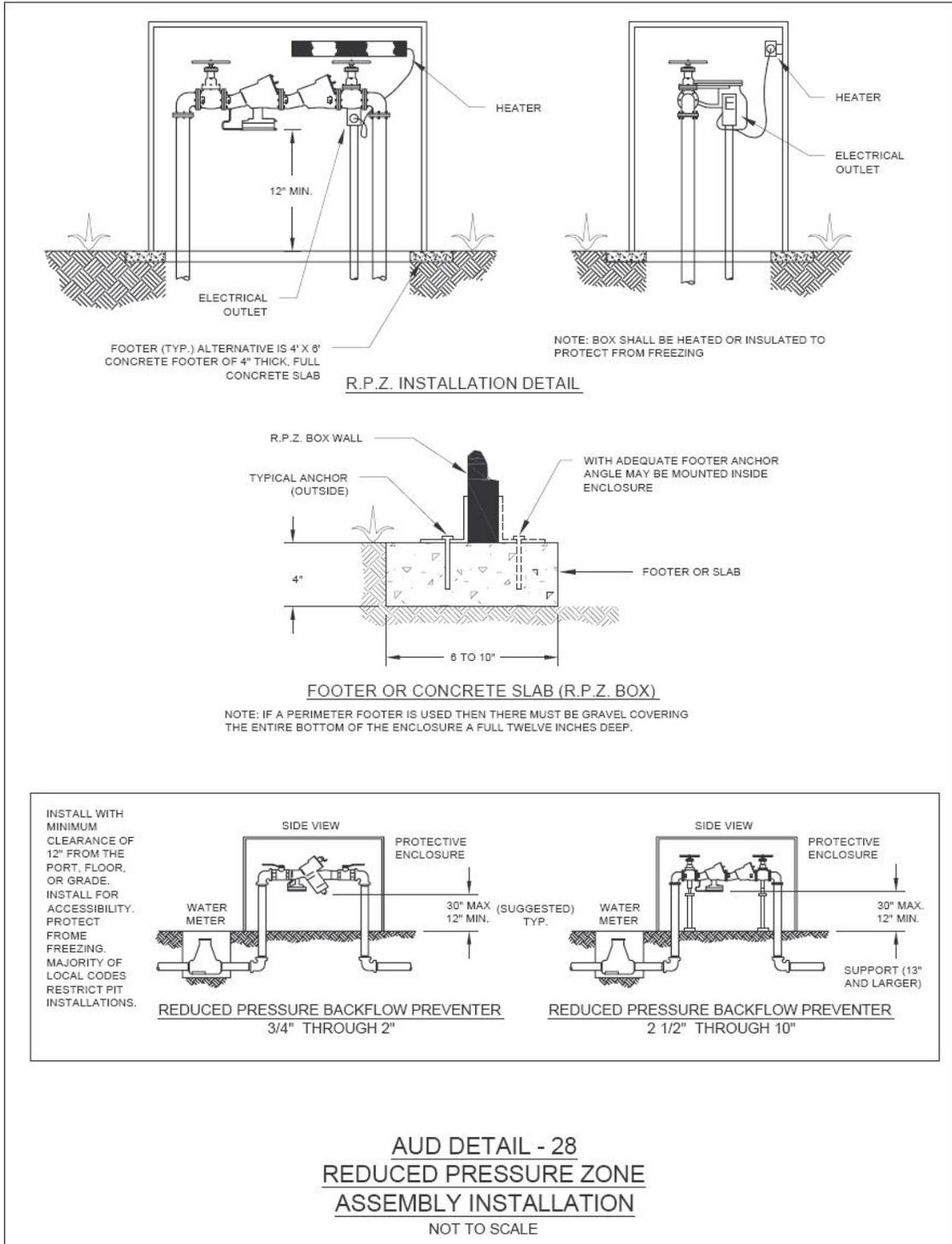
ENCLOSURE: HOTBOX OR EQUIVALENT BOX
SIZED TO ASSEMBLY SIZE 3/4" TO 2"

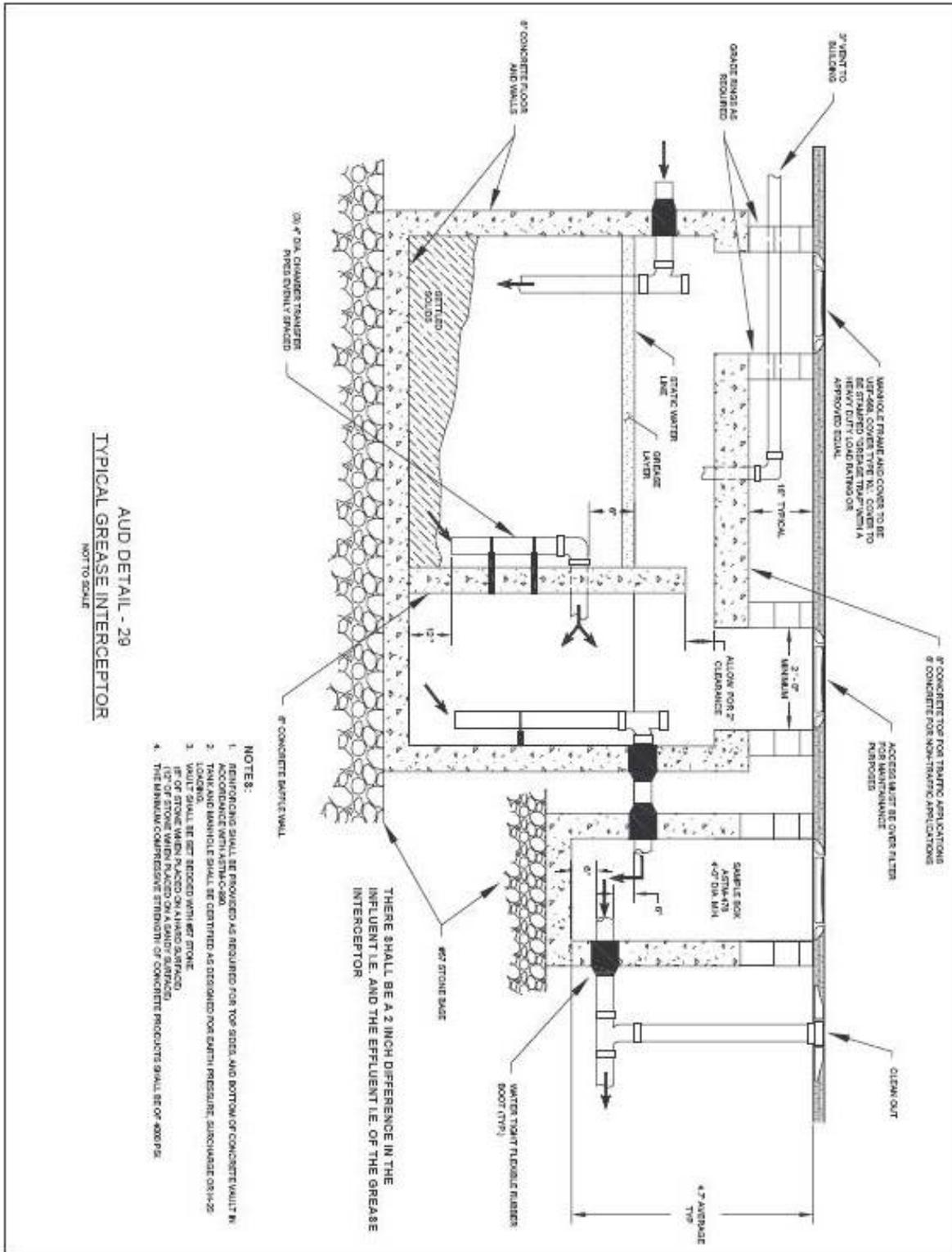
AUD DETAIL - 25
REDUCED PRESSURE ZONE ASSEMBLY
INSTALLATION

NOT TO SCALE











14.7 ERRATA

(1) Additional information in reference to section 14.2.2.2.12

Fire hydrants must conform to the specifications for National Standard fire hydrants for ordinary water works service of the American Water Works Association, and each fire hydrant installed after **January 1, 2008** shall include an Anti Terrorism Valve designed to protect against accidental backflow and intentional contamination of drinking water via the hydrant. The ATV shall be a stealth check valve located internal to the upper barrel of the hydrant and shall consist of four main parts:

- 1) a sleeve-insert valve seat, made of E coated or fusion bonded epoxy steel. The top of the valve seat shall have a machined slot to accommodate a EPDM quad ring which will provide an impenetrable seal between the seat and the valve.
- 2) a valve made of brass with machined slots to accommodate an o-ring between the valve and the upper stem.
- 3) a stainless steel machined upper stem will replace the original upper stem. The brass valve shall be attached to the upper stem in such a manner as to provide free vertical movement along the shaft, and
- 4) a stainless steel spring that shall fit around the upper stem and be of adequate compression strength and length that sufficient pressure is placed on the valve to provide an impenetrable seal when the hydrant is not in use and yet allow water to flow freely when the hydrant is flowed.

Installation of the ATV shall be made by a technician certified by the manufacturer.