Jordanelle Special Service District

Design Standards,
Construction Specifications,
and
Standard Drawings

Revised: May 2016

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CONSTRUCTION SPECIFICATIONS

STANDARD DRAWINGS

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SECTION 100

General Requirements

Revised: May 2016

SECTION 100 - GENERAL REQUIREMENTS

100.1 Introduction: The following Specifications and Standard Drawings were developed to establish practical, uniform design and construction of water, irrigation, and sewer improvements within the boundaries of participating Special Service Districts in Wasatch County. Those districts that have adopted these standards include (listed alphabetically):

- Brighton Estates Special Service District (BESSD)
- Jordanelle Special Service District (JSSD)
- North Village Special Service District (NVSSD)
- Owls Nest Special Service District (ONSSD)
- Strawberry Lakeview Special Service District (SLSSD)
- Strawberry Ranch Special Service District (SRSSD)
- Twin Creeks Special Service District (TCSSD)

For simplicity, all standards and drawings show the logo and name of JSSD, but apply to the districts listed above. These criteria are not intended to replace professional and competent workmanship on the part of the Engineer or the Contractor in the design and construction of water, sewer and irrigation facilities within the District. These Specifications are not intended for extraordinary circumstances; in such instances alternatives may be allowed, where justified, upon approval of the Engineer for the applicable District.

It is the responsibility of the developer and/or designer to obtain and be familiar with current Uniform Building, Uniform Plumbing, and Uniform Electrical Codes, Wasatch County, State of Utah, and federal standards and regulations. The districts assumes no responsibility for inconsistencies between these specifications and other specifications and regulations.

100.2 Abbreviations and Definitions: In the interpretation and construction of these Specifications, or in any documents or instruments dealing with the construction operations governed by these Specifications, the following words, terms and abbreviations, or pronouns in place of them shall each be construed as defined below:

100.2A Abbreviations: Wherever the following abbreviations are used in these Specifications Documents, they are to be construed the same as the respective expressions represented:

A.A.N.	American Association of Nurserymen
A.A.R.	Association of American Railroads
A.A.S.H.T.O.	American Association of State Highway and Transportation Officials
A.C.I.	American Concrete Institute
A.G.A.	American Gas Association
A.G.C.	Associated General Contractors of America
A.I.A.	American Institute of Architects
A.I.S.C.	American Institute of Steel Construction
A.N.S.I.	American National Standards Institute
A.P.W.A.	American Public Works Association
A.R.A.	American Railway Association
A.R.E.A.	American Railway Engineering Association
A.S.C.E.	American Society of Civil Engineers
A.S.L.A.	American Society of Landscape Architects
A.S.T.M.	American Society for Testing and Materials

A.W.P.A.	American Wood Preservers' Association
A.W.W.A.	American Water Works Association
A.W.S.	American Welding Society
F.H.W.A.	Federal Highway Administration
F.S.S.	Federal Specifications and Standards General Services Administration
I.E.E.E.	Institute of Electrical & Electronic Engineers
J.B.O.Z.	Jordanelle Basin Overlay Zone
J.S.S.D.	Jordanelle Special Service District
N.E.C.	National Electrical Code
N.E.M.A.	National Electrical Manufacturers Association
N.V.S.S.D.	North Village Special Service District
O.N.S.S.D.	Owls Nest Special Service District
S.H.S.S.D.	Strawberry Highlands Special Service District
T.C.S.S.D.	Twin Creeks Special Service District
U.D.O.T.	Utah Department of Transportation
U.O.S.H.D.	Utah Occupational Safety and Health Division
U.S.A.S.I.	United States of America Standards Institute

100.2B Definitions:

"Acceptable Alternate/Equal": In order to establish a basis of quality for some things in the work, certain processes, types of machinery or equipment, or kind of material may be mentioned on the Approved Plans by designating a manufacturer by name and referring to his brand or model numbers. Such mention is not intended to exclude other processes, equipment or materials that will measure up to the designated standards of that mentioned. If the Contractor desires to use other products as equal thereto, he shall secure acceptance by the District Engineer before entering an order therefore. Wherever in the Specifications a manufacturers name, brand or model is mentioned, it is to be understood that the phrase “acceptable alternate" is assumed to follow thereafter whether or not it does in fact.

Approved Plans: The final construction drawings, plans, profiles, typical cross-sections, specifications and materials, and supplemental drawings, or reproductions thereof, approved by the District Engineer and the County Engineer (when applicable), which show the location, character, dimensions and details of work to be performed. All such documents are to be considered as a part of the plans whether attached to the Specifications or separate therefrom.

Bridges: A structure, other than a culvert, which carries traffic over a watercourse, highway, trail or ski run or visa-versa.

Contractor: The Contractor is the individual or organization responsible for doing the work. The Contractor is further defined as the individual, firm, co-partnership or corporation, and his, their, or its heirs, executors, administrators, successors and assigns, or the lawful agent of any such individual firm, partnership, covenant or corporation, or his, their, or its surety under the contract bond, constituting one of the principals to the Contract and undertaking to perform the work herein specified. Were any pronoun is used as referring to the word "Contractor” it shall mean the Contractor as defined above. All contractors performing construction within the District shall possess a valid Utah Contractor’s license applicable to the work being performed.

Culvert: A drainage structure which may or may not directly support traffic, extending across and beneath a highway, street, driveway or alley.

Days: Unless otherwise designated, days as used in the Specifications will be understood to mean calendar days including weekends and holidays.

Developer: The person, corporation, legal entity or other organization functioning to build, erect, improve, or otherwise construct improvements within the District. The Developer is further defined as the entity responsible for the successful completion of improvement projects in compliance with District Standard Specifications and approved plans.

District: The governing special service district as applicable for the project. This may also refer to the applicable district's duly authorized officials and representatives and employees.

District Engineer: The person or Consulting Engineer who represents the applicable district.

Engineer: This term shall primarily mean a Professional Engineer Licensed in the State of Utah or an authorized member of a consulting firm or organization licensed in the State of Utah to provide engineering services and retained by the Developer for design and construction engineering of specific projects.

This term shall also apply to the County or District Engineer in cases where requirements need to be altered to serve the best interests of the County or District.

Inspector: The authorized representative of the District or District Engineer assigned to make all necessary inspections of the work performed or being performed, or of materials furnished or being furnished by the Contractor.

Lateral: The sewer line and appurtenances extending from the outside of the building to the public sewer line.

Pavement: The uppermost layer of bituminous or Portland-cement concrete material placed on the traveled way or shoulders for a riding surface, whether rigid or flexible in composition. This term is used interchangeably with surfacing. See Wasatch County Specifications for Pavement Requirements.

Record Drawings: These drawings shall show the improvements as they were built and shall be printed on reproducible mylar made by the developers' Engineer. These drawings shall be submitted with electronic files and water system models. They shall include any and all changes made to the construction plans before and during construction. The drawings shall be clearly identified as "Record" drawings. In addition, the record drawings shall be provided in the latest AUTO Cad software Format to District officials and the District Engineer correctly located in the District coordinate system, which is the *NAD 1983 StatePlane Utah Central FIPS 4302 (US Feet)* coordinate system.

Roadway or Street (Right of Way): That portion of the highway included between curbs, gutters, or ditches, intended primarily for vehicular traffic, and including all appertaining structures and other features necessary to proper drainage and protection, together with a shoulder of from 5 feet to 10 feet outside of the paved area where vehicles may park and snow may be stored from time to time. See Wasatch County Specifications for Right-of-way Requirements.

Shop Drawing: Supplementary plans, manufacturer's cut sheets, installation diagrams, framework, falsework, reinforcing steel bending diagrams, construction plans or similar data used during construction that is not part of the original Construction Plans. The Contractor shall submit shop drawings to the District or County Engineer or for approval.

Specifications: The directions and requirements of the Standard Specifications contained herein, as supplemented by such Special Conditions as may be provided.

Standard Drawings or Plans: The standard illustrative details which accompany these Construction Specifications.

Subgrade: That portion of the roadbed surface which has been prepared, as specified, and upon which a layer of specified roadbed material or base, or sub surfacing, or pavement is to be placed. See Wasatch County Specifications.

Supplemental Specifications: Supplemental specifications are those adopted subsequent to the Standard Specifications and generally involve alterations and new construction items, or substantial changes in the Standard Specifications.

Surety: The surety responsible for the bidders' acts in the execution of the contract, or which is bound with and for the Contractor to insure performance of the Contract the payment of all obligations pertaining to the work, and the fulfillment of such other conditions as may be specified or required by law.

Surfacing: The uppermost layer of bituminous or Portland-cement concrete material placed on the traveled way or shoulders for a riding surface, whether rigid or flexible in composition. This term is used interchangeably with pavement. See Wasatch County Specifications for Pavement Requirements.

Traffic Control Devices: Fixed or portable signs, signals, street lights, barricades, guard rails, pavement markings, channelization and other equipment or materials used for the purpose of regulating, warning and guiding traffic.

Traveled Way: That portion of the roadway intended for movement of vehicles.

Work: All the work specified, indicated, shown or contemplated in the contract to construct the improvement, including all alterations, amendments or extensions thereto made by contract change order or other written orders of the District Engineer.

100.3 Revisions of Standards and Specifications: Technical Specifications produced by industrial or trade associations which are referred to in this document (ASTM, AASHTO, ANSI, etc.) are those Specifications as they appeared at the time this document is adopted. Subsequent revisions to those Specifications may be made from time to time, but shall not be construed as reducing the Construction Standards called for here. In the event a specific Technical Standard or Specification is revised or renumbered by the association preparing the standards, this document shall incorporate the successor provision to any of the Technical Specifications referred to herein. These Specifications may be modified or deleted by appropriate notes on Approved Drawings.

100.4 General Construction Items: The following definitions/explanations shall apply to all projects constructed within the District boundaries.

100.4A Temporary Construction Drainage: The Contractor shall be responsible for maintaining control of drainage and erosion during construction in compliance with County, State, and Federal regulations including NDPES Permitting. Particular attention should be given to existing drainage patterns which run through cleared areas and over extreme slopes. These patterns should be identified to isolate problem areas where water will concentrate. Provisions shall be made to channel runoff away from new or existing improvements to prevent undermining and general site erosion. These provisions should be stabilized and should remain in place until the permanent storm drainage facilities are installed and functional.

100.4B Protection of Public and Private Utilities: The Contractor shall support and protect by timbers or otherwise, all pipes, conduits, poles, wires or other apparatus which may be in the way affected by the work, and do everything to support, sustain and protect the same, under, over, along or across said work. In case of any said pipes, conduits, poles, wires, or apparatus should be damaged they shall be repaired by the authorities having control of same, and the expense of such repairs shall be charged to the Contractor.

The Contractor shall protect all survey monuments located in the vicinity of the contract work. If the monuments are disturbed or destroyed, they will be reset by the proper authorities and the expense of such efforts shall be charged to the Contractor.

The Contractor shall further be responsible for any damage done to any street or other public property, or to any private property by reason of the breaking of any water pipes sewer or gas pipe, electric conduit, or other utility by or through his negligence. The Contractor is responsible for locating all utilities and for notifying Blue Stakes at least 48 hours prior to commencement of construction.

Specific requirements in other sections of these Specifications or Special Provisions shall prevail over the foregoing requirements in case of conflict.

100.4C Winter: Winter is after October 15 and before April 15. Winter conditions may put additional responsibilities, limitations, and constraints on some construction activities. Depositing mud on public roadways is not allowed. The following preventive measures must be taken. Adherence to ACI cold weather concreting standards is required unless waived by the County Engineer. Asphalt concrete may be placed after October 15 and before April 15 only with written Permission by the County Engineer; and the asphalt concrete will be considered temporary, to be replaced after April 15 under suitable conditions, unless otherwise approved by the County Engineer. See other sections for specific Winter requirements.

100.4D Open Trenches: The length of trench excavated for pipe or other utility placement shall be kept to a minimum and in no case shall any open trench exceed three hundred (300)feet unless otherwise specifically authorized by the District Representative. Trench widths, shoring, bracing, and trenching procedures shall conform to Utah Occupational Safety and Health Rules, Regulations and General Standards. The District reserves the right to suspend work, when in its opinion, unsafe work conditions exist.

100.5 Control of Material:

100.5.1 Source of Supply and Quality Requirements: The materials used on the work shall

meet all quality requirements of the Standard Specifications and approved plans. In order to expedite the inspection and testing of materials, the Contractor shall notify the Engineer of his proposed sources of materials prior to delivery. At the option of the Engineer, materials may be approved at the source of supply before delivery is started. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other approved sources.

The use of material from other than designated sources will not be permitted until representative samples taken by the Engineer have been approved and written authority is issued for the use thereof.

> 100.5.1A Site Approval: The District Engineer may approve sites by testing representative samples and approving suitability. The Contractor will assume the cost of processing samples to determine the suitability of the material. A period of 30 days shall be allowed for sampling and testing after the Engineer has been notified in writing of the location of the source or deposit. Source of supply and control of pits shall comply with this section. The Engineer may order procurement of material from any portion of a deposit, lot, case, or batch, and may reject portions of the said unit as unacceptable if the material fails to comply with the Specifications.

100.5.2 Samples, Tests, Cited Specifications: All materials must be inspected, tested and accepted by the Engineer before incorporation in the work. Any work in which untested and unaccepted materials are used will be performed at the Contractors risk and may be considered as unacceptable and unauthorized work. Unless otherwise designated, tests shall be made in accordance with the most recent cited standard methods of AASHTO, ASTM, or those established by the District prior to the date of advertisement of bids. The tests will be made by and at the expense of the Contractor. *All materials are subject to inspection test and/or rejection at any* time *prior to final acceptance of the work*. Copies of test reports will be furnished to the District.

The Contractor shall furnish certificates of compliance for all manufactured materials obtained from vendors or producers, prior to their incorporation in the work. Such certification shall be subject to verification by field inspection or further testing by the Engineer.

References to AASHTO, ASTM, UL and other specifications shall be the most recent edition at the time of advertising the bids.

100.5.3 Storage of Materials: Materials shall be so stored as to insure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection Private property shall not be used for storage purposes without written permission of the owner or lessee and, if requested by the Engineer, copies of such written permission shall be furnished by the Contractor at his expense. All storage sites shall be restored to their original condition by the Contractor at his expense, and inspected by the District.

100.5.4 Handling Materials: All materials shall be handled in such manner as to preserve their quality and fitness for the work.

100.5.5 Unacceptable Materials: All materials not conforming to the requirements of the Specifications shall be considered as unacceptable and all such material will be rejected and shall be removed immediately from the site of the work unless otherwise instructed. No rejected material, the defects of which have been corrected, shall be used until approval has been given.

100.5.6 District-Furnished Materials: The Contractor shall furnish all materials required to complete the work, except those specified to be furnished by the District.

Material furnished by the District will be delivered or made available to the Contractor at the points specified through agreement.

100.6 Record Drawings and On-Site Contract Documents: Contractor shall maintain at the site for the Engineer one copy of all drawings, specifications, addenda, approved shop drawings, change orders and other modifications, in good condition and order, and marked to record all changes made during construction. These shall be available to the District Engineer.

To facilitate the above, the Developer will furnish the Contractor with one set of blue line prints of all drawings which are a part of this contract. Contractor shall maintain this set of prints in good condition in his field office. Installation of any work in locations or in a manner other than shown on the drawings shall be recorded daily by the Contractor on the drawings. The Contractor shall see that the mechanical and electrical subcontractors shall do likewise. Dimensions shall be given to permanent objects such as building columns, buildings, sidewalks, curbs and driveway and/or grids.

Whenever necessary to complete the record drawings in a neat, legible manner, the Developer shall employ a competent draftsperson, satisfactory to Engineer, to make new drawings or to indicate changes on the prints.

On or before the date of final inspection, the Developer shall deliver the corrected and completed prints to the Engineer as a record of construction, with electronic files and water system models reflecting changes to construction drawings if applicable. Delivery of the prints to Engineer will not relieve the Developer of the responsibility of furnishing required information that may be omitted from the prints. Delivery of the prints must be made before release of bonds. The 2-year warranty period shall not begin prior to this submittal.

100.7 Acceptance of Work Under no circumstances shall the presence, observations, testing or initial approval by the District's authorized representative be construed as final approval or acceptance of the Work. Preliminary approval of a portion of work by the District’s representative does not guarantee final approval of said portion or the entire project. The Developer and Contractor are responsible for the quality and workmanship of all materials, whether inspected or not, and to comply with the requirements of the approved plans and specifications until the warranty period has elapsed.

- END OF SECTION -

SECTION 200

General Improvement requirements and design guidelines

Jordanelle

Revised: May 2016

SECTION 200 - GENERAL IMPROVEMENT REQUIREMENTS AND DESIGN GUIDELINES

200.1 Scope: This section defines the general requirements for all improvements to be built and installed within the District and/or improvements which may become the responsibility of the District. In addition to these requirements, all other applicable codes and ordinances remain in effect.

200.2 Design Process:

200.2.1 Description: The Design Process for all projects shall consist of a Detailed Design Review, a Final Design Submittal, and Record Drawings Submittal. The Design Process for land development projects shall first begin with an early feasibility review prior to the Detailed Design Review, Final Design Submittal, and Record Drawings Submittal.

A. Early Feasibility Review for Land Development Projects:

1. Information for the plan concept shall be submitted to the District, which may include drawings, descriptions, draft plats, tables, etc. The information provided shall include the location of the project, the intended uses proposed for the development, the number and type of proposed units, the planned connections to District infrastructure, and the amount of planned irrigated acreage. This information shall meet the satisfaction of the District and the District may request additional information not listed herein.

2. The District will issue a Feasibility Letter upon completion of the Feasibility Review, which will communicate to the developer foreseen special circumstances and requirements that will or might apply to the development.

200.2.2 Detailed Design Review: One (1) sets of Detailed Design Review plans (hard copy) shall be submitted to the District Office for review and approval. Additionally, one (1) set of electronic design plans shall be submitted to the District Office and the District Engineer. The electronic set of drawings must be in .pdf format and also include a base map in .dwg format. The coordinate system of the .dwg file must be in the District's coordinate system, *NAD 1983 StatePlane Utah Central FIPS 4302 (US Feet)*. Electronic files may be submitted via email, a removable storage device (CD), or a downloadable link.

District Office:	P.O. Box 519 6135 East Lake Creek Road Heber City, Utah 84032
District Engineer:	Keith Larson, P.E. klarson@bowencollins.com Submit electronic files to: jdietrich@bowencollins.com 154 E 14000 S Draper, Utah 84020

The requirements for Detailed Design Review shall include:

A. Site Location Map – The project shall be shown on a vicinity map showing adjacent streets, projects, etc. T*o*wnship, range and section should be indicated.

B. Sewer and Water Layout:

1. Plans shall be provided that show the location of proposed sewer and water lines and laterals and services in relation to existing streets and utilities, water lines, property lines, etc.

2. Connections to the existing sewer and water system shall be clearly shown.

3. The locations of manholes shall be specified and labeled as manholes.

C. Topographic Map – A topographic map with 2-foot contours of area shall be included.

D. The submittal shall include the estimated maximum number of units to be serviced by the proposed system, zoning, project acreage, and estimated peak and average flows. A master plan shall be included, when applicable.

E. All existing streets and sewer and water lines shown shall be labeled.

F. The plans shall be recommended for District approval by the District Engineer before the Final Design Submittal.

G. Preliminary plans submitted to the District shall be 24" x 36" in size.

H. Plans shall include typical road sections which show typical placement of all utilities including water, sewer, storm drain, gas, power, communications, etc. These sections shall indicate the typical vertical and horizontal separation between all utilities.

I. The Detailed Design Review submittal may be required to be repeated as many times as necessary until, in the opinion of the District Engineer, the design complies with District Standards and is suitable for the Final Design Submittal.

200.2.3 Final Design Submittal: Four (4) sets of Final Design plans (2 Large Sets, and 2 Smaller 11x17 inch sets is preferred) shall be submitted to the District Office for approval. No construction shall be started until plans have been stamped approved by the District Manager and a Notice to Proceed has been issued by Wasatch County. The plans and design shall meet the guidelines of the Detailed Design Review and the standards defined in the Design Standards, Construction Specifications, and Standard Drawings, and other plans and governing ordinances. The minimum information required on drawings for improvements is as follows:

A sewer and water construction cost estimate for inspection purposes is required with the final design.

All drawings and/or prints shall be clear and legible and conform to good engineering and drafting practice. Size of large drawings shall be 24" x 36" (trim line).

The following items are required on drawings:

A. North arrow (plan).

B. Vicinity map.
C. Scale and elevations referenced to District's Datum.
D. Stationing and elevations for profile.
E. Title block to include:
    1. Project title (subdivision, etc.)
    2. Specific type and location of work.
    3. Space for approval signature of District Engineer with date.
    4. Name of engineer or firm preparing drawings with license number.
    5. Number all sheets.
F. Benchmark location and elevation.
G. Dedication plat or signed easements shall be submitted, reviewed and approved along with Final Design Submittal plans.

200.3 Inspection: All construction work involving the installation of improvements shall be subject to inspection by the District. Certain types of construction may require continuous inspection while others may have only periodic inspections. All inspection and testing costs are paid by Developer or Contractor unless the District contractually assumes this financial burden. No inspections can be made on Sunday or holidays observed by the District.

A. Continuous inspection is required on the following types of work:

    1. Laying of sewer pipe, water pipe, valves, and hydrants, setting manholes, and testing.

B. Periodic inspection is required on the following:

    1. Excavations for structures.
    2. Trenches for laying pipe.
    3. Staking of limits of disturbance.
    4. Landscaping and landscape sprinkler information.
    5. Water service connections.
    6. Sewer lateral connections.

C. Requests for Inspection: Requests for inspection of work requiring continuous inspection shall be made to the District three (3) working days (Mon-Fri) prior to commencement of the work. Periodic inspection will require a two (2) full working day (Mon.-Fri.) notification prior to the requested inspection.

200.4 Construction Completion Inspection: An inspection shall be made by the District Engineer upon notice by developer after all construction work is completed. Any faulty or defective work shall be corrected within a period of thirty (30) days of the date of the District Engineers Inspection Report defining the faulty or defective work.

200.5 Finishing and Cleanup:

200.5.1 Description: After all other work embraced in the Contract is completed and before final acceptance of the Contract, the entire roadway including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades, and cross-sections shown on the Approved Plans and as hereinafter specified.

200.5.2 Construction Details: Slopes, sidewalk areas, planting areas, and roadway shall be

smoothed and finished to the required cross-section and grade by means of a grading machine insofar as it is possible to do so without damaging existing improvements, trees, and shrubs. Machine dressing shall be supplemented by handwork to meet requirements outlined herein, to the satisfaction of the Engineer.

Upon completion of the cleaning and dressing the project shall appear uniform in all respects. All graded areas shall be true to line and grade as shown on the typical sections and as required by the Engineer. Where the existing planting is below sidewalk and curb, the areas shall be filled and dressed out to the walk regardless of limits shown on the Approved Plans. Wherever fill material is required in the planting area it shall be left higher to allow for final settlement but, nevertheless, the raised surface shall present a uniform appearance.

Trash of all kinds resulting from clearing and grubbing or grading operations shall be removed and legally disposed of and not placed in areas adjacent to the project. Where machine operations have broken down brush and trees beyond the lateral limits of the project, the Contractor shall remove, replace, and dispose of same at his own expense. Damage to existing vegetation shall be repaired by a qualified tree surgeon or replaced by comparable size plant(s) at the Contractor's expense. Pruning shall maintain the natural shape of the plant.

Drainage facilities such as inlets, catch basins, culverts, and open ditches shall be cleaned of all debris which is the result of the Contractor's operations, unless the Specifications of any particular section or the Contract Documents provide otherwise.

Where, by permission, soil is dumped on private property, the Contractor shall have a proper grading/drainage permit.

All pavements and oil mat surfaces, whether new or old, shall be thoroughly cleaned. Existing improvements such as portland cement concrete curbs, curb and gutters, walls, sidewalks, and other facilities which have been sprayed by the asphalt cement shall be cleaned to the satisfaction of the Engineer. Castings for manholes, monuments, water gates, lamp poles, vaults, and other similar installations which have been sprayed with the asphalt material shall be cleaned to the satisfaction of the Engineer.

The Contractor shall sweep the street at the conclusion of the work unless otherwise provided in the Contract Documents. Sidewalks shall be hand broomed.

On sewer and water distribution projects where all or portions of the construction is in undeveloped areas, the entire area which has been disturbed by the construction shall be shaped so that upon completion the area will present a uniform appearance, blending into the contour of the adjacent properties. All other requirements outlined previously shall be met, except that it will not be necessary to pick up more surface rocks than is necessary to result in the appearance of adjacent undisturbed areas.

200.6 Two Year Warranty Period: If within two years after completion, any work is found to be defective, the Contractor or Developer shall promptly, without cost to the District, either correct such defective work or remove it from the site and replace it with non-defective work. If the Contractor or Developer does not promptly comply, or in an emergency where delay would cause serious risk of loss, injury or damage, the District may have the defective work corrected or the rejected work removed and replaced, and all direct and indirect costs of such removal and replacement, including

compensation for additional professional services, shall be collected by the District in the manner most convenient to the District from the Developer and Contractor. Whatever sharing of cost may be agreed upon between the Developer and Contractor is strictly a private matter between the Developer and the Contractor. The two-year correction period shall not begin prior to final approval of the project, receipt of Record Drawings, electronic files and final water models if applicable.

200.7 Record Drawings Submittal: One (1) set of Record (aka "As-Built") drawings (hard copy) shall be submitted to the District Office. Additionally, one (1) set of Record Drawings (electronic .pdf) shall be submitted to the District Office and the District Engineer. See Section 200.2.2 for District Office and District Engineer information. Service connections shall not be allowed until the District has received record drawings (and copies of the disinfection results if waterlines are installed). The requirements for Record Drawings shall include:

A. Record Drawings shall be 24" x 36" mylar plan and profile construction drawings.

B. Lateral stationing or relation to lot lines shall be indicated. The ends of all laterals shall be referenced with two horizontal distance ties (surveyed) to established property corners. In the event property corners have not been established, ties to "As-Built" surface improvements, preferably sewer manholes, shall be required.

C. Water meter boxes shall be clearly shown.

D. Invert elevations shall be verified. Changes in grade and alignment shall be indicated.

E. Type of pipe installed shall be indicated.

F. The location of "As-Built" sewer and water lines within easements or platted ROW's shall be verified. If revised easements are required, a signed copy of easements shall be submitted with the Record Drawings.

G. Disclaimers on Record Drawings to release the Engineer of any responsibility for the accuracy of the information shown on the drawings, or for errors or omissions, are not allowed.

H. The Project Engineer shall provide written certification that water and sewer construction, preparation of "Record" drawings, and installation of services and laterals constructed as part of mainline work, has been completed in strict accordance with the District approved plans and specifications.

I. For projects completed with a water system model, an electronic copy of the water model, referenced to electronic Record drawings are to be provided.

- END OF SECTION -

SECTION 300

Sanitary Sewers

Revised: May 2016

SECTION 300 - SANITARY SEWERS

301 Design Criteria

301.1 Design Regulations:

A. Sanitary Sewers shall be designed in accordance with Utah Public Rules R317-3, Uniform Plumbing Code, latest edition, and these Standard Specifications and Drawings.

B. All sewer main lines shall not be approved for design until the plat has been recorded.

C. The design engineer shall coordinate with the contractor during construction to ensure that inspections are performed during construction. District inspections will be performed on an as needed basis and could occur at random times during construction.

D. All sanitary sewer systems shall be designed to exclude all storm water runoff, or water from field drainage systems, foundation drains, underground parking structures, roofs, streets, and other paved areas.

E. Downspout connections, foundation and basement drains, sumps and storm drain connections shall be prohibited from discharging into the sanitary sewer system.

F. Grease traps or oil separators shall be sized for peak flows and average loading of grease/oil by an engineer and approved by the District prior to placement. The grease traps or oil separators shall be placed to allow access for inspection and cleaning. This applies to commercial and institutional facilities, and any building or lot with the potential of introducing substances that would be detrimental to facilities of the District.

G. Sewer systems shall be designed to eliminate possible cross connections with culinary water system. If cross connections cannot be eliminated proper cross connection assemblies shall be used in accordance with Section R309.102.5 of the Utah Public Drinking Water Rules, Uniform Plumbing Code, latest edition, and the District's Control of Backflow and Cross Connection Policy.

H. All sewer lines shall be installed with tracer wire conforming to the following:

1. 12 gauge, 600 volt copper wire, PVC jacketed for underground services.

2. Secure wire to pipe @ 20-ft minimum intervals.

3. Install wire continuously along the pipe alignment and at all service connections.

4. Wire shall be looped at all cleanouts and manholes.

5. The tracer wire installation shall be subject to District inspection prior to

backfilling of trenches.

6. Prior to District acceptance of the sewer system, the Contractor shall demonstrate to the District that the tracer wire is in a operable condition to the satisfaction of the District. In the event that the wire is not operable the contractor shall determine the cause of discontinuity, fix the problem and test at no additional cost to the owner or District.

I. As per Utah Administration Code R317-3, geologic considerations shall be made for the location of sewer lines.

301.2 Laterals: Laterals connected to the public sewers shall meet the following requirements:

A. Laterals shall be of PVC, ABS (solid wall), ductile iron, or other material approved by the District.

B. Laterals shall have a nominal inside diameter of not less than 4 inches or greater than 6 inches. Properties requiring laterals greater than 6 inches shall be reviewed and approved by the District Engineer.

C. Each dwelling unit shall be served by an individual lateral unless specifically approved by the District. "Stacked" dwelling units may be served otherwise with a minimum lateral size of 6-inch diameter.

D. Laterals shall be laid at a minimum slope of 1/4 inch per foot (2%) unless specifically approved by the District Engineer/Inspector.

E. Laterals should not be located under driveways. Laterals that cannot reasonably avoid crossing under a driveway must comply with the requirements of Note K below.

F. A minimum of two cleanouts are required on each lateral. One cleanout is required at the property line within the right-of-way. It is recommended that the second cleanout be located next to the building being served.

G. In addition to the above, cleanouts shall be installed at intervals not to exceed 100 feet in straight-line runs and for each aggregate change in direction exceeding 135 degrees and behind any bend greater than 22½ degrees.

H. Laterals shall conform to these Standard Specifications and Drawings.

I. Maintenance for laterals from the building to the main sewer line, including the connection to the main sewer line, shall not be the responsibility of the District.

J. Lateral requirements for pressure sewer systems for individual building units, see Section 301.19.

K. Laterals extending under structures, such as retaining walls, shall be installed in rigid conduit or casing in area of the structure. Where a lateral crosses under a retaining wall, storm drain box, or other structure, a minimum vertical separation of 18-inches shall be maintained.

L. Laterals, when constructed in conjunction with new sewer lines, shall extend from the sewer main to five (5) feet beyond the right-of-way or property line, or as indicated in approved construction drawings. Laterals deeper than fifteen (15) feet shall extend to ten (10) feet beyond the right-of-way or property line or as indicated in approved construction drawings.

M. The District project inspector shall witness all lateral installations before backfilling. Buried laterals not inspected, witnessed or verified will be re-excavated and the end of the lateral exposed for verification at the expense of the contractor.

N. A brightly colored utility warning tape shall be used. The tape shall be placed in the partially backfilled trench one to three feet above the lateral and laid along the laterals entire length to help to locate the pipe when digging.

O. Immediately following installation of the lateral, sewer lateral markers (rebar) are to be installed by the contractor at the end of each lateral. The marker is to be placed at the end of the plugged lateral and extended upward 2 feet above grade, painted green, and is to be visible at Final Construction Approval. In addition, the end of the lateral shall be referenced with horizontal distance ties to property corners. In the absence of established property corners, ties to construction survey control hubs (off-sets) shall be used.

In the event rebar markers or off-set hubs are lost during construction activities, off-set hubs and rebar markers shall be reset using accepted survey practices and procedures as soon as practical after earthwork is completed and the hubs shall remain in place until satisfactory reference points (property corners with distance ties) are established.

P. Stamp S on curb for location of sewer lateral.

Q. Gravity sewer laterals shall not exceed 250' in length. Exceptions must be approved by the District Engineer.

301.3 Design Period: The sewer system shall be designed to serve the estimated ultimate tributary area and shall be based on the best information available, including the District Master Plan Study, current zoning regulations and approved planning and zoning reports when available.

301.4 Design Capacity: Design average flow shall be estimated at not less than 100 gallons per capita per day, including infiltration at 200 gallons per diameter inch per mile per day. To accommodate peak flows, sewers shall be designed, flowing full, to carry not less than the following contributions:

A. (1) 4-inch and 6-inch laterals: 400 gallons per capita per day.
(2) 8-inch thru 15-inch sewers: 400 gallons per capita per day.
(3) Larger than 15-inch sewers: 250 gallons per capita per day.

B. Flow from commercial, municipal and industrial connections.

C. Additional ground water infiltration, if applicable.

D. Infiltration flow rates previously stated apply only to the design of the sewer system. These rates do not apply to sewer line construction and Final Construction Approval.

301.5 Alternate Methods of Design: If use is made of methods of sewer design other than those described above, a complete description of methods used shall be presented to the District Engineer for approval.

301.6 Sewer Size: All public sewers shall be 8 inches in diameter or larger. This requirement does not necessarily imply 8-inch and larger laterals are public sewers.

301.7 Sewer Depth: Sewers shall be placed deep enough to serve all adjacent properties assuming that adjacent properties will have buildings with basements to be served by the sewer system. (2% minimum grade on laterals from basements). The Sanitary sewer lines shall be below frostline at all points. (The generally accepted frostline depth for the District area is approximately 60".) For specific instances and when approved by the District Engineer, less cover may be approved by District Engineer. Sanitary sewer lines shall maintain an 18 inch vertical separation from any adjacent waterlines. (See Section 301.13).

301.8 Sewer Slopes: All sewers shall be designed and constructed for mean flow velocities, when flowing full, of not less than 2.0 feet per second, based on Kutter's formula using an "n" value of 0.013. The following are the minimum slopes which shall be provided; however, slopes greater than these are desirable, especially in the upper reaches of sewer systems.

Sewer Size	Minimum Slope in Feet per 100 Feet
8"	0.40
10"	0.28
12"	0.22
14"	0.17
15"	0.15
16"	0.14
18"	0.12
21"	0.10
24"	0.08

Sewers on slopes 3:1 (33.3%) or steeper shall be anchored immediately downstream from bells with concrete anchors or approved equal as follows:

A. Anchor spacing shall not exceed 24 feet center-to-center on slopes 3:1 to 2:1(33.3% to 50%).

B. Anchor spacing shall not exceed 16 feet center-to-center on slopes steeper than 2:1 (50%).

C. See Standard Detail Drawing for "Pipe Anchors" (Dwg. 300.13).

301.9 Sewer Alignment:

A. Sewers shall be designed on straight alignment between manholes.

B. Sewer lines shall be located at a sufficient distance from curb and gutter and other structures to eliminate disturbance during possible future repair of the sewer line.

301.9.1 Curved Sewers:

A. Curved sewers shall be allowed with HDPE pipe materials only. Curvature shall not be deflected to a smaller radius than the manufacturer's recommended minimum radius and shall be installed in accordance with manufacturer's requirements for curved installation.

B. Curved sewers shall not be allowed on grades of less than 5%.

C. All sewers may only have a single vertical curve OR a single horizontal curve in a reach between manholes.

D. At a slope of 2% or less PVC pipe materials only.

E. All sewer, including curved sewer, must have tracer wire installed per District Standard Drawings.

301.10 Pipe Transitions: At manholes, where sewer diameters change, the flow energy gradient shall be continuous. The 0.8 depth of the two sewers shall be placed at the same elevation, with proper allowance for any manhole head loss, or as required to provide proper flow.

301.11 Manholes:

301.11.1 Location:

A. Manholes shall be installed at the end of each line, at all changes in pipe size, or changes in alignment or grade; at all junctions, and at intervals not to exceed 400 feet.

B. Manholes shall be provided at street intersections.

C. Watertight, seal-down covers shall be provided in areas subject to flooding. Flood plains shall be avoided. If flood plains cannot be avoided, the manhole lid shall be water-tight and set 1 foot above the 100-year flood elevation.

D. Manholes shall not be positioned in waterways, such as gutters.

E. Manholes shall not be placed within 10 feet of storm drains, catch basins or in low points where catch basins are located (as measured from center of structure to center of structure).

F. Manholes shall be placed within a five (5) foot offset from the street centerline whenever possible. If circumstances warrant and as specifically approved by the District Engineer, manholes may be located outside the five-foot offset. However, in these special cases the manhole shall be located within the pavement with a minimum distance of 2.5 feet required between edge of pavement, concrete curb or gutter, and edge of manhole rim.

H. Manholes in high turbulence areas and manholes likely to be effected by excess gas generation in high turbulence areas must be acid-resistant polymer manholes. These situations include:

1. Manholes receiving a pressurized main discharge connection and one (1) manhole immediately downstream of the pressurized discharge connection.

2. Manholes having a drop inlet connection.

3. Manholes which connecting pipes represent a decrease in slope of more than 25% across the manhole and one (1) manhole upstream of the significant change in slope.

I. New sewer lines located along new and existing roads are governed by the above criteria. However, if shown that placing a new sewer line in an existing road is detrimental to the existing road, cost prohibitive, and the alternative is in the best interest of the District, as determined by the District, the sewer line may be located off the roadway providing the following requirements are met:

1. The sewer line shall be located at least five feet outside of the pavement and within the right-of way. The sewer line shall not be placed under existing or planned sidewalks or other utilities. Manholes shall be marked with a 2" diameter galvanized steel pipe painted green with "sanitary sewer" written thereon.

2. The shoulder of the road from the edge of pavement to each manhole shall be at the level of the paved surface including an area around each manhole sufficient in size to allow for easy access to and maintenance of the manholes.

3. The top of manhole castings shall extend two to six inches above finished grade.

4. Grading around the manholes shall provide for side road drainage and drainage away from the manhole.

5. Five foot separation from other utilities.

J. Backlot sanitary sewer lines shall be generally described as public sanitary sewer lines and manholes where the following conditions apply:

1. A section or sections of sewer line (manhole to manhole) is located outside of paved surfaces and;

2. A section or sections of sewer is not accessible, for maintenance purposes, from a manhole which is within 10 feet of the edge of pavement.

K. The use of backlot sewer lines shall be avoided in the design of public sanitary sewers. In the event design conditions warrant the use of backlot sewer lines, the use of such lines is subject to review by the District Engineer and approved by the District Manager. The following items may be required for Final Design Approval at the discretion of the District Manager and District Engineer:

a. Special design considerations (i.e. greater pipe slopes, erosion protection, etc.)

b. Access roads and easements. If Access roads are required, these shall be usable year around and in all weather.

c. Backlot Maintenance Agreement between the Developer and the District.

301.11.2 Inverts: The minimum drop through manholes shall be 0.2 feet.

A. Flow channels through manholes shall be shaped to conform to the cross-section of the connecting sewers. In the case of pre-cast manhole bases with different diameters of connecting sewer, the larger diameter will determine the size of the pre-cast channel.

B. Flow channels shall be smooth with a uniform grade from inflow to outflow pipe flowlines.

C. The amount of drop through manholes and the information to be shown on the construction plans shall be determined as follows:

Slope of Connection	Amount of drop determined by	Information to be shown on construction plans
Minimum slope to 5%	0.2 feet through manhole	In and out elevations shown on profile.
5% to 20%	Carry the upstream pipe slope through the manhole to provide a smooth transition between connecting sewers.	In and out elevations shown on profile.
20% and above	Carry the upstream pipe slope through the manhole to provide a smooth transition between connecting sewers.	In and out elevations shown on profile. Manhole base detail including plan and at least one section.

D. In addition to the above information, a manhole base detail shall be required when the horizontal deflection angle of the connecting sewers is ninety degrees or greater, or when requested by the District Engineer. Horizontal deflection angles greater than ninety degrees shall only be allowed with

approval of the District Engineer.

E. Sufficient information should be shown on the construction drawings to provide for efficient design review, construction, and inspection.

301.11.3 Drop Connections: Shall be used whenever the elevation difference between the inverts of the inflow pipe and the outflow pipe exceed eighteen inches. Drop connections must be constructed with internal drops. The type of drop manhole shall conform to the Standard Detail Drawings for "Drop Manholes" (Dwg. 300.5). Drop manholes shall be a minimum of 5 feet in diameter with eccentric cone and steps. If a drop manhole is to be constructed at an existing 4-foot diameter manhole, the existing manhole shall be replaced with a 5-foot diameter manhole and the drop constructed according to the Standard Detail Drawings.

301.11.4 Diameters: Manhole diameters shall be at least 48 inches. Manholes on sewer lines 15 inches and greater, or 16 feet and deeper, or with 3 or more pipe lines entering & exiting, shall be 60 inches in diameter. 60-inch diameter manholes shall be indicated on the Final Design Drawings.

301.11.5 Shallow Manholes: Shallow manholes shall be required for depths less than 6 feet. See Standard Detail Drawing. Shallow manholes shall be indicated on the Final Design Drawings.

301.12 Cleanouts: Cleanouts shall not be used as an alternative to manholes on sewer lines 8 inches in diameter and greater.

301.13 Protection of Water Supplies: It is generally recognized that sewers and appurtenances must be kept remote from public water supply wells and other water supply sources and structures. The following specific requirements shall be observed at all times:

A. There shall be no physical connection between a public or private potable water supply system and a sewer, or appurtenances thereto, which could permit the passage of any wastewater or polluted water into the potable supply.

B. Sewers shall be laid at least 10-feet horizontally from any existing or proposed water main.

C. Where a water line and sewer line must cross, the water line shall be at least 18-inches above the sewer line.

D. The above requirements shall apply to sewer laterals and water service lines to a building.

E. Refer to the State of Utah Administrative Rules for Public Drinking Water Systems, Section R309-211-7 for installations that are not mentioned in the above specific requirements.

301.14 Easements:

A. Easements shall be required on all public sewers not located in dedicated public roadways.

B. All easements shall be 30 feet wide minimum.

C. Easements shall extend ten feet beyond the last manhole or last section of public sewer pipe.

D. When a sewer is located in an easement, not abutting a street right-of-way, access easements shall be provided.

E. Dedication Plats or signed public utility easements shall be submitted, reviewed, and approved along with Final Design Plans. Whenever the Final Design plans precede the Dedication plat, a letter indicating that all public utility easements will be granted by plat, shall be provided.

F. A display shall be attached to all easements showing the location in relation to the sewer line.

G. The Developer shall record all signed easements with the County Recorder.

301.15 Wastewater Pumping Stations: Use of wastewater pumping stations will be avoided whenever possible. Pumping stations are subject to approval and review by the District Engineer. Wastewater pumping stations shall conform to Section 310.

301.16 Boring:

A. Borings shall be designed and constructed in accordance with the applicable County, State, Federal, and Railroad Standards, permits, and/or as designated on Approved Plans.

B. Steel casings for bored or jacked construction shall be steel pipe conforming to ASTM A 139. Steel shall be Grade B under Railroads and Grade A on all other uses. Minimum wall thickness shall be in accordance with the following:

Diameter of Casing (Inches)	Nominal Wall Thickness (Inches) Under Railroads	All Other Uses
24	0.406	0.281
30	0.469	0.312
36	0.500	0.344

C. Casings under interstates shall extend from right-of-way to right-of-way.

D. Casings shall comply with Section 301.17.

E. The bored portion of the sewer should be completed before construction of the adjacent portions to allow for discrepancies in alignment and grade which may occur during the boring operation.

301.17 Casings: Casings shall be used when additional protection of the sewer pipe is determined by the Project Engineer or as required by the District Engineer.

The design of the casing shall include the following.

A. Casing and sewer pipe material, size, length, thickness and invert elevations shall be shown on the Final Design Drawings.

B. The sewer pipe shall be supported by redwood skids uniformly space and strapped to the pipe, within the casing.

C. The annular space between the casing and sewer pipe shall be filled with sand, “pea” gravel, or approved equal.

D. The ends of the casing shall be sealed and watertight.

E. Upon request of District Engineer structural calculations shall be submitted for review along with Final Design Drawings.

F. Manholes shall be located at each end of casing.

301.18 Prevention of Groundwater Migration: The Engineer shall consider methods to prevent the continuous migration of groundwater along the trench line.

301.19 On-Lot Pressure Sewer Systems (Ejector Pumps):

A. On-Lot pressure sewer systems consist of an ejector pump system and pressurized lateral for a single residence or business.

B. “Stacked” Residences may use a single on-lot pressure sewer system with District Approval. Use and maintenance agreements shall be submitted with plans for review and approval.

C. Pressure Sewer Systems for individual building units shall be avoided whenever possible. Building units or lots requiring pressure sewer systems shall be identified on the project dedication plat. Pressure Sewer Systems shall be located outside of buildings or other structures in a dedicated vault. The pressure sewer system shall be reviewed, approved, and manufactured by E-One or an approved alternative.

D. The design of the pressure sewer system shall be submitted to the District for review and approval. The submitted design information shall include as a minimum; type and size of pumping system, type and size of pressure pipe, valving, connection detail for connection of the pressure line to gravity sewer and all other information required for the design of the system.

E. The pressure sewer system shall conform to the current requirements of the Uniform Plumbing Code, latest edition, and local plumbing department requirements.

F. If any portion of the lateral flows by gravity, a cleanout shall be installed on the gravity line to allow for cleaning of the line.

G. Maintenance for laterals from the building to the main sewer line, including the connection to the main sewer line, shall not be the responsibility of the District.

301.20 Low Pressure Sewer Systems:

A. Low pressure sewer systems are defined as sewer systems pressurized by on-lot pressure sewer systems as defined by Section 301.19. Low pressure sewer systems consist of pressure mains, laterals, flushing stations, manholes and other miscellaneous and appurtenant valves and fittings used to collect and convey pressurized wastewater.

B. Low pressure sewer system use shall be limited and as approved by the District Engineer.

C. Low pressure sewer systems shall be designed and constructed in accordance with State of Utah Wastewater System Standards and Uniform Plumbing Code as applicable.

D. Low pressure sewer mains and laterals shall be constructed of HDPE rated 50 psi higher than designed pressure.

E. All service laterals shall have a check valve and cap placed at the property line. The location shall be shown on the plans referenced to property pins or other permanent physical features and staked with a green painted lathe protruding at least 18 inches above the ground.

F. Low pressure sewer systems shall be designed to be pressurized by E-One ejector pumps, or approved alternative, be reviewed by E-One, and approved by District Engineer.

G. Flushing and drain stations shall be placed at the end of each main and no less than every 500 feet along each main and at other locations as directed by the District.

H. Air release valves shall be placed at high points along the mains.

I. The District will maintain low pressure sewer system mains, flushing stations, and valves located within public right-of-ways and easements. The District will not be responsible for service laterals and all components outside of right-of-ways and easements.

J. Laterals shall connect downstream of the dead end flushing manhole.

302 Materials Requirements

302.1 General: Unless specifically designated otherwise in each case, all materials and equipment furnished for permanent installation in the work shall conform to applicable standard specifications and shall be new, unused and undamaged when installed or otherwise incorporated in the work. No material or equipment shall be used by the Contractor for any purpose other than intended or specified. All materials not conforming to these specifications shall be specifically approved in writing by the District Engineer prior to delivery to the jobsite.

Any material or equipment found by the Inspector not conforming with the Approved

Drawings and/or these District Standards and Specifications will not be approved by the District Engineer. See Section 100.5 for additional general conditions.

302.2 Sewer Pipe:

302.2.1 Ductile Iron Sewer Pipe:

302.2.1A Ductile Iron Pipe: Shall be a minimum wall thickness of Class 50 and conform to ASTM A 746 with cement mortar or bituminous lining. Additional corrosion protection consisting of polyethylene encasement conforming to AWWA C-105/A-21.5 shall be required where corrosive soil conditions exist.

Upon request, a soils report concerning corrosiveness shall be supplied to the District Engineer.

302.2.1B Fittings: Shall be ductile iron and conform to ANSI A 21.10. Fittings shall be consistent with the specified pipe.

302.2.1C Joints: Shall conform to ANSI A 21.11 and shall be mechanical or push-on type.

302.2.2 Polyvinyl Chloride (PVC) Pipe:

302.2.2A Materials: All PVC sewer pipe shall be made from PVC plastic conforming to ASTM D 1784.

302.2.2B PVC Sewer Pipe: PVC sewer pipe will be permitted for installation up to 21-inch diameter and shall conform to ASTM D 3034. Minimum wall thickness shall be SDR-35. Pipe lengths shall not be greater than 20 feet. Joints shall be bell-and-spigot type with integral bell gasketed joints. Gaskets shall conform to ASTM D 3212. For sanitary sewers larger than 21-inches in diameter, materials are to be approved by District Engineer on a case-by-case basis.

302.2.2C Fittings: All fittings shall conform to ASTM D 3034. Minimum wall thickness shall be SDR-35.

302.2.2D Low-Heat Pressure PVC Sewer Pipe: Shall conform to AWWA C 900. Minimum wall thickness shall be DR 18 or Pressure Class 150. Joints shall be bell-and-spigot type with integral bell gasketed joints.

302.2.4 High Density Polyethylene Pipe (HDPE): HDPE pipe shall conform to ASTM D3350. Minimum wall thickness shall be SDR 17.

302.3 Manholes:

302.3.1 General: Manholes shall be watertight, precast reinforced concrete manholes. Cast-in-place concrete bases with precast reinforced concrete sections may be allowed on a case-by-case basis, and must be approved by the District Engineer. Steps are required in all manholes (see Section 302.3.5).

302.3.2 Precast Reinforced Concrete Manholes: Manholes shall conform to ASTM C-478 and the Standard Detail for "Precast Manholes."

Precast base sections shall include a base riser section with integral floor and shall be supplied with a flexible pipe connector conforming to ASTM C-923. Precast base sections and flexible pipe connectors shall be manufactured for the type of pipe being installed. Precast reinforced concrete sections shall be of the ECCONCENTRIC type.

302.3.3 Cast-in-Place Concrete Manholes: Wall, cone sections and risers shall be precast reinforced concrete conforming to ASTM C 478 and the Standard Detail Drawing for "Cast-in-Place Manholes." Precast reinforced concrete cone sections shall be of the ECCONCENTRIC type.

Cast-in-place bases, approved for use by the District Engineer, shall have a 28-day minimum compressive strength of 2500 psi and contain not less than 5½ bags of Type II or V cement per cubic yard and shall conform with the Standard Specification for Portland Cement ASTM C-150.

Manholes 16 feet and deeper shall be 5 feet in diameter and ECCENTRIC type cone section.

302.3.4 Manhole Castings: All castings shall be cast iron rings and covers conforming to ASTM A48 Class 30. Castings shall be cleaned and painted with an asphalt coating prior to delivery to the site. All castings shall have a combined minimum weight of 400 pounds with the cover approximately 150 pounds and the ring approximately 250 pounds. The foundry name and casting number shall appear on the casting. Rings with slots for dust plans shall not be used.

Covers shall be in accordance with the following:

A. Covers shall be 24 inches in diameter.

B. Covers shall be non-vented with a pick-hole for opening.

C. All covers shall have a low profile waffle pattern similar to D&L Supply A-1017-R2 and shall be marked "SEWER."

D. Water-tight seal-down covers shall be of the gasket and bolt down type, with countersunk, hexagonal stainless steel bolts.

E. All lids shall be bended lids.

302.3.5 Manhole Steps: Steps shall conform to ASTM C 478 and shall consist of ½" deformed grade 60 steel reinforcing rod encased in polypropylene conforming to ASTM 2146, Type II, Grade 16906.

Steps shall be supplied in all manholes at a maximum spacing of sixteen inches. Steps shall be vertically aligned and shall not deviate more than 1 inch.

303 Construction Requirements

303.1 General:

303.1.1 Materials Handling: All sewer pipe, manhole sections, castings, and appurtenances shall be transported, handled and stored in a manner which will insure proper installation in an undamaged condition. The Contractor shall replace all material found to be defective or which has been damaged. This includes the replacement of material found to be defective prior to expiration of the guarantee period.

303.1.2 Inspection: All work and materials, from the beginning of the construction until the completion and acceptance of the proposed project, shall be subject to inspection by the District or its authorized representative, at their convenience. The Inspector shall have access to the work at all times. The Inspector will notify the Contractor of any work not conforming with the Approved Plans and/or these District "Standards and Specifications." The Contractor shall make necessary corrections. Any work not conforming to the Approved Plans and/or these District "Standards and Specifications" will not be approved by the Engineer or the District.

The Contractor shall notify the District Engineer 48 hours prior to the start of construction.

303.1.3 Installation of Concrete Products: Concrete products (manhole sections) shall not be installed until seven days has passed since the product has been manufactured. The date stamped on the concrete product will be used as starting date in determining this time period. Any concrete product installed without this seven-day period will not be approved by the District Engineer.

303.1.4: Pre-Construction Meeting: Prior to construction, a Pre-construction meeting specifically for sewer construction shall be held under the direction of the District Engineer or Construction Inspector. The following personnel are to be present:

A. District Engineer or staff.

B. Contractor performing actual Sanitary Sewer construction.

C. Design Engineer.

D. Developer (optional).

E. Any person(s) District Engineer requests to be present.

Scheduling of Pre-Construction meeting is to be done at the convenience of the District Engineer.

303.2 Trench Excavations:

303.2.1: General: The work included under "Trench Excavation" shall include: every operation necessary for excavation of all materials of whatever nature within the designated limits of the trenches; maintaining the excavation by shoring, bracing or

other accepted methods, and its removal; providing for the uninterrupted flow or surface water or sewage during construction; and protecting all pipes, conduits, culverts, bridges and all other public and private property which may be endangered by the work.

303.2.2 Trenching:

303.2.2A Alignment: Trench excavations for pipe installation shall be performed to the alignment and grade as indicated on the plans or as required by the Engineer. Survey staking will be provided as needed for checking alignment and grade of sewer line.

303.2.2B Tunneling: Tunneling may be permitted by the Engineer for economy of construction or necessity or preserving existing improvements.

303.2.2C Pavement Removal: All pavement removal shall be in accordance with the applicable City, County or State Standards and permits.

303.2.2D Trench Width: Typical trenches shall be excavated to a width which will provide adequate working space for proper pipe installation, jointing and embedment. Minimum sidewall clearance shall be 6 inches and the maximum sidewall clearance shall be 12 inches, measured from the outside wall of the installed pipe, at a depth of 12 inches above the pipe. In areas of rock excavation, minimum sidewall clearance shall be 12 inches minimum and 16 inches maximum.

303.2.2E Limit of Excavation: Except by expressed written permission of the District Engineer or Inspector, the maximum length of open trench shall be 300 feet, or the distance necessary to accommodate the amount of pipe installed in a single day (including open excavation, pipe laying and appurtenances, construction and backfill which has not been temporarily resurfaced).

303.2.2F Trenching by Machine or by Hand: The use of mechanical equipment will be permitted except in places where machines may cause damage to existing structures above or below ground, in which case, hand methods shall be employed.

303.2.2G Structure Protection: The Contractor shall provide temporary support, adequate protection, and maintenance of all underground and surface structures, pipes, drains, sewers and other obstructions affected by the construction work. Any structure that has been disturbed shall be restored or replaced.

303.3 Dewatering: All excavation shall be dewatered before any construction is undertaken therein. Concrete shall be placed only upon dry, firm foundation material.

303.4 Blasting: The Contractor's responsibility with respect to the use of explosives during blasting includes compliance with all laws, rules and regulations of Federal, State, City and the insurer, governing the keeping, storage, use, manufacture, sale, handling, transportation, or other distribution of explosives. All operations involving the handling, storage, and use of

explosives shall be conducted with every precaution by trained, reliable workers under satisfactory supervision of a Utah licensed blaster. Blasts shall not be fired until all persons in the vicinity have had ample notice and have reached positions out of danger therefrom. The Contractor shall advise the Engineer, all utility companies, and any other applicable party in advance as to when and where charges are to be set off.

303.5 Safety:

A. Excavations shall be performed, protected and supported as required for safety and in the manner set forth in chapter P, "Excavations, Trenching, and Shoring" of Utah Occupational Safety and Health Standard for Construction. In all cases, the Contractor is responsible for safety.

B. The Contractor shall furnish and maintain all necessary safety equipment, such as barriers, signs, warning lights, and guards to provide adequate protection for persons and property during all phases of construction.

C. The Contractor shall give reasonable notice to the owners of public or private property and utilities when such property and utilities are within the construction area.

D. The Contractor shall at all times observe and comply with all Federal, State and local laws, ordinances, and regulations which will in any manner affect the work.

303.6 Pipe Embedment:

303.6.1 General: The pipe shall be carefully bedded as specified on Approved Plans and/or shall meet the requirements of these District "Standards and Specifications."

303.6.2 Foundation Zone (Area Below the Pipe Zone): The foundation zone shall be competent unexcavated material. If unsuitable foundation is encountered, the Engineer shall determine the depth of material to be removed. The import foundation material shall consist of sewer rock meeting the following requirements:

Sewer Rock

Sieve Size	Percent Passing
2"	95-100
1"	60-70
½"	4-6
No. 200	2

Variations to this gradation shall be reviewed and approved by the District Engineer.

This material shall be placed in 6-inch maximum lifts with consolidation efforts in all areas.

303.6.3 Pipe Zone (Extends 6" Below and Above Pipe): The pipe zone material shall be clean, free draining, well graded, crushed gravel with a maximum aggregate size of ¾ inch. The material shall meet the following gradation requirements:

¾-Inch Crushed Gravel

Sieve Size	Percent Passing
1"	100
¾"	90-100
½ "	20-55
#4	0-10
#8	0-5

Variations to this gradation shall be reviewed and approved by the District Engineer. The trench bottom, shall be constructed to provide a firm and stable support for the entire length of the pipe. The pipe subgrade shall be shaped to fit the bottom of the pipe for a width of ½ the diameter of the pipe. Each joint shall be properly bedded to insure uniform and continuous bearing along the pipe.

The material shall be placed in 6-inch maximum lifts with consolidation efforts in all areas.

303.6.4 Final Backfill Material: The final backfill material shall extend from the top of the pipe zone to the ground surface for sewer lines outside of roadways. The final backfill material shall extend from the top of the pipe zone to the subgrade area for alignments inside roadways.

303.6.4A Outside of The Pavement Prism, Structures, Gutters and Walks:

1. Material shall be suitable material excavated from the trench. The material shall be free of rocks larger than 6-inch diameter, hard clods or frozen materials. Drying or sorting of the excavated material to remove debris, mud, muck, peat or other undesirable material may also be required. This zone shall be compacted to 90% maximum density at optimal moisture (AASHTO T-99) in one-foot maximum lifts. The required testing frequency for density is at least 1 test per 200 linear feet per lift.

2. Import material used to replace unsuitable excavated material, where additional backfill material is required to bring the final backfill to finished grade or where Contractor elects to import material rather than dry or sort the existing excavated material, shall be a select backfill material, free from organic material and conforming to the A-1-a, A-1-b, A-2-4, or A-2-5 classification of AASHTO Designation M-145. The material shall be capable of attaining the required densities when compacted. No additional payment will be made for import material where the Contractor elects to import material rather than dry or sort excavated material.

3. The final surface requirement may vary depending on the location of the sewer line (i.e. trails, ski runs, paths, etc.) The final surface shall be specified on the specific drawings.

303.6.4B Inside of the Pavement Prism, Under Structures, Gutters and Walks: The final backfill in these areas is subject to the Wasatch County Design Standards. The material is typically 6-inch minus native material free from hard clods, frozen material, debris, mud, muck, peat or other undesirable material. It shall be compacted to 96% maximum density (AASHTO T-99) in one-foot maximum lifts. Drying, wetting, or sorting may be required. Any variations must be approved by the Wasatch County

Engineer.

304 Pipe Installation

304.1 General: This section covers the installation of all sanitary sewer pipe, fittings, manholes and appurtenances. No connection to existing structures shall be made without approval of the District. A District approved, watertight plug shall be installed and maintained at the connection of the new sewer system with the existing sewer system until approval for the Developer/Contractor to remove the plug is given by the District.

This plug shall be grouted in, to prevent any debris, inflow or infiltration from the new construction from entering the existing sewer system.

Failure to install and maintain this plug will subject the Developer and Contractor to additional final "punch-list" items such as; cleaning all existing downstream sewer lines as determined by the Inspector and the District; repair of damage to the existing sewer system and treatment facility; and payment of fines as outlined in the Line-Extension Agreement.

304.2 Pipe Laying: All work shall be in accordance with the following related standards and these specifications.

304.2.1 PVC Sewer Pipe: ASTM D 2321 "Standard Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe. ASTM D 2855 "Standard Recommended Practice for Making Solvent-Cement Joints with PVC Pipe and Fittings."

304.2.2 HDPE Pipe: As per manufacturer's recommendation for pipe installation.

304.2.3 General Requirements:

A. Piping shall be laid to the alignment and grades indicated on approved construction drawings within the following limits provided that such variation does not result in a level or reverse grade:

Alignment	2 inches
Grade	+ ½ inch

B. Install pipe of size, material, strength, class and joint type with embedment as shown on the Approved Construction Plans and/or conforming to the Standard Specifications and Drawings.

C. Pipe shall be laid in a straight line at a uniform grade between manholes.

D. Pipe laying shall begin at the lowest elevation and proceed upstream with the bell end of bell-and-spigot pipe positioned upstream.

E. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted.

F. Pipe shall not be laid in water nor under unsuitable weather or trench conditions.

G. All field cuts shall be made at right angles to the axis of the pipe. All pipe

shall be filed to remove roughness.

H. All connections between two piping materials or between two field cuts of the same material shall be made with adapters designed and intended for that specific purpose. No-hub coupling type connections are not approved for construction within the District. To achieve extra strength and rigidity, couplings shall include a stainless steel shear ring as manufactured by "FERNCO", or equal as approved by the District. Shear ring shall be supported by concrete poured under the shear ring.

I. All joint preparation and jointing operations shall comply with the recommendation of the pipe manufacturer.

J. Whenever pipe laying is stopped, the open end of the pipe shall be plugged with a watertight plug and the trench shall be properly backfilled to protect the pipe from floating.

K. If adjustment of position of a pipe length is required after being laid, it shall be removed and rejointed.

L. Any pipe that has floated shall be removed from the trench and the pipe shall be re-laid as directed by the Engineer.

M. In addition to the above general requirements, all pipe installation shall comply to the specific requirements of the pipe manufacturer.

N. When a new sewer line is connected to an existing stub, a tee of the same size as the sewer line, shall be installed at the end of the stub to allow for air testing of new sewer main or water testing of new sewer lateral. The tee shall remain exposed until the line has passed the test, after which the wye or tee shall be plugged and properly backfilled.

O. The sewer system shall be installed to provide a water-tight system. All inflow and infiltration shall be eliminated. Limits of inflow and infiltration apply only to design of the system and not to sewer line construction and final construction approval.

P. Survey staking shall be completed prior to commencing construction.

305 Trench Backfill

305.1 General: The work included under "Trench Backfill" shall include every operation above the pipe embedment zone.

305.2 Backfilling: All backfilling shall be in accordance with the applicable County or State Standards, permits, and/or as designated on Approved Plans.

305.3 Pavement Replacement: All pavement replacement shall be in accordance with the applicable County or State Standards, permits and/or as designated on Approved Plans.

306 Manholes

306.1 General: Manholes shall be constructed at the locations indicated and in accordance with details as shown on the Approved Plans and/or Standard Detail Drawings.

306.2 Subgrade: Manholes are to be constructed on a stable foundation capable of supporting the loads imposed.

306.3 Manhole Base:

306.3.1 Cast-in-Place Bases (Prior Approval Required):

1. The base shall be a continuous pour of concrete.

2. Cast-in-place bases shall be at least 6 inches in thickness below the invert and shall extend at least six (6) inches radially measured from the outside of the precast manhole wall section. The base shall extend at least six (6) inches above the bottom of the wall section on the outside of the wall section.

3. The initial precast wall section shall be supported on concrete blocks and adjusted to proper alignment and grade prior to pouring of the base.

4. The precast wall section shall not bear directly on any of the pipes.

5. Waterstops, specifically designed for use in manhole construction, shall be used where the pipe enters the manhole wall.

306.3.2 Precast Base Sections: Precast base sections shall be placed so as to be fully and uniformly supported in proper alignment.

306.4 Inverts: All inverts, precast bases, cast-in-place bases or connections to existing manholes shall meet the following requirements:

1. Flow channels shall be smooth with a uniform grade, from inflow to outflow pipe flowlines.

2. Minimum drop through manholes shall be as described in Section 301.11.2.

3. Changes in flow direction shall be smooth, uniform and made with the longest radius possible.

4. The cross-sectional shape of the invert channels shall match the lower halves of the inflow and outflow pipes.

5. All openings around pipes in manholes without flexible pipe connectors shall be grouted with non-shrink grout to form a watertight seal. In addition, a waterstop, adaptor, or gasket specifically designed for the application shall be installed on all pipe. Installation of pipe in manholes with flexible pipe connectors shall be per manufacturer's recommendation. In all cases, a watertight manhole is required.

6. The pipe shall protrude into the manhole a maximum, of three (3) inches.

7. The number of private sewer laterals connecting directly to each manhole shall be

limited to three (3). A trough for each lateral shall be formed into the invert channel.

306.5 Wall Sections: Precast sections shall be placed and aligned to provide vertical sides.

306.6 Joints: In all cases, a watertight manhole is required.

306.6.1 Between Sections: All manhole sections shall be specifically designed and constructed to accept and retain manhole joint gaskets. Design of joints and joint gasket material for manholes shall meet ASTM C990 and shall be a butyl rubber sealant. Use of bitumen sealants is not acceptable.

306.6.2 Between Cast-in-Place Base and Sections: All joints between cast-in-place concrete and precast sections and pipe shall be grouted with non-shrink grout after concrete has cured.

All lift holes shall be grouted on the inside and outside with non-shrink grout.

306.7 Backfilling: Backfill according to Section 305.2.

306.8 Placing Castings:

306.8.1 In Roadways:

A. Top of castings shall be set parallel and ½-inch to 1-inch below finished road surface. Castings shall be fully and uniformly supported. Wedges or shims used to elevate castings shall be brick or metal with concrete placed for uniform support. One full course of brick, with all joints sealed, may be used to elevate castings. Cast iron risers may be used upon approval of the District Engineer.

B. Installation of a WHIRLyGIG manhole riser/collar is required. Additional manhole sections shall be required if the distance from top of cone to top of casting is greater than twelve (12) inches.

C. Collars around manholes within District boundaries shall be concrete, a minimum of 12-inches wide 8-inches thick and graded to match the existing paving asphalt. Workmanship shall meet Wasatch County requirements.

306.8.2 Off Roadways:

A. Top of castings shall be set horizontal and eighteen (18) inches above finished grade or as directed by the Engineer.

B. Grading shall be required to prevent a depressed area around the manhole.

C. Installation of a WHIRLyGIG manhole riser/collar is required. Bricks are not acceptable.

D. Additional manhole sections shall be required if the distance from top of cone to top of casting is greater than twelve (12) inches.

306.8.3 Roadway Shoulders:

A. The top of castings for Manholes within ten (10) feet of the edge of pavement shall be set horizontal and match shoulder grade.

B. The shoulder of the road from the edge of pavement to each manhole shall be at the level of the paved surface including an area around each manhole sufficient in size to allow for easy access to and maintenance of the manholes.

Grading around the manholes shall provide for road side drainage and drainage away from the manhole.

C. The casting shall be uniformly supported. Grade rings are not acceptable to raise casting. Bricks are not acceptable.

D. Manhole locations shall be marked with marking post.

306.8.4 Within Landscaped Area:

A. Grading shall be required to prevent a depressed area around the manhole.

B. Top of castings around buildings shall be set horizontally at or above finish grade or as required by the District Engineer.

C. All castings shall be uniformly supported. Grade rings are acceptable to raise casting. Bricks are not acceptable.

D. Additional manhole sections shall be required if the distance from top of cone to top of casting is greater than eighteen (18) inches.

E. Top of castings within concrete or asphalt walkways shall be set flush with the finish surface. Raising of castings shall be performed in accordance with Section 306.8.1, A & B.

F. Top of castings within landscaped areas and not in building areas shall be adjusted in accordance with Section 306.8.2.

306.9 Stubs: All stubs shall be plugged with watertight plugs at the end of pipes outside of the manhole.

306.10 Over Existing Sewers: Manholes to be built on an existing sewer shall be constructed in such a manner as will not disrupt service of the existing sewer. The manhole base, walls and invert shall be completed before the top half of the sewer pipe is cut or broken away. Rough edges of the pipe thus exposed shall be grouted in such a manner as to produce a smooth and acceptable finish. Any portion of the existing sewer damaged shall be repaired or replaced by the Contractor.

306.11 Protection During Construction: A plywood bottom or plugs shall be placed in manholes during construction to prevent debris from entering sewer lines.

306.12 Drop Manholes: Drop manhole connections, as indicated on Approved Plans or as required whenever the elevation differences between the flowlines of the inflow pipe and the

outflow exceed eighteen inches, shall conform to the Standard Detail Drawing for "Drop Manholes" or Approved Plans. Drop manholes may be constructed with internal drops. Drop manholes shall be a minimum five feet in diameter with eccentric cone and steps.

If a drop is to be constructed at an existing manhole which is four feet in diameter, the existing manhole shall be replaced with five foot diameter manhole and the drop constructed according to the Standard Detail Drawings.

306.13 Connections to Existing Manholes: The connection of new sewer lines to existing manholes shall be accomplished by core drilling the existing manhole wall and floor to allow for placement of the new pipe in the manhole and provide a trough in the manhole floor. A watertight seal at the new connection shall be provided. A flexible boot conforming to ASTM C923 is preferred. The transition from the new trough to the existing trough shall be smooth and uniform, and the minimum drop from the new line to the existing line shall be as previously stated in these standards.

During the connection of new sewer lines to existing manholes, the alignment of the existing pre-cast sections, grade rings, and castings shall be maintained and the joints between sections, grade rings, and casting, lift holes and connections of existing inflow and outflow pipes shall be watertight.

The Contractor shall provide for continuous sewage flow and shall prevent entrance of any ground water, storm water, debris or dirt into the existing facilities during this construction process.

307 Laterals

307.1 General: This section covers the connection of laterals to main sewer lines. Any alterations to this specification shall be approved by the District.

When an individual property owner desires to make a lateral connection to an existing main line sewer the Owner shall make application to the District for the proposed sewer lateral. In addition to connection fees, the Owner shall provide the District a site plan having the following items:

A. Location plan map of the project.

B. Property lines of property and adjacent properties involved, identified.

C. Location of existing sewer line to which new lateral is to be connected.

D. Size and slope of proposed lateral shown.

E. Method of connection.

307.2 Lateral Inspection: All connections, lines and appurtenances shall be examined by the District Inspector prior to backfilling. The District shall be notified forty-eight hours prior to installation of the sewer lateral.

307.3 Lateral Requirements:

A. All subdivision laterals servicing future lots shall be installed at the time of

construction. No plan approval will be given by the District until all laterals for future lots are correctly shown on the design drawings.

B. Laterals shall be constructed in accordance with Section 301.2.

B. Unless specifically designated otherwise in each case, all materials and equipment furnished for permanent installation in the work shall conform to applicable standard specifications and shall be new, unused and undamaged when installed or otherwise incorporated in the work. No material or equipment shall be used by the Contractor for any purpose other than intended or specified. All materials not conforming to the specifications shall be specifically approved in writing by the District Inspector prior to delivery to the jobsite.

307.4 Cleanout Requirements:

A. A minimum of two cleanouts are required on each lateral. One cleanout is required at the property line within the right-of-way. It is recommended that the second cleanout be located next to the building being served.

B. In addition to the above, cleanouts shall be installed at intervals not to exceed one hundred feet in straight-line runs and for each aggregate change in direction exceeding 135 degrees and behind bends exceeding 22½ degrees.

C. Cleanout risers shall be the same size as the lateral and shall be capped with a brass or cast iron cap. Concrete support blocks shall be poured around wyes for cleanouts. Cleanouts shall be in accordance with the Standard Detail Drawing for Typical "Sewer Laterals".

307.5 Lateral Connection Requirements:

307.5.1 General:

A. All sewer lines shall remain in service while connections are made.

B. Any damage to existing sewer manholes or lines during connections shall be corrected by the Contractor as directed by the District.

C. Sewer Laterals shall not be directly connected to sewer lines larger than 15 inches in diameter.

D. In all cases, a manhole shall be used to connect sewer lines eight (8) inches and larger to existing sewer mains.

E. Lateral connections shall be bedded, backfilled and compacted as per main line specifications, pipe manufacturer specifications or as directed by the District Inspector.

F. The invert of all sewer laterals at the point of connection shall be at or above the springline of the sewer main.

G. Laterals installed during the construction of the sewer main shall be connected to the sewer main by installing an "in-line" "wye" or "tee" branch

made specifically for sewer lateral connections. These "in-line' branches shall be installed in all new construction at 2 o'clock and 9 o'clock locations on main line, where laterals are indicated in Approved Drawings.

307.5.2 Connection to Existing Stub: When a lateral is extended to a building from an existing lateral stub which was installed during main line construction, a test tee shall be installed at the connection to the existing stub to allow for testing of the new construction. The tee shall remain exposed until all testing has been completed, after which the tee shall be plugged and properly backfilled. (See Standard Detail Drawing 300.16).

307.5.3 Connection to Existing Main:

A. The connection of sewer laterals to existing sewer mains shall be made by installing a "saddle" fitting. "Saddle" fittings shall be "Romac 'CB' Sewer Saddles" as manufactured by Romac Industries, Inc., or equal as approved by the District. (See Standard Detail Drawing 300.15).

B. The invert of all sewer laterals at the point of connection shall be between 10 and 2 o'clock position.

307.5.4 Connection to Existing Manhole: Connection shall be made in accordance with Section 306.13.

307.6 Acceptance Tests (Laterals): Visual inspection and a leakage test shall be performed on all installed sewer laterals prior to acceptance. Additional tests may be required by the District Inspector. Defects designated by the District Inspector shall be repaired prior to acceptance of the sewer lines.

The Contractor is responsible for performing required leakage testing and may select to perform either an "Air Test" or an "Exfiltration Test".

307.6.1 Visual Inspection: Each section shall be uniformly graded with no damaged pipe, misaligned pipe, displaced joints, or other defects. All sections of pipe shall be free of dirt, debris and obstruction.

307.6.2 Air Testing: An "Air Test" shall be performed on the full length of each sewer lateral installed with the requirements and method described in Section 308.3.

307.6.3 Exfiltration Testing: An "Exfiltration Test" shall be performed on the full length of each sewer lateral installed with the following requirements:

A. Test shall be maintained as long as necessary to locate all leaks but not less than two hours.

B. Leakage shall not exceed 0.16 gallons/diameter inch/100 feet/hour.

C. Pipe shall be dewatered upon completion of testing.

D. The District shall be notified forty-eight hours prior to testing.

E. An Inspector shall be present during all testing.

308 Acceptance Tests - Gravity Sewer Mains

308.1 General: Visual inspection and a leakage test shall be performed on all installed sewer lines prior to acceptance. Additional tests may be required by the District Engineer or Inspector. Defects designated by the District Engineer or Inspector shall be repaired and reinspected prior to acceptance of the sewer lines.

308.2 Video Inspection: All sections will be video recorded using distance indexing. Each section of sewer line between manholes shall be straight and uniformly graded with no damaged pipe, misaligned or displaced joints, or other defects. All sections of pipe shall be free of dirt, debris, and obstructions. The Contractor shall furnish one copy of videotape to the District Engineer or Inspector.

308.3 Leakage Test: Perform leakage tests on all installed sewer lines and manholes by means of an “Air Test” and a “Vacuum Test,” respectively. All “Air Tests” and “Vacuum tests” shall be observed by the Engineer unless the test is performed by a Testing Firm approved by the Engineer prior to testing.

308.3.1 Requirements: An "Air Test" shall be performed on the full length of each public sewer line installed with the following requirements:

A. The Contractor shall give the District Engineer 48-hours notice of any test to be performed on the system.

B. All air tests shall be observed by the Inspector, unless the air test is performed by a "Testing Firm" which the District and District Engineer approves prior to the testing.

C. Each section tested shall be noted on an "Air Test" form submitted to the District. Acceptances, failures, reasons for failure and re-tests shall be shown on the form.

D. All sewer pipe shall be tested after the completed backfill.

E. All air tests are to include laterals when installed in conjunction with the sewer main.

F. All stubs are to be air tested.

G. All repairs indicated by any unsuccessful tests shall be made and the tests repeated until the successful performance of all tests is achieved.

H. Equipment for “Air Testing.” Equipment for “Air Testing” shall meet the following minimum requirements:

1. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested.
2. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.
3. All air used shall pass through a single control panel.
4. Three individual hoses shall be used for the following connections:

a) From control panel to pneumatic plugs for inflation.
b) From control panel to sealed line for introducing the low pressure air.
c) From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

308.3.2 Method of Testing: The method of "Air Testing" gravity sewer lines shall be as follows:

A. Clean test section.

B. Plug all pipe outlets with suitable test plugs bracing each plug securely if needed.

C. Raise the internal pressure in the test section to 4.0 psig greater than the average back pressure of any ground water above the pipe, but not greater than the manufacturer's recommendation.

D. The average back pressure of ground water above the pipe shall be determined by dividing the average vertical height in feet of ground water above the invert of the sewer pipe to be tested by 2.31. The result gives the air pressure correction in pounds per square inch to be added. The maximum internal pressure in the test section shall in no case exceed the manufacturer's recommendation.

E. Maintain an internal pressure of 4.0 psig greater than the average ground water back pressure for a period of two minutes.

F. Disconnect the air supply and allow the test pressure to decrease to 3.5 psig greater than the average groundwater back pressure.

G. Determine the time that is required for the internal air pressure to drop from 3.5 psig to 2.5 psig greater than the average ground water back pressure.

H. If the time period is less than the following Time Holding Chart, locate and repair problem and retest.

TIME HOLDING CHART

Time in seconds required for
Pressure Drop from 3.5 to 2.5 psig

	Pipe Diameter (Inches)								
Length	4"	6"	8"	10"	12"	15"	18"	21"	24"
50	5	11	20	32	46	71	102	146	190
75	8	17	30	47	69	106	153	218	285
100	10	23	41	64	91	142	204	291	383
125	13	29	51	79	114	177	255	357	408
150	15	34	61	95	137	212	306	406	540
175	18	40	71	111	160	255	306	406	540
200	20	46	81	127	188	255	306	406	540
225	23	51	91	143	204	255	306	406	540
250	25	57	102	159	205	255	306	406	540
275	28	63	112	174	205	255	306	406	540
300	31	69	122	175	205	255	306	406	540
325	33	74	132	175	205	255	306	406	540
350	36	91	142	175	205	255	306	406	540
375	38	103	142	175	205	255	306	406	540
400	40	103	142	175	205	255	306	406	540

308.3.3 "Vacuum Test": A vacuum test shall be performed on all manholes. The test shall meet the following requirements:

A. Notify Engineer 48 hours prior to any testing.

B. The results of the "Vacuum Test" for each manhole shall be noted on a "Vacuum Test" form and shall be submitted to the Engineer. Acceptance, failures, reasons for failure, and retests shall be shown on the form.

C. All sewer manholes shall be tested after the final backfill is placed.

D. To assure the acceptability of the work and that proper installation procedures are being followed, "Vacuum Test" shall be performed on the first 10 sewer manholes installed, and the results submitted to the Engineer prior to installation of the remaining sewer manholes.

E. All defects indicated by an unsuccessful "Vacuum Test" shall be corrected by restacking of the manhole with joint gasket or manhole section replacement as necessary to achieve a successful test. The test shall repeated until the successful performance of a "Vacuum Test" is achieved. Joint repairs are not acceptable.

308.3.4 Method of Vacuum Testing: The method of "Vacuum Testing" sewer manholes shall be as follows:

A. Clean manhole.

B. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.

C. All air used shall pass through a single control panel.

D. Grade rings will not be required to be included in the test.

E. Inside conditions of the manhole, at the time of the test, shall be dry.

308.4 Video Test: Perform video test on all flexible pipe installed by video recording the interior of the pipe after the pipe has been flushed. The video recording shall be indexed to the pipe length.

308.5 Other Tests: Other tests on the installed sewer line may be required, as determined by the Engineer, to assure compliance with the specifications.

309 Cleanup

All surplus materials, tools, and any temporary structures shall be removed from the construction site by the Contractor. All rubbish, dirt or excess earth from the excavation shall be removed by the Contractor at the earliest possible date and the construction site left clean and acceptable to the construction inspector per Section 200.5.

309.1: The interior of all sewer lines, manholes, and other appurtenances shall be cleaned of all dirt, debris, or other foreign material. Cleaning shall be by jetting or other approved means as required to remove such foreign material.

309.2: Connections between new construction and the existing system shall be plugged to prevent any debris from the new construction or from cleaning operations from entering the existing system. Any debris entering the existing system shall be removed at the expense of the Contractor.

310 Wastewater Pump Stations

310.1 General:

310.1.1: All wastewater pumping stations shall meet the requirements of the latest edition of the Utah Administrative Code, Section R317-3 "Administrative Rules for Design Requirements for Wastewater Collection, Treatment and Disposal Systems," sub-section R317-3-3 "Sewage Pumping Stations."

310.1.2 District Wastewater Facilities Design Criteria:

A. Maximum Average Daily Flow per Equivalent Residential Unit = 340 gallons per day (gpd/ERU).

B. Peaking factor for wastewater pump stations shall be determined as follows:

Lift Station Size	With 2 hours Emergency Storage	Without 2 Hours Emergency Storage
Small Pump Station	Peaking Factor = 4.5	Peaking Factor = 12.0
Medium Pump Station	Peaking Factor = 4.5	Peaking Factor = 7.0
Large Pump Station*	Peaking Factor = 4.0	Peaking Factor = 6.0

*Note: Peaking Factor for extremely large lift stations to be determined by the District Engineer.

310.2 Basic Pump Station Requirements:

310.2.1: Pump stations shall be readily accessible by maintenance vehicles during all weather conditions. Easements shall be granted to the District and shall be sufficient to allow access by maintenance vehicles.

310.2.2: Pump stations shall have adequate security to prevent unauthorized entry.

310.2.3: Large pump stations shall have suitable devices for measuring flow.

310.2.4: Small and medium pump stations shall be provided with a riser from the discharge side of the pump station with quick connect coupling and appropriate valving for connection of portable pumps.

310.2.5: All pump stations shall be provided with a spare pump equal in size to the largest pump at the pump station. The spare pump shall be labeled to show what pump station it corresponds to, and shall be stored in the location directed by the District.

310.2.6: Pump stations shall have Supervisory Control and Data Acquisition

(SCADA) capability and compatable with the District's SCADA system. SCADA consists of monitoring equipment, signal wiring, RTU's, radio transmitters, modems, battery backup, antennas, masts, wiring, repeaters, wiring, computers, software, and other miscellaneous and appurtenant equipment used to remotely monitor and operate pumping facilities. SCADA systems shall be designed using the following guidelines:

A. RTU's shall be Abbey MicroLink or MiniLink, latest model in sufficient number to monitor and transfer all required equipment and signals.

B. System and power supply shall be enclosed in a NEMA 4X enclosure.

C. Power supply shall include 120 V, single phase AC and 24 V DC power.

D. Battery backup via a suitably sized uninterruptible power supply capable of 1 hour backup shall be supplied.

E. RTU's shall have power fail functions.

F. Internal radio and modems with proper antenna, cables, and connectors shall be supplied. If necessary to relay signal to the District's Master Site, additional relay towers may be required.

G. SCADA system software shall be compatible with District's Master Site.

H. Contact Mike Hiltz, Remote Control Systems, Inc. with questions (801) 268-1198.

The SCADA system shall monitor and transmit signals including, but not be limited, to the following:

A. Pump on (for each pump).

B. Pump fail (for each pump).

C. Motor Overheat (for each motor).

D. Low water level.

E. Power failure.

F. Generator on.

G. Generator fail.

H. High water level.

I. Grinder Motor Overheat (for each motor)

J. Flow Metering

K. Access/Entry Alarm

310.2.7: All pump station designs shall be submitted to the District for approval. Submittals for design approval shall include design calculations, pump data and curves, projected energy consumption calculations, control sequence of operations, etc.

310.2.8: Acceptance of the pump station by the District shall require the following:

A. Six copies of the operation and maintenance manuals and control and wiring diagrams.

B. Four hours (minimum) of operation and maintenance training for District personnel.

C. Start-up of all major equipment in the pump station shall be by each equipment manufacturer, followed by a report from the manufacturer that the installation complies with their requirements. The District shall be notified 48 hours prior to start-up and testing so that District personnel may attend.

D. All major equipment shall have a two-year warranty.

E. The pump station shall operate for 72 hours (minimum) without any failure.

310.3 Small Pump Stations:

310.3.1: Small pump stations are defined as those serving 30 ERUs or less.

310.3.2: A minimum of two operating pumps shall be provided for system redundancy. The pumps shall alternate operation. The spare pump shall not be counted or used as an operating pump. Submersible grinder pumps shall be acceptable.

310.3.3 Emergency Overflow Storage:

A. Emergency storage shall be provided to contain 2 hours of the maximum average daily flow. An alternative to providing emergency storage is to provide a dedicated onsite generator.

B. Emergency storage shall be in either the wetwell or adjacent underground vault. Where an adjacent vault is used, the wetwell shall be sized to contain 2 hours (minimum) of the maximum average daily flow.

C. Adjacent vaults shall meet the following:

1. An access hatch shall be provided for removing wastewater from the vault.

2. Piping to the vault shall be at a sufficient height above normal operating levels such that the vault does not normally contain sewage.

310.3.4 Emergency Power:

A. The pump station shall be designed for operation by a portable generator if an onsite generator is not provided.

310.4 Medium Pump Stations:

310.4.1: Medium pump stations are defined as those serving more than 30 ERUs and less than or equal to 100 ERUs.

310.4.2: A minimum of two operating pumps shall be provided for system redundancy. The pumps shall alternate operation. The spare pump shall not be counted or used as an operating pump. Self-priming or flooded-suction pumps are required. Submersible pumps shall not be acceptable.

310.4.3 Emergency Overflow Storage:

A. Emergency storage shall be provided to contain 2 hours of the maximum average daily flow. An alternative to providing emergency storage is to provide a dedicated onsite generator.

B. Emergency storage shall be in either the wetwell or adjacent underground vault. Where an adjacent vault is used, the wetwell shall be sized to contain 2 hours (minimum) of the maximum average daily flow.

C. Adjacent vaults shall meet the following:

1. An access hatch shall be provided for removing wastewater from the vault.

2. Piping to the vault shall be at a sufficient height above normal operating levels such that the vault does not normally contain sewage.

310.4.4 Emergency Power:

A. The pump station shall be designed for operation by a portable generator. If the pump station is located greater than 45 minutes from the District Maintenance Building, a dedicated, adequately sized generator shall be installed.

B. If a permanent standby generator is installed, it shall be sized to operate all equipment in the pump station. The generator shall use diesel fuel, with an above ground storage tank sized to hold 24 hours of fuel. The generator shall be housed in a vented building.

310.4.5 Pump Station Building:

A. A suitable enclosure shall be constructed to contain the pump station pumps, motors, valves, electrical controls, and lifting apparatus.

B. The enclosure must be sturdy and adequate for the purpose. Prefabricated fiberglass enclosures fit for the purpose are acceptable.

310.5 Large Pump Stations:

310.5.1: Large pump stations are defined as serving 101 ERUs or more.

310.5.2: For large pump stations with a capacity of less than1 million gallons per day

(mgd), a minimum of two operating pumps shall be provided for system redundancy. The pumps shall alternate operation. The spare pump shall not be counted or used as an operating pump. Dry pit pumps with flooded suction lines controlled by VFD are required. Submersible pumps are not acceptable.

310.5.3: For large pump stations with a capacity of 1 mgd or greater, a minimum of three operating pumps shall be installed. The pump station shall be able to operate at average conditions using any two of the three pumps for system redundancy. The pumps shall cycle operation. The spare pump shall not be counted or used as an operating pump. Dry pit pumps with flooded suction lines controlled by VFD are required. Regardless of the type of pump is installed, a separate grinding or screening device shall be installed upstream of the pumps.

310.5.4 Emergency Overflow Storage:

A. Emergency Storage can be required by the District Engineer.

B. If it is required, emergency storage shall be in either the wet well or adjacent underground vault. Where an adjacent vault is used, the wet well shall be sized to contain 2 hours (minimum) of the maximum average daily flow.

C. Adjacent vaults shall meet the following:

1. An access hatch shall be provided for removing wastewater from the vault.

2. Piping to the vault shall be at a sufficient height above normal operating levels such that the vault does not normally contain sewage.

310.5.5 Emergency Power:

A permanent standby generator shall be provided at each pump station. The generator shall be sized to operate all equipment in the pump station. The generator shall use diesel fuel with an above ground storage tank sized to hold 24 hours of fuel. The generator shall be housed in an air-conditioned building.

310.5.6 Pump Station Building:

A. A building shall be constructed to contain the pump station pumps, motors, valves, electrical controls, and lifting apparatus.

B. The building shall have a pitched roof and architectural treatment similar to planned development.

C. A crane and track system shall be built into the building with sufficient clearance and size to freely remove the pumps with motors out of the wet well and onto the back of a service vehicle.

D. The building shall be built according to Uniform Building Code, latest edition.

311 Acceptance Tests – Pressure Sewer Mains

311.1 General: The preferred testing medium is clean water. Use of other testing medium

to be approved by District Engineer. Testing procedure to be as follows:

A. Fill test section completely with water. During filling operation vent off air from pipeline.

B. Pressurize test section to 1.5 times the anticipated operating pressure. Over 3 hour period add water to maintain 1.5 time operating pressure to account for expansion in pipeline.

C. Reduce test pressure by 10 psi and observe for a 1 hour period. A successful test is achieved if pressure is maintained within 5% of testing pressure.

- END OF SECTION -

SECTION 400

Potable Water Systems

Revised: May 2016

SECTION 400 - POTABLE WATER SYSTEMS

401 Design Criteria

401.1 Required Improvements: The following improvements are generally required unless waived by the District on the basis of site conditions which make these improvements unnecessary. The design of the improvements will vary depending on site conditions, planning documents adopted by the District that may cover the site or adjoining public properties. Unless otherwise stipulated all improvements shall be designed and built to generally accepted engineering standards.

A. The distribution system shall deliver water at pressures between 60 and 120 psi pressure, as measured at the main, to each system connection. Water pressure may drop to 20 psi during fire flow scenarios. If necessary, pressure reducing valves shall be placed on the mains. Pressure reducing valves on service laterals in lieu of system PRV's shall only be allowed by the review and approval of the District Engineer. At no time shall water pressure exceed 150 psi to each system connection. At no time shall services be connected to transmission lines. Where service line pressures exceed 90 psi, an on-lot pressure reducing valve is recommended to be installed. In any case, the International Building Codes (IPC) should be adhered to when designing plumbing systems.

B. The water system pumps, storage tanks, transmission and distribution mains, etc. shall be of adequate size to deliver a peak day flow of 1,800 gpd per ERU at velocities less than 7 fps. (*As a rule of thumb, use a peak day demand design velocity of 5 feet per second.)*

The water system shall also have adequate capacity to deliver the peak instantaneous demand and/or peak day demand plus fire flow requirements at a velocity less than 10 fps.

The system shall be designed to provide fire flows per Wasatch County Fire District standards.

C. Fire hydrants are required along public ways or walks or drives which are to be snow-plowed. Fire hydrant spacing shall be in accordance with Wasatch County Fire District requirements. All water mains serving a hydrant shall be a minimum of eight-inch diameter. Each hydrant shall have an auxiliary gate valve flanged to the hydrant assembly. All water mains not serving a hydrant shall be a minimum of 8-inch diameter.

D. A metallic tracer wire and brightly-colored utility warning tape are required to be placed over all underground utility lines.

E. Water line shall be laid at least 10-feet horizontally and 18-inches vertically above any existing or proposed sewer lines.

F. All utilities and meter locations must be shown, including water and sewer laterals.

G. All connections to the District water system shall be inspected and metered unless otherwise approved by the District Engineer. All connections 4 inches in diameter or larger shall also be provided with a valve at the tee or property line and in other locations subject to the approval of the District Engineer. All connections, piping,

and appurtenances on the consumer's side of the water meter or beyond a point 5 feet outside of the public roadway are to be maintained privately, not by the District. Any large addition to the water system, such as a new condominium project or subdivision, may also be required to install a master zone meter.

1. The Water System Connection inspection is in three phases, each phase shall be inspected by the District Engineer:

    a) Excavation, Tapping, and Backfilling
    b) Meter Set Request
    c) Public Improvements (post-landscape)

H. Any staging area must be identified if requested by the District Engineer. Site survey information including detailed horizontal and vertical information relating to existing and future items may be required by the District Engineer.

I. Methods of temporary and permanent erosion control on construction sites and along all drainage channels, swales, or streams below construction sites. Methodology is subject to approval by an independent landscape architect and shall be in accordance with generally-accepted standards of landscape architecture. Limits of disturbance shall be shown on the plans. A landscaping and revegetation plan including irrigation sprinklers may be required.

J. Wherever possible open channels shall be preserved for all major drainages shown on the Master Storm Drainage Plan. Culverting of these channels is not allowed unless approved by the Wasatch County Engineer. Landscaping and revegetating to stabilize soils may be required.

K. Water system improvements necessary to keep the District's water storage and distribution system fully operational are required, and shall comply with recommendations from the Insurance Services Office and Utah State Board of Health regulations. Improvements required include but are not limited to: reservoirs and appurtenances, including excess capacity as need to provide efficient long-term system operation, pressure reducing stations, pump stations, valves, air release valve vaults, meter vaults, water distribution lines, telemetering, and computer modeling by the District or the consulting engineer of the District's choice as necessary to determine the impacts of a proposed development on the District water system. The District Engineer may require manhole-size valve vaults as per Standard Drawings 400.12 at any valve. A completely-detailed design of each pump house will be required; scope of review includes but is not limited to exterior design and safety issues such as kill switches, ground faulting, and panel locations (2 feet off floor minimum). Pumps and motors shall have a minimum of 75% wire-to-water efficiency unless otherwise approved by District Engineer.

L. As-built drawings or record drawings showing the as-built location of all public improvements tied to as-built surface improvements.

M. All water lines shall be installed with tracer wire conforming to the following:

1. 12 gauge, 600 volt copper wire, PVC jacketed for underground services.

2. Secure wire to pipe @ 20-ft minimum intervals.

3. Install wire continuously along the pipe alignment and at all service connections.

4. Wire shall be looped at all valves, hydrants, vaults and other appurtenances.

5. The tracer wire installation shall be subject to District inspection prior to backfilling of trenches.

6. Prior to District acceptance of the water system, the Contractor shall demonstrate to the District that the tracer wire is in a operable condition to the satisfaction of the District. In the event that the wire is not operable the contractor shall determine the cause of discontinuity, fix the problem and test at no additional cost to the owner or District.

N. All water main lines shall not be approved for design until the plat has been recorded.

O. The design engineer shall coordinate with the contractor during construction to ensure that inspections are performed during construction. District inspections will be performed on an as needed basis and could occur at random times during construction.

P. Dead end water lines shall not exceed 1300 feet. Dead end water lines exceeding this length shall not be approved by District Engineer.

Q. Valves are required at every water main tee. Valve spacing shall also not exceed every 1000 feet.

R. As per Utah Administrative Code R309-550-13(3), all pipe and fittings shall be ANSI Certified as meeting NSF standard 61.

S. As per Utah Administrative Code R309-550-5(6), the character of the soil through which water mains are to be laid shall be considered. This information shall accompany any submittal for a pipeline project.

T. As per Utah Administrative Code R309-550-8(8), special consideration shall be given to surface water crossings:

a) Above Water Crossing - The pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.

b) Underwater Crossing – A minimum cover of two feet or greater as local conditions may dictate, shall be provided over the pipe, when crossing water courses which are greater than 15 feet in width, the following shall be provided:

i) The pipe shall be of special construction, having restrained joints for any joints within the surface water course and flexible restrained joints at both edges of the water course.

ii) Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible, and not subject to flooding; and the valve nearest to the

supply source shall be in a manhole.

iii) Permanent taps shall be made on each side of the valve within the manhole to allow insertion of testing equipment to determine leakage and for sampling purposes.

U. All pipes and pipe fittings shall be "lead free" in accordance with section 1417 of the Federal Safe Drinking Water Act. They shall be certified as meeting ANSI/NSF 372 or Annex G of ANSI/NSF 61.

402 Water Main and Service Line Construction

402.1 General: All water mains and service line construction within the Districts water system or intended to be connected to the Districts water system shall be accomplished in accordance with the requirements of these Specifications. In all cases construction must conform to Rule R309-550 of Utah's Drinking Water Regulations. All water lines, connections, and appurtenances on the customer's side of the meter or beyond a point five feet beyond the edge of the nearest all-weather roadway, whichever creates the greater distance of private line, shall be privately maintained. No public water mains shall be accepted by the District until there is sufficient usage through the line to prevent wintertime freezing. No landscape irrigation line shall be connected to the District system without a backflow preventer similar to Standard Drawing 400.14.

The maximum bury depth for waterlines in the District is eight (8) feet below finished grade, unless otherwise approved by the District Engineer. Pipe, joints, fittings, valves, and fire hydrants shall be installed per AWWA standard installation requirements.

402.2 Approved Plans: Water main construction shall be done in accordance with the Contract Documents for the work, prepared under the direction of a Professional Engineer licensed in Utah and approved by the District Engineer.

402.3 Licenses and Permit Required:

A. All water mains and service line construction shall be done by a General Utility Contractor licensed and bonded in Utah.

B. When construction is required within the public right-of-way, a permit shall be secured by the Contractor from Wasatch County Engineer's Office or other governing body at least 48 hours (two full working days) before initiating construction.

When construction necessitates shutting down a segment of public water main for a connection, the connection shall be made between the hours of 2:00 a.m. and 7:00 a.m. local time unless otherwise approved by the District.

C. A street cut permit fee may be charged by the County.

D. A cash bond shall be posted to guarantee the work for a period of two years after final acceptance of the work by the County/District.

E. A certificate of insurance may also be required to be posted to guarantee that the District will not be liable for any accidents, property damage or physical damage to any individual related to acts of the Contractor.

F. The District Engineers Office shall be notified 48 hours (two full working days) minimum before the planned construction is to commence and also before starting up whenever construction is interrupted for any reason.

402.4 Inspection: All work shall be inspected by a District authorized Inspector who shall have the authority to halt construction when, in the opinion of the inspector, construction is being performed contrary to the approved plans and specifications, Contractors are required to give notification two full working days, (Mon.-Fri.) prior to a requested inspection. Whenever any portion of these Specifications is violated, the District Engineer and/or the County Engineer, by written notice, may order that portion of construction which is in violation of the Contract Documents to cease until violation is corrected. A copy of that order may be filed with the Contractor's license application for future review. If deficiencies are not corrected, performance shall be required of the Contractors Surety.

402.4.01 Construction Staking: Whenever construction staking is inadequate to reflect a water line's location with respect to other utilities, structures, or curb and gutter, the District Engineer or District authorized inspector may request additional staking be provided to enable verification of conformance with the approved construction drawings and the specifications. Supplemental staking shall be provided prior to burial of the waterline and within 48 hours of the request. Supplemental staking not provided within the allotted period may be considered cause for the District to halt waterline construction.

402.5 Cold-Weather Construction: During cold-weather conditions, special requirements must be followed to insure that proper construction methods are maintained. During the period from October 15th to May 15th, the following supplemental requirements apply. Inspection coordination is the responsibility of the Contractor. Failure to comply with these special requirements will be considered cause for the District to halt construction.

A. Trench excavation is limited to the quantity of pipe laying that the Contractor can install in one day. Trenches shall be completely backfilled (including bends, valves and end of pipe) at the end of each day.

B. When frost is encountered, it must be moved away from the excavation area to avoid contaminating the backfill material.

C. Snow must be removed from the immediate construction area to avoid contaminating the backfill material.

D. Bedding material shall be protected from contamination by moisture, including ice and snow. Bedding material containing any quantity of ice, snow, or frost shall not be placed in the trench.

E. Dewatering of the trench during cold-weather construction shall be conducted to discharge water away from the construction area and be prevented from entering pavement or gutters where freezing could present a hazard to the public.

F. When water has been introduced into pipelines prior to final acceptance of the water system (i.e. testing and disinfection purposes, interim fire protection, etc.), waterlines and appurtenances shall be protected from freezing. Backfilling shall be completed to the top of the casting around meter vaults, valve boxes, and reducing vaults.

G. Additional or supplemental testing of piping and backfill materials may be required by

the District Engineer when warm-weather conditions return.

H. Concrete for structures and thrust blocking to be placed when the atmospheric temperature is below **40°**F. shall comply with the following requirements:

1. The temperature of the concrete at time of placing shall not be less than 50°F. nor more than 70°F. The temperature of aggregates and mixing water prior to mixing with the cement shall be in accordance with "Recommended Practice for Cold Weather Concreting." ACI Standard 306.

2. When the daily minimum temperature is less than 40°F., concrete structures shall be insulated or housed and heated after placement. The temperature of the concrete and air adjacent to the concrete shall be maintained at not less than 50°F. nor more than 90°F. for the duration of the curing period.

3. Methods of insulating, housing and heating the structure shall conform to "Recommended Practice for Cold Weather Concreting," ACI Standard 306.

4. When dry heat is used to protect concrete, means of maintaining an ambient humidity of at least 40 percent shall be provided unless the concrete has been coated with an approved curing compound or is covered tightly with an approved impervious material.

403 Pipe for Water Mains

403.1 General: These Specifications cover the pipe and fittings normally used for water distribution systems. Special conditions will be covered in the Approved Plans and Special Conditions.

403.2 Pipe:

403.2.01 Cast Iron Pipe: Cast iron pipe may only be used with special prior permission from the District Engineer. It shall conform to AWWA Standard C106 Class 22, except that 21/45 iron shall be used. Cement lining shall be in accordance with AWWA C104. All polyethylene encasement used to coat any cast iron or ductile pipe and fittings shall conform to AWWA 105.

All fittings under this specification shall be short body cast iron fittings conforming to ANSI/AWWA C110 or Ductile Iron Compact MJ fittings with megalugs conforming to ANSI/AWWA C153/A21.53.

Joint sockets, socket flanges, packing glands, gaskets, and bolts shall conform to the requirements of ANSI/AWWA CIII.

403.2.02 Ductile Iron Pipe: Ductile Iron Pipe shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50 for a minimum of 150 psi (or project requirements, whichever is greater) rated working pressure plus a 100 psi surge allowance (if anticipated surge pressures are other than 100 psi, the actual anticipated pressure should be used); a 2 to 1 factor of safety on the sum of working pressure plus surge pressure; type of laying conditions and a depth of cover of 5 feet to 7 feet. (Typically Ductile Iron Pipe shall be of thickness Class 51 for 3 and 4 inch pipe and thickness Class 50 for pipe sizes 6 inches through 12 inches.)

Ductile Iron pipe shall be manufactured in the U.S.A. in accordance with the latest revision of ANSI/AWWA for the appropriate class. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.

Pipe shall have standard asphaltic coating on the exterior. Pipe shall also have cement-mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4, of latest revision.

The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters “DI" or “Ductile” shall be cast or stamped on the pipe.

All pipe shall be furnished with Push-on Type Joints, such as Tyton® or Fastite®. Joints shall be in accordance with ANSI/AWWA Cl11/A21.11, of latest revision, and be furnished complete with all necessary accessories.

Fittings shall be manufactured in the U.S.A. and be either ductile iron or gray iron. Ductile iron fittings shall conform to the latest revisions of either ANSI/AWWAC110/A21.10 or ANSI/AWWAC153/A21.53. Gray iron fittings shall be in accordance with ANSI/AWWAC110/A21.10 of latest revision. Fittings shall have a standard asphaltic coating on the exterior. Fittings shall also have a cement- mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4, of latest revision.

Fittings and accessories shall be furnished with either Push-on or Mechanical Type joints with megalugs in accordance with ANSI/AWWAClll/A21.11,of latest revision. Ninety degree bends shall not be allowed unless otherwise approved by the District Engineer.

All pipe, fittings, and accessories shall be installed and tested in accordance with the latest revision of ANSI/AWWA C600. Newly installed ductile iron water mains shall be disinfected in accordance with these specifications prior to placing in service.

The District Engineer, at his discretion, can require ductile iron pipe to be “bagged”.

403.2.03 Concrete Cylinder Pipe: Reinforced concrete water pipe, steel cylinder type, pretensioned shall conform to AWWA Standard C303. Size, class, marking, specials, lengths, etc., shall be specified in the Special Conditions. This pipe may be used, only when special permission from the District Engineer has been obtained.

403.2.04 Welded Steel Pipe: The work of this section consists of furnishing and installing all steel pipe and fittings as described in the Approved Plans. This pipe may be used only when special permission has been obtained from the District Engineer. All steel pipe and material shall be in accordance with AWWA Standard C200, for “Steel Water Pipe 6 Inches and Larger”.

Fabrication Specifications shall comply with Section 4 of AWWA C200. Pipe fabricated from steel sheets shall conform to the requirements of ASTM A1011, Grade 30 or plates conforming to ASTM A283, Grade C. The diameter of the pipe and steel wall thickness shall be shown on the Standard Drawings. The nominal diameter shall be O.D. for 28 inches and under and I.D. for 30 inches and over.

All pipe shall be shop tested to a hydrostatic pressure conforming to AWWA

Specification C200. Pipe shall be designed and manufactured so as to conform, when laid, with the lines and grades as shown on the Approved Plans and profile with outlets, connections and appurtenances as shown on the Approved Plans.

403.2.04A Coatings for Steel Pipe: Types of protective treatment shall be as follows:

1. Fusion Epoxy Lining and Coatings per AWWA 213.

2. Cement Mortar Lining and Coatings per AWWA 205.

403.2.04B Couplings for Steel Pipe: All steel pipe 6 inches and larger shall be coupled by the following.

1. Dresser coupling type 38, or equal.

2. Bell and spigot with 0-ring gaskets which provides unrestricted flow in either direction.

3. Flanges shall conform to AWWA Standard C207.

4. Other types as approved by the District Engineer. Couples shall be coated same as the pipe.

Steel Pipe used within the interior of a building shall be fabricated from steel sheets and plates. Approved Plans shall show the sizes and general arrangements of all pipes and appurtenances. Responsibility for furnishing exact length of the various sizes of pipe for proper make-up rests with the Contractor. The pipe shall be shop fabricated. Field welding will be allowed only with the written permission of the District Engineer.

403.2.04C Fittings: Steel fittings for pipe 4 inches and larger shall conform to AWWA C208. Pressure Class shall be at least the same as pipe. Fittings shall be coated the same as pipe. The Contractor shall supply certifications from supplier and/or manufacturer that the fittings meet all steel pipe fabrications. All Fittings shall me made in the USA.

403.2.05 Polyvinyl Chloride Plastic Water Pipe: (This type of pipe may only be used with prior Permission of the District Engineer.) All PVC pressure pipe and fittings shall conform to AWWA C900, C905, or C909 Pressure Class 200 or better as required by the District Engineer. PVC pipe shall not be used on lines serving only a fire hydrant or on any other dead-end use because of difficulty in thawing frozen pipe. Fittings shall be Ductile Iron Compact MJ fittings with megalugs conforming to ANSI/AWWA C153/A21.53.

The rigid PVC pipe shall bear the seal of approval and “NSF Mark” of the National Sanitation Foundation Testing Laboratory, Inc., which has qualified the pipe for potable water service.

Pipe shall be produced in standard and random lengths. At least 85% of the total footage of any class and size shall be furnished in standard lengths. The remaining 15% may be in random lengths.

1. Standard laying lengths shall be 20 feet plus or minus one inch for all sizes.

2. Random length shall not be less than 10 feet long.

Each standard and random length of pipe shall be marked on the outside surface with the trade name with the appropriate designation code (e.g. PVC 1120) DR, nominal size, pressure classification and date of manufacture.

Samples of pipe, physical and chemical data sheets, may be required to be submitted to the Engineer for approval and approval may be required before the pipe is purchased. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be as uniform in color as commercially practical.

The rigid PVC pipe used in the District water distribution system, when approved, shall be composed of PVC compounds meeting the requirements of ASTM D1784.

403.3 Buried Fittings: All buried fittings shall have SST nuts and bolts with Teflon coated nuts.

All buried fittings must be wrapped in Denso LT petroleum corrosion protection tape (or approved equal).

404 Trench Excavation and Backfill for Water Mains

404.1 General: The Specifications in this Section, and those of Sections 403 through 409, shall apply to the construction of water distribution mains and appurtenances in sizes up to and including twenty-four inches (24") in diameter for both temporary and permanent installation under ordinary conditions.

Water mains will be constructed on locations as shown on the Approved Plans.

Where grading is required, such grading or excavation and embankment shall conform to the requirements of Wasatch County. Sub-grade in roadways and final grade off-road shall be completed before excavation of the water main trench.

404.1.1 Ungraded Streets: On streets, when grading is not provided in the contract schedule, the depth of trench excavation shall be as shown on the Approved Plan and Profile and as staked by the Engineer.

Where the Approved Plans show the pipe is to be laid above the existing ground surface, an embankment fill shall be made and compacted conform with the section shown on the Approved Plans and the water main trench shall be excavated therein. That portion of the embankment below the bottom of the pipe shall be compacted with rollers or mechanical compactors under controlled moisture conditions as required by Wasatch County.

Where no bid items are provided in the contract schedule for earthwork, filling, or embankment fill, such work shall be considered as incidental to the construction and all costs thereof shall be included in the unit contract price per linear foot for waterline installed.

Where, in the opinion of the Engineer, the extent of the work of earthwork, filling, or embankment fill justifies bid items, such items and payment will be as provided in the Special Conditions.

404.1.2 Clearing and Grubbing in Ungraded Streets: Where not provided under schedules for "Grading" the area to be excavated or filled shall be cleared and grubbed by the Contractor. This work shall consist of the removal and disposal of all logs, stumps, roots, brush, organic soils, and other refuse. All such material shall be removed and disposed of as directed by the Engineer.

Payment for clearing and grubbing will be included in the unit contract price per linear foot for waterline installed unless otherwise provided.

404.1.3 Removal and Replacement of Pavement From Driveways and Sidewalks: Removal and replacement of existing street improvements shall be performed as specified in the Wasatch County Standards, except that payment therefore shall be considered as incidental to the construction and the costs thereof shall be included by the Contractor in the unit contract price per linear foot for installed waterline.

The removal of material from pavement, driveway and sidewalk and the disposal thereof shall be considered as incidental to the construction, and the costs thereof shall be included by the Contractor in the unit contract price per linear foot for installed waterline, unless otherwise provided.

404.1.4 Grade and Alignment: Grade and alignment on ungraded streets will be given from hubs set parallel to the line of the pipe, and on graded streets the grade and alignment shall be taken from established points on the existing curbs or sidewalks, when directed by the Engineer. Trenches for the pipe shall be opened in accordance with the lines and grades given or to the standard minimum cover of five (5) to seven (7) feet, depending on elevation and future surface treatment, whichever is greater. The Contractor shall transfer lines and grades to the pipe from hubs set by the Engineer or from existing concrete curbs or sidewalks as an incidental part of his work.

Sequence of operations, traffic requirements, or restrictions on the amount of open trench, if any, will be provided in the Special Conditions.

404.2 Trench Excavation: The Contractor shall perform all excavation of every description and of whatsoever substances encountered to the depth indicated on the Standard Drawings or specified herein. All excavations shall be made by open cut unless otherwise provided in the Contract Documents. The banks of the trenches shall be kept in accordance with Utah Occupational Health and Safety Division (UOSHA) requirements. To protect adjacent structures the trench shall be properly sheeted and braced.

Work shall comply with the "Utah Occupational Safety and Health Rules and Regulations" for the Utah State Industrial Commission.

All grading and other excavations nearby shall be controlled to prevent surface water from flowing into the excavations. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance away from the edges of trenches to avoid overloading and to prevent slides or cave-ins. Unsuitable material, or that in excess to the needs for embankments or backfill, shall be removed and disposed of by the Contractor.

The Contractor shall exercise sound engineering and construction practices in excavating the trench and maintaining it so that no damage will occur to any foundation, structure, pole line, pipe line, or other facilities because of slough, slopes, or from any other cause. If, as a result of the excavation, there is disturbance of the ground such as to endanger other property, the Contractor shall immediately take remedial action at his own expense. No act, representation or instruction of the Engineer or his representatives shall in any way relieve the Contractor from liability for damages or costs that result from trench excavation.

Care shall be taken not to excavate below the depth indicated, and excavation below that depth shall be backfilled with selected backfill material and compacted to the satisfaction of the Engineer at the Contractor's expense.

The bottom of trenches shall be accurately graded to provide uniform bearing and support for each length of pipe or undisturbed or compacted soil at every point along its entire length, except at the joints. Bell holes shall be excavated to an extent sufficient to relieve bearing pressure at the bell joint.

404.2.1 Protecting Existing Services: The Contractor shall carefully do all necessary excavation to fully expose such services. If the Contractor elects to excavate the trench without first exposing the services, he shall be responsible for any and all damages incurred to the services by reason of his operations and shall immediately arrange for replacement of all damaged services. All additional costs incident to such work by the Contractor shall be considered as incidental to the construction and shall be included in the unit contract price per linear foot for installed waterline.

404.2.2 Solid Rock Excavation: Solid rock shall include solid rock formations requiring systematic drilling and blasting with explosives and any boulders or broken rock larger than one-half cubic yard in volume. Hardpan or cemented gravel, even though it may be advantageous to use explosives in its removal, shall not be classified as solid rock excavation. Solid rock shall be excavated to a width equal to the outside barrel diameter of the pipe plus 24 inches, and to a grade line not less than 12 inches below bottom of the pipe bell. Bottom of the trench shall be brought up to grade by backfilling with selected backfill material. The material shall be compacted to the satisfaction of the Engineer.

The Contractor's responsibility with respect to the use of explosives during blasting includes compliance with all laws, rules and regulations of Federal, State, City and the insurer, governing the keeping, storage, use, manufacture, sale, handling, transportation, or other distribution of explosives. All operations involving the handling, storage, and use of explosives shall be conducted with every precaution by trained, reliable workers under satisfactory supervision of a Utah licensed blaster. Blasts shall not be fired until all persons in the vicinity have had ample notice and have reached positions out of danger therefrom. The Contractor shall advise the Engineer, all utility companies, and any other applicable party in advance as to when and where charges are to be set off.

404.2.3 Extra Excavation: If, in the opinion of the Engineer, it is necessary to adjust, correct, relocate or in any way change the line and grade, such changes shall be made by the Contractor.

404.2.4 Unforeseen Buried Objects Encountered in Trench Excavation on Graded Streets: Where streets have been graded, it is presumed that stumps, railroad ties,

buried pavements, etc., will have been removed in the original grading work. Where such unexpected objects are encountered in trench excavation for water mains, they shall be removed and disposed of by the Contractor.

404.2.5 Removal of Unsuitable Materials: Wherever in excavating the trench for water mains the bottom of the trench exposes peat, soft, clay, quicksand, organic soils, or other material which is unsuitable in the opinion of the District Engineer, such material shall be removed and disposed of by the Contractor. The material thus removed shall be replaced by suitable surplus material obtained from trench excavation within the limits of the project which shall be deposited and compacted in eight-inch maximum depth layers by mechanical compaction. If surplus material is not available within the limits of the project, the Contractor shall furnish suitable material, as provided in Section 404.2.8, 3/4 inch crushed rock for Trench Backfill.

404.2.6 Pipe Bedding: Pipe bedding material shall consist of ¾ inch minus crushed rock of which 100% will pass the U.S. Standard 3/4-inch opening and not more than 3% will pass the U.S. No. 200 (wet sieve), graded granular sand or rejected road base. Bedding material will be placed in accordance with Standard Drawings 400.1 and 400.2. *Under no circumstances shall mine tailings be used as bedding material.*

404.2.7 Backfilling Trenches: Backfilling of trenches shall be made with the same materials excavated from the trenches unless these materials are found to be unsuitable by the District Engineer.

Prior to backfilling, all form lumber and debris shall be removed from the trench. Sheeting used by the Contractor shall be removed just ahead of the backfilling unless it is ordered by the Engineer to be left in place.

The bedding, up to 12 inches over the top and both sides of the pipe, shall be evenly and carefully placed 3/4 inch minus crushed rock free of hard clods, frozen material or other debris capable of damaging the pipe or its coating. The balance of the backfill material may be placed in uniform layers to the compaction required in 404.2.8.

A minimum of a 3-inch sand cushion shall be placed between the water main and existing pipelines or other conduits when encountered during construction and as directed by the Engineer. No extra payment will be made for furnishing and placing sand as specified but the cost thereof shall be considered as being included in the unit prices bid for the various items comprising the improvement.

404.2.8 Compaction of Backfill: On graded streets without pavement or on roadway shoulders and unimproved areas, compaction of backfill may be by mechanical tamping or wheel rolling.

For all graded streets, including the shoulders, asphalt, and parkway strip located in the Right-of-Way, the backfill shall be compacted to 96% of the maximum modified proctor density at optimal moisture content as determined by the Compaction Control Tests specified in ASTM D-1557 and verified by the methods specified in ASTM D2911 (AASHTO T238) or ASTM Dl556(AASHTO T-191). The compaction may be reduced to 90% for areas where vehicle traffic will never occur, and/or the most distant five (5) feet of the Right-of-Way with written approval from the District Engineer. Density testing shall occur at least once per 200 linear feet of trench per lift.

404.2.8A Water Settling of Trenches: Water settling is not allowed.

404.2.8B Compaction of Backfill under Special Conditions: At locations where paved streets, driveways or sidewalks will be constructed or reconstructed over the trench, or where provided for in the Special Conditions or directed by the Engineer, the backfill shall be spread in layers and be compacted by mechanical tampers. In such cases the backfill material shall be placed in successive layers, not exceeding eight (8) inches in loose thickness and each layer shall be compacted with mechanical tampers to the density specified by the District Engineer.

405 Pipe Installation for Water Mains

405.1 General: Pipe shall be installed in accordance with manufacturer's specifications and instructions for installing the type of pipe used unless modified or changed in the Special Conditions. The Contractor shall provide all tools and equipment including any special tools designed for installing each particular type of pipe used. All pipe shall be installed with the bell end positioned uphill.

405.2 Construction:

405.2.1 Dewatering of Trench: Where water is encountered in the trench, it shall be removed during pipe laying operations and the trench so maintained until the ends of the pipe are sealed and provisions are made to prevent floating of the pipe. Trench water shall not be allowed to enter the pipe at any time.

405.2.2 Handling of Pipe: All types of pipe shall be handled in such manner as will prevent damage to the pipe, pipe lining or coating. Damage to the pipe, pipe lining or coating shall be repaired to the satisfaction of the Engineer or the damaged pipe shall be removed from the job and methods of handling corrected to prevent further damage.

Threaded pipe ends shall be protected by couplings or other means until laid.

The pipe and fittings shall be inspected for defects and cast iron pipe, while suspended above grade, shall be rung with a light hammer to detect cracks.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joints during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. *(At times when pipe laying is not in progress, the open ends of the pipe shall be closed by watertight plug or by other effective seal approved by the Engineer to ensure absolute cleanliness inside the pipe.)*

405.2.3 Laying of Pipe on Curves: For pipe diameters 8-inches to 12-inches, long radius curves shall not have a radius of curvature less than 205 feet or less than the manufacturer's recommended minimum radius of curvature, whichever is more restrictive. Curvature shall be either horizontal or vertical, but not both.

For pipelines 14-inches and larger, long radius curves shall not have a radius of curvature less than 340 feet or less than the manufacturer's recommended minimum radius of curvature, whichever is more restrictive. Curvature shall be either horizontal

or vertical, but not both.

If the pipe is shown curved on the Approved Plans and no special fittings are shown, the Contractor cannot assume that the curves can be made by deflection of the joints with the standard lengths of pipe. The Contractor is responsible for verifying the maximum degree of curvature allowed according to AWWA for the type and size of pipe he is installing.

Where field conditions require deflection for curves not anticipated by the Approved Plans, the Engineer will determine the methods to be used. Maximum deflections at pipe joints and laying radius for various pipe lengths are as found in the following standards:

Ductile Iron Pipe Mechanical joints	AWWA C600, Table 6
Ductile Iron Pipe Push-On Joints	AWWA C600, Table 5
Concrete Cylinder Pipe	AWWA C303, Section 4.3
Steel Pipe O-Ring Joints	See Manufacturer's specs.
Steel Pipe Welded Joints	See latest AWWA Specifications
PVC	AWWA C900

When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be made wider on curves for this purpose.

The District Engineer may require the Contractor to run a *mandrel* through each section of curved water line to verify maximum deflection. Such verification shall be incorporated into the Contractor's bid price for water main.

405.2.4 Laying Ductile & Cast Iron Pipe:
Ductile and cast iron pipe shall be layed in accordance with manufacturer's specifications.

405.2.5 Joining Mechanical Joint Pipe: The outside diameter of the spigot end of bell-and-spigot pipe varies with the type, size and class of pipe. There is only one joint size for each diameter of mechanical joint pipe. Thus, difficulty may be met when attempts are made to connect existing bell-and-spigot pipe to mechanical joint pipe. When such a correction must be made, an adapter having a fitting bell and a mechanical joint socket is manufactured and shall be used.

405.2.5A Cleaning and Assembling Joint: The last 8 inches outside of the spigot and inside of the bell of mechanical joint pipe shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter from the joint, and then painted with a soap solution made by dissolving one-half cup of granulated soap in one gallon of water. The cast iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket or bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with the thick edge toward the gland.

405.2.5B Bolting of Joint: The entire section of the pipe shall be pushed forward to seat the spigot end of the bell. The gasket shall then be pressed

into place within the bell, being careful to have the gasket evenly located around the entire joint. The cast iron gland shall be moved along the pipe into position for bolting, all of the nuts inserted, and the nuts screwed up tightly with the fingers. *All nuts shall be tightened with a torque wrench.* The torque for various sizes of bolts shall be as follows:

Size Inch	Range of Torque Ft.-Lbs.
5/8	40 - 60
3/4	60 - 90
1	70 - 100
1-1/4	90 - 120

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland. M.J. fittings shall use "Cor-ten" tee bolts made in the U.S.A. Flange fittings shall use stainless steel bolt packs made in the U.S.A. All valves shall be protected from their environment with polyethylene wrap with a minimum thickness of four millimeters unless otherwise approved by the District Engineer.

405.2.6 Jointing Rubber Gasket Joint Pipe:

405.2.6A Cleaning and Assembling Joint: The inside of the bell shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating) and other foreign matter from the joint. The circular rubber gasket shall be flexed inward and inserted in the gasket seat provided in the socket and released with the gasket fitting over the bead in a gasket seat.

A thin film of gasket lubricant shall be applied to the inside surface of the gasket. Gasket lubricant shall be a solution of vegetable soap or other solution supplied by the pipe manufacturer and approved by the Engineer.

The spigot end of the pipe shall be cleaned and entered into the rubber gasket in the socket, using care to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the bottom of the socket, using a forked tool or jack-type tool or other device approved by the Engineer. *(Pipe which is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.)*

Field cut pipe lengths shall be filed or ground to resemble the spigot end of manufactured pipe.

405.2.7 Laying Steel Pipe:

405.2.7A Threaded Steel Pipe in Sizes up to and including 3½ Inch: All steel pipe in sizes up to and including 3½ inch shall be connected with malleable iron screwed couplings in accordance with ANSI Specification Bl6.3. Couplings shall be galvanized. Unions or flanges shall be used on all equipment and valves. Steel pipe shall only be used in vaults or other areas where it shall not be in contact with soil.

Exposed threads, after jointing, shall be brush-coated with an asphalt coating approved by the Engineer.

405.2.7B Coupled Pipe 4-inch and Larger: All steel pipe 4-inch and larger for use in underground services shall be coupled by either one of the following methods:

Dresser Couplings, Style 38 or approved equal.

O-Ring rubber gasket joint of a design approved by the Engineer and having the following basic design:

One end expanded to form a bell.

The other, or spigot end, shall have a rolled groove to accommodate a round rubber gasket of proper diameter and cross-section.

All parts shall be thoroughly cleaned before assembly and a vegetable soap solution shall be brushed on the inside of the bell just prior to assembly.

All component parts of couplings, rings, bells, etc., shall receive a protective coating in the same manner as specified for steel pipe bolts and nuts, exposed edges, flanges, etc. shall, after installation, be covered with a heavy hot pour of asphalt if asphalt coated pipe is used, or with coal tar enamel if coal tar coated pipe is used.

All steel pipe 4-inch and larger for above ground service shall be coupled with flanges, dresser type or victaulic type couplings. All flanges for steel pipe shall conform to AWWA Standard C207, Class B for working, pressures up to 86 psi, Class D for working, pressures up to 150 psi, and Class E for working pressure up to 275 psi.

Pipe for outdoor service above ground shall be protected with one coat primer and one coat coal tar paint approved by the Engineer.

Pipe for indoor service shall be protected with one coat of red lead and two coats of approved enamel paint of a color specified or selected by the Engineer.

405.2.8 Laying Reinforced Concrete Pressure Pipe: Reinforced concrete pressure pipe with steel joint rings, or concrete non-cylinder pipe when called for in the Contract Documents shall be laid to conform with requirements that follow:

405.2.8A Cleaning and Assembling Joint: All parts of the joint, both bell and spigot ends, shall be thoroughly brushed and cleaned to remove oil, grit and other foreign matter. The circular rubber gasket provided with the pipe shall be stretched and snapped into the groove provided on the spigot end. It shall be lifted and released at several points on the circumference to equalize tension and remove twist in the gasket.

The bell end of the pipe shall be lubricated with a solution of vegetable soap and water or other prepared solution supplied by the pipe manufacturer and approved by the Engineer. The pipe shall then be jacked home until it stops.

The outside annular space at the joint shall be filled with cement mortar.

The grouting of the outside joints shall be made by wrapping the joint with two bands of strong, waterproof sisal kraft paper or visqueen. The bands of paper or visqueen shall then be tightly strapped to the pipe with 3/8-inch box strapping, using tools recommended by the manufacturer of the strapping. Hand-tamped backfill shall be built up around the band to the horizontal diameter of the pipe. The joint shall then be filled with mortar from one side only until the mortar appears on the other side of the pipe. Mortar shall be mixed with the least amount of water that will permit placing by the method described. Flexible wires shall be worked around the joint to assist grouting and ensure proper filling on the joint The top of the pipe shall then be grouted and the paper band laid over the entire joint to protect it while curing.

The inside annular space shall also be filled with cement mortar and troweled flush. Mortar shall consist of one part Portland cement and two parts of plaster sand. Mortar for inside joints shall be mixed with only enough water for "dry packing."

No grouting of joints will be allowed within three joints of laying operations. A representative of the Engineer shall be present when outside joints are being poured.

405.2.9 Laying PVC Pipe: PVC pipe may be used only with the permission of the District Engineer, and then only persons competent in the opinion of the District Engineer at laying plastic pipe shall be employed on this phase of the work, and complete suitable equipment necessary for the execution of same is required. Any incompetency observed by the Engineer must be rectified at his request and where improper equipment or lack of same appears to be impairing the quality or speed of the work, such adjustments in same shall be made to the Engineers satisfaction.

The pipe, fittings, and valves shall be placed in the trench with care. *Under no circumstances shall pipe or other materials be dropped or dumped into the trench.* The pipe shall not be dropped in a manner which would cause scratching of the pipe surface. An excessive amount of scratching of the surface of the pipe will be considered cause for rejection.

When requested by the Engineer, all PVC pipe will be tested after laying and backfilling by pulling a deflection detection device *(mandrel)*. The device shall verify less than 5% deflection in all pipe sections.

405.2.10 Connections to Existing Mains:

A. All connections to water mains in use shall be made by the Contractor unless otherwise provided in the Special Conditions.

B. The Contractor shall notify the District at least 48 hours (two full working days) in advance of such connections.

C. *Existing District water lines can only be shut down by crews authorized by the District Engineer.*

D. The Contractor shall also provide written notice giving the date of the notice, the date and time of the shutdown, and the duration of the shutdown. Major shutdowns shall only occur between 2:00 a.m. and 7:00 a.m.

E. *The maximum time allowed for shutdown shall be 4 hours.* If the Contractor should need more time than the above limit, it shall be necessary to turn on the water for at least 1 hour before the next period of shutdown begins.

F. The contractor must contact District Engineer for final decision regarding a hot top or cutting into the main line in order to place tees and valves.

All crosses or other specials required to be inserted in any main already in use shall be furnished and set by the Contractor. The Contractor shall furnish the special, as shown on the Approved Plans, and all other material required. He shall make all necessary excavations to assure gradual transition between the new and existing water main, and he shall perform all necessary backfilling to the requirements of Sections 404.2.06 and 404.2.07.

405.2.10A Disruption of Services: Where the connection of new work to old requires interruption of service and notification of customers affected, the District Engineer, and the Contractor shall mutually agree upon a date for connections which will allow ample time to assemble labor and materials, and to notify all customers affected. The Contractor will be required to notify all affected customers, the District Engineer 24 hours in advance of service being interrupted.

405.2.10B Wet Tap Connections: Wet tap connections shall not be made on Friday, Saturday, Sunday, Holidays, or after 12:00 Noon subject to approval by the District Engineer. Where connections are made between new work and existing pipelines, such connections shall be made in a thorough, neat manner using suitable and proper fittings to suit the conditions encountered. Each connection with an existing water line shall be made at a time under conditions which will least interfere with normal user consumption and as authorized by the District. Suitable facilities shall be provided for proper dewatering, drainage and disposal of all water removed from the dewatered lines and excavations without damage to adjacent property. Air and/or water testing may be requested by the District Engineer. Where bolted flexible couplings or transitions are required, they shall be constructed of material corresponding to the pipe indicated in the following table:

TYPE OF PIPE	COUPLING MATERIAL
Steel Pipe	Cast Iron or Steel
Cast Iron Pipe (earth covered or inaccessible to periodic inspection)	Cast Iron
Cast Iron Pipe (accessible to periodic inspection and painted)	Cast Iron or Steel
Polyvinyl Chloride	Cast Iron

Couplings shall be equal to Smith-Blair, Dresser, Blair, or Rockwell.

Great care shall be taken to prevent line contamination when dewatering, cutting, or making connection with existing pipes used for conveyance or distribution of potable water for domestic or public use. The Contractor shall conduct his operations in such a manner that no trench water, mud, or other contaminating substances are permitted to get into the connected line or lines at any time during the progress of the work.

405.2.10C Contracted Repair Work: Certain repair work may be specified in the Contract Documents as part of a Contract. This work shall be done as specified/contracted and in accordance with this section.

405.2.10D Accidental Repair Work: If, for any reason, the Contractor accidentally cuts an existing waterline, replaces defective materials, or in any way disrupts water service, he shall notify the District Engineer immediately. It shall be the Contractors responsibility to immediately repair or replace the damaged pipe at no additional cost to the District. The Contractor shall notify the District Inspector of any repair work. Unless otherwise approved by the District Engineer, Dresser Couplers will be used for repairs. Only one repair is allowed for each section of pipe.

405.2.11 Field Tests: All exposed pipes, fittings, valves and joints shall be carefully examined during the tests. Any cracked or defective pipes, fittings, or valves discovered during the field tests shall be removed and replaced by the Contractor with sound material and the test repeated as required, at the expense of the Contractor. All testing shall be done in the presence of the District Inspector. The District Inspector shall be notified two full working days prior to any testing. The Contractor shall be responsible to provide testing equipment, with gauges and measuring devices accessible, and have all lines to be tested stabilized prior to the scheduled inspection time.

A visual inspection shall be made of each and every connection made to an existing main when, in the determination of the District Engineer, the field test procedure specified in this section cannot be accomplished.

405.2.11A Main Line Hydrostatic Tests: All pipe and appurtenances shall be subjected to a hydrostatic test after they are laid. The Contractor shall be responsible to assure that each section of pipe between valves shall be tested as soon as possible after laying, or when directed by the District Engineer. *Hydrostatic and leakage tests may not be done simultaneously unless approved by the District Engineer*.

At points where pressure reaction and movement may occur, such as at bends, tees and plugs the pipe shall be properly blocked or braced.

Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after testing. All costs to the Contractor for installing temporary blocking shall be included in the unit bid prices for the water mains. The Contractor shall furnish all pumping apparatus, labor, tools, pressure gauges and other equipment for making the tests.

Where the District has water available for testing, it may be furnished without charge upon arrangement with the District. All costs of tapping and piping shall be borne by the Contractor unless otherwise specified in the Special Conditions. Where water is not available from the District, the Contractor shall provide water from an approved source for testing and the cost thereof shall be included in other unit contract prices of the work.

Hydrostatic tests shall be performed on every complete section of water main between two gate valves or equivalent (in the determination of the District Engineer), and each valve shall withstand the same test pressure as the pipe, with no pressure active in the section of pipe beyond the closed gate valves.

Each section of pipe line to be tested shall be slowly filled with water so that the specified test pressure is reached at the highest point in the section of pipe line under test. This pressure shall be corrected to the elevation of the test gauge by means of a pump connected to the pipe in a manner satisfactory to the District Engineer.

The Contractor shall subject the pipe to a hydrostatic pressure 50 percent higher than the highest working pressure, but not less than 225 psi, for a period of not less than 1 hour.

> 405.2.11A.1 Water Service Line Hydrostatic Testing: The Contractor may select to perform hydrostatic testing of water service lines independently of the water main. The Contractor shall subject the pipe to a hydrostatic pressure of 50 percent higher than the highest working pressure, but not less than 150 psi, for a period of not less than 1 hour.

405.2.11B Leakage Test: After the pressure test has been satisfactorily completed, the Contractor shall continue testing the water lines for leakage. The Contractor shall furnish all pumping apparatus, labor, tools, pressure gauges, measuring devices for leakage test, and other equipment required for making the test. The hydrostatic and leakage tests may be performed concurrently *only* with the permission of the District Engineer.

The duration of the leakage test shall be for not less than 2 hours, and during the leakage test, and piping shall be subjected to a minimum hydrostatic pressure 50% higher than the highest working pressure of the pipe, but not less than 225 psi, based on the elevation of the highest point of the section of pipe line under test and corrected to the elevation of the test gauge.

Leakage shall be defined as the quantity of water than must be supplied into any section of newly laid pipe line, or any valved section thereof, to maintain pressure within 0.5 psi of the specified test pressure after the air in the pipe line has been expelled and the pipe has been filled with water.

The allowable leakage in the water lines shall not exceed that specified in the latest revision of AWWA Standard C600 "Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances" of the latest revision of AWWA C900 (PVC), or the latest revision of AWWA C200 (Steel).

Should any test of the pipe disclose leakage greater than that specified above, the Contractor shall, at his own expense, locate and repair defective joints, disinfect and retest until the leakage is within the specified allowance.

405.2.11C Records and Documentation: Both the pressure tests and leakage tests shall be recorded by the Contractor with the District Inspector present Records shall contain the length of pipe tested, size of pipe, type of pipe, rated working pressure of pipe, time and duration of test(s), pressure(s) used, complete list of test equipment used, list of personnel performing the test(s), and any comments about the test. Test records shall be submitted to the District Engineer before the water line will be accepted.

405.2.11D Testing of Hydrants and Hydrant Service Line: When hydrants are included with the main pipe, the main line shall be tested to the hydrant valve. Testing of the hydrant and hydrant service line shall be performed as specified in Section 408.4.

405.2.11E Testing Extensions from Existing Mains: The Contractor shall be responsible for following these procedures. Where an existing water main is extended with new pipe to a new valve, the connection of the new pipe to existing pipe shall not be made until after hydrostatic tests have been made to the required pressure in both directions against the new gate valve. This shall be accomplished by a temporary cap or plug installed on the end of the new pipe, beyond the new gate, as close as possible to the existing pipe for testing purposes.

The short length of pipe between the temporary cap or plug end with the new gate valve in the closed position, with no hydrostatic pressure active on the opposite side of the gate valve, shall be subjected to the required test pressure. The same test shall be made against the other side of new gate valve when that section of pipe is tested with no hydrostatic pressure active in the short section of pipe toward the existing main pipe.

405.2.12 Disinfection of Water Lines: Before being placed in service, all new water lines and repaired portions or extensions of existing mains shall be chlorinated and flushed in accordance with these standards and AWWA C651. The Contractor shall review the proposed method of chlorination with the District Engineer prior to water line construction and shall notify the Inspector 48 hours (two full working days) prior to chlorination of the water line.

405.2.12A Flushing: The Contractor shall be responsible for maintaining the disinfected condition of existing water lines when connecting to, cutting into, repairing, or tapping existing water lines. Disinfection procedures for these operations shall be in accordance with the AWWA Standard C651. Mains shall be flushed without using hydrants, unless approved by the District Engineer. Taps required by the Contractor for chlorination or flushing purposes shall be provided by him as a part of the construction of water mains, unless otherwise provided in the Special Conditions.

The Contractor shall be responsible for disposal of heavily chlorinated treated water flushed from mains and shall neutralize the waste water for protection of the environment before disposal into any natural draining

channel, sanitary sewer, storm drain, curb and gutter, or onto the ground, unless approved by the District Engineer. The Contractor shall be responsible to confirm the acceptable point of discharge with the District Engineer prior to chlorination of the water line.

405.2.12B Chlorinating Valves and Hydrants: In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.

405.2.12C Bacteriological Samples: Twenty four (24) hours after the line is flushed by the Contractor, the Contractor shall take three (3) bacteriological samples from the installed pipe line with the Engineer present. The locations of the samples shall be at intervals along the pipe line as directed by the Engineer. The sampling bottles and methods used shall be in accordance with the Utah State Board of Health, "Public Drinking Water Regulations," or other similar applicable regulating agencies. Sample results shall be sent to the District Engineer.

405.2.12D Records and Documentation: All disinfection operations shall be observed and recorded by the Inspector. Records shall contain the length of pipe disinfected, size of pipe, type of pipe, location of pipe, date, time, and duration of disinfecting operations, complete list of equipment used and personnel performing the disinfection, and any comments about the disinfection operations. Three sets of these records shall be submitted to the Engineer.

405.2.12E Repetition of Flushing and Testing: Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained. Failure to get a satisfactory test shall be considered as failure of the Contractor to keep the pipe clean during construction, or to properly chlorinate the main, and no additional payment will be made for refusing and rechlorinating.

405.2.13 Concrete Blocking : Concrete thrust blocking shall be placed at bends, tees, and crosses or as directed by the Engineer. Blocking shall be Class 4000 (1 ½" minus aggregate) concrete mix placed in place. (See Standard Detail 400.16).

Concrete blocking, when placed as indicated on the Standard Drawings, shall be bearing against solid undisturbed earth at the sides and bottom of the trench excavation and shall be shaped so as not to obstruct access to the joints of the pipe or fittings. Payment for blocking will be included in the unit price for water line installed.

406 Valves for Water Mains

406.1 Description: The valves shall be suitable for an ordinary waterworks service intended to be installed in a normal position on buried pipe lines for water distribution systems. All valves shall be Mueller non-rising stem valves. Valve vaults as per Standard Drawing 400.12 shall be installed at critical valve locations and in selected locations above 7,300 feet as determined by the District Engineer.

The minimum requirements for all gate valves shall, in design, material and workmanship, conform to the standards of AWWA C500. All materials used in the manufacture of waterworks gate valves shall conform to the AWWA Standards designed for each material listed. All gate valve operating stems shall be equipped with a two (2) inch operating nut. All gate valves shall open counterclockwise.

The minimum requirements for all butterfly valves shall, in design, material and workmanship conform to the standards of the AWWA C504. Any water valve 12 inches or larger shall be butterfly-type. Also, any water line with working pressure greater than 150 psi shall have only butter-fly type valves installed.

Valves 12-inches or larger shall have approved concrete anchors, submit detail for approval.

Where static line pressure exceeds 125 psi, only 250 psi working-pressure valves shall be used.

All valves shall be protected from their environment by polyethylene wrap with a minimum thickness of four millimeters unless otherwise approved by the District Engineer.

406.2 Materials:

406.2.1 Manufacture and Marking: the valves shall have the name or mark of the manufacturer, year valve casting was made, size and working pressure plainly cast in raised letters on the valve body.

406.2.2 Type and Mounting: The valve bodies shall be cast iron, mounted with approved noncorrosive metals. All wearing surfaces shall be bronze or other approved noncorrosive material. Contact surfaces shall be machined and finished in the best workmanlike manner, and all wearing surfaces shall be easily renewable.

All gate valves shall be two-faced, double disc, with parallel seats and bronze or other approved wedging devices placed between them. The stem shall be of high tensile strength bronze or other approved non-corrosive metal.

406.2.3 End Connections: The dimensions for the mechanical joint connections shall conform to the ANSI Specifications No. A21.10.

The end flanges of flanged valves shall conform in dimensions and drilling to the standard ANSI B16.1 for cast iron flanges and flanged fittings, Class 125, unless specifically provided otherwise. The bolt holes shall straddle the vertical center line.

406.2.4 Gate Valve Stem Seals: Unless otherwise designated in the Approved Plans, all gate valves up to and including 12-inch in size shall be furnished with O-Ring Stem Seals. Number, size and design shall conform to the AWWA Standards for gate valve O-Ring Stem Seals. For all valves over 12 inches, the stem seals shall be conventional type stuffing-box with graphited packing per AWWA Standard No. C600-18.1.

406.2.5 Tapping Valves: Tapping valves shall be furnished with flanged inlet end connections having a machined projection on the flanges to mate with a machined recess on the outlet flanges of the tapping sleeves and crosses. The outlet ends shall conform in dimensions to the AWWA Standards for hub or mechanical joint connections, except that the outside of the hub shall have a large flange for

attaching a drilling machine. The seat opening of the valves shall be larger than normal size to permit full diameter cuts.

406.2.6 Hydrostatic Test Pressure at Factory for Class 150 Valves: Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subjected to the following hydrostatic pressure tests; each 3-inch to 12-inch valve, inclusive, shall be subjected to test pressures of 300 psi and 150 psi. These tests shall be conducted in accordance with provisions of AWWA C500, Section 5. Tests for special valves shall be made as provided in the Special Conditions and shall be witnesses by a District representative.

406.2.7 Hydrostatic Test Pressure at Factory for Class 250 Valves: Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subjected to the following hydrostatic pressure tests; each 3-inch to 12-inch valves, inclusive, shall be subjected to hydrostatic test under pressures of both 400 psi and 275 psi, and each 16-inch to 48-inch valves, inclusive, shall be subjected to test pressures of 400 psi and 250 psi. These tests shall be conducted in accordance with provisions of AWWA C500, Section 5. Tests for special valves shall be made as provided in the Special Conditions and shall be witnesses by a District representative.

406.2.8 Hydrostatic Test Pressure at Factory for Class 350 Valves: Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subjected to the following hydrostatic pressure tests; each 3-inch to 12-inch valves, inclusive, shall be subjected to hydrostatic test under pressures of both 500 psi and 375 psi, and each 16-inch to 48-inch valves, inclusive, shall be subjected to test pressures of 500 psi and 350 psi. These tests shall be conducted in accordance with provisions of AWWA C500, Section 5. Tests for special valves shall be made as provided in the Special Conditions and shall be witnesses by a District representative.

406.3 Installation of Gate Valves: All gate valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. The valves shall also be carefully inspected for injury to the outer protective coatings.

Valves 120-inch and under shall be installed in a vertical position and be provided with a standard valve chamber or cast iron gate box so arranged that no shock will be transmitted to the valve. The box shall be centered over the operating nut, and the cast iron box cover shall be set one-half (½) inch below the roadbed or finished paved surface. All valve boxes must be brought to this elevation prior to the placement of asphalt, unless otherwise approved by the District.

After installation, all valves shall be subjected to the field test for piping as outlined in Section 405.2.13 of these specifications. Should any defects in design, materials or workmanship appear during these tests, the Contractor shall correct such defects with the least possible delay and to the satisfaction of the Engineer.

406.4 Butterfly Valves: Butterfly valves shall be cast iron or ductile iron body, rubber seated, tight closing type butterfly valves conforming to the AWWA Specification C504. Other types may be used if specified or approved by the Engineer.

Valves shall be fitted with Class 150 or Class 250 flanges conforming to ANSI B16-1.

The valve body shall be high strength cast iron ASTM A 126 Class B with 18-8 Type 304 stainless steel body seat. Valve vane shall be high strength cast iron ASTM A48 Class 40, having rubber seat mechanically secure with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel nylon locked screws.

Rubber seat shall be a full circle 360° seat not penetrated by the valve shaft. Valve shaft shall be one piece, extending full size through the entire valve and operator with no neckdown, keyways or holes to weaken it. Valve shaft shall have 304 stainless steel journals rotating in reinforced teflon bearing. Packing shall be "triple-seal" rubber designed for permanent duty in underground service.

Certification of performance, leakage and hydrostatic tests as described in Section 12 of AWWA Specification C504 shall be furnished. Valves shall be the product of a manufacturer having a minimum of five years experience in the manufacturer of waterworks and distribution valves. Butterfly valves shall be as manufactured by Henry Pratt, Dresser or approved equal.

406.5 Globe Valves: As specified in the Contract Documents or as shown on the Approved Plans.

406.6 Ball Valves: As specified in the Contract Documents or as shown on the Approved Plans.

406.7 Check Valves:

General: Internal spring-loaded check valves for water pumps, compressors, gas, air, and steam shall be of the full-flow internal spring-loaded poppet type. The valves shall be designed for a water-working pressure of not less than 150 psi unless otherwise indicated.

Body: The bodies of valves 3-inches and larger shall be of cast iron conforming to ASTM A 126 with 125 lb flanged ends conforming to ASME B 16.1 unless otherwise indicated. Valves smaller than 3-inches shall have bronze bodies with screwed ends conforming to ASME B 1.201, suitable for a minimum working pressure of 200 psi, and a temperature of 250 degrees F, unless otherwise indicated. The type of bronze shall be suitable for the intended service.

Disc and Stem: Shall be bronze conforming to ASTM B 584 or stainless steel.

Seat**:** Shall have bubble-tight shut-off with resilient seats of Buna-N, Teflon, or other suitable material.

Spring: Valves in sizes 3-inches and larger shall have Type 316 stainless steel springs, and valves smaller than 3-inches shall have stainless steel or beryllium copper springs, as suitable for the service. The spring tension of the valves shall be designed for the individual pressure condition of each valve.

Manufacturers, or Equal

APCO (Valve and Primer Corp.)

CPV (Combination Pump Valve Company)
Miller Valve Co., Inc.
VAL-MATIC (Valve and Manufacturing Corporation)

406.8 Air Relief/Vacuum Relief Valves: Air Relief Valves shall be Val-Matic or equal of the type and model shown on the Approved Plans or as specified in the contract documents.

406.9 Miscellaneous Valves: All other valves on the main line shall be furnished according to the bid item description or Special Conditions and installed as shown on the Standard Drawings.

406.10 Valve Boxes and Covers: All valves not in a vault as per Standard Drawing 400.12 shall be provided with a cast iron valve box of the extension sleeve type, and the correct adjustable height to bring the top of the valve box flush with the finished surface. The valve box shall not be less than (five) 5 inches in diameter, and shall have a minimum thickness of 3/16 inch, and shall be provided with suitable base and cover. The word "Water" shall be cast on the cover. Valve boxes shall be equal to MUELLER H-10357 with No. 6 or No. 8 round base as needed. There shall also be furnished to the District, one (1) "T" handle operating wrench for each five (5) new valves installed on the project.

FOR PRESSURE RELIEF VALVE (PRV) SPECIFICATIONS: SEE STANDARD DRAWINGS 400.15A AND 400.15B.

407 Water Service Connections and Fire Lines

407.1 Description: In all developments, the service connections will be made by the Contractor, in accordance with these Specifications and Standard Drawings. This excludes setting the meter, which will be accomplished by District personnel, only after proper inspection of the service connection at the main service line, yoke, and lid assembly (*furnished by the Contractor*). All connections to the Districts water system excluding fire lines shall be metered unless otherwise approved by the District Engineer. All service connections including fire lines shall be constructed in accordance with the provisions of this section up to the first shut-off valve within the building. Doubling a fire line as a water service connection is not allowed.

All subdivision service laterals to future lots shall be installed at the time of construction. No plan approval will be given by the District until all laterals for future lots are correctly shown on the design drawings.

Service connections will be activated only after inspection, testing, chlorination and flushing of all new water line facilities, and also only after acceptance of the main line, unless otherwise approved by the District Engineer.

Each culinary service connection must be pressure tested in accordance with Section 405.2.11 except that the test pressure shall not be less than 50 psi greater than the line pressure. Each fire line shall be pressure tested in accordance with Section 405.2.11 except that the test pressure shall not be less than 200psi.

Water service connections shall be installed in accordance with the Standard Drawings, whichever is applicable. *No water service tap shall be made where the tap size exceeds one-third of the main diameter unless an approved lapping sleeve is used and prior approval is obtained from the District Engineer, (see Sec. 407.3).*

407.2 Materials:

Corporation Stops: Corporation Stops will be of brass with compression fittings in accordance with AWWA Standard C800.

Service Clamps: All service taps made to PVC, Ductile Iron, Cast Iron, or Asbestos-Cement mains shall be equipped with bronze, double-strap service clamps.

Pipe Materials: All service lines will be polyethylene, conforming to AWWA Standard C800 and ASTM B88 and being installed without any connections or appurtenances between the corporation stop and the meter yoke. Commercial fire sprinkler lines shall typically be 4" or larger ductile iron pipe connected by a tapping sleeve with valve to the main water line. Culinary lines shall be tapped at the main or fire line and installed according to the appropriate specifications.

Meter Yoke: Meter yokes for 1" and smaller will be a Ford "copper setting" of molded copper or polyethylene tubing with compression fittings and reinforcing bars and locking type angle valve; meter fittings will be standard thread. Meter yokes for 1½-inch will be Ford VF-66 series. Please refer to the appropriate Standard Drawing. High pressure setters shall be used.

Meter Box: Meter boxes will be 48-inch diameter for the following: (see the applicable standard drawings)

- Single 1-inch meter installation
- Single 1 1/2 –inch meter installation
- Single 2-inch meter installation
- Double 1-inch meter installation

Meter box will be 60-inch for the following: (see the applicable standard drawings)

- Double 1 1/2 –inch meter installation

Meter box will be 72-inch for the following: (see the applicable standard drawings)

- Double 2-inch meter installation

Meter box shall be located as per the approved drawings and is subject to approval by the District Engineer. Meter box shall be insulated.

Meter Box Frost Free Lid: Meter box lids will be frost free and of cast iron. The lid shall be secured with standard nut. A one inch long, ¼ inch wide notch will be cut in each lid for telemetry wire. All top meters lids shall have one (1) 1" tap and plug for each yoke, to facilitate the remote read meters used in the District. All meter lids must have prior approval of the District Engineer.

Curb Stop and Curb Box : (*Prior approval by the District Engineer required*), Mueller Oriseal curb valve and cast iron extension-type curb box with arch pattern base with cast iron foot piece as manufactured by Mueller. Prior approval by District Engineer required for substitution.

Meters: Normally the District provides meters. A fee shall be charged. Acquisition,

calibration, and distribution will be at the District's discretion.

407.3 Construction: Taps shall be made and pipe laid at a right angle to the water main. The tap shall be made on the middle of the main at an angle between 45° and 60° from the vertical plane, on the side of the main to which service is to be extended. For copper tubing larger than one (1) inch, it is allowable to increase the angle to approximately ninety (90)° due to the difficulty of putting a goose neck in the larger diameter copper. Taps of 1 " shall be no closer than 24" to a pipe joint. Taps larger than 1" shall be no closer than 48" to a pipe joint. The minimum allowable distance between taps and any other fitting is twenty-four (24) inches. Hot taps are preferred for service lines and for fire lines. Tapping sleeves must be used for taps larger than (2) two inches. Mechanical joint ductile iron tapping sleeves may be used for ductile iron and asbestos cement type mains. Stainless steel tapping sleeves may be used for P.V.C or other plastic mains. All service laterals shall be marked with a W stamped in the Curb.

Water line taps shall not be made on: Fridays, Saturdays, Sundays, Holidays, or after 12:00 Noon on any day unless otherwise authorized by the District Engineer.

The water main shall be tapped by keyhole sawing a hole in it the size to fit the corporation valve for the service line. The drilling machine and method of tapping shall be approved by the District Engineer. A representative of the District Engineer shall inspect the main and tap prior to backfilling. In the event the tap is covered before it is inspected, it shall be uncovered by the Contractor to allow for inspection. If the tap or water main is damaged during the process of locating, it shall be repaired immediately by the Contractor in a manner acceptable to the District Engineer.

No service line may be constructed through, or in front of any adjoining property. When authorized by the District Engineer a curb valve with curb box may be installed within four feet of the edge of road or back of gutter.

If the line is not connected initially to a meter yoke, the end of the service line shall then be sealed shut to keep rocks and dirt out of the line. Every precaution shall be taken to prevent foreign material, including trench water, from entering the pipe.

Unless otherwise approved by the District Engineer water meters, vaults/boxes, and the associated appurtenances shall be placed in the County Right-of-Way between 5 (five) and 10 (ten) feet behind the curb/gutter/edge of asphalt and in a landscaped area. Proposed interior placement of water meters must be submitted to the District Engineer at the time the building plans are submitted for initial review.

The District will maintain water service lines to the cold side of the water meter yoke or the edge of the County Right-of-Way, whichever is the shorter distance. If the water meter vault/box is on private property the District will maintain the water meter, yoke, and vault/box only, not the line.

The frost free meter lid shall have three (3) feet of soil placed and compacted radially from the edge of the lid at the approximate lid grade, while providing drainage away from the meter lid. All meter installations will be installed so that the frost-free meter box lid is at grade with a tolerance of +½". Grade rings are acceptable only with prior approval of the District Engineer.

If the meter box is located on a slope the following conditions must be met:

1. Satisfactory erosion control on the high and low side must be established.

2. A channel must be constructed in which the diverted water will flow around and away from the meter box.

3. The soil on the low side must be raised and compacted to the approximate elevation of the meter lid and radially out a minimum of three (3) feet from the edge of the lid, while providing drainage away from the meter lid.

The following are unacceptable conditions:

1. Silting in of the water meter lid and box.

2. Water pooling on the water meter lid.

3. The water meter lid being covered with soil and/or sod.

4. Trees being planted directly over the service line.

To avoid these and other potential problems, it is recommended to recognize them in advance and plan for the correct elevation and landscaping.

Erosion and drainage control must be totally established for a successful District Inspection.

All irrigation sprinkling systems will be connected on the customer side of the meter, *but not within the meter box.*

Adequate provisions shall be made by the Contractor during construction for the care and protection of mains or services in use.

Where salvage of pipe, valves, hydrants and fittings is required under the contract, salvage methods shall be used which will save all materials intact and undamaged. Salvaged material shall be stored at the trench site for removal by the utility, unless otherwise provided.

If salvage is not specified, the materials there from shall become the property of the Contractor and shall be promptly removed from the site for disposal as he sees fit.

To supply customers with water during the construction of a water main project where any section of the pipe has passed a satisfactory hydrostatic and bacteriological test, the District reserves the right to tap corporation stops into the section of the new main and install service connections at such locations as the District may elect, at no expense to the Contractor. The attaching of any such service connections by the District shall not be construed by the Contractor as an acceptance by the District or any part of the work required under the Contract. It is unacceptable to connect a service line to a fire line without specific prior approval by the District Engineer.

Bypass devices on 1½" and 2" meter yokes are authorized for commercial buildings ONLY. The bypass shall be lockable. Bypass devices on 1½" and 2" meter yokes shall not be used for residential buildings.

Any request for a meter larger than 1½" must be accompanied by a proposal submitted to the District Engineer prior to construction. The proposal needs to justify the larger meter.

408 Fire Hydrants

408.1 Description: These Specifications are to be used in conjunction with the AWWA Standard C502 or the latest revision thereof for fire hydrants for ordinary water works service. It is unacceptable to connect a service line to a fire line without specific approval by the District Engineer.

408.2 Materials:

408.2.1 Material for Hydrants and Appurtenances: All materials used in the production of fire, hydrants for ordinary service shall conform to the specifications designated for each material listed in AWWA Standard C502.

408.2.2 Hydrant Size and Type: Hydrants shall be five (5)-inch minimum size with two (2) 2½-inch hose nozzles and one (1) 4½-inch pumper nozzle. Hydrants shall be supplied with O-Ring seals and a six (6)-inch ASA 125 pound flanged inlet. *Each hydrant shall be supplied complete with a flanged mechanical joint auxiliary gate valve with box. They shall be Mueller Centurion or Waterous*. A hydrant key shall be provided to the District for each five hydrants installed.

408.2.3 Auxiliary Valve: Per Section 406 of these Specifications.

408.2.4 End Connections: The dimensions of the mechanical joint connection shall conform to the ANSI Specification No. A21.10.

The flanged lateral connection shall be faced and drilled to conform to the American Standard for 125-lb. W.P. flanged fittings when static pressures do not exceed 125 pounds and 250 pounds working pressure flanged fittings shall be used when working pressure is greater than 125 pounds. Flanges shall be machine finished to a true surface. Bolt holes shall straddle the vertical center line.

408.2.5 Sidewalk Flange Construction: Hydrants shall be provided with a sidewalk flange. Breaking devices, if required, shall be at the sidewalk flange which will allow the hydrant barrel to separate at this point with a minimum breakage of hydrant parts in case of damage. There shall also be provided at this point a safety stem coupling on the operating stem that will shear at the time of impact Unless otherwise specified, all hydrants shall be equipped with C)-Ring stem seals.

408.2.6 Factory Hydrostatic Test: All hydrants installed shall have certification of being subjected to an internal hydrostatic test of 300 pounds per square inch with the hydrant valve in a closed position and begin with the hydrant valve in an open position upon request by the District Engineer.

408.3 Construction Details:

408.3.1 Setting Hydrants: Hydrants shall be installed in accordance with the detail shown on Standard Drawing 400.11 in the location specified in the Approved Plans or as designated by the Engineer.

All hydrants shall be inspected in the field upon arrival to ensure proper working order. After installation, they shall be subjected to a hydrostatic test not to exceed the factory test pressure. New hydrants are to be marked by a spring-loaded flag.

*Hydrants shall **not** be operated for the purpose of obtaining water for construction purposes.*

408.3.2 Hydrant Connections: Hydrant laterals shall consist of a section of mechanical joint ductile iron six (6-inch pipe from the main to the hydrant and shall include an auxiliary gate valve set vertically and placed in the line as indicated in the Standard Drawings for hydrant settings.

408.3.3 Relocating Existing Hydrants: When shown on the Approved Plans or when directed by the Engineer, existing hydrants shall be moved. When the existing tee is moved to a new hydrant location, a new tee shall be inserted and the open part of the abandoned tee shall be securely sealed and blocked. When the existing hydrants are blocked to the main line, the same method shall be used to anchor the hydrants at their new locations. The work shall conform in all respects to hydrant settings as described elsewhere in these Specifications. (See break-away flanges in Sec. 408.3.4).

408.3.4 Hydrant Extensions: The minimum requirements for all flanged hydrant barrel extensions, operating stems and flanged adapters for hydrant lateral connections shall, in design, material and workmanship conform to the AWWA Standards for such castings. The drilling of the flanges on the extensions shall match the drilling of the flanges on the hydrant. The drilling of the adapter flanges shall match those of the hydrant foot flange and the auxiliary gate valve flange. When a hydrant is installed, moved, or extended, the Contractor shall ensure that the breakaway flange is at the final grade level, six inches above grade maximum, or manufacturer's recommendation; and is positioned in the correct direction to facilitate proper break-away action upon vehicular or other object impact.

408.4 Testing of Fire Hydrants: Fire hydrants shall be subjected to a hydrostatic test at a hydraulic pressure of 225 psi for a period of one hour, after being connected to the main water line and after concrete anchor blocks at all thrust points are in place. Testing shall be made with the whole interior of the hydrant under pressure with the auxiliary valve closed and the foot valve open and the hose nozzles and pumper connections closed. Under the test procedure, there shall be no leakage through the main valve or stuffing box, nor through the castings or the joints of the assembled hydrant. Under the test conditions, the leakage through the drain valve shall not exceed four fluid ounces per minute. Other leakage or other imperfections found in either test shall be corrected before the hydrant is accepted. **The Contractor shall leave the foot valve open during all phases of water line construction and testing until the District Inspector has authorized closing the foot valve. Hydrants shall not be operated for obtaining water for construction purposes**.

409 Restoration and Cleanup of Water Main Construction

409.1 General: Surface improvements such as pavement curb, curb and gutter and other like surface facilities that have been removed or damaged during the construction of water mains, shall be restored by the Contractor.

409.2 Construction Details:

409.2.1 Removal of Existing Street Improvements: Removal and disposal of existing street improvements shall be done in accordance with applicable sections of these Specifications, and Section 404.1.3 which provides that removal and disposal shall be considered as incidental to the construction and the costs thereof shall be

included in the unit contract price per linear foot for “Waterline Installed.”

409.2.2 Restoration of Existing Street Improvements: Restoring of existing street improvements shall be as specified in the applicable sections of these Specifications pertaining to their construction and the measurement and payment will be as described in Section 409.3.1 and 409.3.2.

At all pavement openings where backfill is to be compacted with mechanical tampers in accordance with Section 404.2.7D and where the pavement is not restored immediately, the Contractor shall place and maintain at his own expense an asphalt concrete surfacing to the elevation of the existing pavement until final restoration is made.

409.2.3 Finishing and Cleanup: Finishing and cleanup shall be as specified in Section 200.5

410 Disinfection of Water Storage Tanks

Finished water storage structures shall be disinfected before being put into service for the first time, and after being entered for cleaning repair, or painting. The reservoir must be cleaned of all refuse and should then be washed with clean water prior to adding the disinfectant.

AWWA Standard DI 05 must be followed for reservoir disinfection. However, the following procedures may also be employed:

To disinfect reservoirs, sufficient chlorine shall be added to give a concentration to the water of at least 50 parts per million (ppm) of available chlorine. This chlorinated water shall be retained in the reservoir being treated for 24 hours and should have a free chlorine residual at the end of the retention period of at least 25 ppm at all points. At the end of the retention period the reservoir should be thoroughly drained and flushed with clean water. *The chlorinated water must be disposed of in an acceptable manner and in conformance with the Utah Wastewater Disposal Regulations*. If there is any question as to the effectiveness of the chlorine treatment, the procedure should be repeated.

Table A gives the amount of hypochlorite to be used for disinfecting reservoirs to give a concentration of 50 ppm of available chlorine.

TABLE A
Chlorine Requirements for 50 PPM

Tank Capacity (Gal.)	Liquid Chlorine (Gal.)	70% Hypo-Chlorite (Gal.)	50% Hypo-Chlorite (Gal.)	25% Hypo-Chlorite (Gal.)	12% Hypo-Chlorite (Lbs.)	5.25% Hypo-Chlorite (Lbs.)
1,000	0.416	0.6	0.83	1.7	0.5	1.0
2,000	0.833	1.2	1.70	3.4	1.0	2.0
5,000	2.080	3.0	4.20	8.4	2.0	5.0
10,000	4.160	6.0	8.30	17.0	4.0	9.6
20,000	8.330	12.0	17.00	33.0	8.0	19.0
30,000	12.550	18.0	25.00	50.0	12.5	29.0
40,000	16.700	24.0	33.00	67.0	17.0	38.0

50,000	20.800	30.0	42.00	83.0	21.0	48.0
75,000	31.200	45.0	63.00	125.0	31.0	72.0
100,000	41.600	60.0	83.00	167.0	41.0	96.0
200,000	83.300	119.0	167.00	333.0	83.0	190.0
300,000	125.000	179.0	250.00	500.0	125.0	286.0
500,000	208.000	298.0	417.00	833.0	208.0	476.0
700,000	292.000	417.0	583.00	1,170.0	292.0	670.0
1,000,000	416.000	595.0	833.00	1,668.0	416.0	955.0

With large reservoirs where it is not economical to treat the entire contents with 50 ppm of chlorine, disinfection may be accomplished by swabbing or spraying all interior surfaces with chlorine solution containing 20 ppm of available chlorine. The surface of the reservoir must be kept wet for a minimum of 30minutes before the structure is filled. The spray operator shall be protected with suitable protective clothing and gas mask or respirator.

At least one satisfactory bacteriologic sample must be achieved from the reservoir after the disinfection procedure has been accomplished and the tank has been filled with potable water. If the sample shows the presence of coliform bacteria, the disinfection procedure must be repeated.

- END OF SECTION -

SECTION 500

IRRIGATION WATER SYSTEMS

REVISED: MAY 2016

SECTION 500 - IRRIGATION WATER SYSTEMS

501 Design Criteria

501.1 Required Improvements: The following improvements are generally required unless waived by the District. Unless otherwise stipulated all improvements shall be designed and built to generally accepted engineering standards.

A. Irrigation systems shall be designed to eliminate possible cross connections with culinary or sewer water systems.

B. All irrigation systems shall be designed with a continual slope to a drain for winterizing capabilities.

C. All connections to existing irrigation systems shall be inspected by the District prior to connection. Connections, piping and appurtenances on the consumer's side of the meter box or a point 5 feet outside of the public roadway are to be maintained privately, not by the District. Large master planned projects or subdivisions may also be required to install a master zone meter.

D. All utilities and meter locations must be shown, including irrigation, water and sewer laterals.

E. A metallic tracer wire and brightly-colored utility warning tape will be required to be placed over all underground utility lines.

F. Meter sizes and lateral service lines shall be as follows:
   a. Lots less than 0.5 acres shall have a maximum 1" service line and meter.
   b. Lots 0.5 acres to 1.0 acres shall have a maximum 1" service line and meter.
   c. Lots 1.0 acres to 2.0 acres shall have a maximum 2" service line and meter.
   d. Lots 2.0 acres to 5.0 acres shall have a maximum 3" service line and meter.
   e. Lots over 5.0 acres shall be determined by the District Engineer.

G. All irrigation main lines shall not be approved for design until the plat has been recorded.

H. The design engineer shall coordinate with the contractor during construction to ensure that inspections are performed during construction. District inspections will be performed on an as needed basis and could occur at random times during construction.

502 Irrigation Water Main and Service Line Construction

502.1 General: All irrigation mains and service line construction within the Districts system or intended to be connected to the Districts irrigation system shall be accomplished in accordance with the requirements of these Specifications. All irrigation lines, connections, and appurtenances on the customer's side of the meter or beyond a point five feet beyond the edge of the nearest all-weather roadway, whichever creates the greater distance of private line, shall be privately maintained. All irrigation mains and laterals shall be designed to accommodate draining to prevent wintertime freezing.

The minimum bury depth for irrigation lines in the District is three feet six inches (3.5 feet)

below finished grade, unless otherwise approved by the District Engineer.

502.2 Approved Plans: Irrigation main construction shall be done in accordance with the Contract Documents for the work, prepared under the direction of a Professional Engineer licensed in Utah and approved by the District Engineer.

502.3 Licenses and Permit Required:

A. All irrigation mains and service line construction shall be done by a General Utility Contractor licensed and bonded in Utah.

B. When construction is required within the public right-of-way, a permit shall be secured by the Contractor from Wasatch County Engineer's Office or other governing body at least 48 hours (two full working days) before initiating construction.

When construction necessitates shutting down a segment of public water main for a connection, the connection shall be made between the hours of 2:00 a.m. and 7:00 a.m. local time unless otherwise approved the District.

C. A street cut permit fee may be charged by the County.

D. A cash bond shall be posted to guarantee the work for a period of two years after final acceptance of the work by the County/District.

E. A certificate of insurance may also be required to be posted to guarantee that the District will not be liable for any accidents, property damage or physical damage to any individual related to acts of the Contractor.

F. The District Engineers Office shall be notified 48 hours (two full working days) minimum before the planned construction is to commence and also before starting up whenever construction is interrupted for any reason.

502.4 Inspection: All work shall be inspected by a District authorized Inspector who shall have the authority to halt construction when, in the opinion of the inspector, construction is being performed contrary to the approved plans and specifications, Contractors are required to give notification two full working days, (Mon.-Fri.) prior to a requested inspection. Whenever any portion of these Specifications is violated, the District Engineer and/or the County Engineer, by written notice, may order that portion of construction which is in violation of the Contract Documents to cease until violation is corrected. A copy of that order may be filed with the Contractor's license application for future review. If deficiencies are not corrected, performance shall be required of the Contractors Surety.

502.4.01 Construction Staking: Whenever construction staking is inadequate to reflect a irrigation line's location with respect to other utilities, structures, or curb and gutter, the District Engineer or District authorized inspector may request additional staking be provided to enable verification of conformance with the approved construction drawings and the specifications. Supplemental staking shall be provided prior to burial of the irrigation line and within 48 hours of the request. Supplemental staking not provided within the allotted period may be considered cause for the District to halt irrigation line construction.

502.5 Cold-Weather Construction: During cold-weather conditions, special requirements

must be followed to insure that proper construction methods are maintained. During the period from October 15th to May 15th, the following supplemental requirements apply. Inspection coordination is the responsibility of the Contractor. Failure to comply with these special requirements will be considered cause for the District to halt construction.

A. Trench excavation is limited to the quantity of pipe laying that the Contractor can install in one day. Trenches shall be completely backfilled (including bends, valves and end of pipe) at the end of each day.

B. When frost is encountered, it must be moved away from the excavation area to avoid contaminating the backfill material.

C. Snow must be removed from the immediate construction area to avoid contaminating the backfill material.

D. Bedding material shall be protected from contamination by moisture, including ice and snow. Bedding material containing any quantity of ice, snow, or frost shall not be placed in the trench.

E. Dewatering of the trench during cold-weather construction shall be conducted to discharge water away from the construction area and be prevented from entering pavement or gutters where freezing could present a hazard to the public.

F. When water has been introduced into pipelines prior to final acceptance of the irrigation system (i.e. testing, etc.), irrigation lines and appurtenances shall be protected from freezing. Backfilling shall be completed to the top of the casting around meter vaults, valve boxes, and reducing vaults.

G. Additional or supplemental testing of piping and backfill materials may be required by the District Engineer when warm-weather conditions return.

H. Concrete for structures and thrust blocking to be placed when the atmospheric temperature is below **40°**F. shall comply with the following requirements:

1. The temperature of the concrete at time of placing shall not be less than 50°F. nor more than 70°F. The temperature of aggregates and mixing water prior to mixing with the cement shall be in accordance with “Recommended Practice for Cold Weather Concreting.” ACI Standard 306.

2. When the daily minimum temperature is less than 40°F., concrete structures shall be insulated or housed and heated after placement. The temperature of the concrete and air adjacent to the concrete shall be maintained at not less than 50°F. nor more than 90°F. for the duration of the curing period.

3. Methods of insulating, housing and heating the structure shall conform to “Recommended Practice for Cold Weather Concreting,” ACI Standard 306.

4. When dry heat is used to protect concrete, means of maintaining an ambient humidity of at least 40 percent shall be provided unless the concrete has been coated with an approved curing compound or is covered tightly with an approved impervious material.

503 Pipe for Irrigation Water Mains

503.1 General: These Specifications cover the pipe and fittings normally used for irrigation water distribution systems. Special conditions will be covered in the Approved Plans and Special Conditions.

503.2 Pipe:

503.2.01 Polyvinyl Chloride Plastic Irrigation Water Pipe: All Polyvinyl Chloride (PVC) pipe shall be purple in color indicating secondary or non-potable water. All PVC pressure pipe and fittings 4-inch to 12-inch shall conform to ANSI/AWWA C900 Pressure Class 200 or better. All PVC pressure pipe and fittings 14-inch to 48-inch shall conform to ANSI/AWWA C905 pressure Class 200 or better.

All PVC pipe shall meet the requirements of ASTM D 2241 except that the pipe shall have outside diameters of ductile iron pipe sizes instead of iron pipe sizes and shall meet the requirements of AWWA C 900 or C905 as applicable with DR of 18 or as approved by District Engineer and as indicated on the Drawings.

Pipe shall be produced in standard and random lengths. At least 85% of the total footage of any class and size shall be furnished in standard lengths. The remaining 15% may be in random lengths.

1. Standard laying lengths shall be 20 feet plus or minus one inch for all sizes.

2. Random length shall not be less than 10 feet long.

Each standard and random length of pipe shall be marked on the outside surface with the trade name with the appropriate designation code (e.g. PVC 1120) DR, nominal size, pressure classification and date of manufacture.

The rigid PVC pipe used in the District's irrigation water distribution system, shall be composed of PVC compounds meeting the requirements of ASTM D1784.

Joints for buried PVC pipe shall be either an integral bell manufactured on the pipe or a separate coupling both employing a rubber ring joint. The bell and coupling shall be the same thickness as of the pipe barrel, or greater thickness. The sealing ring groove in the coupling shall be of the same design as the groove in cast iron fittings and valves available from local water works supply distributors.

Provisions shall be made for contraction and expansion at each joint with a rubber ring and integral thickened bell as part of each joint. The rubber ring shall meet the requirements of ASTM D 1869. The bell section shall be at least as strong as the pipe barrel.

Joint shall be sealed with an elastomeric gasket meeting the requirements of ASTM F 477 and ASTM D3139. Gaskets and lubricants shall be made from materials that are compatible with the plastic material and with each other when used together. They shall not support the growth of bacteria and shall not adversely affect the qualities of the water that is to be transported. One elastomeric gasket shall be furnished with each length of bell-end pipe.

Fittings shall be cast or ductile iron fittings as specified in 503.2.02, sized for the dimensions of the pipe being used. All Fittings shall be polywrapped, hardware

coated with non-oxide grease, mortar lined on the interior, use thrustblocks and meet all the requirements of section 503.2.02 below.

Samples of pipe, physical and chemical data sheets, may be required to be submitted to the Engineer for approval and approval may be required before the pipe is purchased. The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be as uniform in color as commercially practical.

503.2.02 Ductile Iron Pipe: Ductile Iron Pipe may only be used with special prior permission from the District Engineer. It shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50 for a minimum of 150 psi (or project requirements, whichever is greater) rated working pressure plus a 100 psi surge allowance (if anticipated surge pressures are other than 100 psi, the actual anticipated pressure should be used); a 2 to 1 factor of safety on the sum of working pressure plus surge pressure; type of laying conditions and a depth of cover of 5 feet to 7 feet. (Typically Ductile Iron Pipe shall be of thickness Class 51 for 3 and 4 inch pipe and thickness Class 50 for pipe sizes 6 inches through 12 inches.)

Ductile Iron pipe shall be manufactured in the U.S.A. in accordance with the latest revision of ANSI/AWWA for the appropriate class. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.

Pipe shall have standard asphaltic coating on the exterior. Pipe shall also have cement-mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4, of latest revision.

The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters “DI" or “Ductile” shall be cast or stamped on the pipe.

All pipe shall be furnished with Push-on Type Joints, such as Tyton® or Fastite®. Joints shall be in accordance with ANSI/AWWA Cl11/A21.11, of latest revision, and be furnished complete with all necessary accessories.

Fittings shall be manufactured in the U.S.A. and be either ductile iron or gray iron. Ductile iron fittings shall conform to the latest revisions of either ANSI/AWWAC110/A21.10 or ANSI/AWWAC153/A21.53. Gray iron fittings shall be in accordance with ANSI/AWWAC110/A21.10 of latest revision. Fittings shall have a standard asphaltic coating on the exterior. Fittings shall also have a cement- mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4, of latest revision.

Fittings and accessories shall be furnished with either Push-on or Mechanical Type joints with megalugs in accordance with ANSI/AWWAClll/A21.11,of latest revision. Ninety degree bends shall not be allowed unless otherwise approved by the District Engineer.

All pipe, fittings, and accessories shall be installed and tested in accordance with the latest revision of ANSI/AWWA C600. Newly installed ductile iron water mains shall be disinfected in accordance with these specifications prior to placing in service.

504 Trench Excavation and Backfill for Irrigation Water Mains

504.1 General: The Specifications in this Section, and those of Sections 503 through 508, shall apply to the construction of irrigation water distribution mains and appurtenances in sizes up to and including twenty-four inches (24") in diameter for both temporary and permanent installation under ordinary conditions.

Irrigation water mains will be constructed on locations as shown on the Approved Plans.

Where grading is required, such grading or excavation and embankment shall conform to the requirements of Wasatch County. Sub-grade in roadways and final grade off-road shall be completed before excavation of the irrigation water main trench.

504.1.1 Ungraded Streets: On streets, when grading is not provided in the contract schedule, the depth of trench excavation shall be as shown on the Approved Plan and Profile and as staked by the Engineer.

Where the Approved Plans show the pipe is to be laid above the existing ground surface, an embankment fill shall be made and compacted to conform with the section shown on the Approved Plans and the irrigation water main trench shall be excavated therein. That portion of the embankment below the bottom of the pipe shall be compacted with rollers or mechanical compactors under controlled moisture conditions as required by Wasatch County.

Where no bid items are provided in the contract schedule for earthwork, filling, or embankment fill, such work shall be considered as incidental to the construction and all costs thereof shall be included in the unit contract price per linear foot for irrigation waterline installed.

Where, in the opinion of the Engineer, the extent of the work of earthwork, filling, or embankment fill justifies bid items, such items and payment will be as provided in the Special Conditions.

504.1.2 Clearing and Grubbing in Ungraded Streets: Where not provided under schedules for "Grading" the area to be excavated or filled shall be cleared and grubbed by the Contractor. This work shall consist of the removal and disposal of all logs, stumps, roots, brush, organic soils, and other refuse. All such material shall be removed and disposed of as directed by the Engineer.

Payment for clearing and grubbing will be included in the unit contract price per linear foot for waterline installed unless otherwise provided.

504.1.3 Removal and Replacement of Pavement From Driveways and Sidewalks: Removal and replacement of existing street improvements shall be performed as specified in the Wasatch County Standards, except that payment therefore shall be considered as incidental to the construction and the costs thereof shall be included by the Contractor in the unit contract price per linear foot for installed waterline.

The removal of material from pavement, driveway and sidewalk and the disposal thereof shall be considered as incidental to the construction, and the costs thereof shall be included by the Contractor in the unit contract price per linear foot for installed waterline, unless otherwise provided.

504.1.4 Grade and Alignment: Grade and alignment on ungraded streets will be given from hubs set parallel to the line of the pipe, and on graded streets the grade and alignment shall be taken from established points on the existing curbs or sidewalks, when directed by the Engineer. Trenches for the pipe shall be opened in accordance with the lines and grades given or to the standard minimum cover of five (5) to seven (7) feet, depending on elevation and future surface treatment, whichever is greater. The Contractor shall transfer lines and grades to the pipe from hubs set by the Engineer or from existing concrete curbs or sidewalks as an incidental part of his work.

Sequence of operations, traffic requirements, or restrictions on the amount of open trench, if any, will be provided in the Special Conditions.

504.2 Trench Excavation: The Contractor shall perform all excavation of every description and of whatsoever substances encountered to the depth indicated on the Standard Drawings or specified herein. All excavations shall be made by open cut unless otherwise provided in the Contract Documents. The banks of the trenches shall be kept in accordance with Utah Occupational Health and Safety Division (UOSHA) requirements. To protect adjacent structures the trench shall be properly sheeted and braced.

Work shall comply with the "Utah Occupational Safety and Health Rules and Regulations" for the Utah State Industrial Commission.

All grading and other excavations nearby shall be controlled to prevent surface water from flowing into the excavations. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance away from the edges of trenches to avoid overloading and to prevent slides or cave-ins. Unsuitable material, or that in excess to the needs for embankments or backfill, shall be removed and disposed of by the Contractor.

The Contractor shall exercise sound engineering and construction practices in excavating the trench and maintaining it so that no damage will occur to any foundation, structure, pole line, pipe line, or other facilities because of slough, slopes, or from any other cause. If, as a result of the excavation, there is disturbance of the ground such as to endanger other property, the Contractor shall immediately take remedial action at his own expense. No act, representation or instruction of the Engineer or his representatives shall in any way relieve the Contractor from liability for damages or costs that result from trench excavation.

Care shall be taken not to excavate below the depth indicated, and excavation below that depth shall be backfilled with selected backfill material and compacted to the satisfaction of the Engineer at the Contractor's expense.

The bottom of trenches shall be accurately graded to provide uniform bearing and support for each length of pipe or undisturbed or compacted soil at every point along its entire length, except at the joints. Bell holes shall be excavated to an extent sufficient to relieve bearing pressure at the bell joint.

504.2.1 Protecting Existing Services: The Contractor shall carefully do all necessary excavation to fully expose such services. If the Contractor elects to excavate the trench without first exposing the services, he shall be responsible for any and all damages incurred to the services by reason of his operations and shall immediately arrange for replacement of all damaged services. All additional costs incident to such work by the Contractor shall be considered as incidental to the construction and

shall be included in the unit contract price per linear foot for installed waterline.

504.2.2 Solid Rock Excavation: Solid rock shall include solid rock formations requiring systematic drilling and blasting with explosives and any boulders or broken rock larger than one-half cubic yard in volume. Hardpan or cemented gravel, even though it may be advantageous to use explosives in its removal, shall not be classified as solid rock excavation. Solid rock shall be excavated to a width equal to the outside barrel diameter of the pipe plus 24 inches, and to a grade line not less than 12 inches below bottom of the pipe bell. Bottom of the trench shall be brought up to grade by backfilling with selected backfill material. The material shall be compacted to the satisfaction of the Engineer.

The Contractor's responsibility with respect to the use of explosives during blasting includes compliance with all laws, rules and regulations of Federal, State, City and the insurer, governing the keeping, storage, use, manufacture, sale, handling, transportation, or other distribution of explosives. All operations involving the handling, storage, and use of explosives shall be conducted with every precaution by trained, reliable workers under satisfactory supervision of a Utah licensed blaster. Blasts shall not be fired until all persons in the vicinity have had ample notice and have reached positions out of danger therefrom. The Contractor shall advise the Engineer, all utility companies, and any other applicable party in advance as to when and where charges are to be set off.

504.2.3 Extra Excavation: If, in the opinion of the Engineer, it is necessary to adjust, correct, relocate or in any way change the line and grade, such changes shall be made by the Contractor.

504.2.4 Unforeseen Buried Objects Encountered in Trench Excavation on Graded Streets: Where streets have been graded, it is presumed that stumps, railroad ties, buried pavements, etc., will have been removed in the original grading work. Where such unexpected objects are encountered in trench excavation for water mains, they shall be removed and disposed of by the Contractor.

504.2.5 Removal of Unsuitable Materials: Wherever in excavating the trench for water mains the bottom of the trench exposes peat, soft, clay, quicksand, organic soils, or other material which is unsuitable in the opinion of the District Engineer, such material shall be removed and disposed of by the Contractor. The material thus removed shall be replaced by suitable surplus material obtained from trench excavation within the limits of the project which shall be deposited and compacted in eight-inch maximum depth layers by mechanical compaction. If surplus material is not available within the limits of the project, the Contractor shall furnish suitable material, as provided in Section 504.2.8, 3/4 inch crushed rock for Trench Backfill.

504.2.6 Pipe Bedding: Pipe bedding material shall consist of ¾ inch minus crushed rock of which 100% will pass the U.S. Standard 3/4-inch opening and not more than 3% will pass the U.S. No. 200 (wet sieve), graded granular sand or rejected road base. Bedding material will be placed in accordance with Standard Drawings 500.1. *Under no circumstances shall mine tailings be used as bedding material.*

504.2.7 Backfilling Trenches: Backfilling of trenches shall be made with the same materials excavated from the trenches unless these materials are found to be unsuitable by the District Engineer.

Prior to backfilling, all form lumber and debris shall be removed from the trench. Sheeting used by the Contractor shall be removed just ahead of the backfilling unless it is ordered by the Engineer to be left in place.

The bedding, up to 12 inches over the top and both sides of the pipe, shall be evenly and carefully placed 3/4 inch minus crushed rock free of hard clods, frozen material or other debris capable of damaging the pipe or its coating. The balance of the backfill material may be placed in uniform layers to the compaction required in 504.2.8.

A minimum of a 3-inch sand cushion shall be placed between the water main and existing pipelines or other conduits when encountered during construction and as directed by the Engineer. No extra payment will be made for furnishing and placing sand as specified but the cost thereof shall be considered as being included in the unit prices bid for the various items comprising the improvement.

504.2.8 Compaction of Backfill: On graded streets without pavement or on roadway shoulders and unimproved areas, compaction of backfill may be by mechanical tamping or wheel rolling. Compaction by water settling may be done under the conditions stipulated in Section 504.2.8A.

For all graded streets, including the shoulders, asphalt, and parkway strip located in the Right-of-Way, the backfill shall be compacted to 96% of the maximum modified proctor density at optimal moisture content as determined by the Compaction Control Tests specified in ASTM D-1557 and verified by the methods specified in ASTM D2911 (AASHTO T238) or ASTM Dl556(AASHTO T-191). The compaction may be reduced to 90% for areas where vehicle traffic will never occur, and/or the most distant five (5) feet of the Right-of-Way with written approval from the District Engineer.

504.2.8A Water Settling of Trenches: Water settling is not allowed.

504.2.8B Compaction of Backfill under Special Conditions: At locations where paved streets, driveways or sidewalks will be constructed or reconstructed over the trench, or where provided for in the Special Conditions or directed by the Engineer, the backfill shall be spread in layers and be compacted by mechanical tampers. In such cases the backfill material shall be placed in successive layers, not exceeding eight (8) inches in loose thickness and each layer shall be compacted with mechanical tampers to the density specified by the District Engineer.

505 Pipe Installation for Irrigation Water Mains

505.1 General: Pipe shall be installed in accordance with manufacturer's specifications and instructions for installing the type of pipe used unless modified or changed in the Special Conditions. The Contractor shall provide all tools and equipment including any special tools designed for installing each particular type of pipe used. All pipe shall be installed with the bell end positioned uphill.

505.2 Construction:

505.2.1 Dewatering of Trench: Where water is encountered in the trench, it shall be removed during pipe laying operations and the trench so maintained until the ends of

the pipe are sealed and provisions are made to prevent floating of the pipe. Trench water shall not be allowed to enter the pipe at any time.

505.2.2 Handling of Pipe: All types of pipe shall be handled in such manner as will prevent damage to the pipe, pipe lining or coating. Damage to the pipe, pipe lining or coating shall be repaired to the satisfaction of the Engineer or the damaged pipe shall be removed from the job and methods of handling corrected to prevent further damage.

Threaded pipe ends shall be protected by couplings or other means until laid.

The pipe and fittings shall be inspected for defects and cast iron pipe, while suspended above grade, shall be rung with a light hammer to detect cracks.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joints during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. *(At times when pipe laying is not in progress, the open ends of the pipe shall be closed by watertight plug or by other effective seal approved by the Engineer to ensure absolute cleanliness inside the pipe.)*

505.2.3 Laying of Pipe on Curves: For pipelines 8-inches to 12-inches, long radius curves shall not be less than 205 degrees, either horizontal or vertical. For pipelines 14-inches and larger, long radius curves shall not be less than 340 degrees, either horizontal or vertical. For curve radius larger than these limits, the pipe may be laid by deflections at the joints. If the pipe is shown curved on the Approved Plans and no special fittings are shown, the Contractor cannot assume that the curves can be made by deflection of the joints with the standard lengths of pipe. The Contractor is responsible for verifying the maximum degree of curvature allowed according to AWWA for the type and size of pipe he is installing.

Where field conditions require deflection for curves not anticipated by the Approved Plans, the Engineer will determine the methods to be used. Maximum deflections at pipe joints and laying radius for various pipe lengths are as found in the following standards:

Ductile Iron Pipe Mechanical joints	AWWA C600, Table 6
Ductile Iron Pipe Push-On Joints	AWWA C600, Table 5
PVC	AWWA C900 or C905

When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be made wider on curves for this purpose.

The District Engineer may require the Contractor to run a *mandrel* through each section of curved water line to verify maximum deflection. Such verification shall be incorporated into the Contractor's bid price for water main.

505.2.4 Laying Ductile & Cast Iron Pipe:

Ductile and cast iron pipe shall be layed in accordance with manufacturer's

specifications.

505.2.5 Joining Mechanical Joint Pipe: The outside diameter of the spigot end of bell-and-spigot pipe varies with the type, size and class of pipe. There is only one joint size for each diameter of mechanical joint pipe. Thus, difficulty may be met when attempts are made to connect existing bell-and-spigot pipe to mechanical joint pipe. When such a correction must be made, an adapter having a fitting bell and a mechanical joint socket is manufactured and shall be used.

505.2.5A Cleaning and Assembling Joint: The last 8 inches outside of the spigot and inside of the bell of mechanical joint pipe shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter from the joint, and then painted with a soap solution made by dissolving one-half cup of granulated soap in one gallon of water. The cast iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket or bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with the thick edge toward the gland.

505.2.5B Bolting of Joint: The entire section of the pipe shall be pushed forward to seat the spigot end of the bell. The gasket shall then be pressed into place within the bell, being careful to have the gasket evenly located around the entire joint. The cast iron gland shall be moved along the pipe into position for bolting, all of the nuts inserted, and the nuts screwed up tightly with the fingers. *All nuts shall be tightened with a torque wrench.* The torque for various sizes of bolts shall be as follows or as manufacturer's recommendation:

Size Inch	Range of Torque Ft.-Lbs.
5/8	40 - 60
3/4	60 - 90
1	70 - 100
1-1/4	90 - 120

Nuts spaced 180 degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland. M.J. fittings shall use "Cor-ten" tee bolts made in the U.S.A. Flange fittings shall use stainless steel bolt packs made in the U.S.A. All valves shall be protected from their environment with polyethylene wrap with a minimum thickness of four millimeters unless otherwise approved by the District Engineer.

505.2.6 Jointing Rubber Gasket Joint Pipe:

505.2.6A Cleaning and Assembling Joint: The inside of the bell shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating) and other foreign matter from the joint. The circular rubber gasket shall be flexed inward and inserted in the gasket seat provided in the socket and released with the gasket fitting over the bead in a gasket seat.

A thin film of gasket lubricant shall be applied to the inside surface of the gasket. Gasket lubricant shall be a solution of vegetable soap or other

solution supplied by the pipe manufacturer and approved by the Engineer.

The spigot end of the pipe shall be cleaned and entered into the rubber gasket in the socket, using care to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the bottom of the socket, using a forked tool or jack-type tool or other device approved by the Engineer. *(Pipe which is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.)*

Field cut pipe lengths shall be filed or ground to resemble the spigot end of manufactured pipe.

505.2.7 Laying PVC Pipe: PVC pipe may be used only with the permission of the District Engineer, and then only persons competent in the opinion of the District Engineer at laying plastic pipe shall be employed on this phase of the work, and complete suitable equipment necessary for the execution of same is required. Any incompetency observed by the Engineer must be rectified at his request and where improper equipment or lack of same appears to be impairing the quality or speed of the work, such adjustments in same shall be made to the Engineers satisfaction.

The pipe, fittings, and valves shall be placed in the trench with care. *Under no circumstances shall pipe or other materials be dropped or dumped into the trench.* The pipe shall not be dropped in a manner which would cause scratching of the pipe surface. An excessive amount of scratching of the surface of the pipe will be considered cause for rejection.

When requested by the Engineer, all PVC pipe will be tested after laying and backfilling by pulling a deflection detection device *(mandrel)*. The device shall verify less than 5% deflection in all pipe sections.

505.2.8 Connections to Existing Mains:

A. All connections to water mains in use shall be made by the Contractor unless otherwise provided in the Special Conditions.

B. The Contractor shall notify the District at least 48 hours (two full working days) in advance of such connections.

C. *Existing District irrigation water lines can only be shut down by crews authorized by the District Engineer.*

D. The Contractor shall also provide written notice giving the date of the notice, the date and time of the shutdown, and the duration of the shutdown. Major shutdowns shall only occur between 2:00 a.m. and 7:00 a.m.

E. *The maximum time allowed for shutdown shall be 4 hours.* If the Contractor should need more time than the above limit, it shall be necessary to turn on the water for at least 1 hour before the next period of shutdown begins.

F. The contractor must contact District Engineer for final decision regarding a hot top or cutting into the main line in order to place tees and valves.

All crosses or other specials required to be inserted in any main already in use shall be furnished and set by the Contractor. The Contractor shall furnish the special, as shown on the Approved Plans, and all other material required. He shall make all necessary excavations to assure gradual transition between the new and existing water main, and he shall perform all necessary backfilling to the requirements of Sections 504.2.06 and 504.2.07.

505.2.8A Disruption of Services: Where the connection of new work to old requires interruption of service and notification of customers affected, the District Engineer, and the Contractor shall mutually agree upon a date for connections which will allow ample time to assemble labor and materials, and to notify all customers affected. The Contractor will be required to notify all affected customers, the District Engineer 24 hours in advance of service being interrupted.

505.2.8B Wet Tap Connections: Wet tap connections shall not be made on Friday, Saturday, Sunday, Holidays, or after 12:00 Noon subject to approval by the District Engineer. Where connections are made between new work and existing pipelines, such connections shall be made in a thorough, neat manner using suitable and proper fittings to suit the conditions encountered. Each connection with an existing water line shall be made at a time under conditions which will least interfere with normal user consumption and as authorized by the District. Suitable facilities shall be provided for proper dewatering, drainage and disposal of all water removed from the dewatered lines and excavations without damage to adjacent property. Air and/or water testing may be requested by the District Engineer. Where bolted flexible couplings or transitions are required, they shall be constructed of material corresponding to the pipe indicated in the following table:

TYPE OF PIPE	COUPLING MATERIAL
Steel Pipe	Cast Iron or Steel
Cast Iron Pipe (earth covered or inaccessible to periodic inspection)	Cast Iron
Cast Iron Pipe (accessible to periodic inspection and painted)	Cast Iron or Steel
Polyvinyl Chloride	Cast Iron

Couplings shall be equal to Smith-Blair, Dresser, Blair, or Rockwell.

Great care shall be taken to prevent line contamination when dewatering, cutting, or making connection with existing pipes used for conveyance or distribution of potable water for domestic or public use. The Contractor shall conduct his operations in such a manner that no trench water, mud, or other contaminating substances are permitted to get into the connected line or lines at any time during the progress of the work.

505.2.10C Contracted Repair Work: Certain repair work may be specified in

the Contract Documents as part of a Contract. This work shall be done as specified/contracted and in accordance with this section.

505.2.10D Accidental Repair Work: If, for any reason, the Contractor accidentally cuts an existing waterline, replaces defective materials, or in any way disrupts water service, he shall notify the District Engineer immediately. It shall be the Contractors responsibility to immediately repair or replace the damaged pipe at no additional cost to the District. The Contractor shall notify the District Inspector of any repair work. Unless otherwise approved by the District Engineer, Dresser Couplers will be used for repairs. Only one repair is allowed for each section of pipe.

505.2.9 Field Tests: All exposed pipes, fittings, valves and joints shall be carefully examined during the tests. Any cracked or defective pipes, fittings, or valves discovered during the field tests shall be removed and replaced by the Contractor with sound material and the test repeated as required, at the expense of the Contractor. All testing shall be done in the presence of the District Inspector. The District Inspector shall be notified two full working days prior to any testing. The Contractor shall be responsible to provide testing equipment, with gauges and measuring devices accessible, and have all lines to be tested stabilized prior to the scheduled inspection time.

A visual inspection shall be made of each and every connection made to an existing main when, in the determination of the District Engineer, the field test procedure specified in this section cannot be accomplished.

505.2.9A Main Line Hydrostatic Tests: All pipe and appurtenances shall be subjected to a hydrostatic test after they are laid. The Contractor shall be responsible to assure that each section of pipe between valves shall be tested as soon as possible after laying, or when directed by the District Engineer. *Hydrostatic and leakage tests may not be done simultaneously unless approved by the District Engineer*.

At points where pressure reaction and movement may occur, such as at bends, tees and plugs the pipe shall be properly blocked or braced.

Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking and remove it after testing. All costs to the Contractor for installing temporary blocking shall be included in the unit bid prices for the water mains. The Contractor shall furnish all pumping apparatus, labor, tools, pressure gauges and other equipment for making the tests.

Where the District has water available for testing, it may be furnished without charge upon arrangement with the District. All costs of tapping and piping shall be borne by the Contractor unless otherwise specified in the Special Conditions. Where water is not available from the District, the Contractor shall provide water from an approved source for testing and the cost thereof shall be included in other unit contract prices of the work.

Hydrostatic tests shall be performed on every complete section of water main between two gate valves or equivalent (in the determination of the District Engineer), and each valve shall withstand the same test pressure as the

pipe, with no pressure active in the section of pipe beyond the closed gate valves.

Each section of pipe line to be tested shall be slowly filled with water so that the specified test pressure is reached at the highest point in the section of pipe line under test. This pressure shall be corrected to the elevation of the test gauge by means of a pump connected to the pipe in a manner satisfactory to the District Engineer.

The Contractor shall subject the pipe to a hydrostatic pressure 50 percent higher than the highest working pressure, but not less than 225 psi, for a period of not less than 1 hour.

> 505.2.9A.1 Water Service Line Hydrostatic Testing: The Contractor may select to perform hydrostatic testing of water service lines independently of the water main. The Contractor shall subject the pipe to a hydrostatic pressure of 50 percent higher than the highest working pressure, but not less than 150 psi, for a period of not less than 1 hour.

505.2.9B Leakage Test: After the pressure test has been satisfactorily completed, the Contractor shall continue testing the water lines for leakage. The Contractor shall furnish all pumping apparatus, labor, tools, pressure gauges, measuring devices for leakage test, and other equipment required for making the test. The hydrostatic and leakage tests may be performed concurrently *only* with the permission of the District Engineer.

The duration of the leakage test shall be for not less than 2 hours, and during the leakage test, and piping shall be subjected to a minimum hydrostatic pressure 50% higher than the highest working pressure of the pipe, but not less than 225 psi, based on the elevation of the highest point of the section of pipe line under test and corrected to the elevation of the test gauge.

Leakage shall be defined as the quantity of water than must be supplied into any section of newly laid pipe line, or any valved section thereof, to maintain pressure within 0.5 psi of the specified test pressure after the air in the pipe line has been expelled and the pipe has been filled with water.

The allowable leakage in the water lines shall not exceed that specified in the latest revision of AWWA Standard C600 "Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances" of the latest revision of AWWA C900 or C905 (PVC), or the latest revision of AWWA C200 (Steel).

Should any test of the pipe disclose leakage greater than that specified above, the Contractor shall, at his own expense, locate and repair defective joints, disinfect and retest until the leakage is within the specified allowance.

505.2.9C Records and Documentation: Both the pressure tests and leakage tests shall be recorded by the Contractor with the District Inspector present Records shall contain the length of pipe tested, size of pipe, type of pipe, rated working pressure of pipe, time and duration of test(s), pressure(s) used, complete list of test equipment used, list of personnel performing the test(s), and any comments about the test. Test records shall be submitted to

the District Engineer before the water line will be accepted.

505.2.9D Testing Extensions from Existing Mains: The Contractor shall be responsible for following these procedures. Where an existing water main is extended with new pipe to a new valve, the connection of the new pipe to existing pipe shall not be made until after hydrostatic tests have been made to the required pressure in both directions against the new gate valve. This shall be accomplished by a temporary cap or plug installed on the end of the new pipe, beyond the new gate, as close as possible to the existing pipe for testing purposes.

The short length of pipe between the temporary cap or plug end with the new gate valve in the closed position, with no hydrostatic pressure active on the opposite side of the gate valve, shall be subjected to the required test pressure. The same test shall be made against the other side of new gate valve when that section of pipe is tested with no hydrostatic pressure active in the short section of pipe toward the existing main pipe.

505.2.10 Flushing of Water Lines: Before being placed in service, all new water lines and repaired portions or extensions of existing mains shall be flushed in accordance with these standards.

505.2.10A Flushing: Mains shall be flushed without using culinary hydrants, unless approved by the District Engineer. Taps required by the Contractor for flushing purposes shall be provided by him as a part of the construction of water mains, unless otherwise provided in the Special Conditions.

505.2.11 Concrete Blocking : Concrete thrust blocking shall be placed at bends, tees, and crosses or as directed by the Engineer. Blocking shall be Class 4000 (1 ½" minus aggregate) concrete mix placed in place. (See Standard Detail 400.16).

Concrete blocking, when placed as indicated on the Standard Drawings, shall be bearing against solid undisturbed earth at the sides and bottom of the trench excavation and shall be shaped so as not to obstruct access to the joints of the pipe or fittings. Payment for blocking will be included in the unit price for water line installed.

506 Valves for Water Mains

506.1 Description: The valves shall be suitable for an ordinary waterworks service intended to be installed in a normal position on buried pipe lines for water distribution systems. All valves shall be Mueller non-rising stem valves. Valve vaults similar to and as per Standard Drawing 400.12 shall be installed at critical valve locations and in selected locations above 7,300 feet as determined by the District Engineer.

The minimum requirements for all gate valves shall, in design, material and workmanship, conform to the standards of AWWA C500. All materials used in the manufacture of waterworks gate valves shall conform to the AWWA Standards designed for each material listed. All gate valve operating stems shall be equipped with a two (2) inch operating nut. All gate valves shall open counterclockwise.

The minimum requirements for all butterfly valves shall, in design, material and workmanship conform to the standards of the AWWA C504. Any water valve 12 inches or larger shall be

butterfly-type. Also, any water line with working pressure greater than 150 psi shall have only butter-fly type valves installed.

Valves 12-inches or larger shall have approved concrete anchors, submit detail for approval.

Where static line pressure exceeds 125 psi, only 250 psi working-pressure valves shall be used.

All valves shall be protected from their environment by polyethylene wrap with a minimum thickness of four millimeters unless otherwise approved by the District Engineer.

506.2 Materials:

506.2.1 Manufacture and Marking: the valves shall have the name or mark of the manufacturer, year valve casting was made, size and working pressure plainly cast in raised letters on the valve body.

506.2.2 Type and Mounting: The valve bodies shall be cast iron, mounted with approved noncorrosive metals. All wearing surfaces shall be bronze or other approved noncorrosive material. Contact surfaces shall be machined and finished in the best workmanlike manner, and all wearing surfaces shall be easily renewable.

All gate valves shall be two-faced, double disc, with parallel seats and bronze or other approved wedging devices placed between them. The stem shall be of high tensile strength bronze or other approved non-corrosive metal.

506.2.3 End Connections: The dimensions for the mechanical joint connections shall conform to the ANSI Specifications No. A21.10.

The end flanges of flanged valves shall conform in dimensions and drilling to the standard USASI B16.1 for cast iron flanges and flanged fittings, Class 125, unless specifically provided otherwise. The bolt holes shall straddle the vertical center line.

506.2.4 Gate Valve Stem Seals: Unless otherwise designated in the Approved Plans, all gate valves up to and including 12-inch in size shall be furnished with O-Ring Stem Seals. Number, size and design shall conform to the AWWA Standards for gate valve O-Ring Stem Seals. For all valves over 12 inches, the stem seals shall be conventional type stuffing-box with graphited packing per AWWA Standard No. C600-18.1.

506.2.5 Tapping Valves: Tapping valves shall be furnished with flanged inlet end connections having a machined projection on the flanges to mate with a machined recess on the outlet flanges of the tapping sleeves and crosses. The outlet ends shall conform in dimensions to the AWWA Standards for hub or mechanical joint connections, except that the outside of the hub shall have a large flange for attaching a drilling machine. The seat opening of the valves shall be larger than normal size to permit full diameter cuts.

506.2.6 Hydrostatic Test Pressure at Factory for Class 150 Valves: Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subjected to the following hydrostatic pressure tests; each 3-inch to 12-inch valve, inclusive, shall be subjected to test pressures of 300 psi and 150 psi. These tests shall be conducted in accordance with provisions of AWWA C500, Section 5.

Tests for special valves shall be made as provided in the Special Conditions and shall be witnesses by a District representative.

506.2.7 Hydrostatic Test Pressure at Factory for Class 250 Valves: Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subjected to the following hydrostatic pressure tests; each 3-inch to 12-inch valves, inclusive, shall be subjected to hydrostatic test under pressures of both 400 psi and 275 psi, and each 16-inch to 48-inch valves, inclusive, shall be subjected to test pressures of 400 psi and 250 psi. These tests shall be conducted in accordance with provisions of AWWA C500, Section 5. Tests for special valves shall be made as provided in the Special Conditions and shall be witnesses by a District representative.

506.2.8 Hydrostatic Test Pressure at Factory for Class 350 Valves: Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subjected to the following hydrostatic pressure tests; each 3-inch to 12-inch valves, inclusive, shall be subjected to hydrostatic test under pressures of both 500 psi and 375 psi, and each 16-inch to 48-inch valves, inclusive, shall be subjected to test pressures of 500 psi and 350 psi. These tests shall be conducted in accordance with provisions of AWWA C500, Section 5. Tests for special valves shall be made as provided in the Special Conditions and shall be witnesses by a District representative.

506.3 Installation of Gate Valves: All gate valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. The valves shall also be carefully inspected for injury to the outer protective coatings.

Valves 120-inch and under shall be installed in a vertical position and be provided with a standard valve chamber or cast iron gate box so arranged that no shock will be transmitted to the valve. The box shall be centered over the operating nut, and the cast iron box cover shall be set one-half (½) inch below the roadbed or finished paved surface. All valve boxes must be brought to this elevation prior to the placement of asphalt, unless otherwise approved by the District.

After installation, all valves shall be subjected to the field test for piping as outlined in Section 505.2.9 of these specifications. Should any defects in design, materials or workmanship appear during these tests, the Contractor shall correct such defects with the least possible delay and to the satisfaction of the Engineer.

506.4 Butterfly Valves: Butterfly valves shall be cast iron or ductile iron body, rubber seated, tight closing type butterfly valves conforming to the AWWA Specification C504. Other types may be used if specified or approved by the Engineer.

Valves shall be fitted with Class 150 or Class 250 flanges conforming to ANSI B16-1.

The valve body shall be high strength cast iron ASTM A 126 Class B with 18-8 Type 304 stainless steel body seat. Valve vane shall be high strength cast iron ASTM A48 Class 40, having rubber seat mechanically secure with an integral 18-8 stainless steel clamp ring and 18-8 stainless steel nylon locked screws.

Rubber seat shall be a full circle 360° seat not penetrated by the valve shaft. Valve shaft shall be one piece, extending full size through the entire valve and operator with no neckdown, keyways or holes to weaken it. Valve shaft shall have 304 stainless steel journals rotating in reinforced teflon bearing. Packing shall be "triple-seal" rubber designed for permanent duty in underground service.

Certification of performance, leakage and hydrostatic tests as described in Section 12 of AWWA Specification C504 shall be furnished. Valves shall be the product of a manufacturer having a minimum of five years experience in the manufacturer of waterworks and distribution valves. Butterfly valves shall be as manufactured by Henry Pratt, Dresser or approved equal.

506.5 Globe Valves: As specified in the Contract Documents or as shown on the Approved Plans.

506.6 Ball Valves: As specified in the Contract Documents or as shown on the Approved Plans.

506.7 Check Valves:

General: Internal spring-loaded check valves for water pumps, compressors, gas, air, and steam shall be of the full-flow internal spring-loaded poppet type. The valves shall be designed for a water-working pressure of not less than 150 psi unless otherwise indicated.

Body: The bodies of valves 3-inches and larger shall be of cast iron conforming to ASTM A 126 with 125 lb flanged ends conforming to ASME B 16.1 unless otherwise indicated. Valves smaller than 3-inches shall have bronze bodies with screwed ends conforming to ASME B 1.201, suitable for a minimum working pressure of 200 psi, and a temperature of 250 degrees F, unless otherwise indicated. The type of bronze shall be suitable for the intended service.

Disc and Stem: Shall be bronze conforming to ASTM B 584 or stainless steel.

Seat**:** Shall have bubble-tight shut-off with resilient seats of Buna-N, Teflon, or other suitable material.

Spring: Valves in sizes 3-inches and larger shall have Type 316 stainless steel springs, and valves smaller than 3-inches shall have stainless steel or beryllium copper springs, as suitable for the service. The spring tension of the valves shall be designed for the individual pressure condition of each valve.

Manufacturers, or Equal

APCO (Valve and Primer Corp.)
CPV (Combination Pump Valve Company)
Miller Valve Co., Inc.
VAL-MATIC (Valve and Manufacturing Corporation)

506.8 Air Relief/Vacuum Relief Valves: Air Relief Valves shall be Val-Matic or equal of the type and model shown on the Approved Plans or as specified in the contract documents.

506.9 Miscellaneous Valves: All other valves on the main line shall be furnished according to

the bid item description or Special Conditions and installed as shown on the Standard Drawings.

506.10 Valve Boxes and Covers: All valves not in a vault similar to Standard Drawing 400.12 shall be provided with a cast iron valve box of the extension sleeve type, and the correct adjustable height to bring the top of the valve box flush with the finished surface. The valve box shall not be less than (five) 5 inches in diameter, and shall have a minimum thickness of 3/16 inch, and shall be provided with suitable base and cover. The word "Irrigation" shall be cast on the cover. Valve boxes shall be equal to MUELLER H-10357 with No. 6 or No. 8 round base as needed. There shall also be furnished to the District, one (1) "T" handle operating wrench for each five (5) new valves installed on the project.

FOR PRESSURE RELIEF VALVE (PRV) SPECIFICATIONS: SEE STANDARD DRAWING 400.15.

507 Water Service Connections

507.1 Description: In all developments, the service connections will be made by the Contractor, in accordance with these Specifications and Standard Drawings. This excludes setting the meter, which will be accomplished by District personnel, only after proper inspection of the service connection at the main service line, yoke, and lid assembly (*furnished by the Contractor*). All connections to the District's irrigation water system shall be metered unless otherwise approved by the District Engineer. All service connections shall be constructed in accordance with the provisions of this section up to the first shut-off valve within the property.

All subdivision service laterals to future lots shall be installed at the time of construction. No plan approval will be given by the District until all laterals for future lots are correctly shown on the design drawings.

Service connections will be activated only after inspection, testing and flushing of all new irrigation water line facilities, and also only after acceptance of the main line, unless otherwise approved by the District Engineer.

Each irrigation service connection must be pressure tested in accordance with Section 505.2.9 except that the test pressure shall not be less than 50 psi greater than the line pressure.

Irrigation water service connections shall be installed in accordance with the Standard Drawings, whichever is applicable. *No irrigation water service tap shall be made where the tap size exceeds one-third of the main diameter unless an approved lapping sleeve is used and prior approval is obtained from the District Engineer, (see Sec. 507.3).*

507.2 Materials:

Corporation Stops: Corporation Stops will be of brass with compression fittings in accordance with AWWA Standard 0800.

Service Clamps: All service taps made to PVC, Ductile Iron, Cast Iron, or Asbestos-Cement mains shall be equipped with bronze, double-strap service clamps.

Pipe Materials: All service lines will be purple polyethylene CTS 200 psi minimum, conforming to AWWA Standard C800 and ASTM B88 being installed without any connections or appurtenances between the corporation stop and the meter yoke.

Meter Box: Meter boxes will be 24-inch x 36-inch for single 2-inch and 3-inch meter installations; and a standard series 1419 18-inch x 12-inch for a single 1-inch and 1-1/2-inch meter installations; and a 60-inch diameter manhole vault for meter installations 4-inch and larger (refer to Standard Drawings 500.2 to 500.5). Meter box shall be located as per the Approved Drawings and is subject to approval by the District Engineer.

Meter Box Frost Free Lid: Meter box lids will not be required to be frost free. The lid shall be secured with standard nut. A one inch long, ¼ inch wide notch will be cut in each lid for telemetry wire. All top meters lids shall have one (1) 1" tap and plug for each yoke, to facilitate the remote read meters used in the District. All meter lids must have prior approval of the District Engineer.

Curb Stop and Curb Box : (*Prior approval by the District Engineer required*), Mueller Oriseal curb valve and cast iron extension-type curb box with arch pattern base with cast iron foot piece as manufactured by Mueller. Prior approval by District Engineer required for substitution.

Meters: Normally the District provides meters. A fee shall be charged. Acquisition, calibration, and distribution will be at the District's discretion.

507.3 Construction: Taps shall be made and pipe laid at a right angle to the irrigation water main. The tap shall be made on the middle of the main at an angle between 45° and 60° from the vertical plane, on the side of the main to which service is to be extended. For copper tubing larger than one (1) inch, it is allowable to increase the angle to approximately ninety (90)° due to the difficulty of putting a goose neck in the larger diameter copper. Taps of 1 " shall be no closer than 24" to a pipe joint. Taps larger than 1" shall be no closer than 48" to a pipe joint. The minimum allowable distance between taps and any other fitting is twenty-four (24) inches. Hot taps are preferred for service lines. Tapping sleeves must be used for taps larger than (2) two inches. Mechanical joint ductile iron tapping sleeves may be used for ductile iron and asbestos cement type mains. Stainless steel tapping sleeves may be used for P.V.C or other plastic mains. All service laterals shall be marked with an I stamped in the Curb.

Water line taps shall not be made on: Fridays, Saturdays, Sundays, Holidays, or after 12:00 Noon on any day unless otherwise authorized by the District Engineer.

The water main shall be tapped by keyhole sawing a hole in it the size to fit the corporation valve for the service line. The drilling machine and method of tapping shall be approved by the District Engineer. A representative of the District Engineer shall inspect the main and tap prior to backfilling. In the event the tap is covered before it is inspected, it shall be uncovered by the Contractor to allow for inspection. If the tap or water main is damaged during the process of locating, it shall be repaired immediately by the Contractor in a manner acceptable to the District Engineer.

No service line may be constructed through, or in front of any adjoining property. When authorized by the District Engineer a curb valve with curb box may be installed within four feet of the edge of road or back of gutter.

If the line is not connected initially to a meter yoke, the end of the service line shall then be sealed shut to keep rocks and dirt out of the line. Every precaution shall be taken to prevent foreign material, including trench water, from entering the pipe.

Unless otherwise approved by the District Engineer water meters, vaults/boxes, and the associated appurtenances shall be placed in the County Right-of-Way between 5 (five) and 10 (ten) feet behind the curb/gutter/edge of asphalt and in a landscaped area. Proposed interior placement of water meters must be submitted to the District Engineer at the time the building plans are submitted for initial review.

The District will maintain water service lines to the cold side of the water meter yoke or the edge of the County Right-of-Way, whichever is the shorter distance. If the water meter vault/box is on private property the District will maintain the water meter, yoke, and vault/box only, not the line.

The frost free meter lid shall provide drainage away from the meter lid. All meter installations will be installed so that the meter box lid is at grade with a tolerance of +½". Grade rings are acceptable only with prior approval of the District Engineer.

If the meter box is located on a slope the following conditions must be met:

1. Satisfactory erosion control on the high and low side must be established.

2. A channel must be constructed in which the diverted water will flow around and away from the meter box.

3. The soil on the low side must be raised and compacted to the approximate elevation of the meter lid and radially out a minimum of three (3) feet from the edge of the lid, while providing drainage away from the meter lid.

The following are unacceptable conditions:

1. Silting in of the water meter lid and box.

2. Water pooling on the water meter lid.

3. The water meter lid being covered with soil and/or sod.

4. Trees being planted directly over the service line.

To avoid these and other potential problems, it is recommended to recognize them in advance and plan for the correct elevation and landscaping.

Erosion and drainage control must be totally established for a successful District Inspection.

All irrigation sprinkling systems will be connected on the customer side of the meter, *but not within the meter box.*

Adequate provisions shall be made by the Contractor during construction for the care and protection of mains or services in use.

Where salvage of pipe, valves, hydrants and fittings is required under the contract, salvage methods shall be used which will save all materials intact and undamaged. Salvaged material shall be stored at the trench site for removal by the utility, unless otherwise provided.

If salvage is not specified, the materials there from shall become the property of the

Contractor and shall be promptly removed from the site for disposal as he sees fit.

508 Restoration and Cleanup of Water Main Construction

508.1 General: Surface improvements such as pavement curb, curb and gutter and other like surface facilities that have been removed or damaged during the construction of irrigation water mains, shall be restored by the Contractor.

508.2 Construction Details:

508.2.1 Removal of Existing Street Improvements: Removal and disposal of existing street improvements shall be done in accordance with applicable sections of these Specifications, and Section 504.1.3 which provides that removal and disposal shall be considered as incidental to the construction and the costs thereof shall be included in the unit contract price per linear foot for “Waterline Installed.”

508.2.2 Restoration of Existing Street Improvements: Restoring of existing street improvements shall be as specified in the applicable sections of these Specifications.

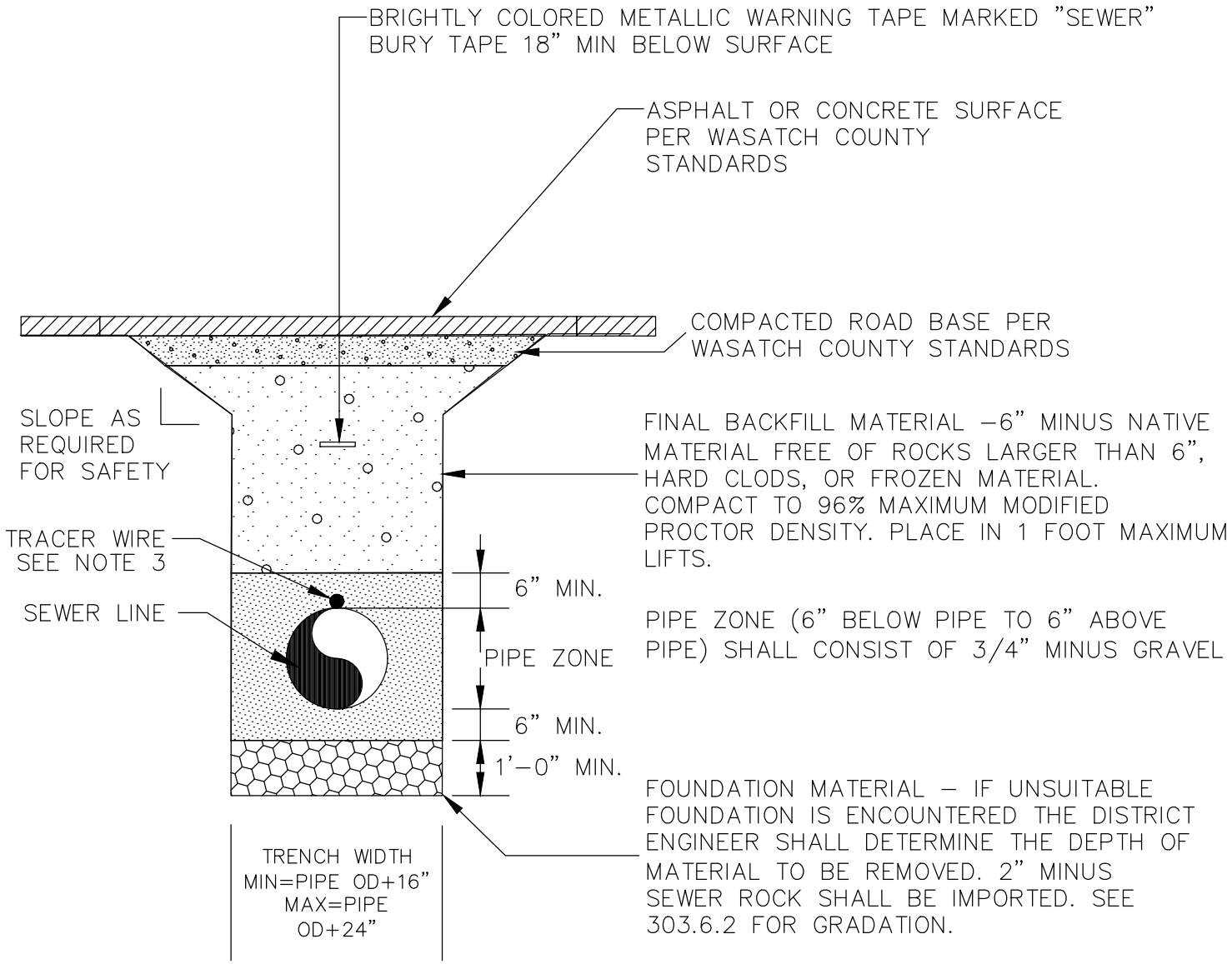
At all pavement openings where backfill is to be compacted with mechanical tampers in accordance with Section 504.2.8 and where the pavement is not restored immediately, the Contractor shall place and maintain at his own expense an asphalt concrete surfacing to the elevation of the existing pavement until final restoration is made.

508.2.3 Finishing and Cleanup: Finishing and cleanup shall be as specified in Section 200.5

- END OF SECTION -

Standard Drawings
Sanitary Sewer

Revised: May 2016



NOTES:

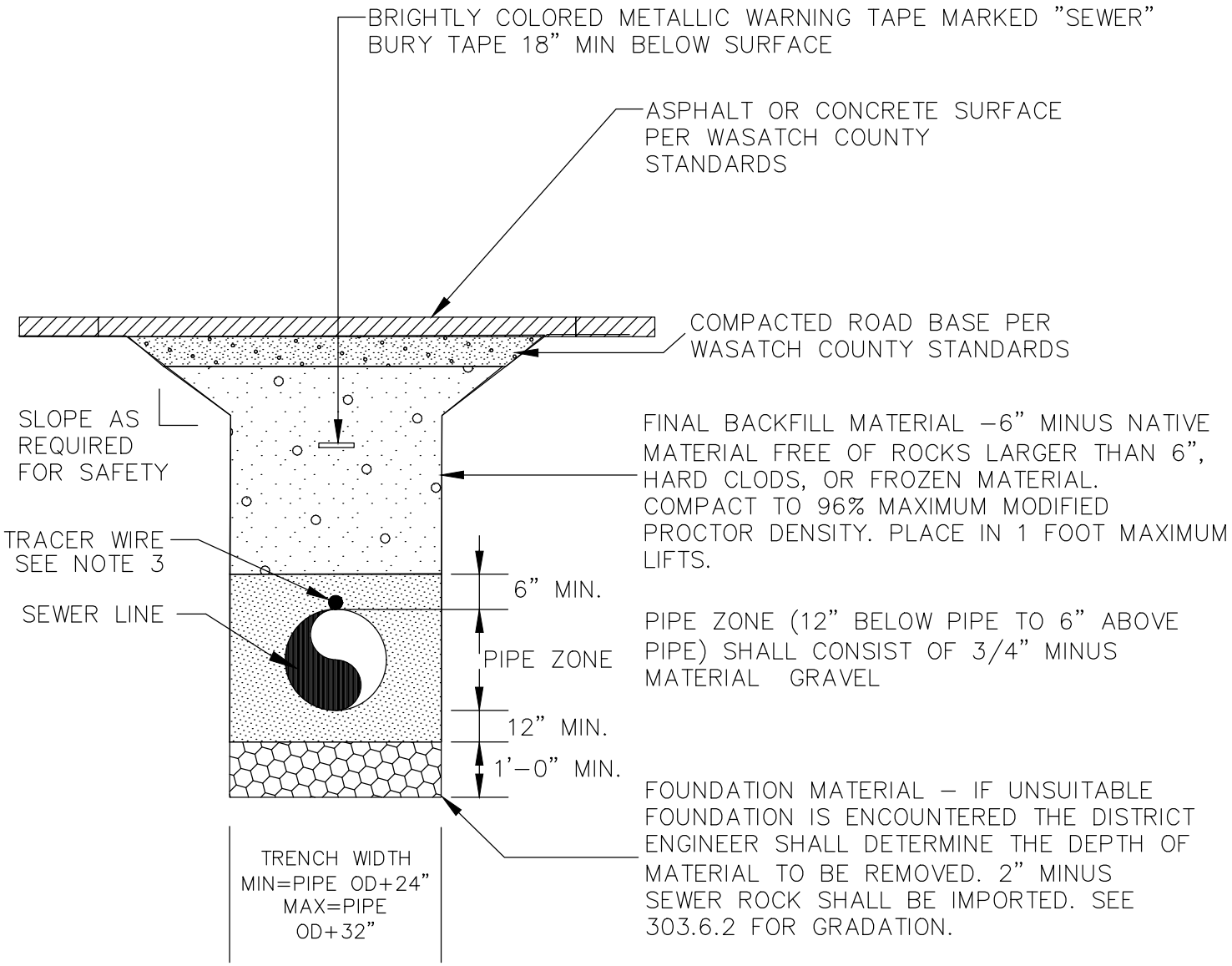
1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
3. TRACER WIRE SHALL BE #12 – GAUGE, 600 VOLT COPPER WIRE. PVC JACKETED FOR UNDERGROUND SERVICES. PROVIDE SURFACE CONNECTIONS AT ALL CLEANOUTS AND MANHOLES. WIRE CONTINUITY WILL BE SUBJECT TO DISTRICT TESTING DURING AND AFTER CONSTRUCTION. CONTRACTOR SHALL FIX ANY DAMAGED LINES TO THE SATISFACTION OF THE DISTRICT.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

SEWER LINE DETAIL IN ROADWAY

DWG. 300.1



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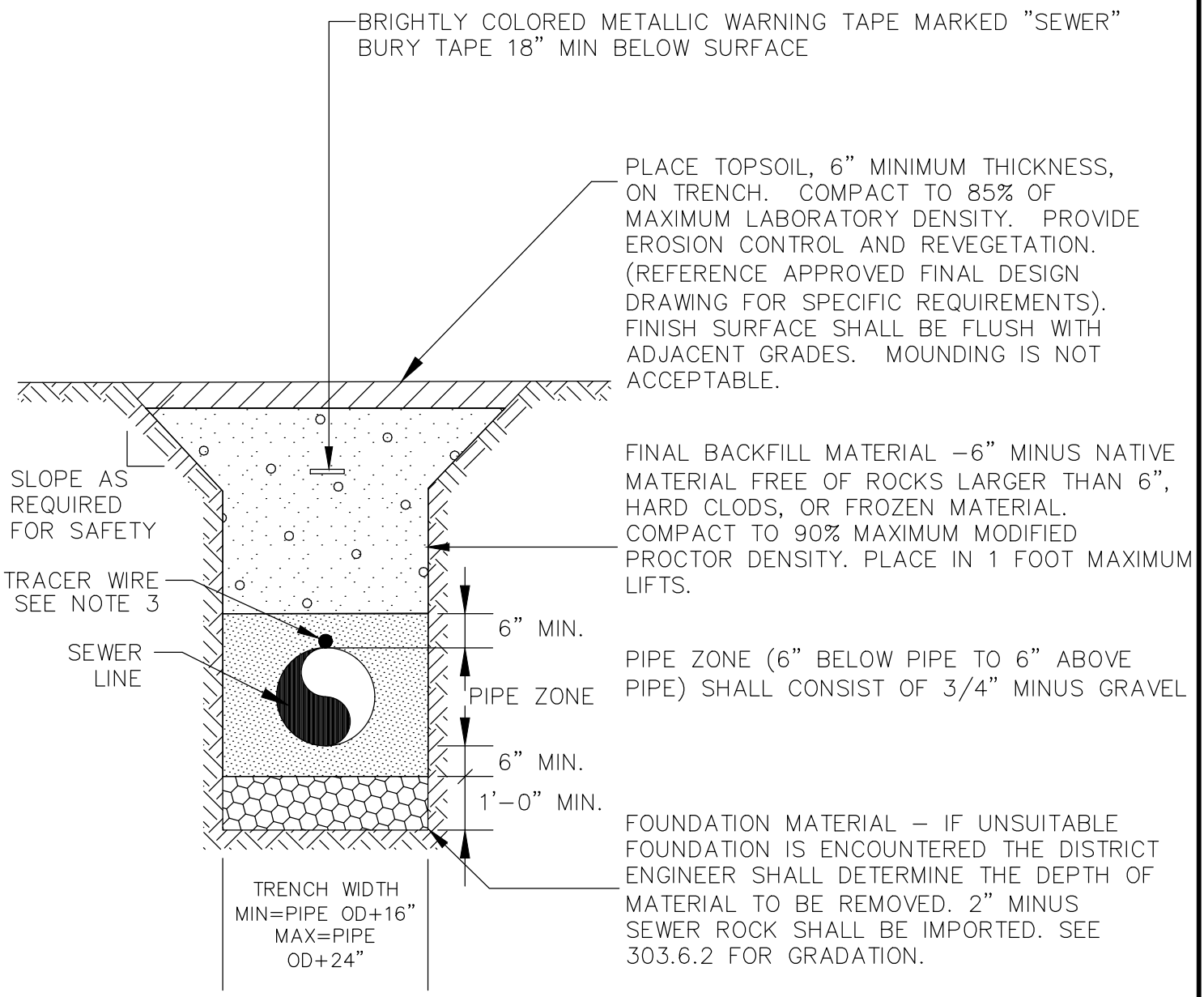
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

SEWER LINE DETAIL IN ROADWAY - ROCK TRENCH

DWG. 300.1A



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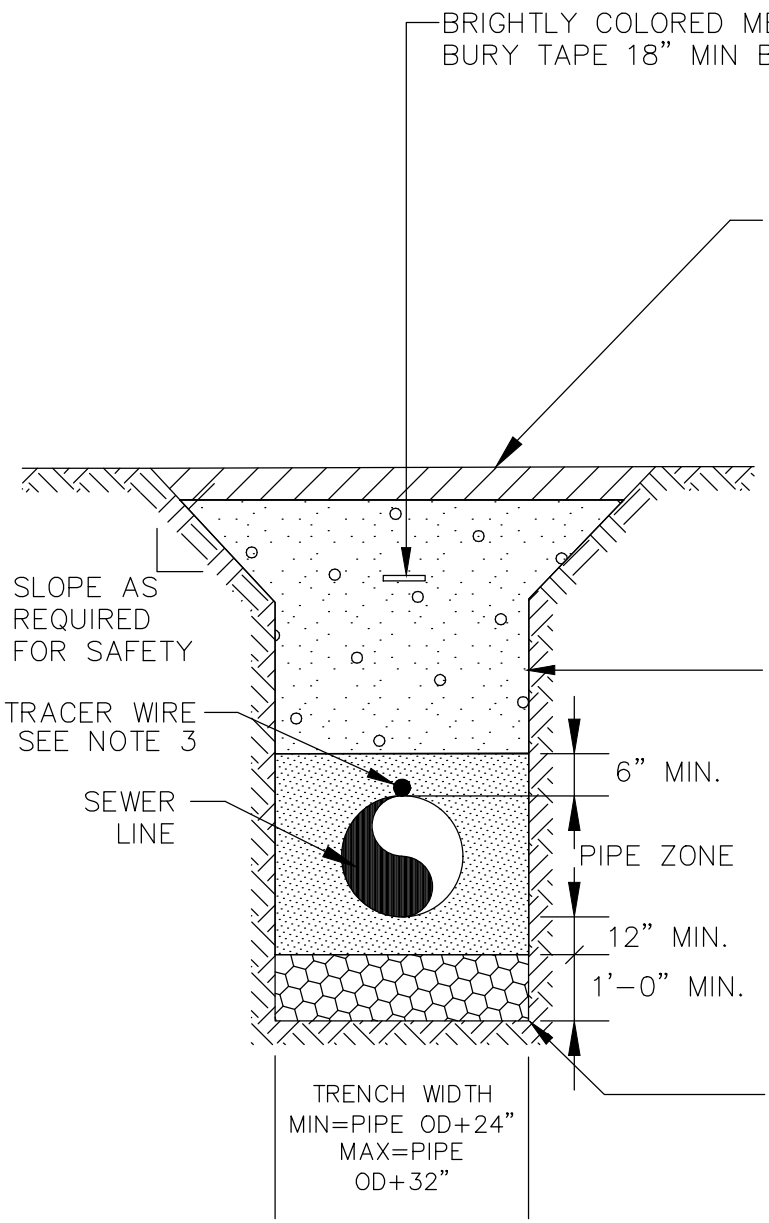
REV. DATE:	MAY 2016
	BOWEN COLLINS

SEWER LINE DETAIL NOT IN ROADWAY

DWG. 300.2



PLACE TOPSOIL, 6" MINIMUM THICKNESS, ON TRENCH. COMPACT TO 85% OF MAXIMUM LABORATORY DENSITY. PROVIDE EROSION CONTROL AND REVEGETATION. (REFERENCE APPROVED FINAL DESIGN DRAWING FOR SPECIFIC REQUIREMENTS). FINISH SURFACE SHALL BE FLUSH WITH ADJACENT GRADES. MOUNDING IS NOT ACCEPTABLE.

FINAL BACKFILL MATERIAL –6" MINUS NATIVE MATERIAL FREE OF ROCKS LARGER THAN 6", HARD CLODS, OR FROZEN MATERIAL. COMPACT TO 90% MAXIMUM MODIFIED PROCTOR DENSITY. PLACE IN 1 FOOT MAXIMUM LIFTS.

PIPE ZONE (12" BELOW PIPE TO 6" ABOVE PIPE) SHALL CONSIST OF 3/4" MINUS GRAVEL

FOUNDATION MATERIAL – IF UNSUITABLE FOUNDATION IS ENCOUNTERED THE DISTRICT ENGINEER SHALL DETERMINE THE DEPTH OF MATERIAL TO BE REMOVED. 2" MINUS SEWER ROCK SHALL BE IMPORTED. SEE 303.6.2 FOR GRADATION.

NOTES:

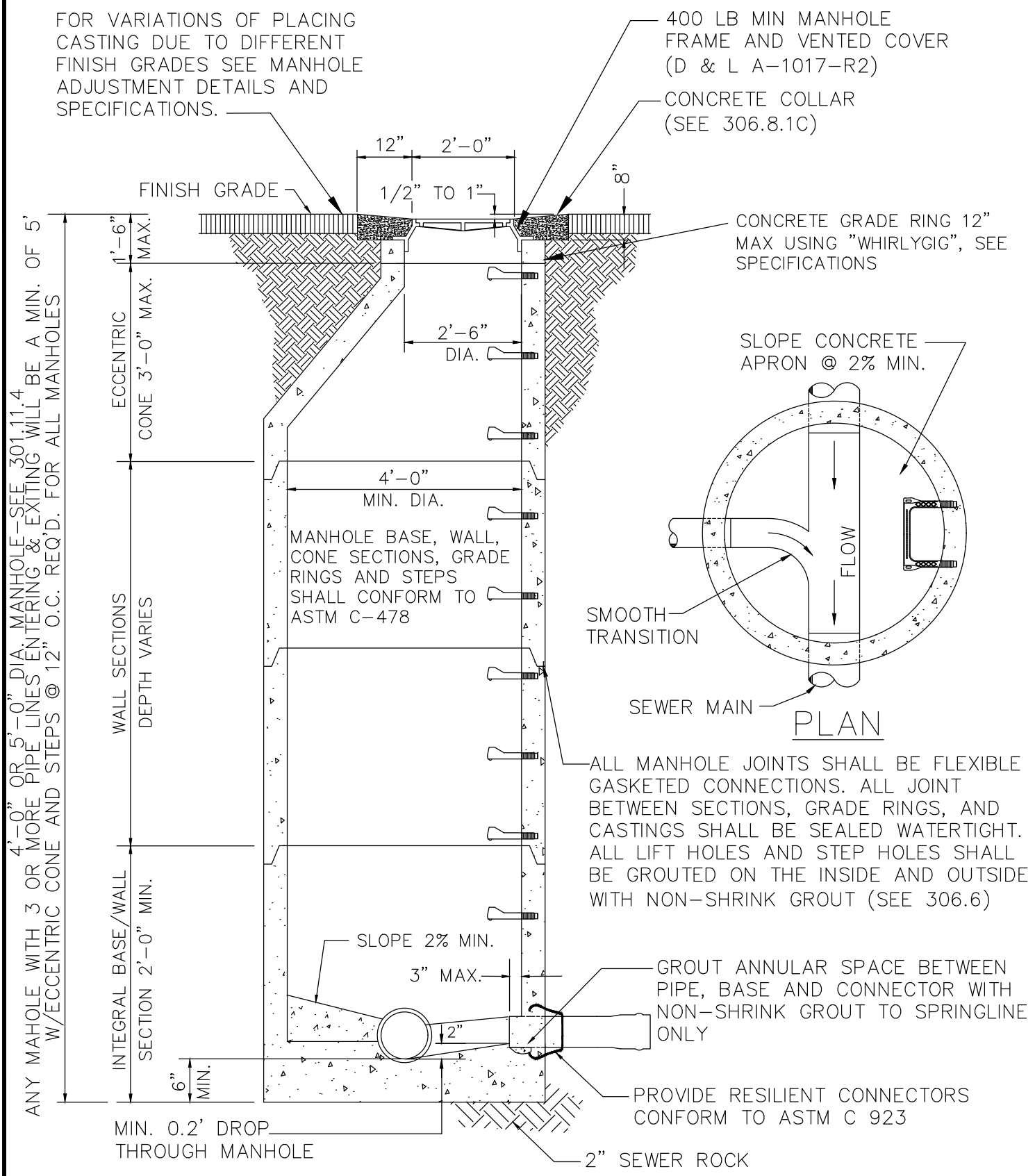
1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
3. TRACER WIRE SHALL BE #12 – GAUGE, 600 VOLT COPPER WIRE. PVC JACKETED FOR UNDERGROUND SERVICES. PROVIDE SURFACE CONNECTIONS AT ALL CLEANOUTS AND MANHOLES. WIRE CONTINUITY WILL BE SUBJECT TO DISTRICT TESTING DURING AND AFTER CONSTRUCTION. CONTRACTOR SHALL FIX ANY DAMAGED LINES TO THE SATISFACTION OF THE DISTRICT.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

SEWER LINE DETAIL
NOT IN ROADWAY - ROCK TRENCH

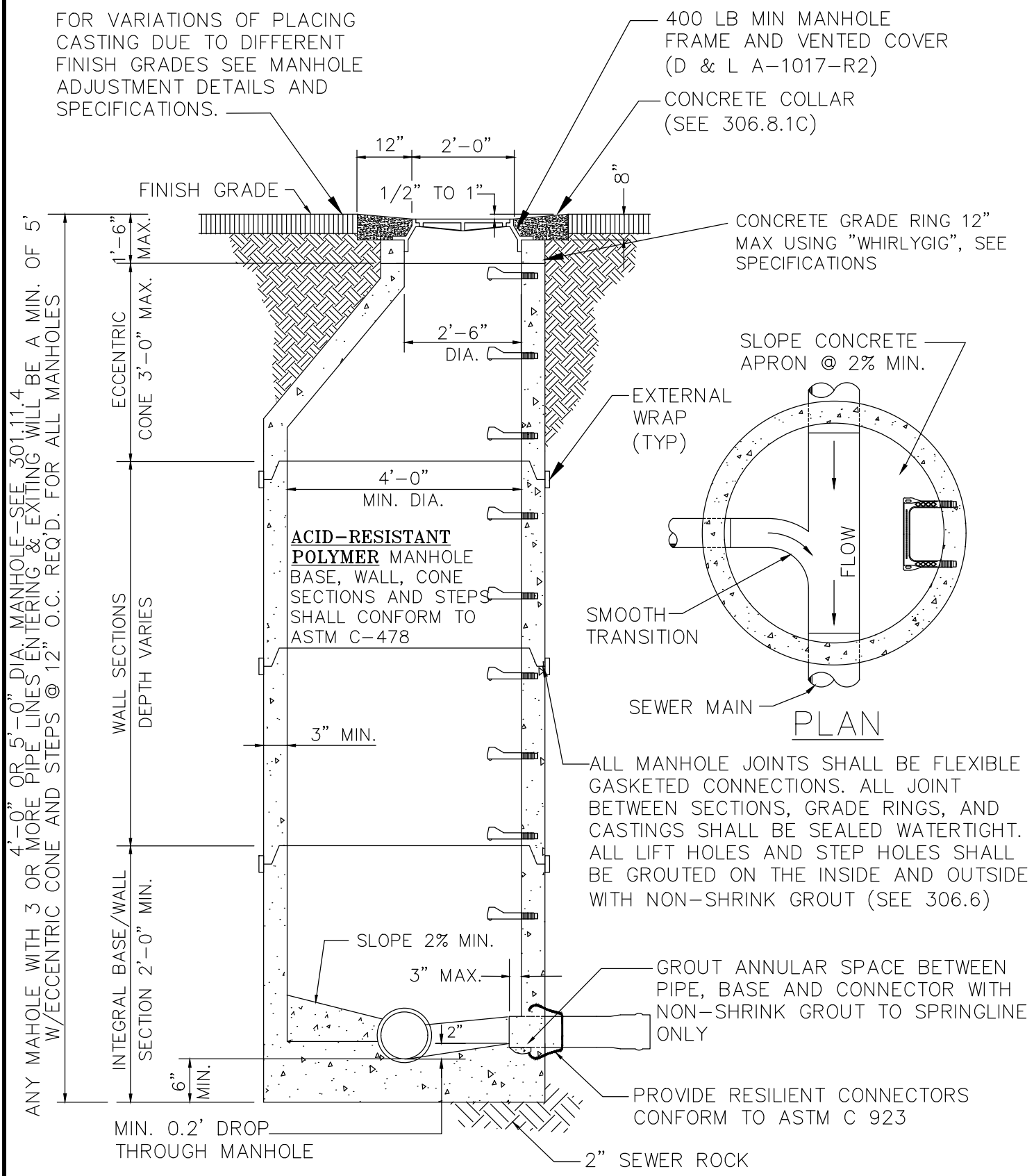
DWG. 300.2A



NOTE:
FOR MANHOLES WHERE PUMPED LINES COME DIRECTLY INTO THE MANHOLE, USE DETAIL 300.3A
FOR DETAILED INFORMATION SEE SPECIFICATIONS

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	PRECAST MANHOLE	DWG. 300.3

ACID–RESISTANT POLYMER MANHOLE



NOTE: ACID–RESISTENT POLYMER MANHOLES REQUIRED AT ALL LOCATIONS WHERE PUMPED MAIN LINES ENTER THE MANHOLE AS WELL AS THE NEXT MANHOLE DOWNSTREAM.

FOR DETAILED INFORMATION SEE SPECIFICATIONS

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	PRECAST ACID-RESISTANT POLYMER MANHOLE	DWG. 300.3A

FOR VARIATIONS OF PLACING CASTING DUE TO DIFFERENT FINISH GRADES SEE MANHOLE ADJUSTMENT DETAILS AND SPECIFICATIONS.

400 LB MIN MANHOLE FRAME AND VENTED COVER (D & L A-1017-R2)

CONCRETE COLLAR (SEE 300.3)

12" 2'-0"

1/2" TO 1"

8"

FINISH GRADE

1'-6" MAX.

ECCENTRIC CONE 3'-0" MAX.

CONCRETE GRADE RING 12" MAX USING "WHIRLYGIG", SEE SPECIFICATIONS

2'-6" DIA.

4'-0" OR 5'-0" DIA. MANHOLE-SEE 301.11.4
ANY MAHOLE WITH 3 OR MORE PIPE LINES ENTERING & EXITING WILL BE A MIN. OF 5' W/ECCENTRIC CONE AND STEPS @ 12" O.C. REQ'D. FOR ALL MANHOLES

WALL SECTIONS DEPTH VARIES

5'-0" MIN. DIA.

MANHOLE BASE, WALL, CONE SECTIONS, GRADE RINGS AND STEPS SHALL CONFORM TO ASTM C-478

SLOPE CONCRETE APRON @ 2% MIN.

FLOW

SMOOTH TRANSITION

SEWER MAIN

PLAN

ALL MANHOLE JOINTS SHALL BE FLEXIBLE GASKETED CONNECTIONS. ALL JOINTS BETWEEN SECTIONS, GRADE RINGS, AND CASTINGS SHALL BE SEALED WATERTIGHT. ALL LIFT HOLES AND STEP HOLES SHALL BE GROUTED SMOOTH ON THE INSIDE AND OUTSIDE WITH NON-SHRINK GROUT (SEE 306.6)

NON-SHRINK GROUT

3" MAX.

6" MIN.

WALL SECTION 2'-0" MIN.

SLOPE SIDES 2% MIN.

GROUT AROUND EXISTING PIPES WITH NON-SHRINK GROUT

WATER STOP, ADAPTER OR GASKET, ALL EXISTING PIPES. CORE DRILL AND RESILIENT CONNECTOR ON NEW PIPES.

1'-6" MAX.

10" MIN.

6" MIN.

CONCRETE OR BEDDING MATERIAL FROM BASE TO FIRST JOINT OF EXISTING PIPE

MIN. 0.2' DROP THROUGH MANHOLE

6" MIN.

UNDISTURBED SOIL OR BEDDING MATERIAL

FOR DETAILED INFORMATION SEE SPECIFICATION

Jordanelle

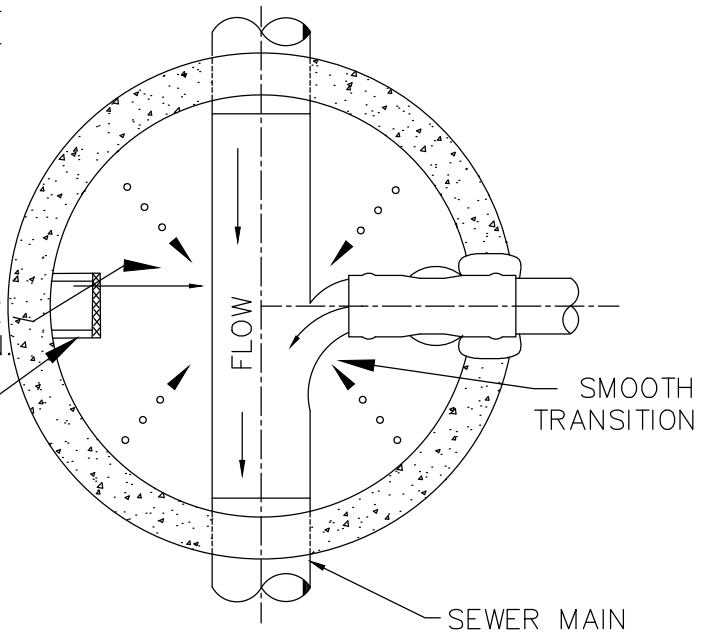
DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

CAST-IN-PLACE MANHOLE

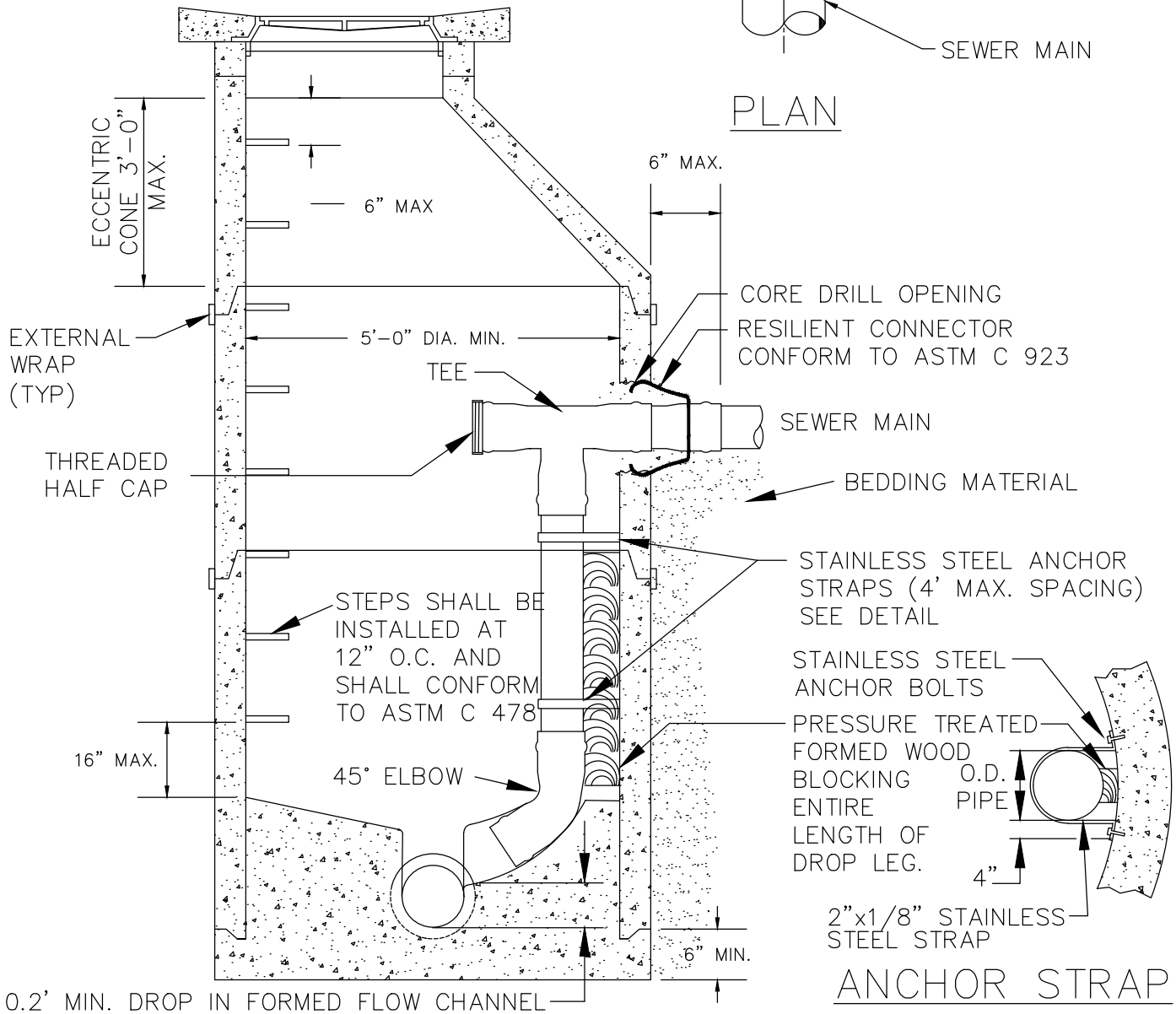
DWG. 300.4

ACID RESISTANT POLYMER MANHOLE

NOTES:
1. PIPE AND FITTINGS FOR DROP SHALL BE ASTM 3034 SDR 35 PVC.
2. BASE, WALL, CONE SECTIONS AND STEPS SHALL CONFORM TO ASTM C-478



PLAN

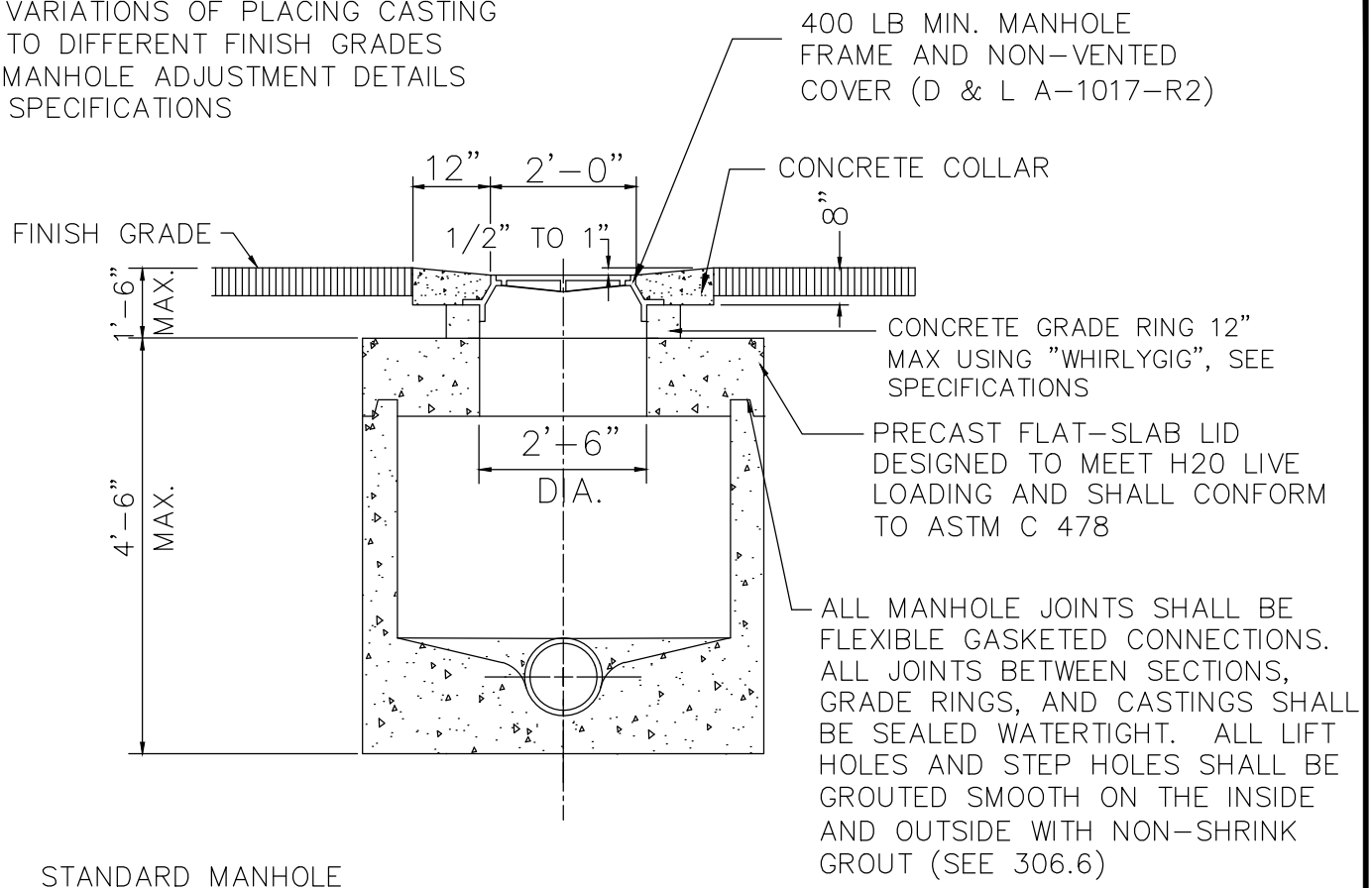


ANCHOR STRAP DETAIL

FOR DETAILED INFORMATION SEE SPECIFICATION

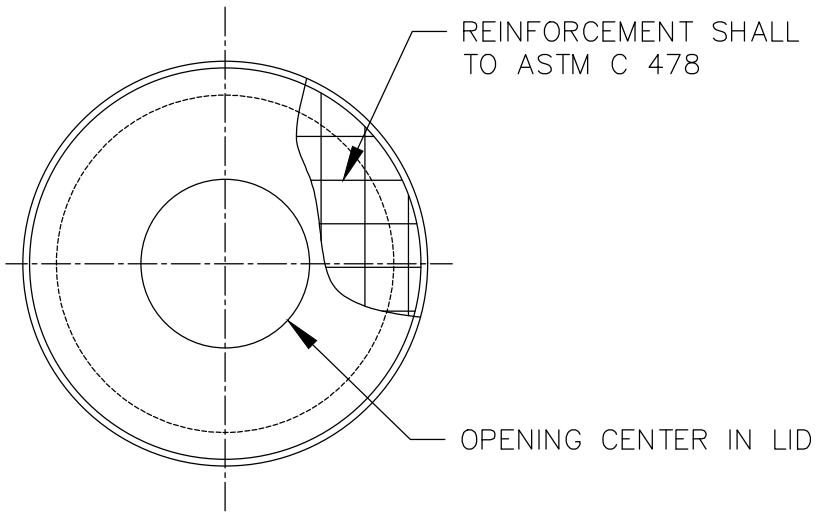
Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	INSIDE DROP MANHOLE	DWG. 300.5

FOR VARIATIONS OF PLACING CASTING DUE TO DIFFERENT FINISH GRADES SEE MANHOLE ADJUSTMENT DETAILS AND SPECIFICATIONS



STANDARD MANHOLE PRECAST OR CAST IN PLACE AS DIRECTED BY DISTRICT ENGINEER

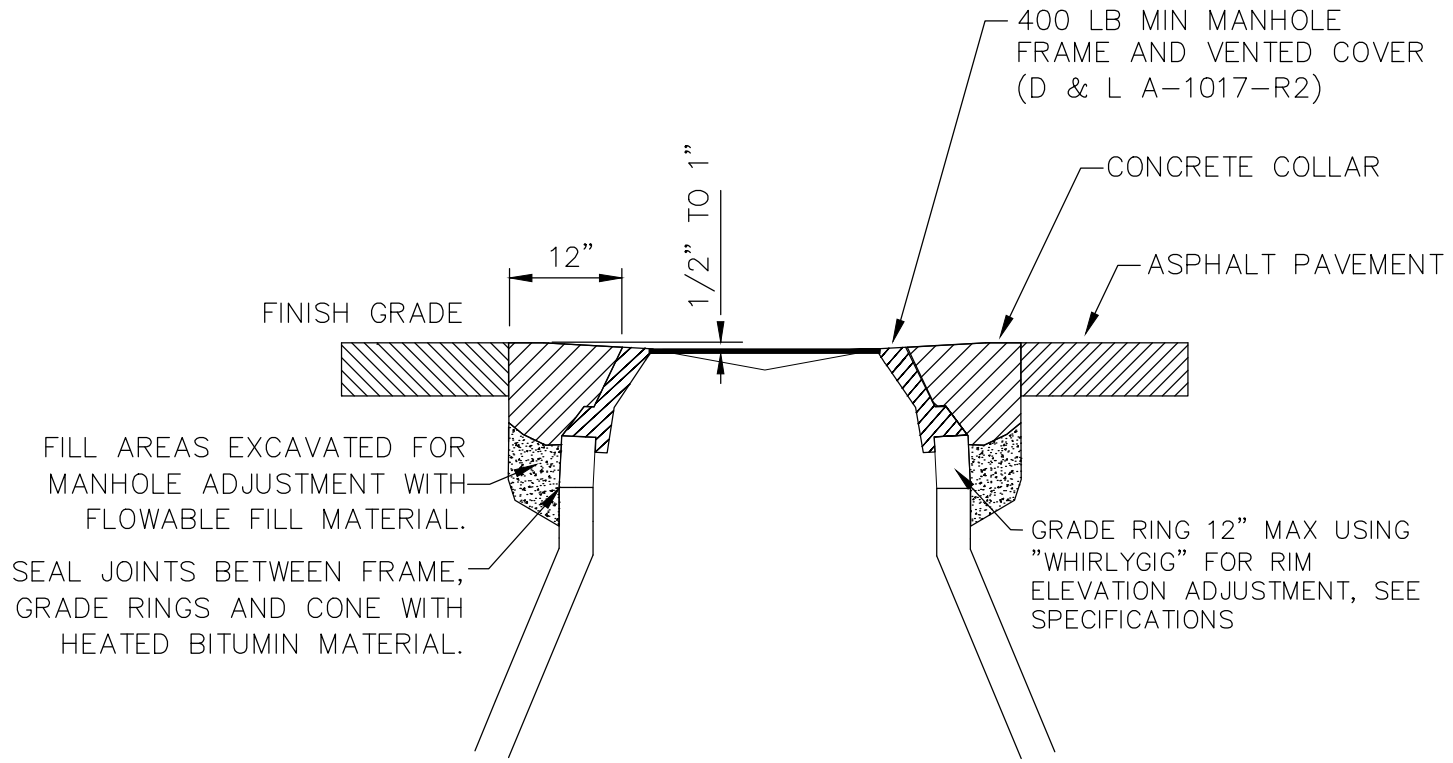
SECTION

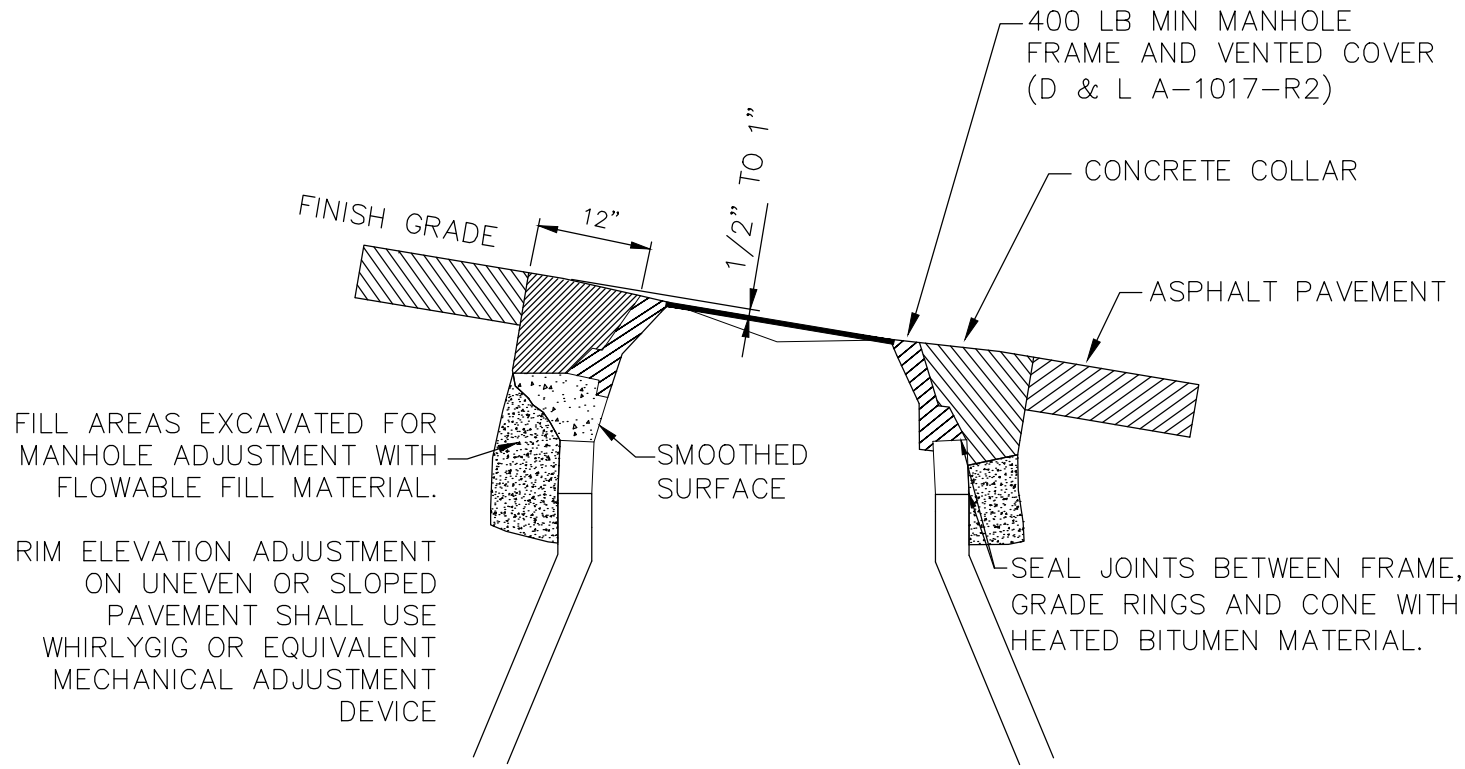


PLAN

FOR DETAILED INFORMATION SEE SPECIFICATION

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	SHALLOW MANHOLE	DWG. 300.6



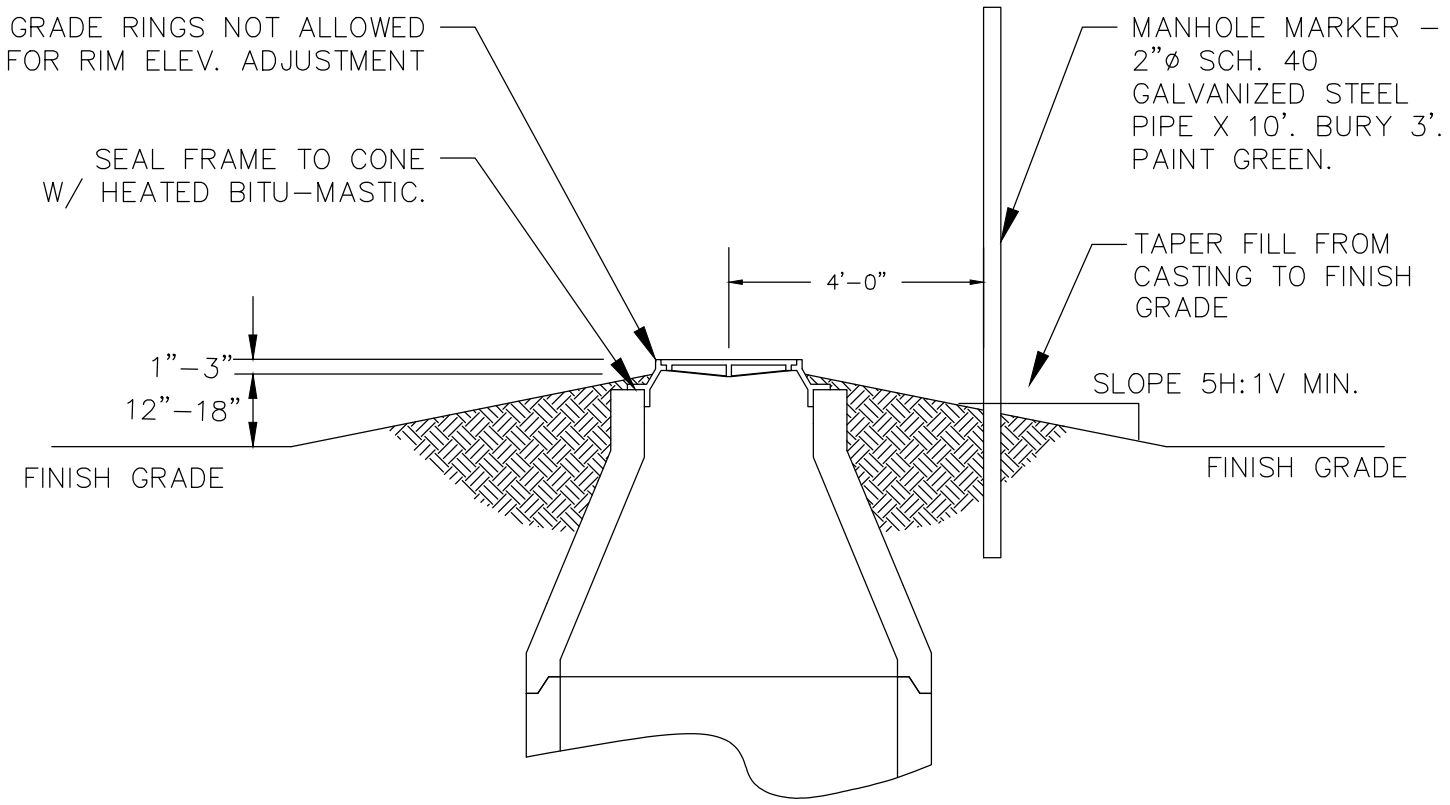


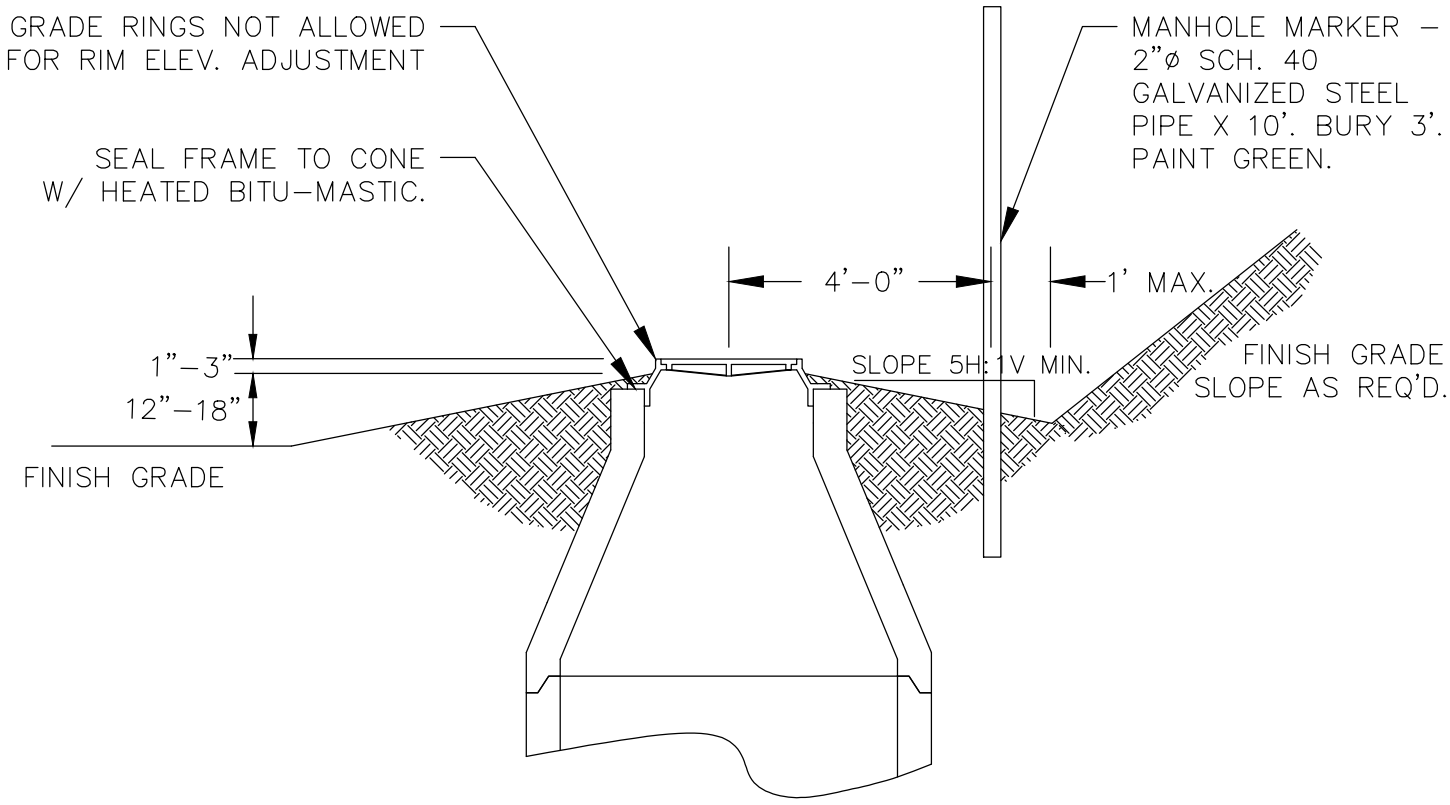
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

MANHOLE ADJUSTMENT WITHIN PAVEMENT

DWG. 300.7





Jordanelle

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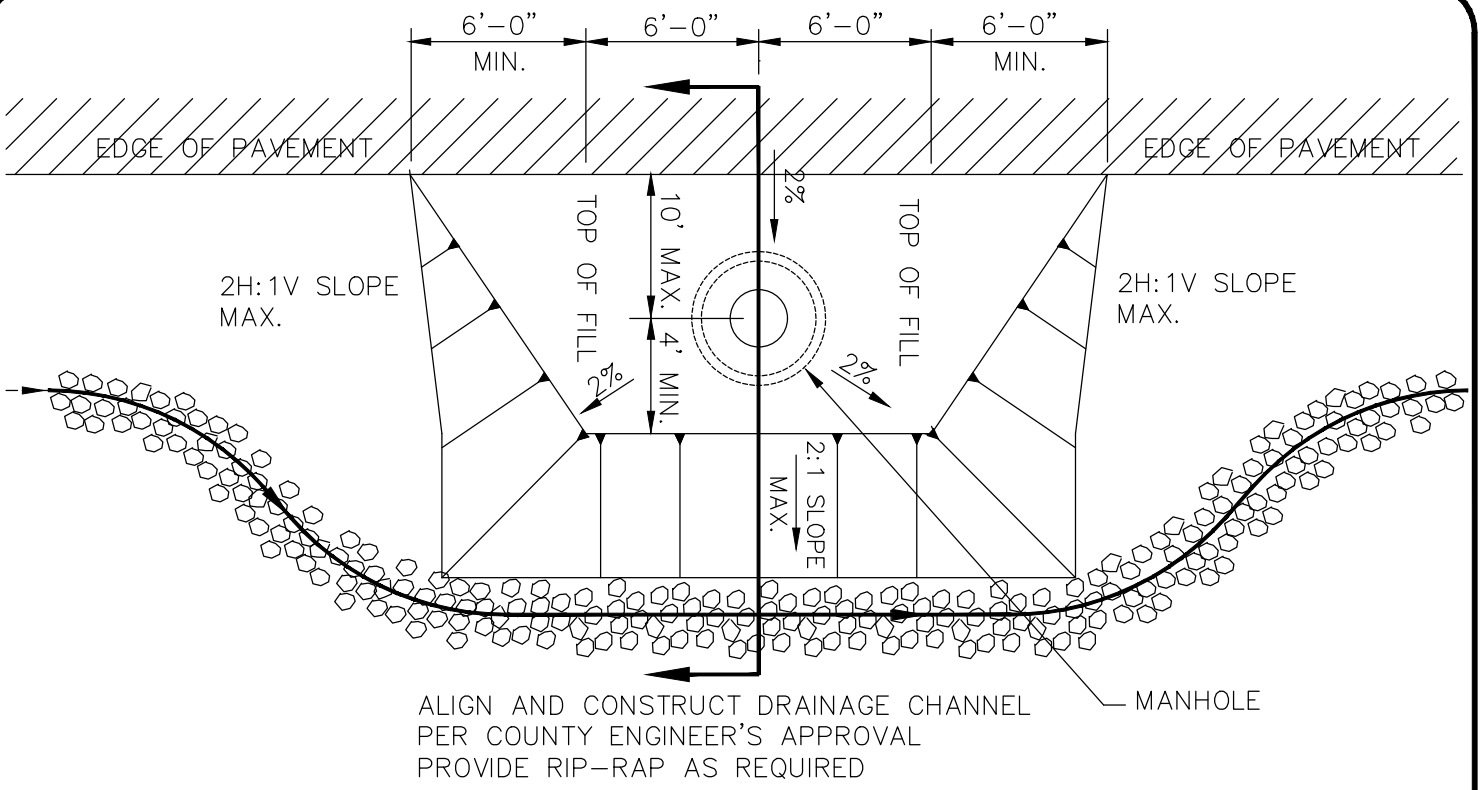
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

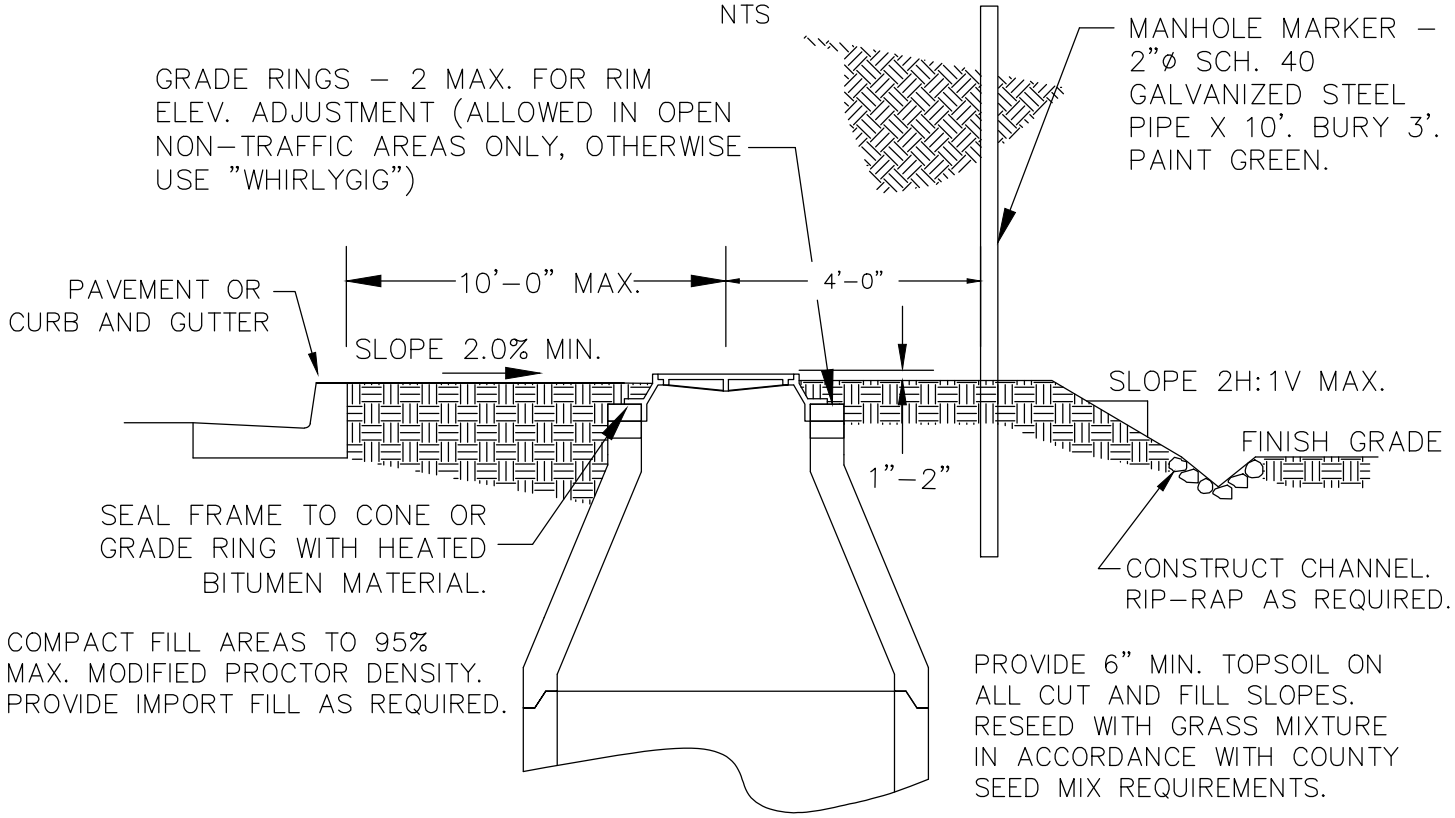
MANHOLE ADJUSTMENT OUTSIDE OF PAVEMENT

DWG. 300.8



PLAN

NTS

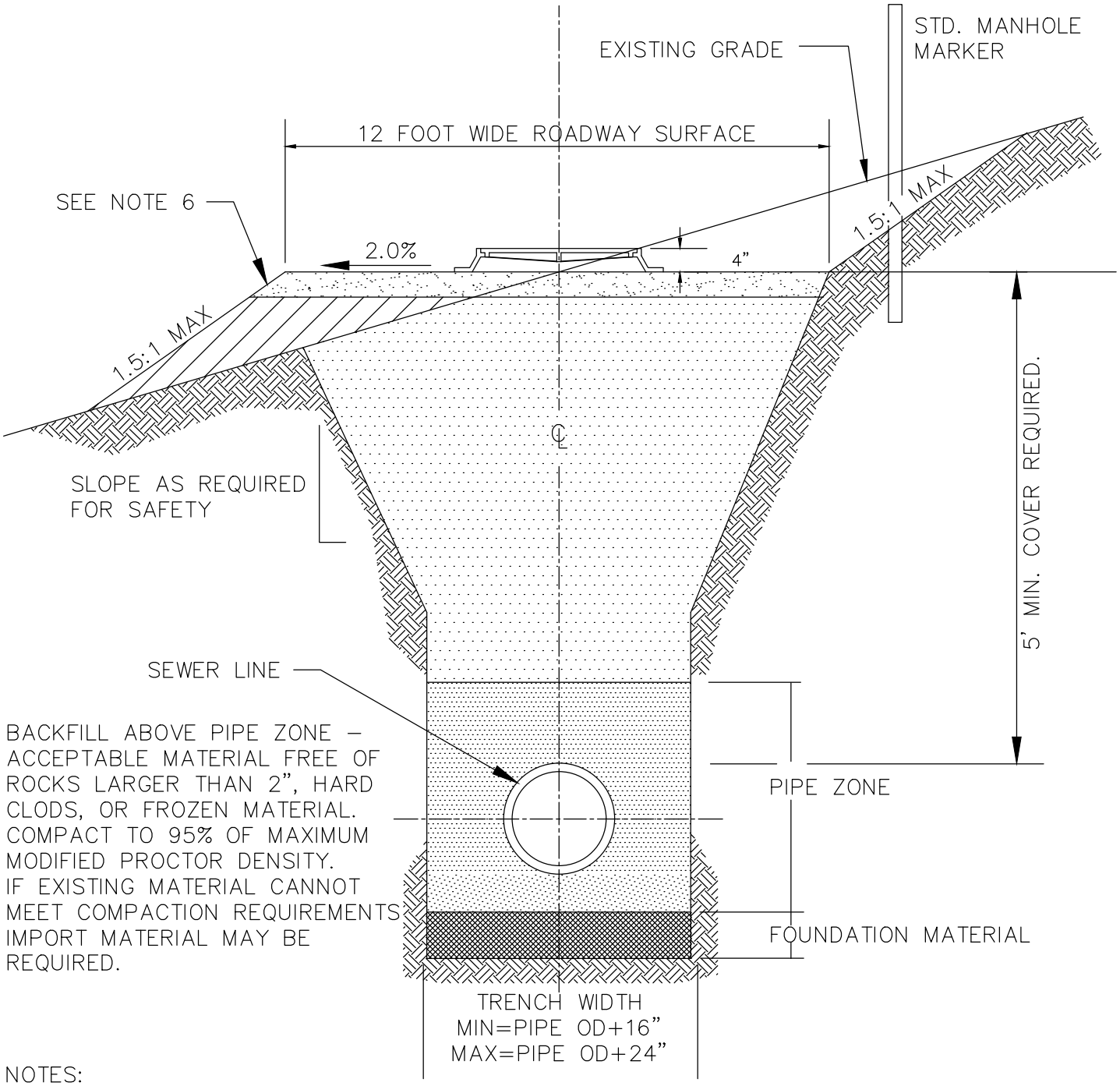


Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

MANHOLE PLATFORM

DWG. 300.9



NOTES:

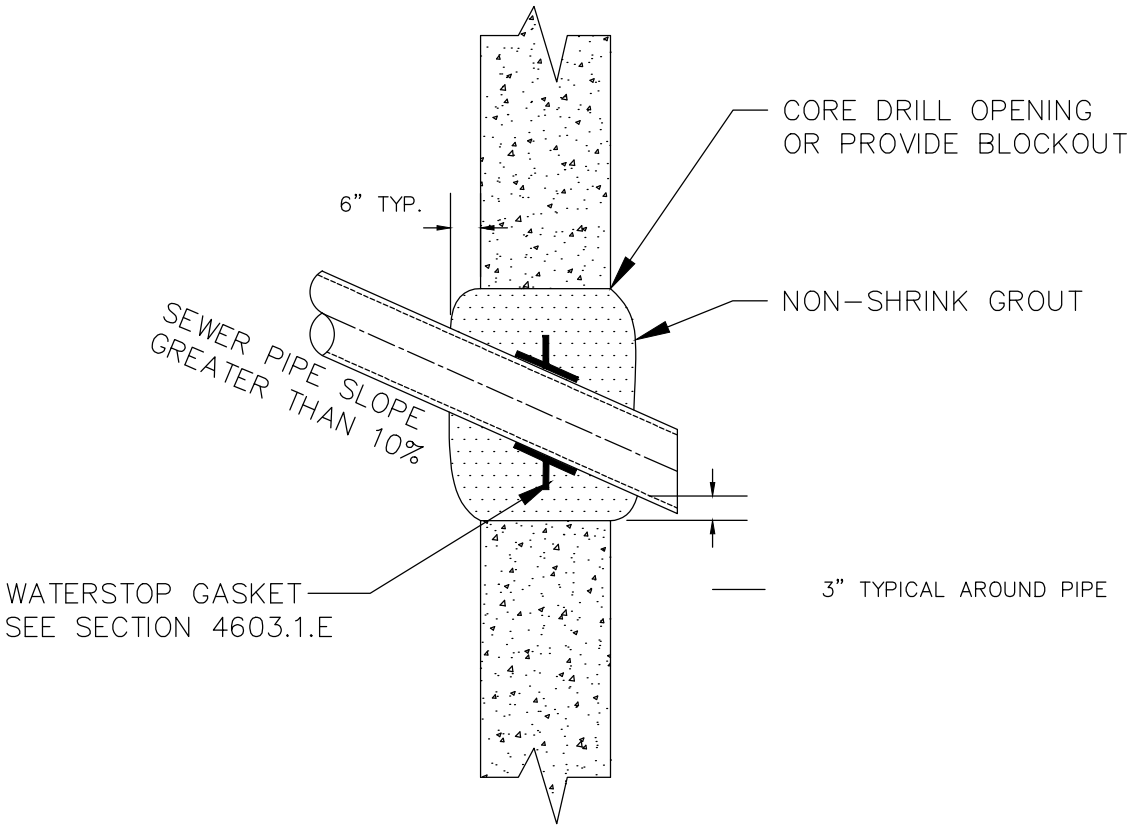
1. REFERENCE APPROPRIATE STANDARD DETAILS FOR PIPE ZONE, PIPE BEDDING, AND FOUNDATION MATERIAL REQUIREMENTS.
2. ACCESS ROADWAY SHALL BE SMOOTH GRADED TO BE TRAVERSABLE BY A TWO-WHEEL DRIVE VEHICLE. MAX. GRAD: 15%; MAX. GRADE TRANSITION: 10% IN 50 FEET.
3. FINAL ROADWAY GRADING SHALL BE ACCEPTABLE TO JSSD.
4. CUT AND FILL SLOPES SHALL BE A MAXIMUM OF 1.5 HORIZONTAL TO 1 VERTICAL, UNLESS APPROVED BY THE DISTRICT ENGINEER AND COUNTY ENGINEER.
5. PLACE 4" MIN. TOPSOIL ON ALL CUTS AND FILL SLOPES AND FILL VOIDS OF ACCESS ROAD GRAVEL WITH TOPSOIL. PROVIDE EROSION CONTROL AND REVEGETATION. REFERENCE APPROVED FINAL DESIGN FOR SPECIFIC REQUIREMENTS.
6. ROADWAY SURFACE SHALL BE WELL-GRADED 4" MINUS ANGULAR ROCK, PLACED TO A MIN. THICKNESS OF 6" INCHES.
7. COMPACT FILL SLOPES AND ROAD SURFACE TO 95% OF MAX. MODIFIED PROCTOR DENSITY.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

ACCESS ROADWAY WITH OFF-ROAD SEWERLINE

DWG. 300.10



NOTES:

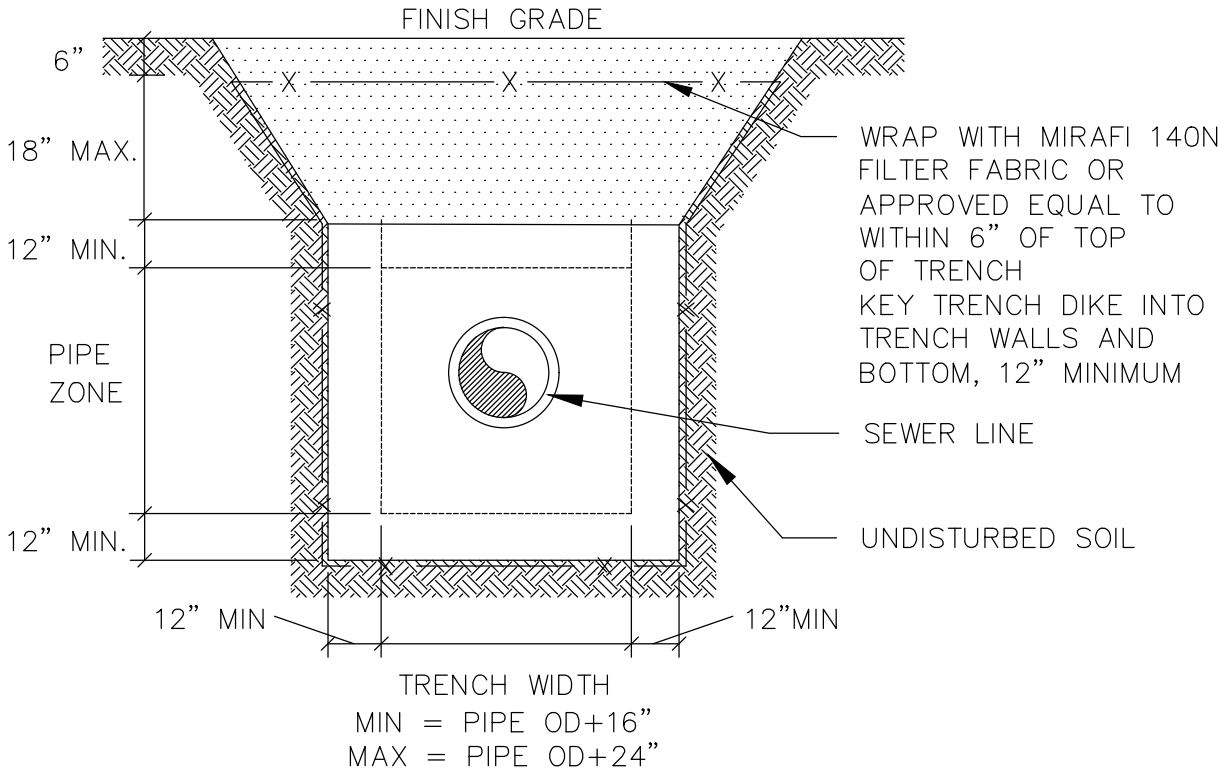
1. PIPES SHALL EXTEND INTO MANHOLES 3"
2. MANHOLE SUPPLIER TO PROVIDE OPENING IN MANHOLE WALL OF SUFFICIENT CLEARANCE TO ALLOW FOR PROPER GROUTING.
3. SLOPE LIMITATIONS ARE BASED ON TYPICAL MANUFACTURERS REQUIREMENTS FOR PRE-CAST MANHOLE BOOT CONNECTORS AND MAY VARY. CONTRACTOR SHALL CHECK WITH SUPPLIER FOR SITE SPECIFIC SLOPE LIMITATIONS.

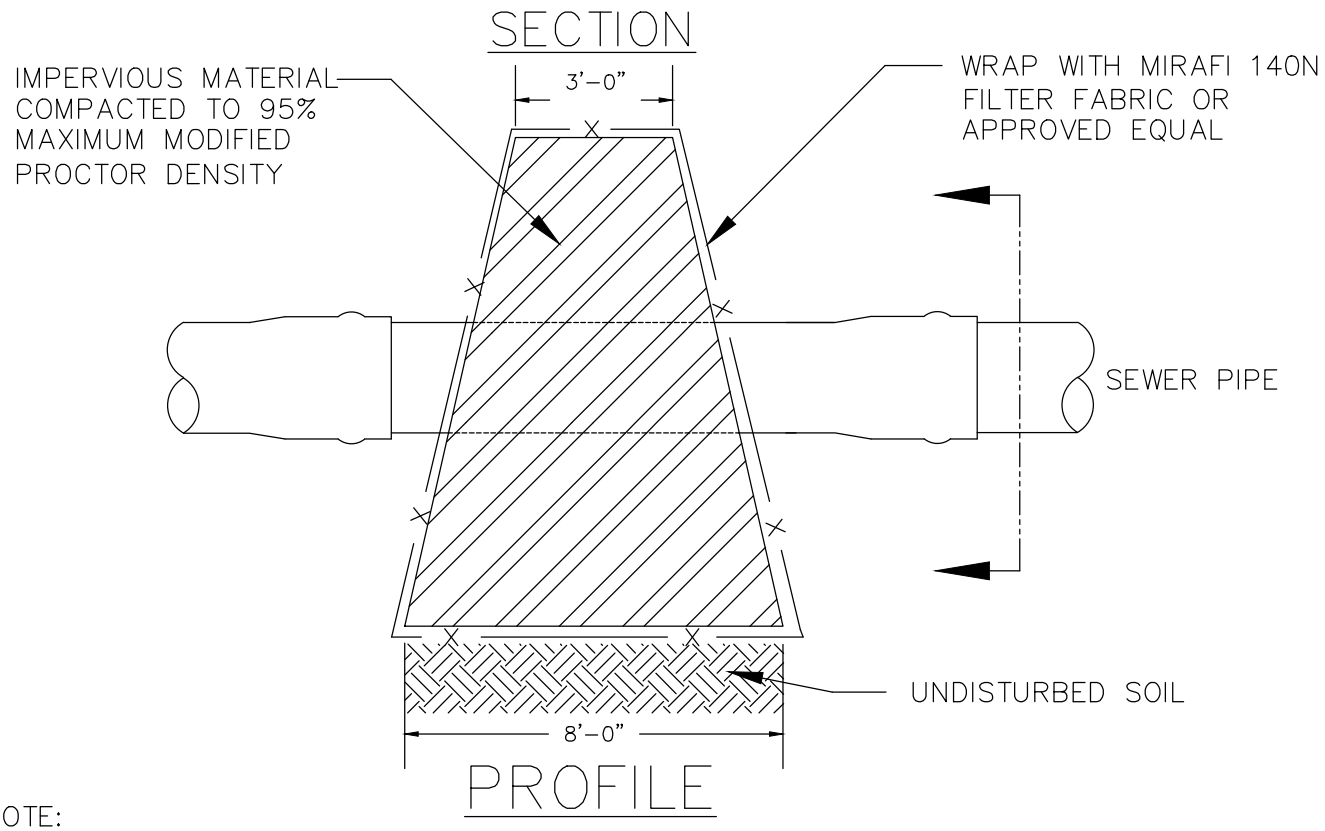
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

PIPE - MANHOLE CONNECTION
PIPE SLOPES GREATER THAN 10%

DWG.
300.11





NOTE:
IMPERVIOUS MATERIAL SHALL MEET THE FOLLOWING GRADATION REQUIREMENTS AND HAVE A PLASTICITY INDEX GREATER THAT TEN:

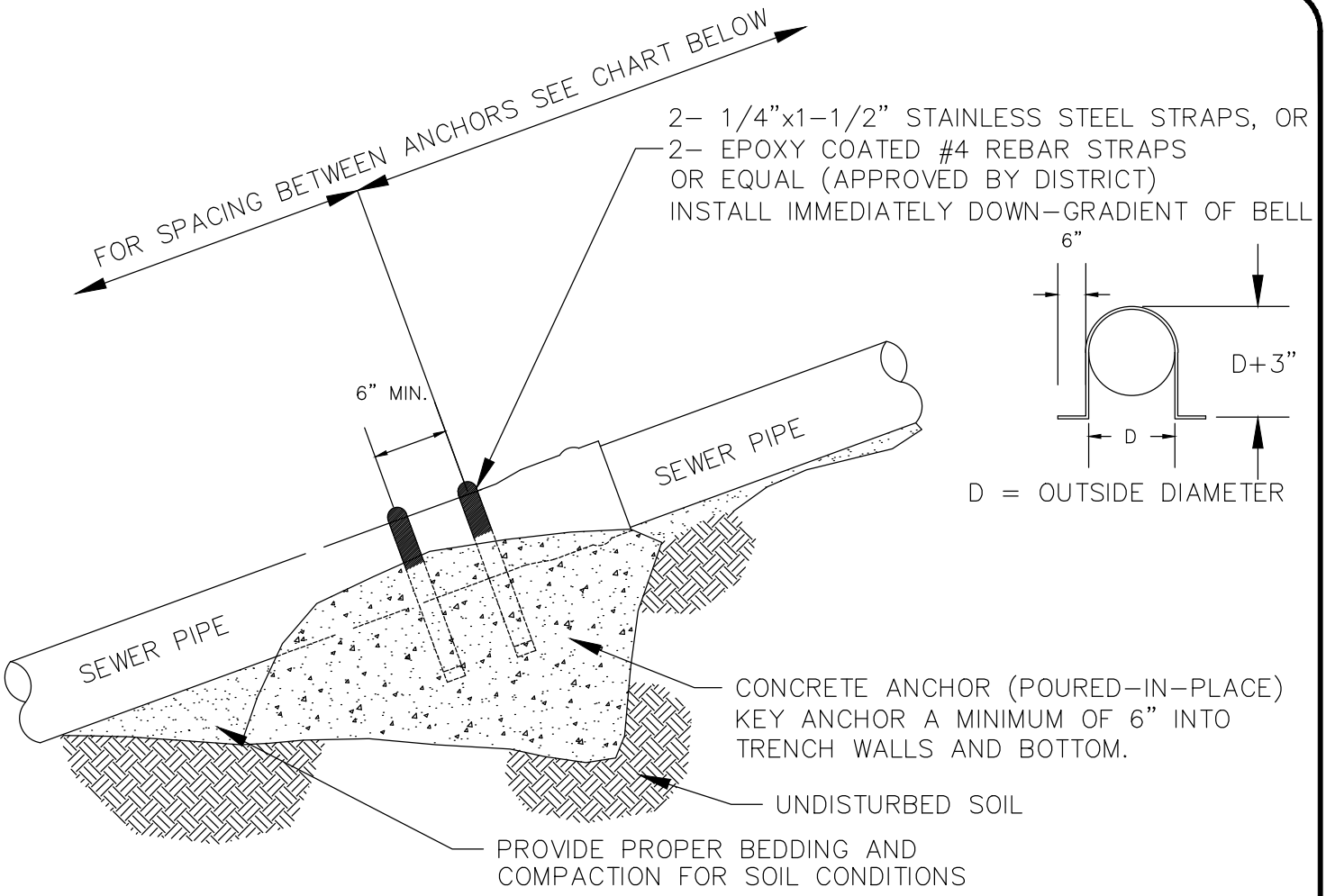
SIEVE SIZE	% PASSING BY WEIGHT
2"	100
No. 4	70–100
No. 200	50–100

Jordanelle

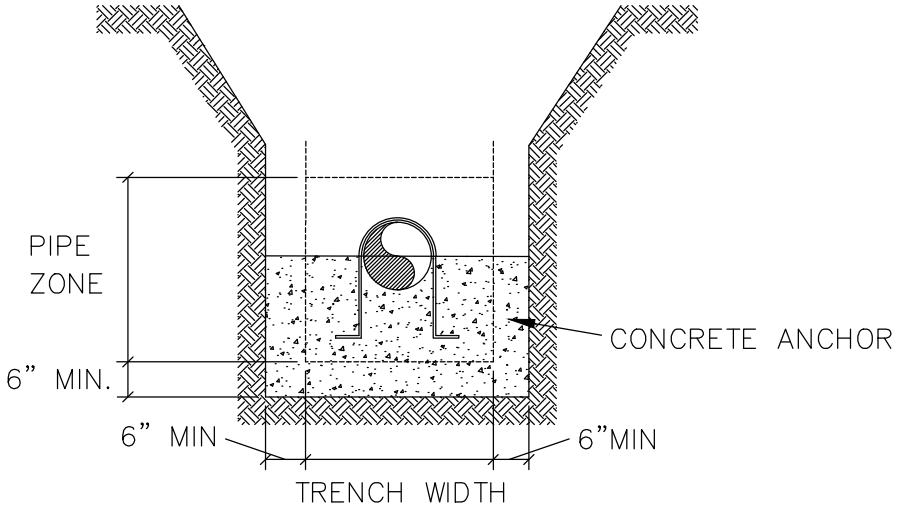
DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

TRENCH DIKE DETAIL

DWG. 300.12



PROFILE



SECTION

ANCHOR SPACING CENTER TO CENTER

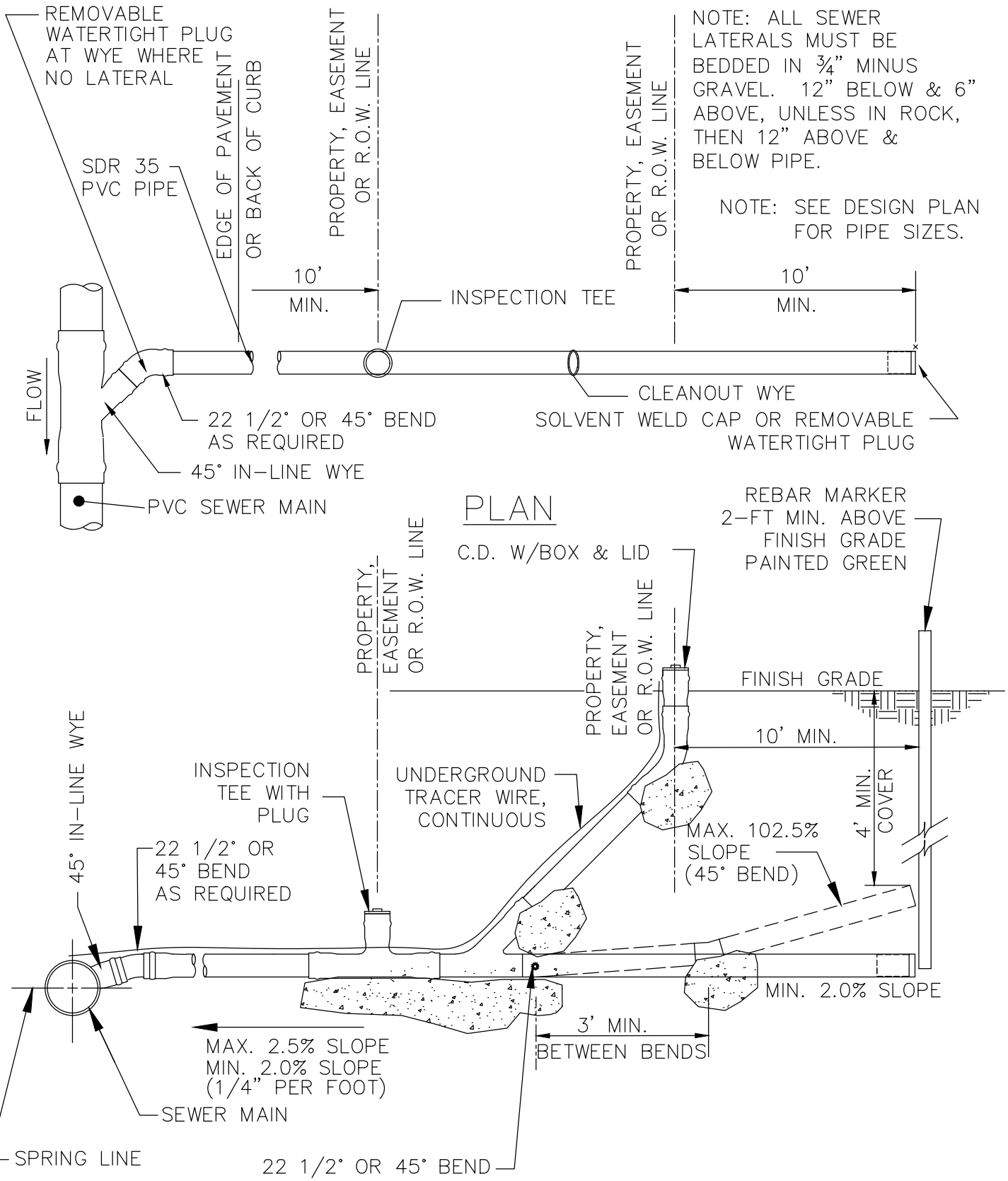
SLOPES 33% TO 50%	24'–0" MAXIMUM
SLOPES 50% AND GREATER	16'–0" MAXIMUM

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

PIPE ANCHOR

DWG. 300.13



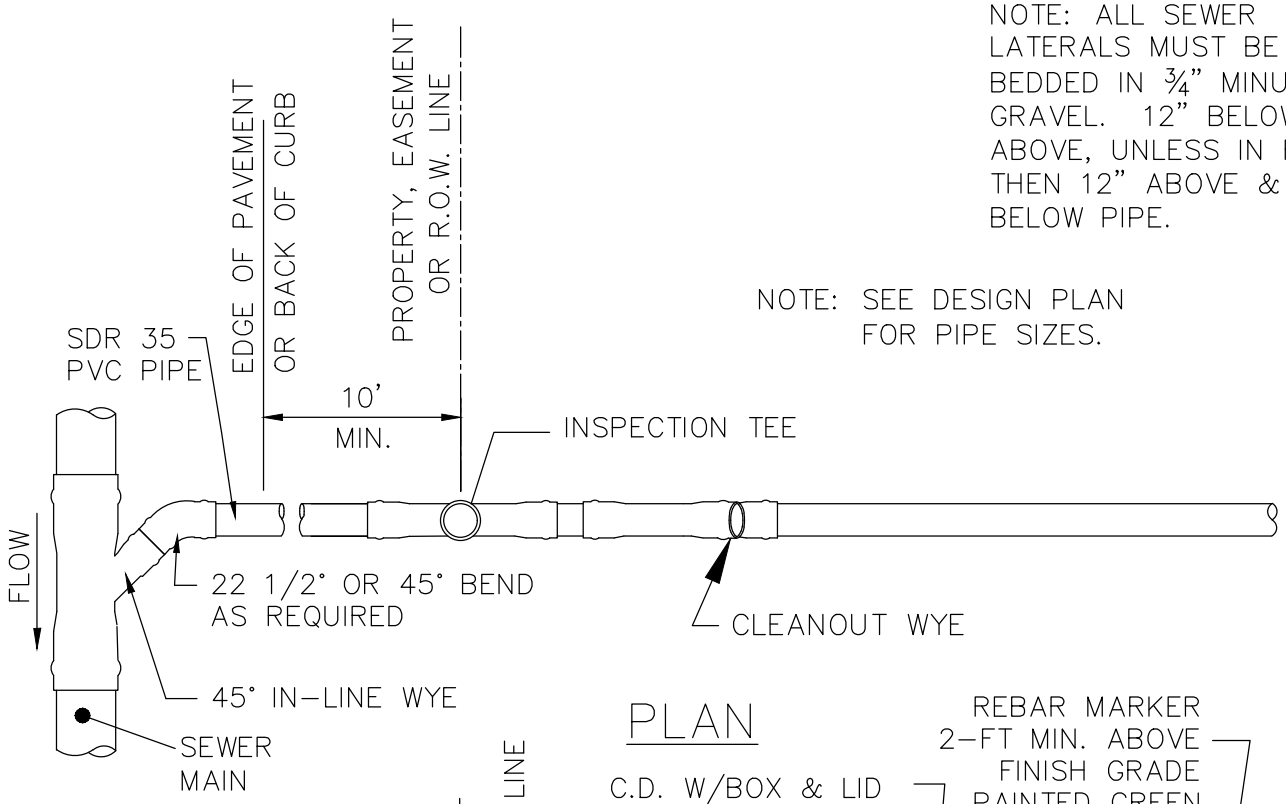
INSTALL SEWER WARNING TAPE 2'-3' ABOVE PIPE

PROFILE

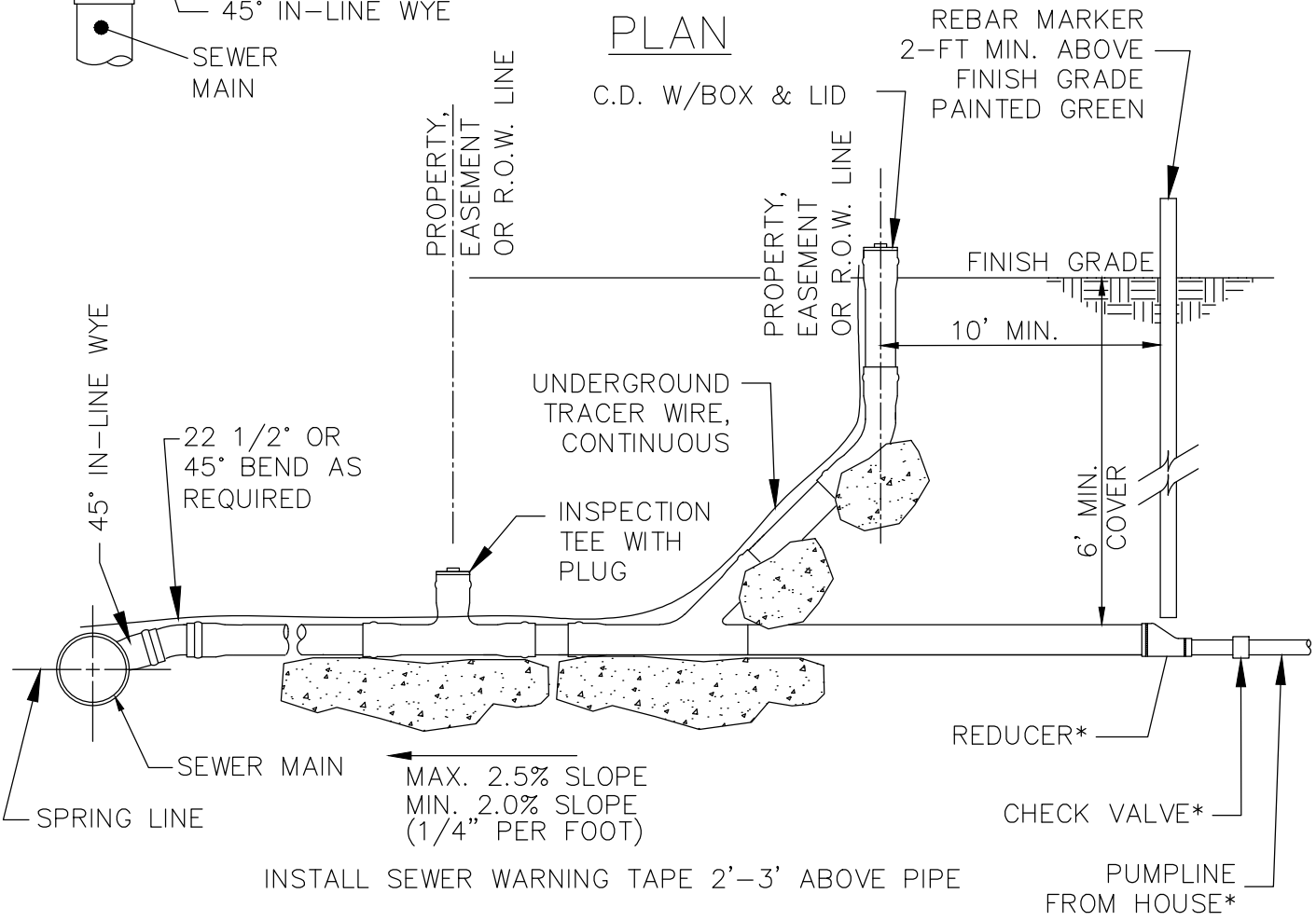
Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	**SANITARY SEWER** **PVC MAIN LINE TO PVC LATERAL LINE**	DWG. 300.14

NOTE: ALL SEWER LATERALS MUST BE BEDDED IN ¾" MINUS GRAVEL. 12" BELOW & 6" ABOVE, UNLESS IN ROCK, THEN 12" ABOVE & BELOW PIPE.

NOTE: SEE DESIGN PLAN FOR PIPE SIZES.



PLAN



PROFILE

NOTE:
6' MINIMUM COVER REQUIRED FOR LATERALS SERVICING LOTS THAT REQUIRE SEWER EJECTOR PUMPS.

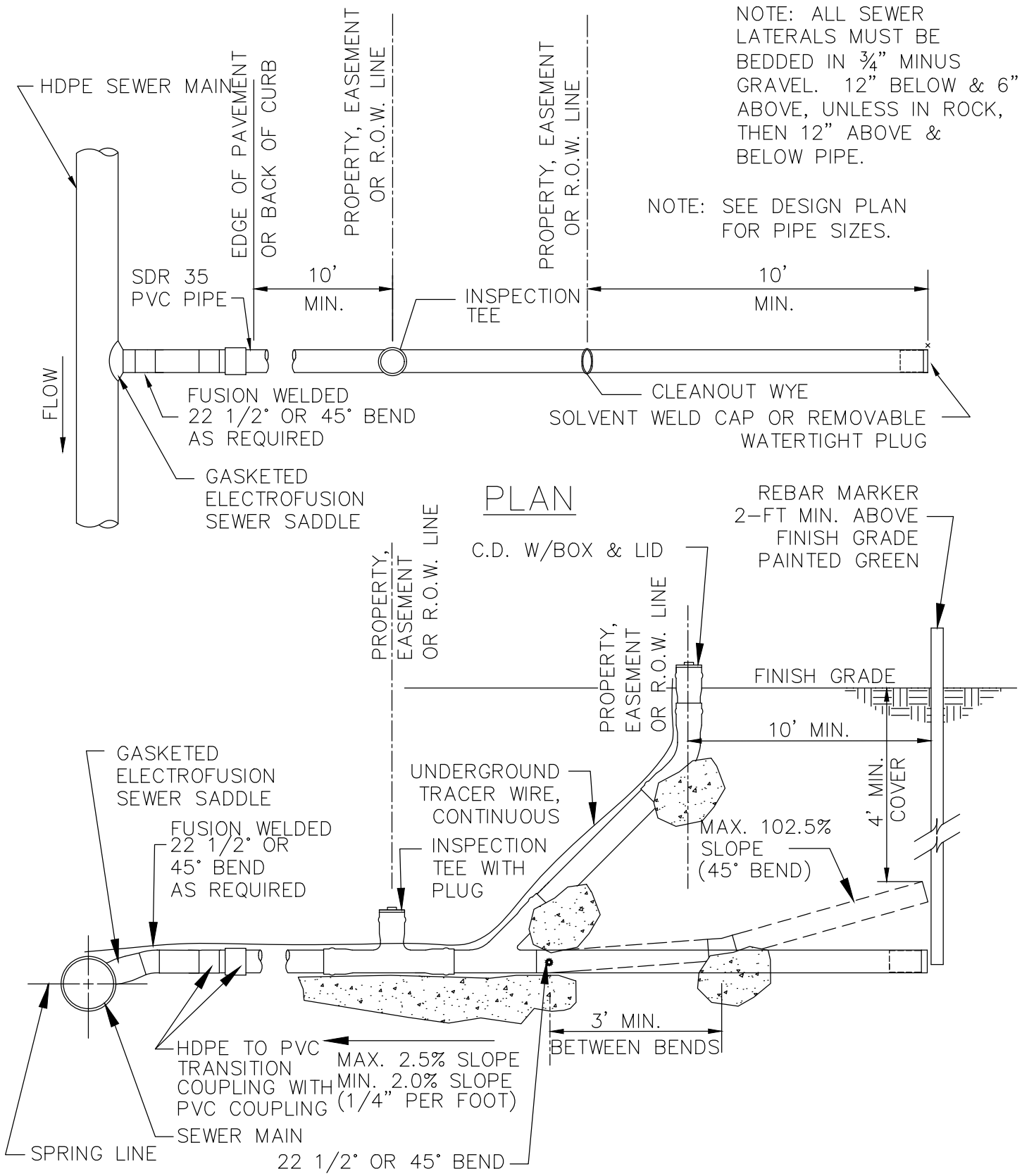
* SIZES TO BE APPROVED BY DISTRICT ENGINEER

Jordanelle

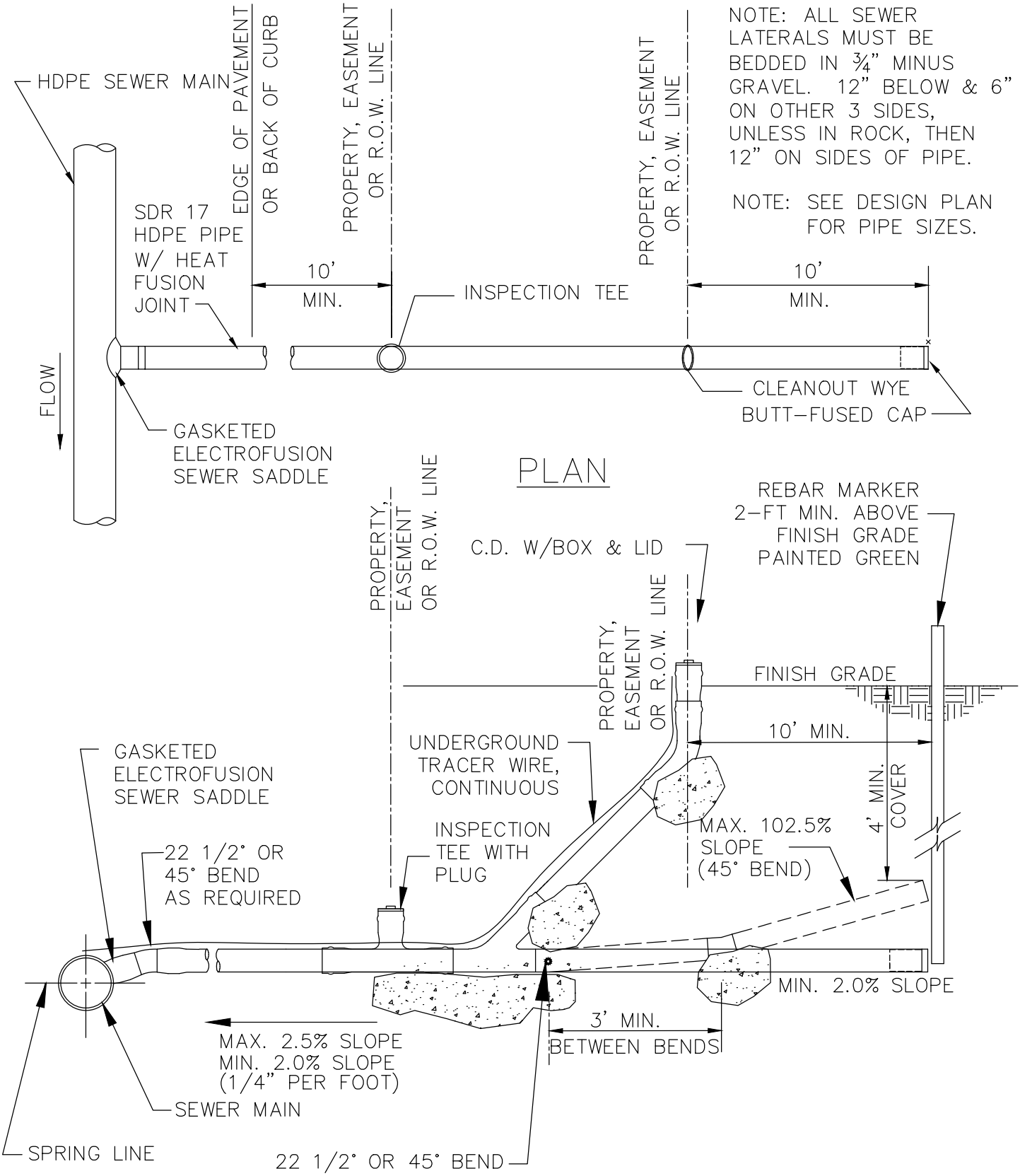
DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

PUMP LOT SANITARY SEWER LATERAL STUB

DWG. 300.14A



Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	**SANITARY SEWER** **HDPE MAIN LINE TO PVC LATERAL LINE**	DWG. 300.14B

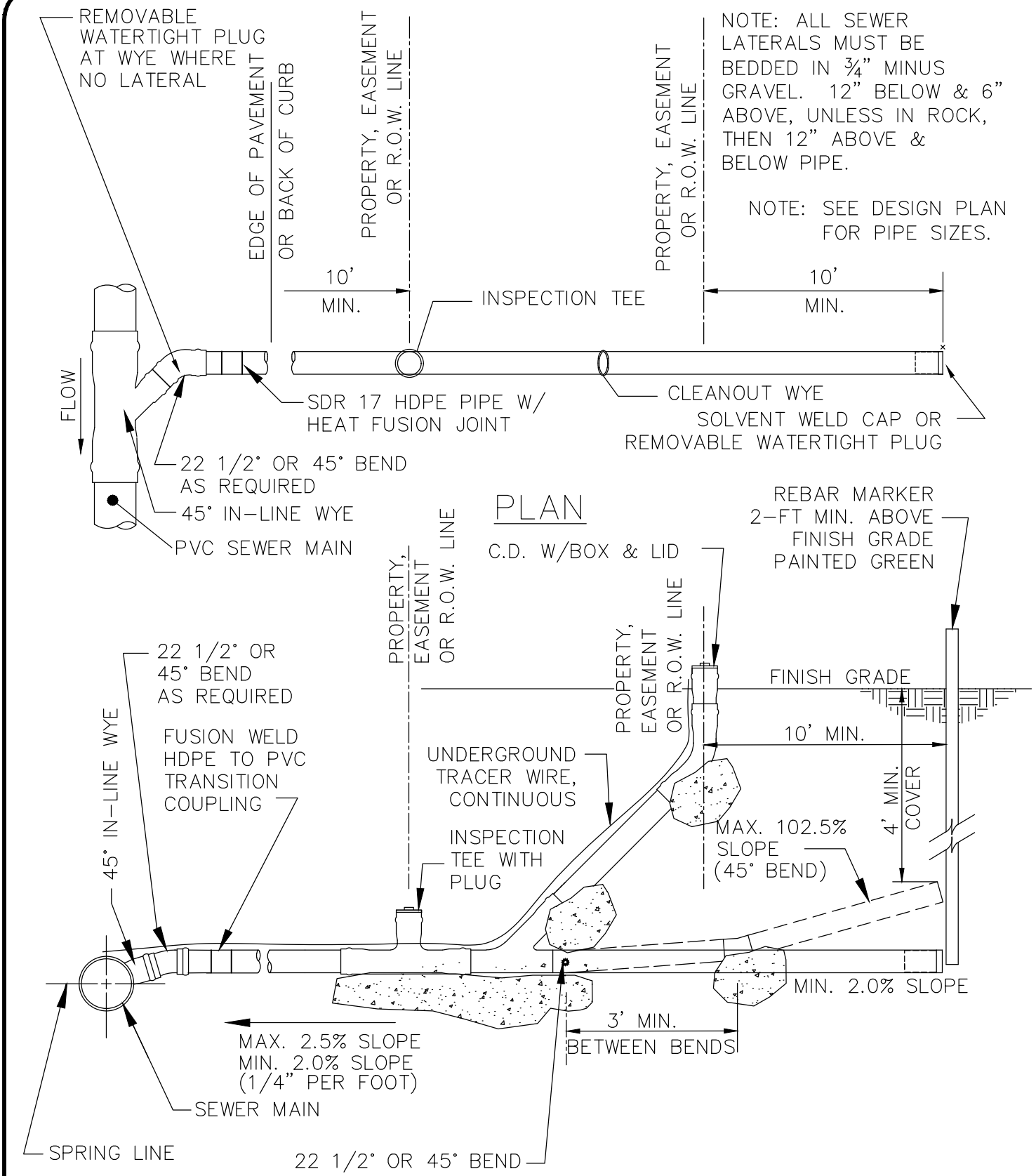


PLAN

INSTALL SEWER WARNING TAPE 2'-3' ABOVE PIPE

PROFILE

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	**SANITARY SEWER** **HDPE MAIN LINE TO HDPE LATERAL LINE**	DWG. 300.14C

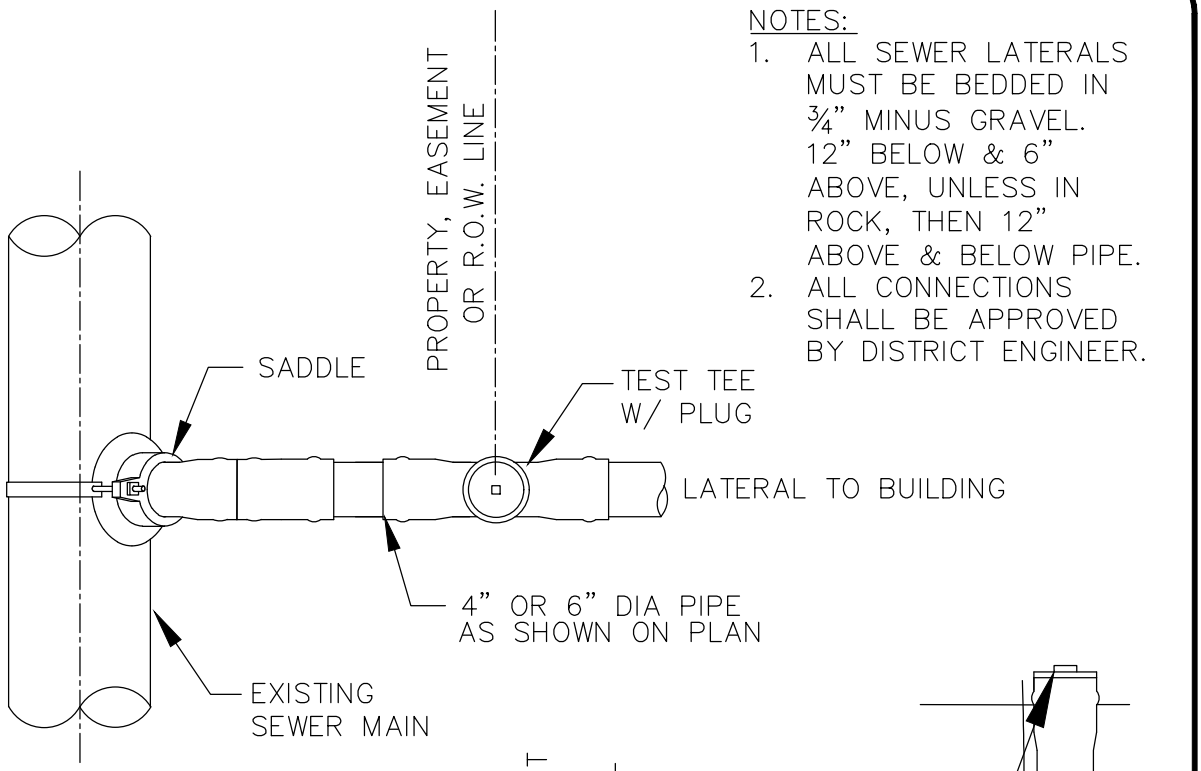


INSTALL SEWER WARNING TAPE 2'-3' ABOVE PIPE

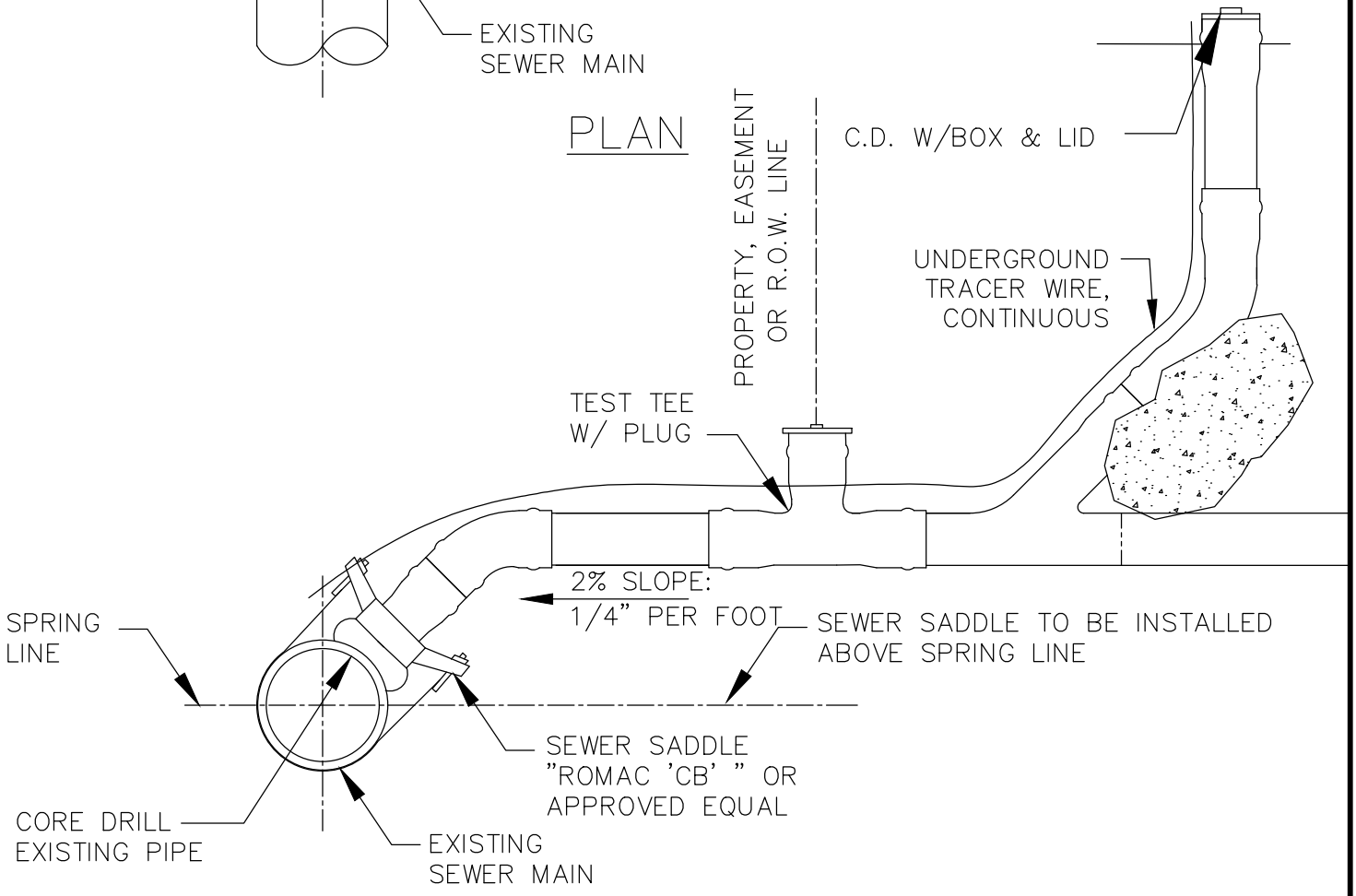
PROFILE

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	SANITARY SEWER PVC MAIN LINE TO HDPE LATERAL LINE	DWG. 300.14D

NOTES:
1. ALL SEWER LATERALS MUST BE BEDDED IN ¾" MINUS GRAVEL. 12" BELOW & 6" ABOVE, UNLESS IN ROCK, THEN 12" ABOVE & BELOW PIPE.
2. ALL CONNECTIONS SHALL BE APPROVED BY DISTRICT ENGINEER.



PLAN



PROFILE

FOR DETAILED INFORMATION SEE SPECIFICATIONS

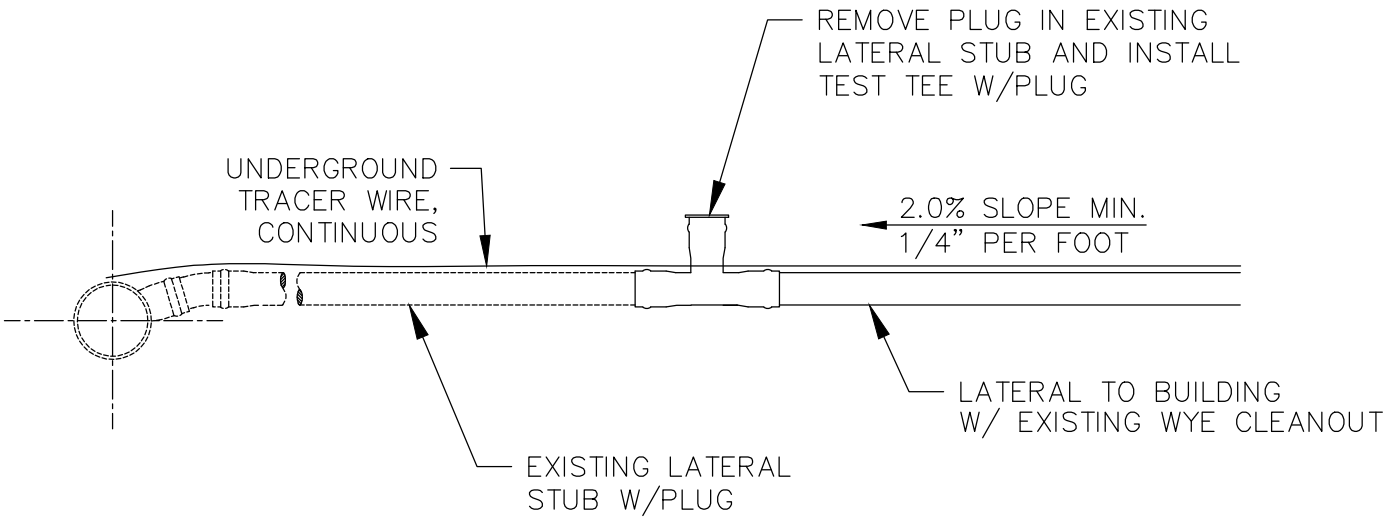
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

LATERAL CONNECTION TO EXISTING SEWER MAIN

DWG. 300.15

NOTE: ALL SEWER LATERALS MUST BE BEDDED IN ¾" MINUS GRAVEL. 12" BELOW & 6" ABOVE, UNLESS IN ROCK, THEN 12" ABOVE & BELOW PIPE.



NOTES
1. VERIFY CONDITION OF EXISTING STUB PRIOR TO CONNECTION
2. INSTALL SEWER WARNING TAPE 2'–3' ABOVE PIPE

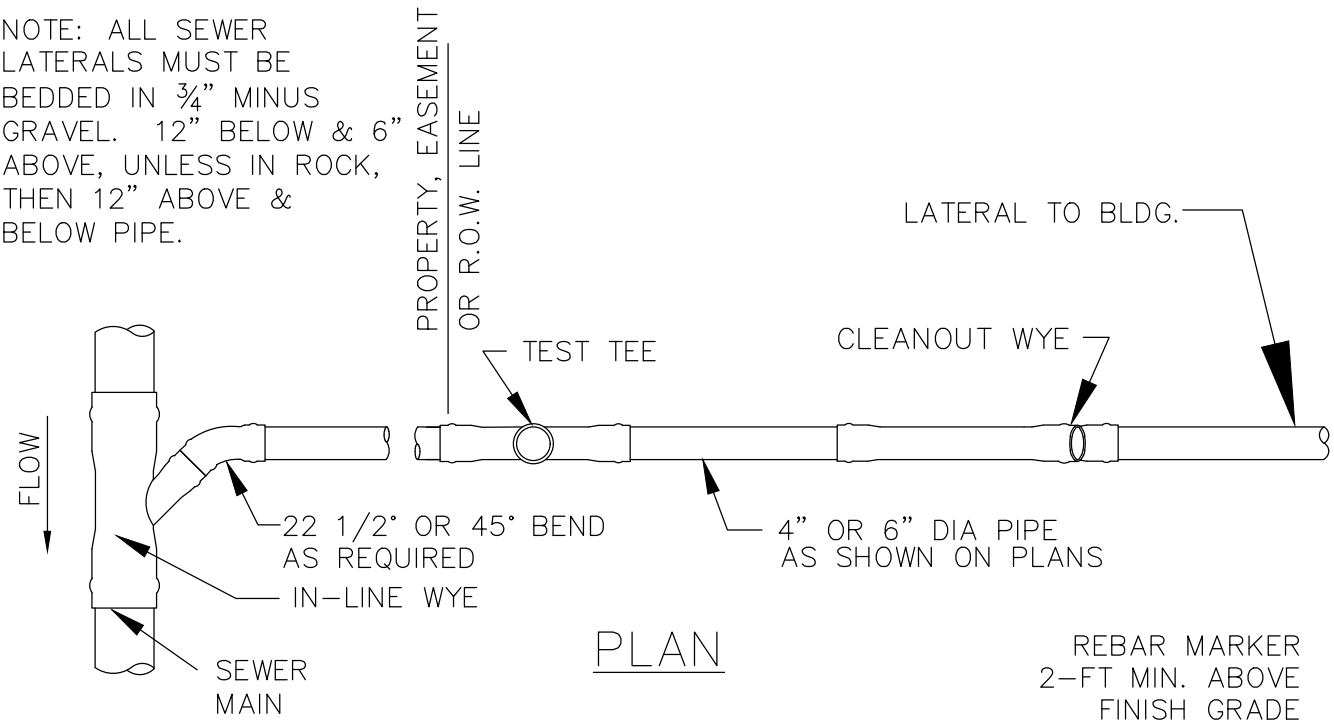
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

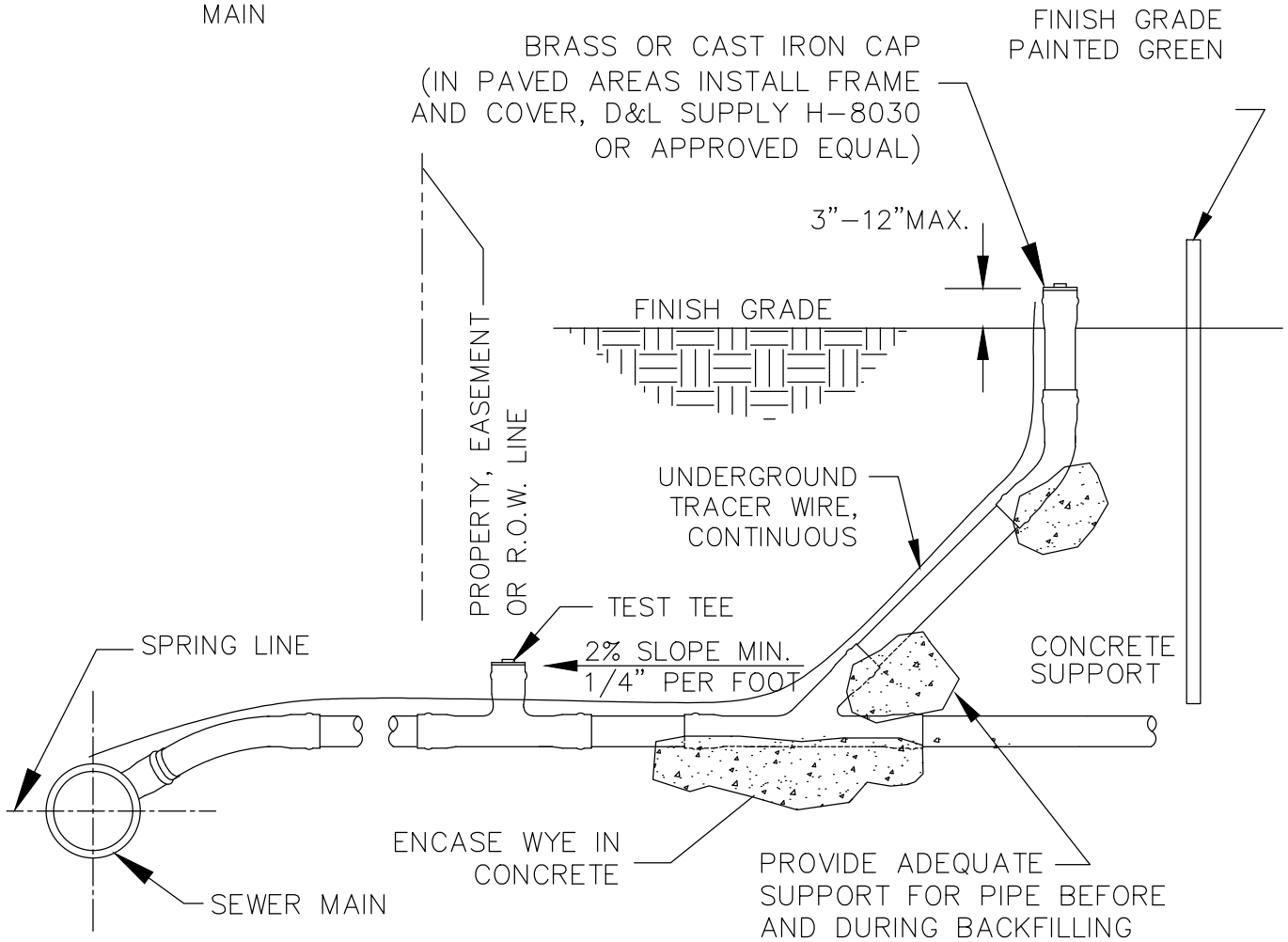
LATERAL CONNECTION TO EXISTING LATERAL STUB

DWG. 300.16

NOTE: ALL SEWER LATERALS MUST BE BEDDED IN ¾" MINUS GRAVEL. 12" BELOW & 6" ABOVE, UNLESS IN ROCK, THEN 12" ABOVE & BELOW PIPE.



PLAN



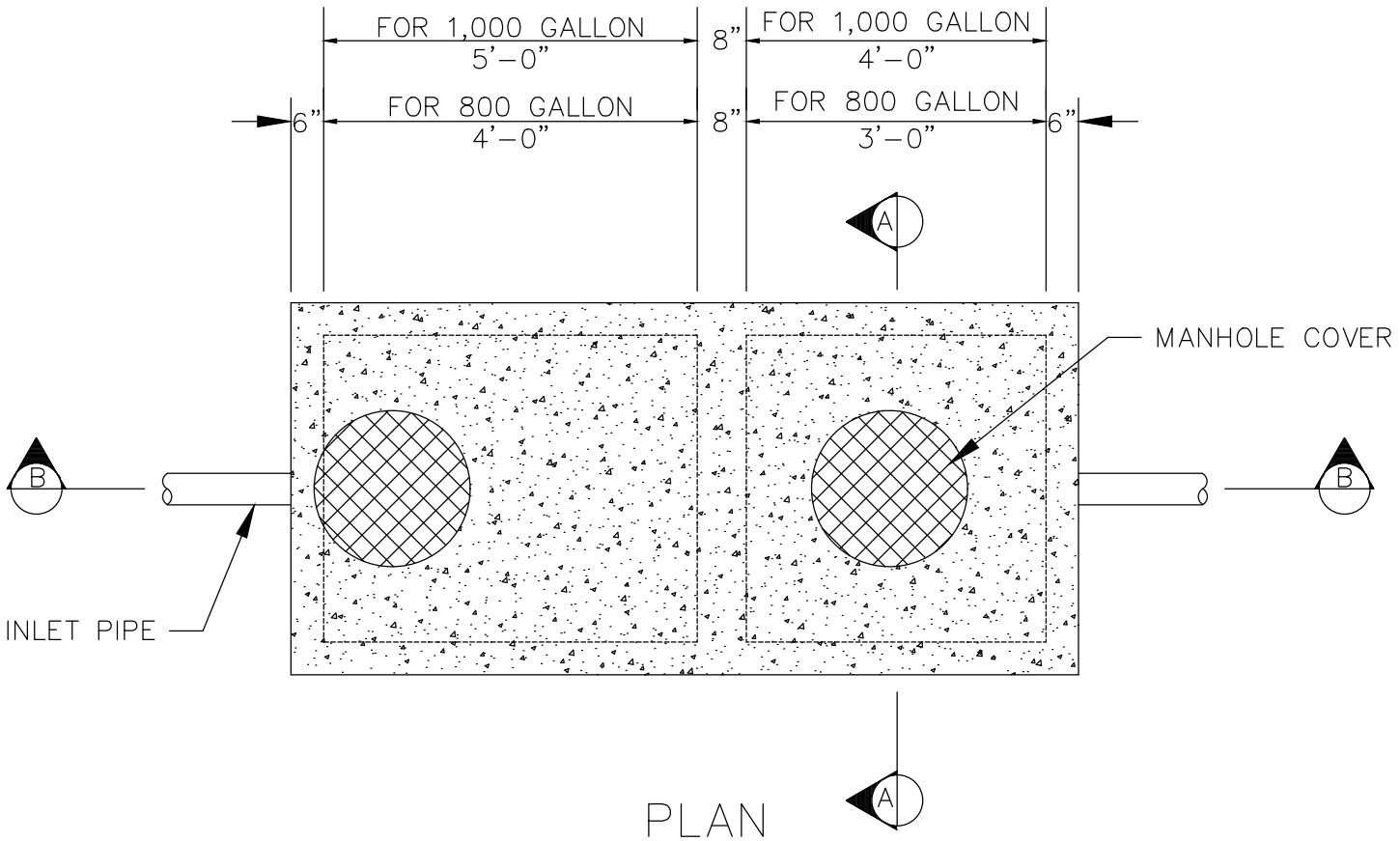
PROFILE

FOR DETAILED INFORMATION SEE SPECIFICATIONS

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	**SANITARY SEWER CLEANOUT**	DWG. 300.17

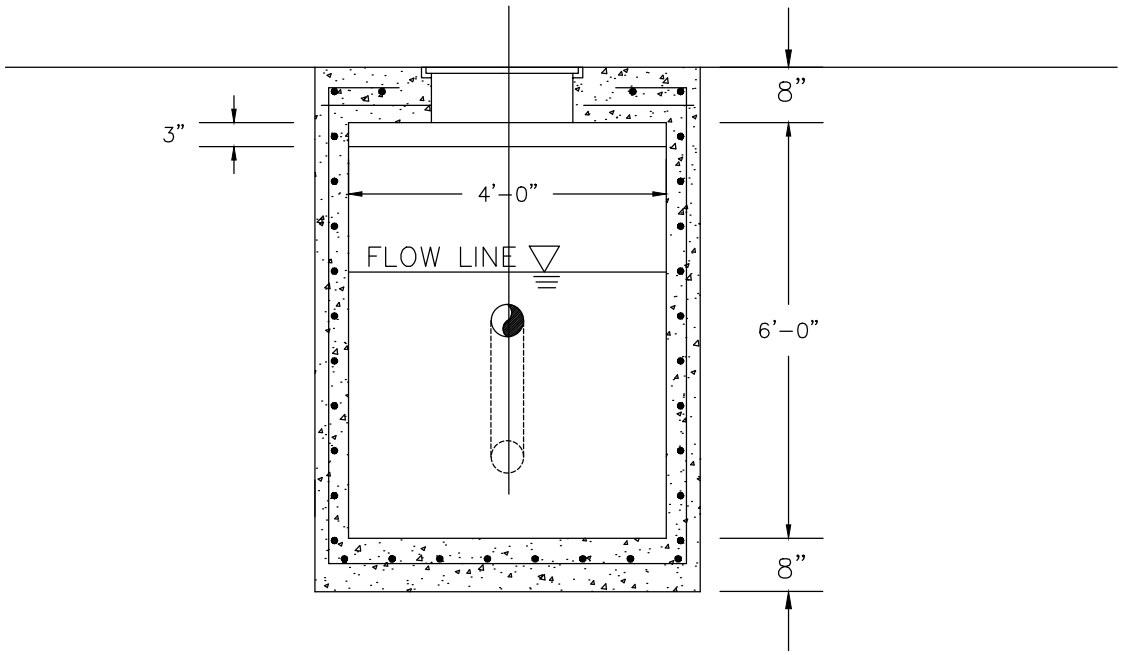
NOTES:

1. CONCRETE SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 4000 PSI.
2. REINFORCING STEEL SHALL BE ASTM A615 GRADE 60.
3. CONCRETE COVER OVER REINFORCING STEEL SHALL BE A MINIMUM OF 1 1/2".
4. STRUCTURE SHALL BE DESIGNED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE STATE OF UTAH.
5. STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOADING CRITERIA:
   A) WALLS DESIGNED FOR A SATURATED EQUIVALENT FLUID AT-REST SOIL PRESSURE OF 90 PCF PLUS TRUCK SURCHARGE
   B) DESIGN SURCHARGE LOADING: AASHTO H-20 TRUCK LOAD.
6. PIPING PER DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS.
7. THE MANHOLE FRAME & COVER SHALL BE A TRAFFIC TYPE CASTING FOR H-20 TRUCK LOAD.
8. COVERS SHALL BE CIRCULAR AND SHALL BE SOLID WITH PICKHOLES FOR REMOVAL
9. THE INLET PIPE SHALL BE ONE INCH HIGHER THAN THE OUTLET PIPE.
10. PLUMBING ON THE UPSTREAM SIDE OF THE GREASE INTERCEPTOR SHALL BE IN ACCORDANCE WITH LOCAL REGULATIONS.
11. SANITARY WASTES SHALL NOT BE PLUMBED TO GREASE INTERCEPTOR.
12. WHERE THE SEWER LINE ALREADY EXISTS, THE SEWER INVERT INTO AND OUT OF THE INTERCEPTOR MAY BE 4'-0" ABOVE THE TANK FLOOR.

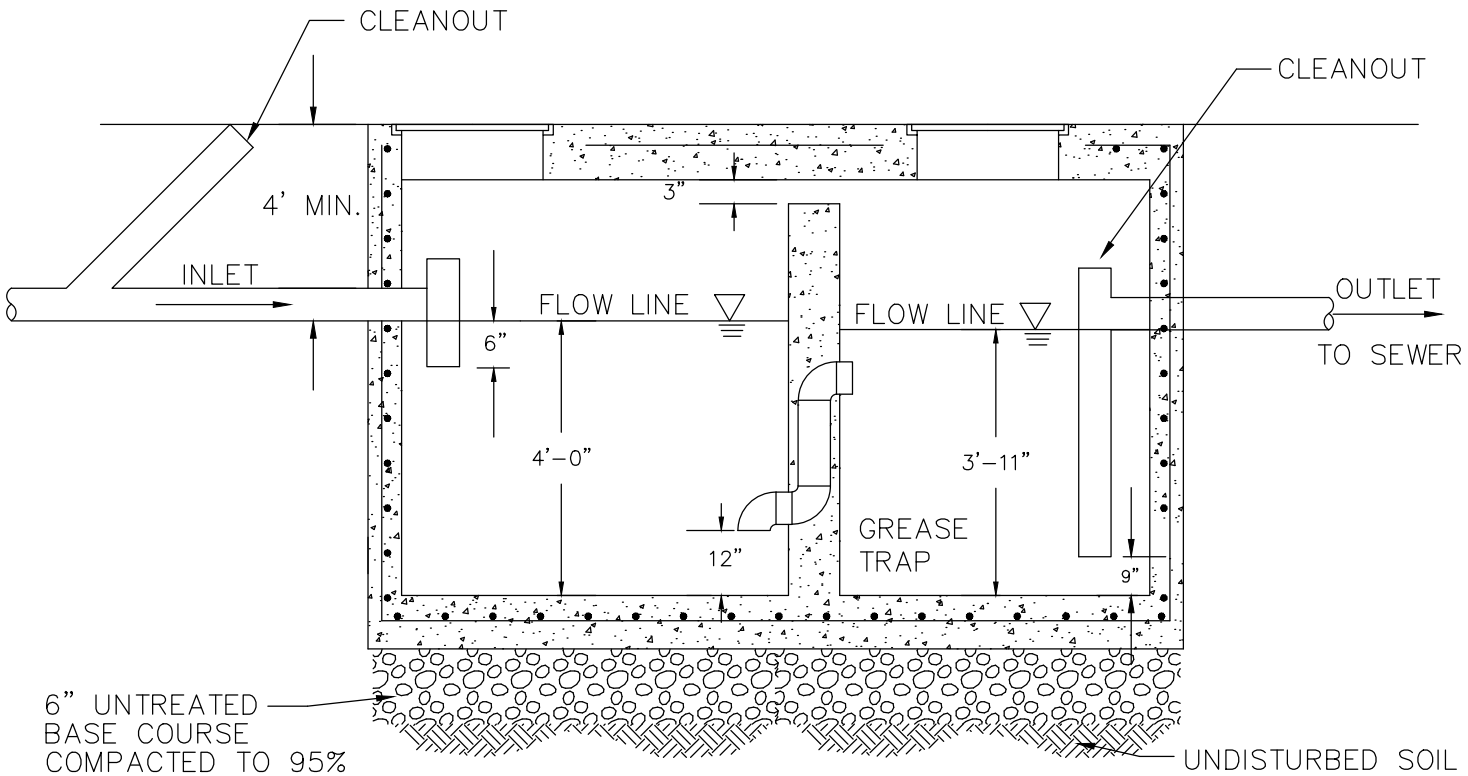


PLAN

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	GREASE INTERCEPTOR	DWG. 300.18



SECTION A

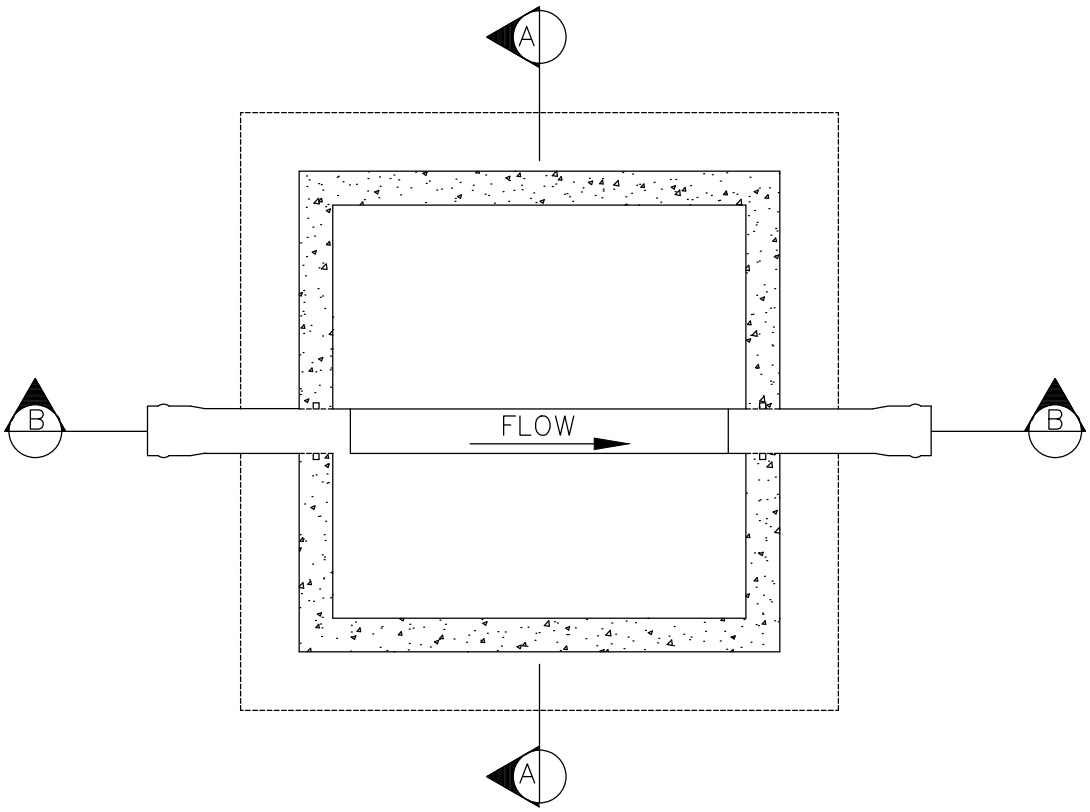


SECTION B

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	GREASE INTERCEPTOR	DWG. 300.18A

NOTES:

1. CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI.
2. REINFORCING STEEL SHALL BE ASTM A615 GRADE 60.
3. CONCRETE COVER OVER REINFORCING STEEL SHALL BE A MINIMUM OF 1 1/2 INCHES.
4. STRUCTURE SHALL BE DESIGNED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE STATE OF UTAH.
5. STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOADING CRITERIA:
   A) WALLS DESIGNED FOR A SATURATED EQUIVALENT FLUID AT-REST SOIL PRESSURE OF 90 PCF PLUS TRUCK SURCHARGE.
   B) DESIGN SURCHARGE LOADING: AASHTO H-20 TRUCK LOAD.
6. PIPING PER DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS.
7. ALL MANHOLES OVER 4 FEET IN DEPTH SHALL HAVE STAINLESS STEEL OR PLASTIC STEPS.
8. ALL MANHOLES SHALL HAVE ROUND NOTCHED LIDS WITH PICKHOLE FOR REMOVAL.
9. FOR NEW CONSTRUCTION, INLET PIPE INVERT MUST BE AT LEAST 4 INCHES ABOVE HIGHEST STRUCTURE INVERT.
10. MINIMUM WIDTH OF CHANNEL WITHIN MANHOLE TO BE DIAMETER OF PIPE.
11. MANHOLE BASE, WALL, CONE SECTION, AND GRADE RINGS SHALL CONFORM TO ASTM C478.
12. 4 FOOT DIAMETER MANHOLE MAY BE PROVIDED IN LIEU OF 5 FOOT SQUARE WITH APPROVAL OF JSSD.



PLAN

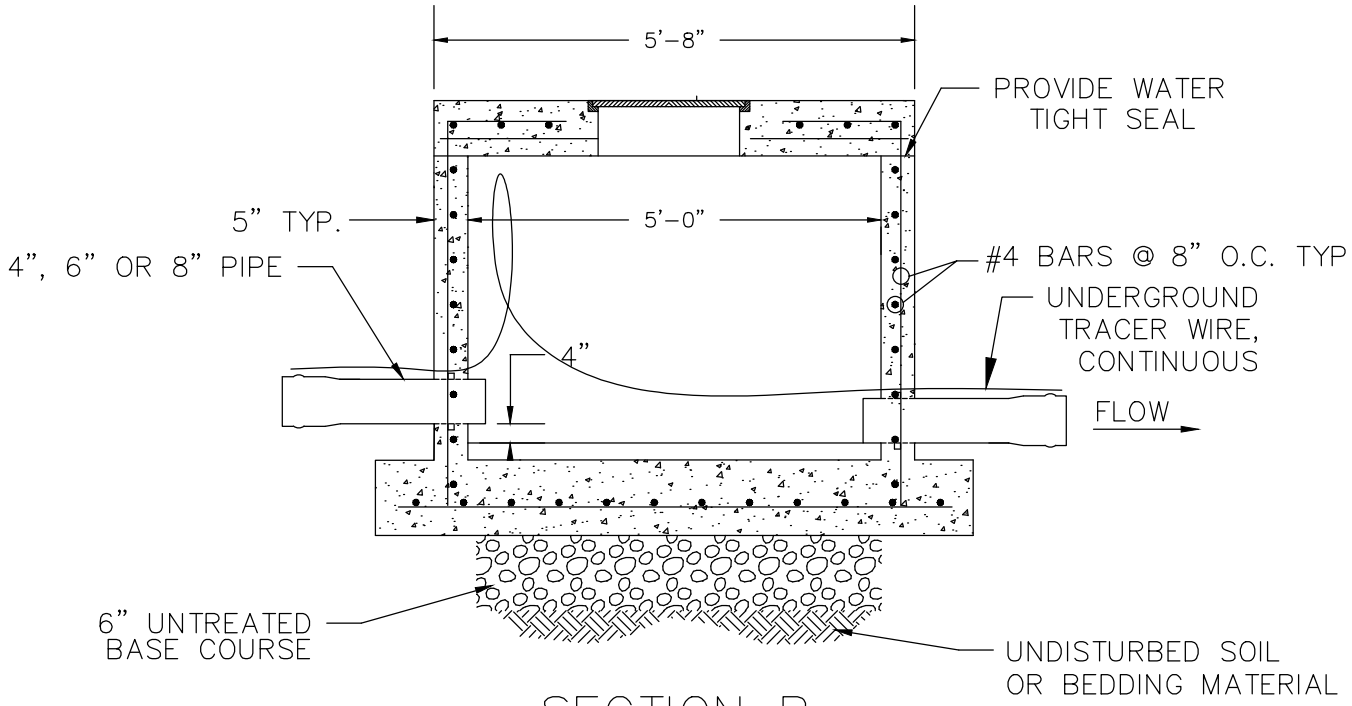
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

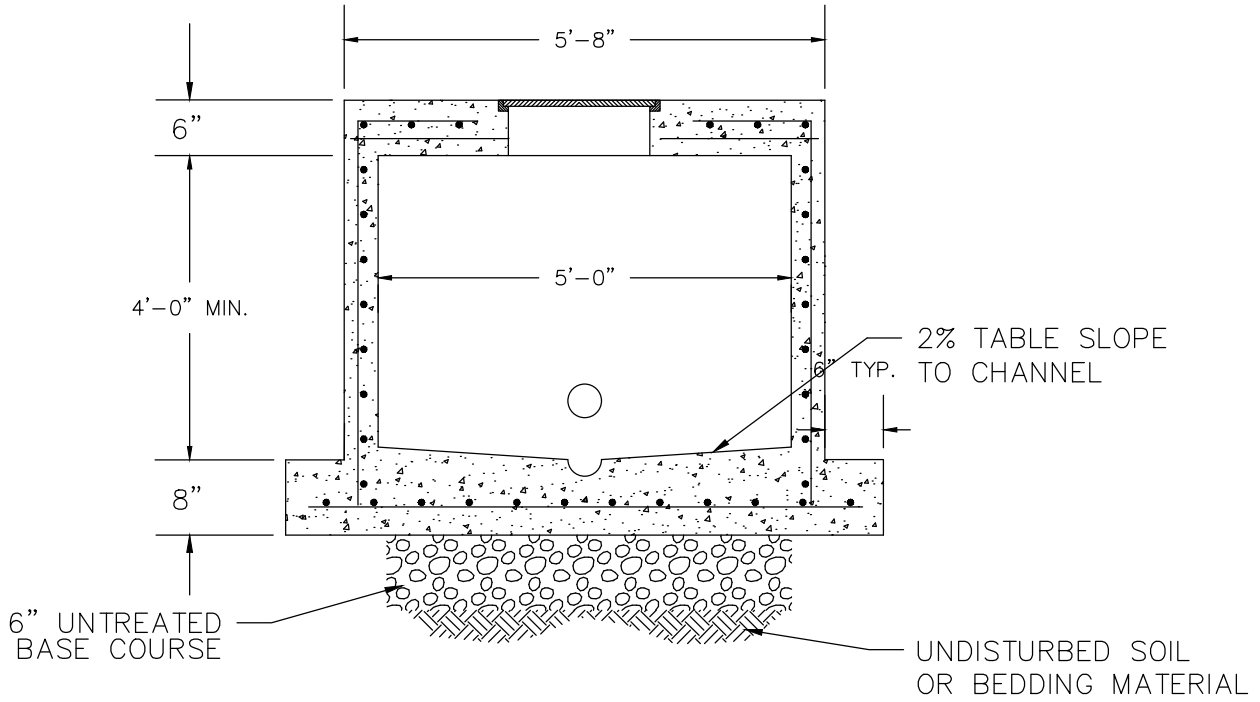
SAMPLING MANHOLE LESS THAN 6 FEET DEEP

DWG. 300.19

XYPEX MANHOLE OR APPROVED EQUIVALENT



SECTION B



SECTION A

Jordanelle

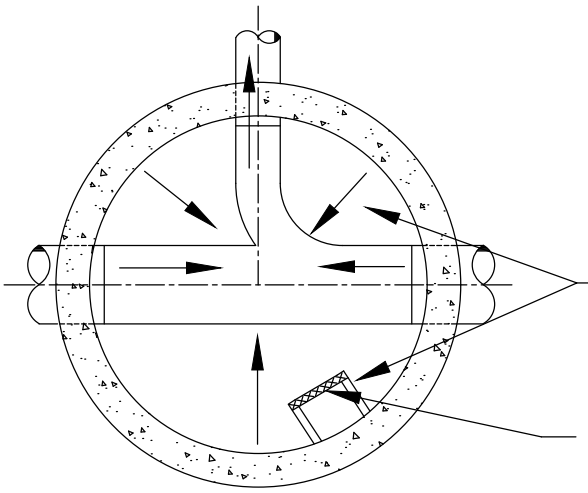
DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

SAMPLING MANHOLE LESS THAN 6 FEET DEEP

DWG. 300.19A

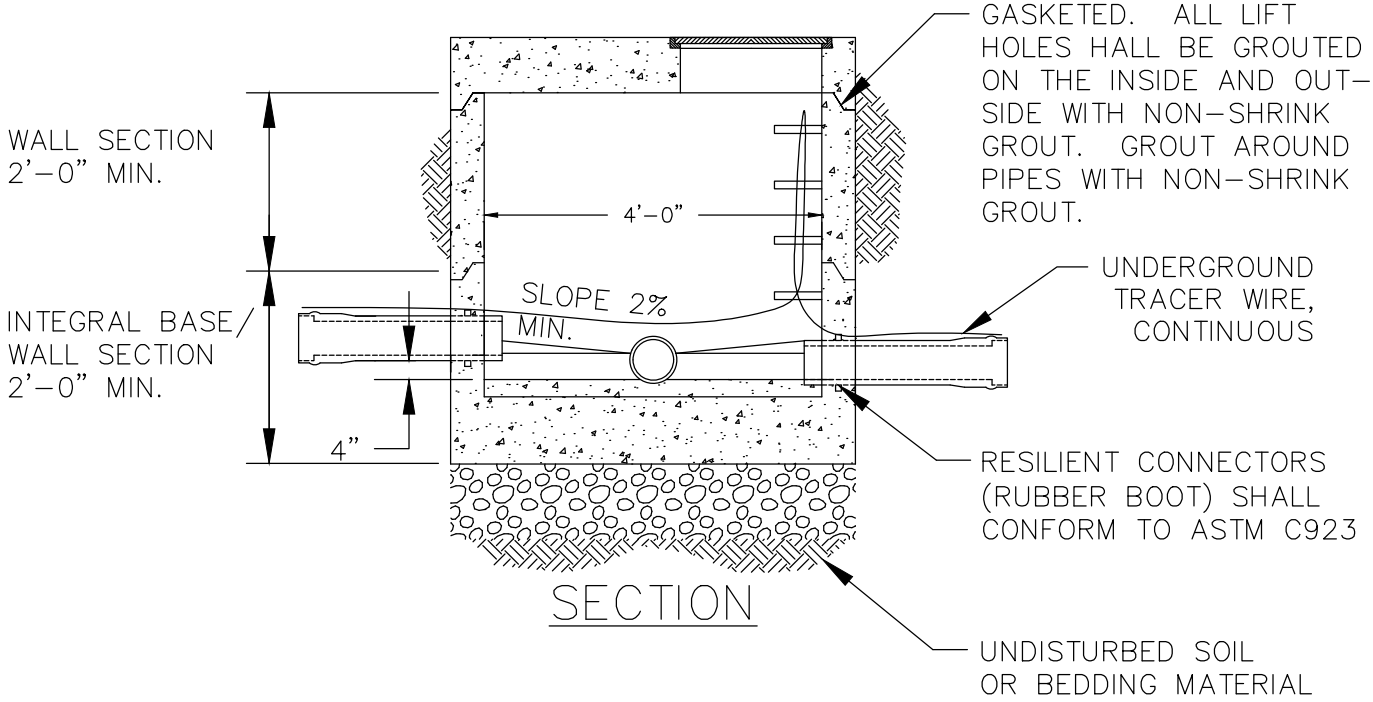
XYPEX MANHOLE OR APPROVED EQUIVALENT

ANY MAHOLE WITH 3 OR MORE PIPE LINES ENTERING & EXITING WILL BE A MIN. OF 5'



MANHOLE BASE, WALL, CONE SECTIONS, GRADE RINGS AND STEPS SHALL CONFORM TO ASTM C478

PLAN



SECTION

NOTES:

1: CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI.
2: THE STRUCTURE SHALL BE DESIGNED BY A REGISTERED PROFESSIONS ENGINEER LICENSED IN THE STATE OF UTAH
3: THE STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOADING CRITERIA:
   A) WALLS DESIGNED FOR A SATURATED EQUIVALENT FLUID AT-REST SOIL PRESSURE OF 90 PCF PLUS TRUCK SURCHARGE
   B) TRUCK LOADING USING A AASHTO H-20 TRUCK LOAD.
4: PIPING PER DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS.
5: ALL MANHOLES MUST HAVE ROUND LIDS, WITH PICKHOLE FOR REMOVAL
6: THE WYE SHOWN IN THE PLAN MUST BE IN THE MANHOLE
7: (NEW CONSTRUCTION) INLET PIPE MUST BE AT LEAST 4" ABOVE THE BOTTOM OF THE INVERT
8: THE MINIMUM WIDTH OF CHANNEL WITHIN MANHOLE TO BE DIAMETER OF PIPE.

Jordanelle

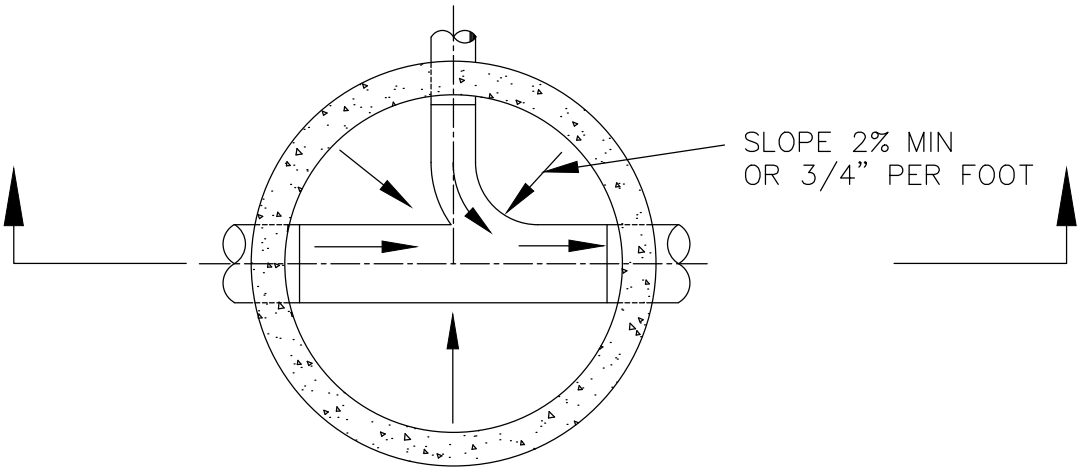
DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

CIRCULAR SAMPLING MANHOLE LESS THAN 6 FEET DEEP

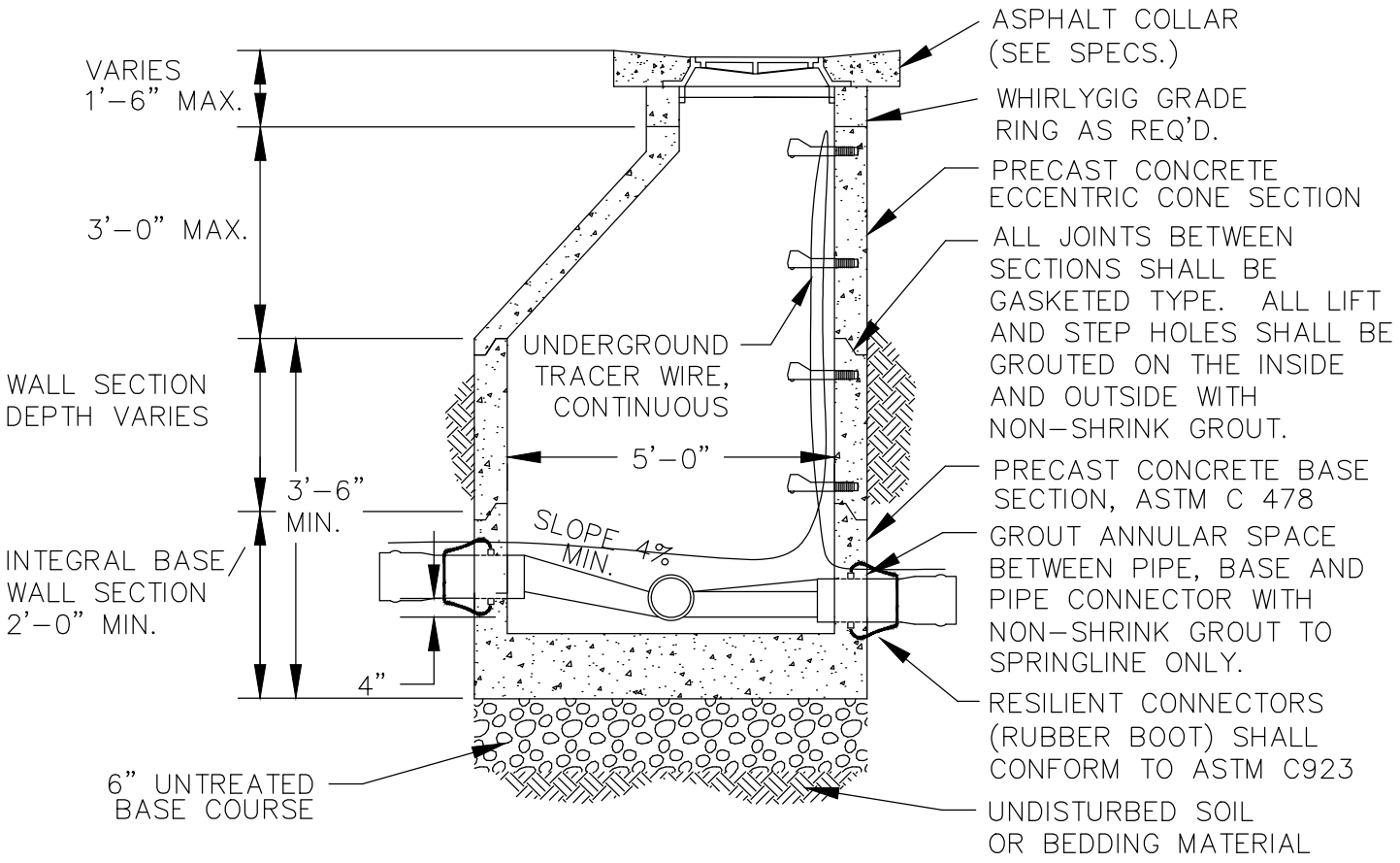
DWG. 300.19B

XYPEX MANHOLE OR APPROVED EQUIVALENT

ANY MAHOLE WITH 3 OR MORE PIPE LINES ENTERING & EXITING WILL BE A MIN. OF 5'



PLAN



SECTION

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	SAMPLING MANHOLE 6 FEET AND DEEPER	DWG. 300.20

NOTES:

1. CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI.
2. REINFORCING STEEL SHALL BE ASTM A615 GRADE 60.
3. CONCRETE COVER OVER REINFORCING STEEL SHALL BE A MINIMUM OF 1 1/2 INCHES.
4. STRUCTURE SHALL BE DESIGNED BY A REGISTERED PROFESSIONAL ENGINEER LICENSED IN THE STATE OF UTAH.
5. STRUCTURE SHALL BE DESIGNED FOR THE FOLLOWING LOADING CRITERIA:

   A) WALLS DESIGNED FOR A SATURATED EQUIVALENT FLUID AT-REST SOIL PRESSURE OF 90 PCF PLUS TRUCK SURCHARGE.

   B) DESIGN SURCHARGE LOADING: AASHTO H-20 TRUCK LOAD.
6. PIPING PER DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS.
7. ALL MANHOLES OVER 4 FEET IN DEPTH SHALL HAVE STAINLESS STEEL OR PE STEPS.
8. ALL MANHOLES SHALL HAVE ROUND NOTCHED LIDS WITH PICKHOLE FOR REMOVAL.
9. THE WYE SHOWN IN THE PLAN VIEW MUST BE IN THE MANHOLE.
10. FOR NEW CONSTRUCTION, INLET PIPE INVERT MUST BE AT LEAST 4 INCHES ABOVE THE HIGHEST STRUCTURE INVERT.
11. MINIMUM WIDTH OF CHANNEL WITHIN MANHOLE TO BE DIAMETER OF PIPE.
12. MANHOLE BASE, WALL, CONE SECTION, GRADE RINGS AND STEPS SHALL CONFORM TO ASTM C478.

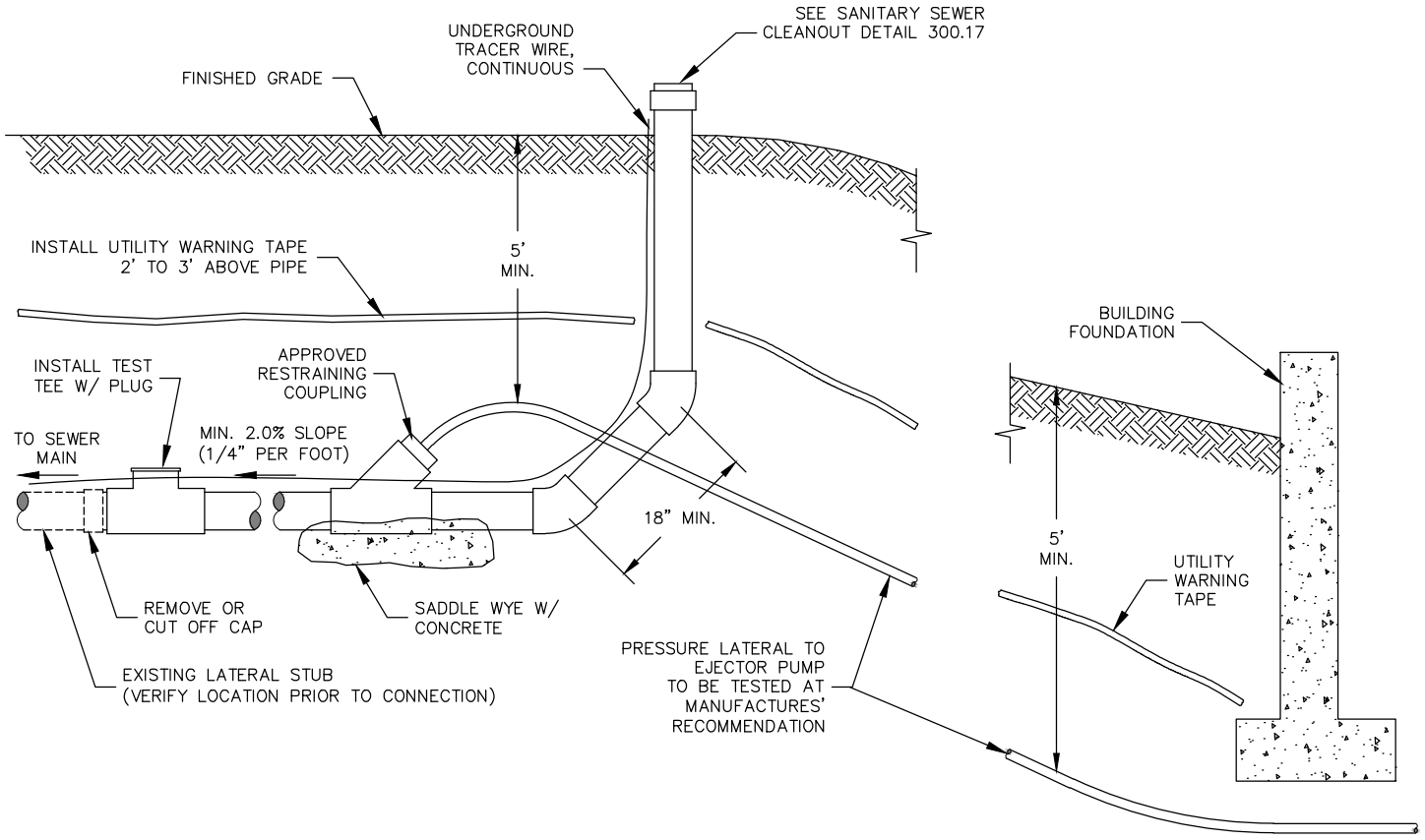
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

SAMPLING MANHOLE 6 FEET AND DEEPER

DWG. 300.20A

NOTE: ALL SEWER LATERALS MUST BE BEDDED IN ¾" MINUS GRAVEL. 12" BELOW & 6" ABOVE, UNLESS IN ROCK, THEN 12" ABOVE & BELOW PIPE.

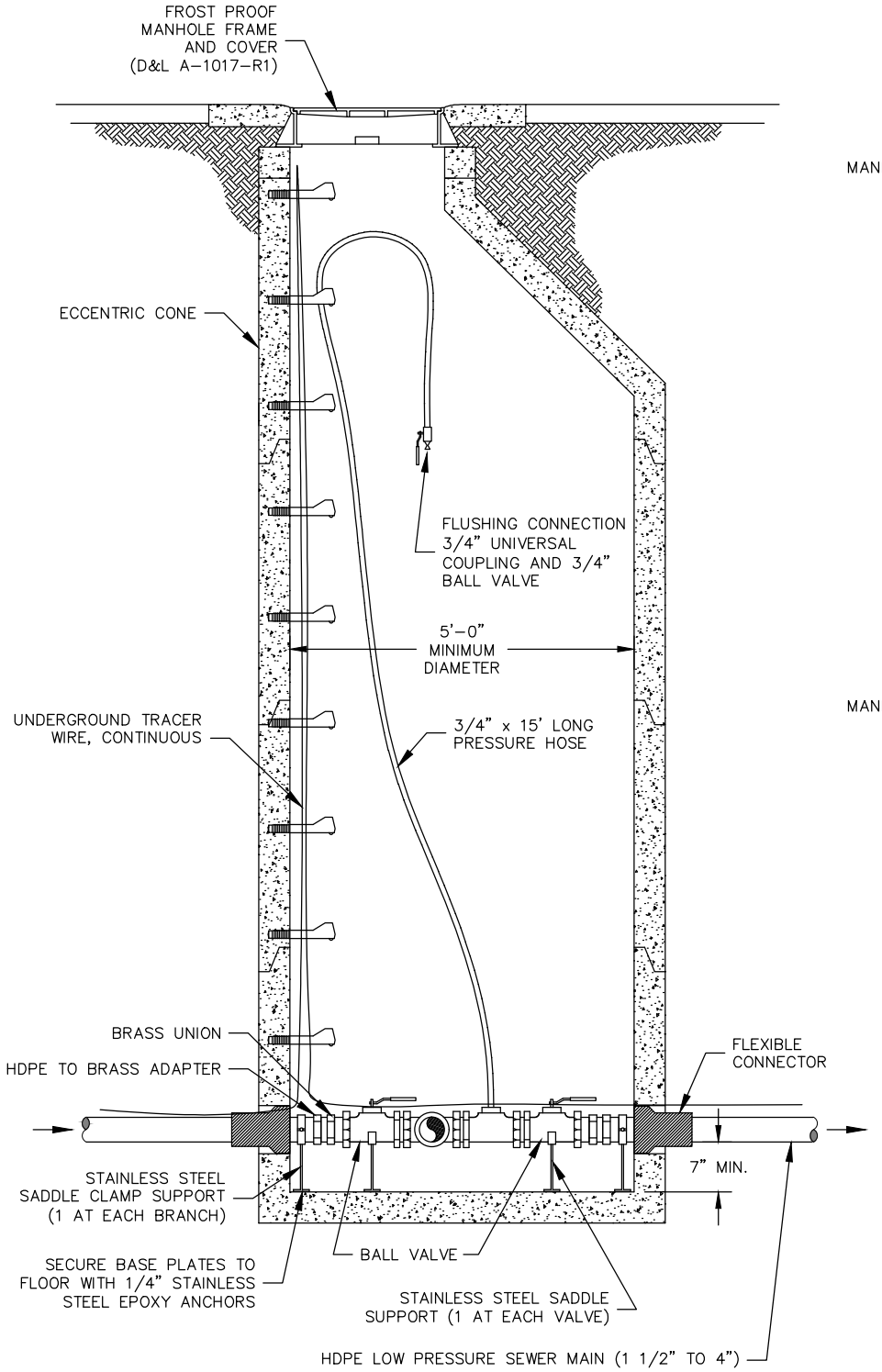


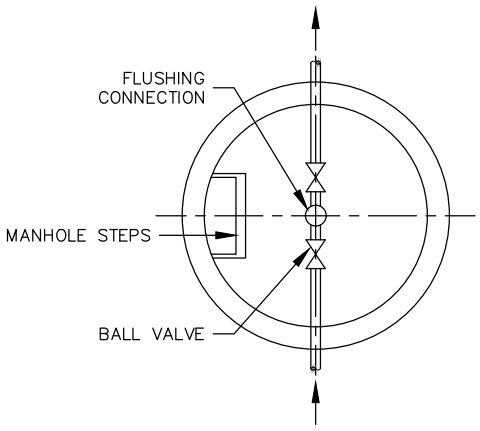
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

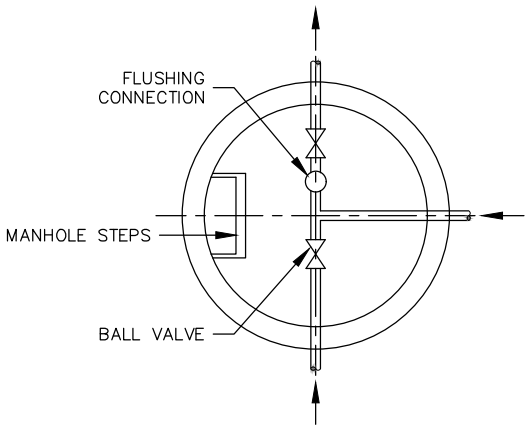
SANITARY SEWER PRESSURE LINE TO GRAVITY LINE CONNECTION

DWG. 300.21

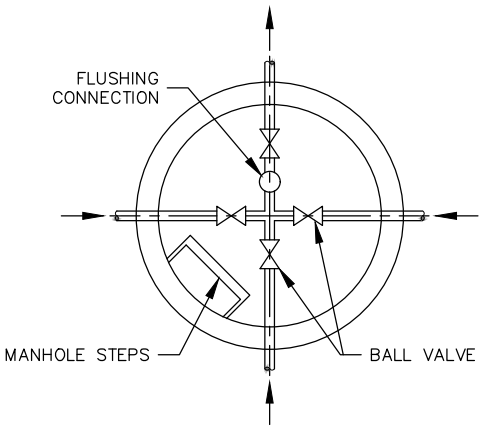




2-WAY (IN-LINE)
FLUSHING CONNECTION



3-WAY
FLUSHING CONNECTION

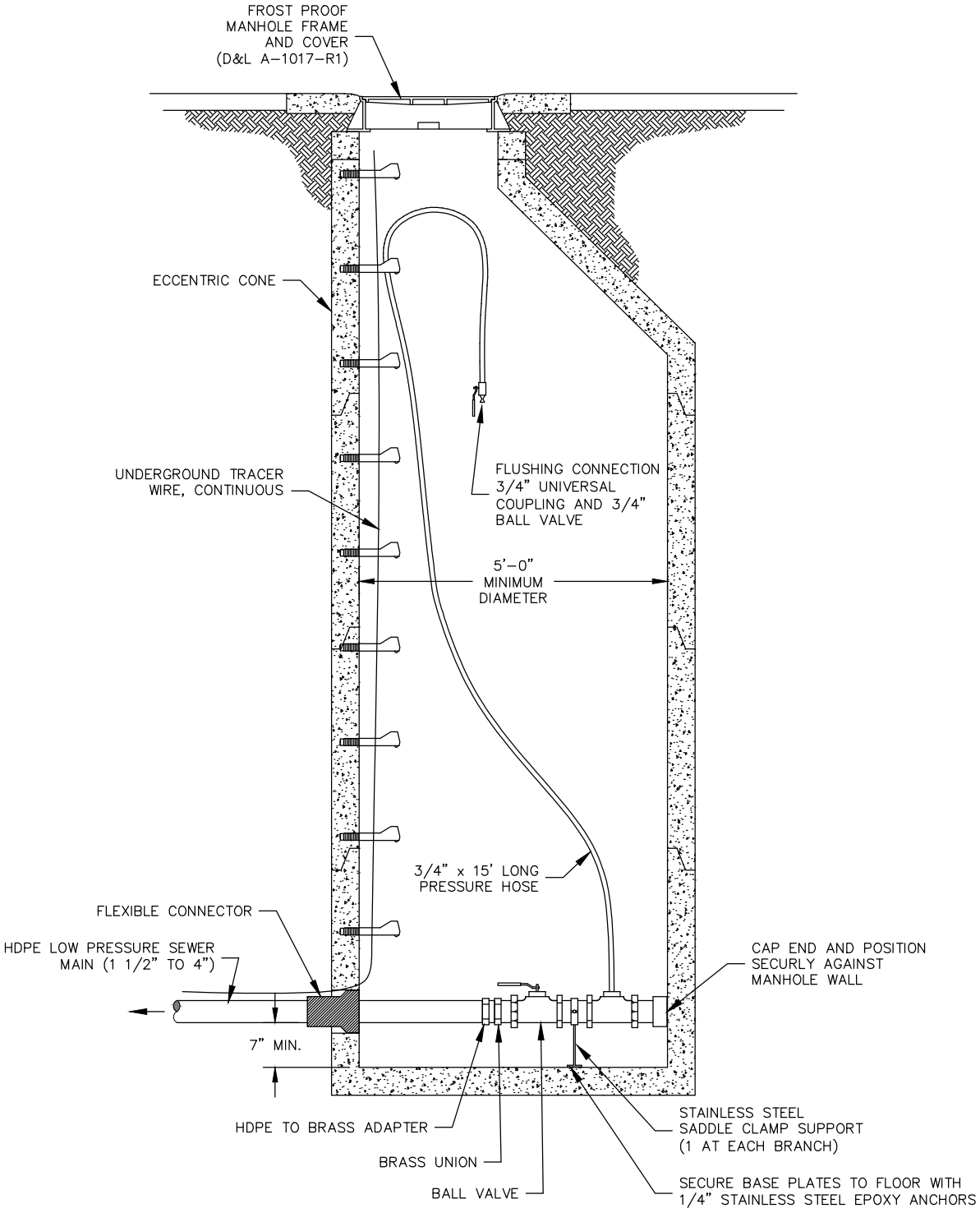


4-WAY
FLUSHING CONNECTION

NOTES:

1. ALL PIPES AND FITTINGS SHALL BE BRASS.
2. FOR DETAILED MANHOLE INSTALLATION REFER TO STANDARD DETAIL 300.3.

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	LOW PRESSURE FLUSHING CONNECTION	DWG. 300.22



NOTES:

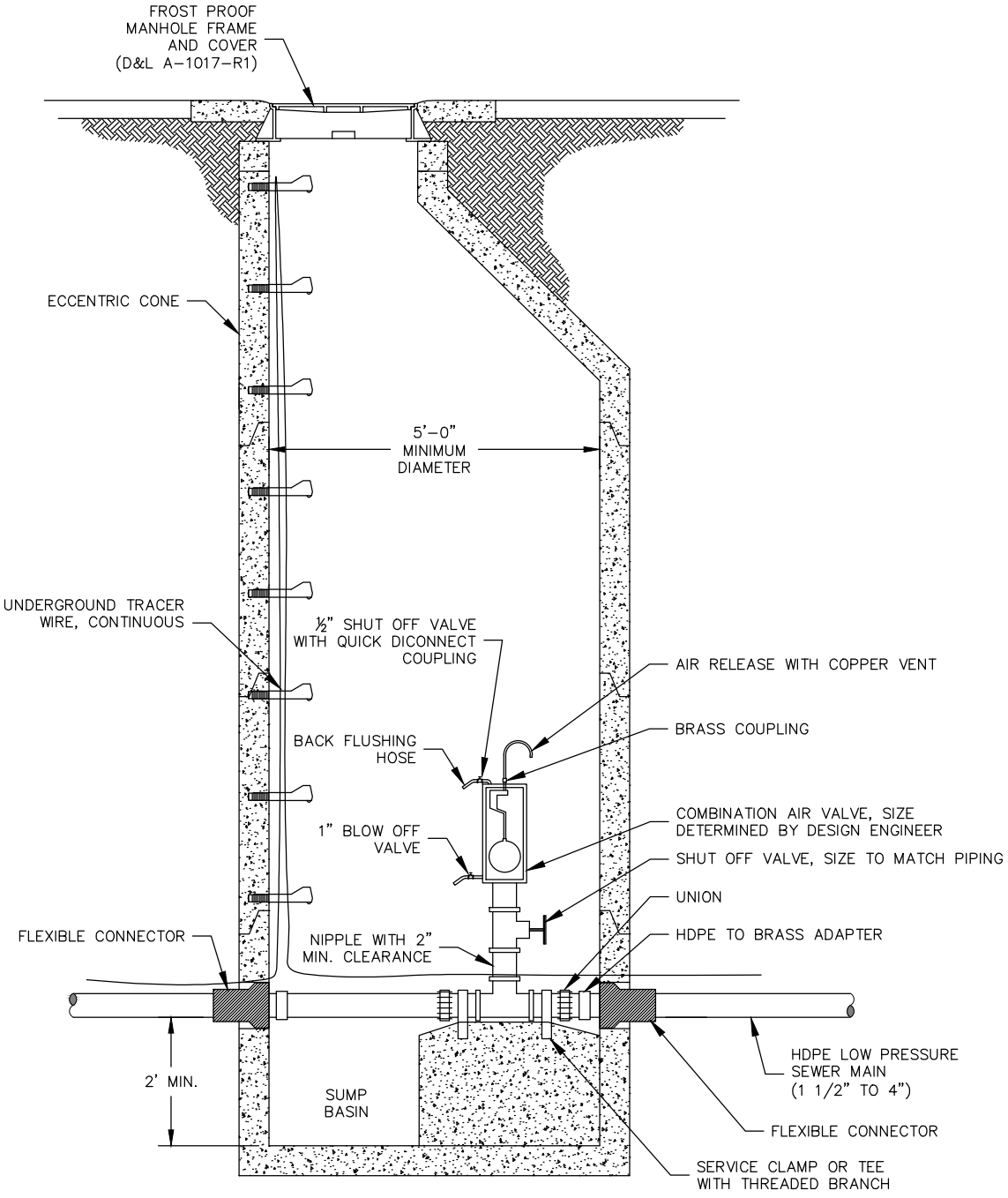
1. ALL PIPES AND FITTINGS SHALL BE BRASS.
2. FOR DETAILED MANHOLE INSTALLATION REFER TO STANDARD DETAIL 300-3.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

DEAD END LOW PRESSURE FLUSHING CONNECTION

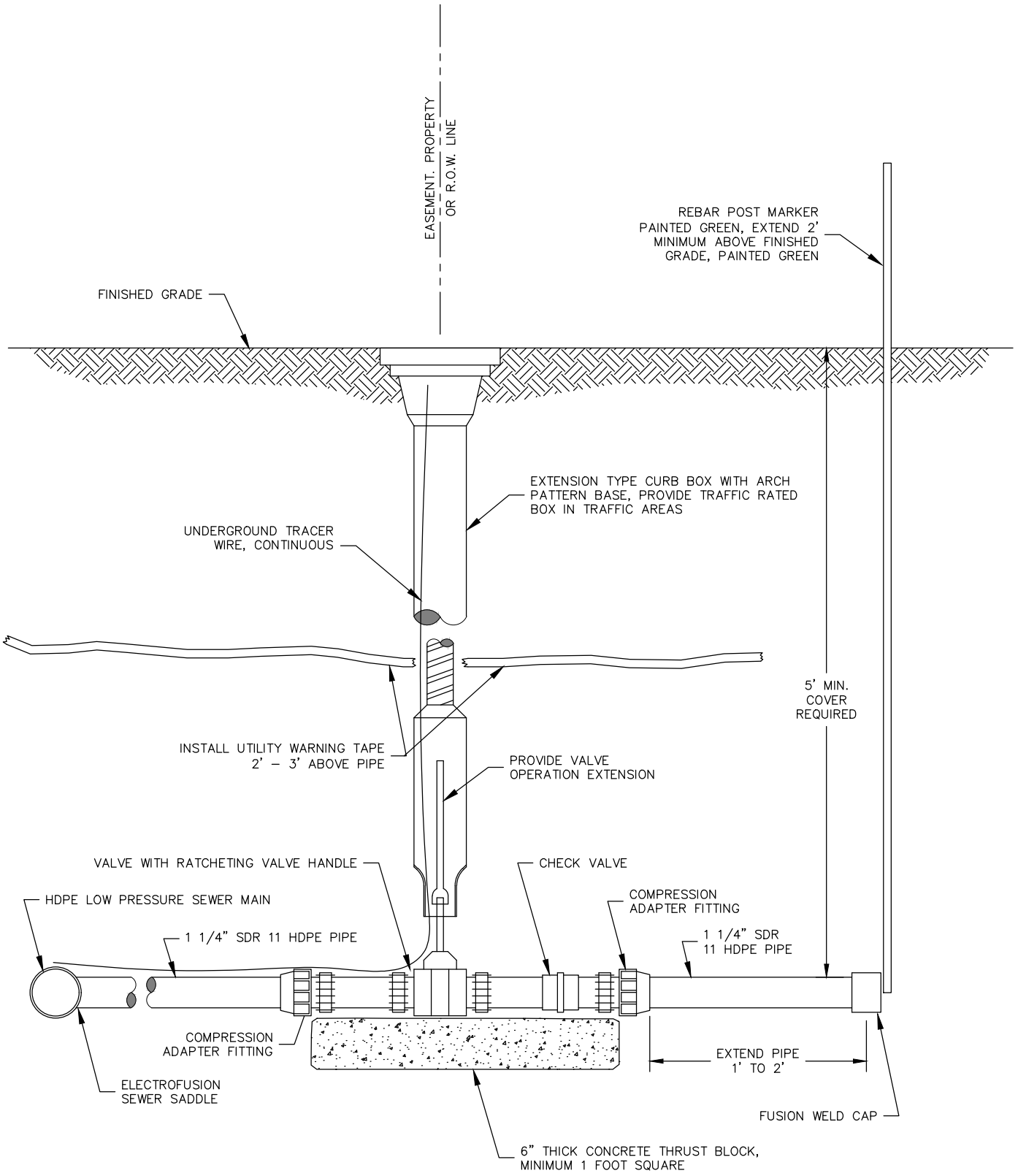
DWG. 300.23



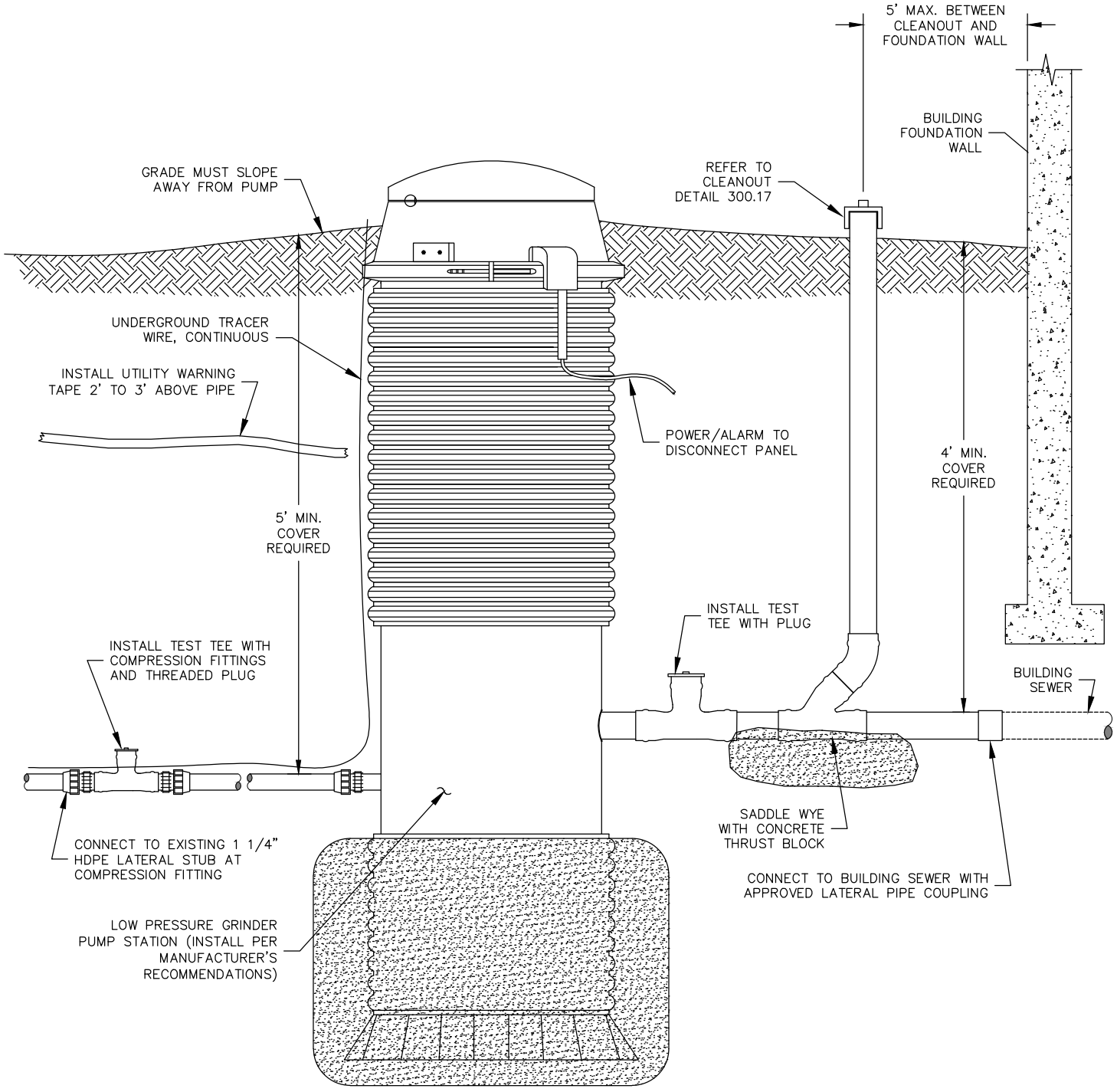
NOTES:

1. ALL PIPES AND FITTINGS SHALL BE BRASS.
2. FOR DETAILED MANHOLE INSTALLATION REFER TO STANDARD DETAIL 300-3.

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	LOW PRESSURE COMBINATION AIR VALVE	DWG. 300.24



Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	LOW PRESSURE PRIVATE LATERAL STUB	DWG. 300.25



Jordanelle

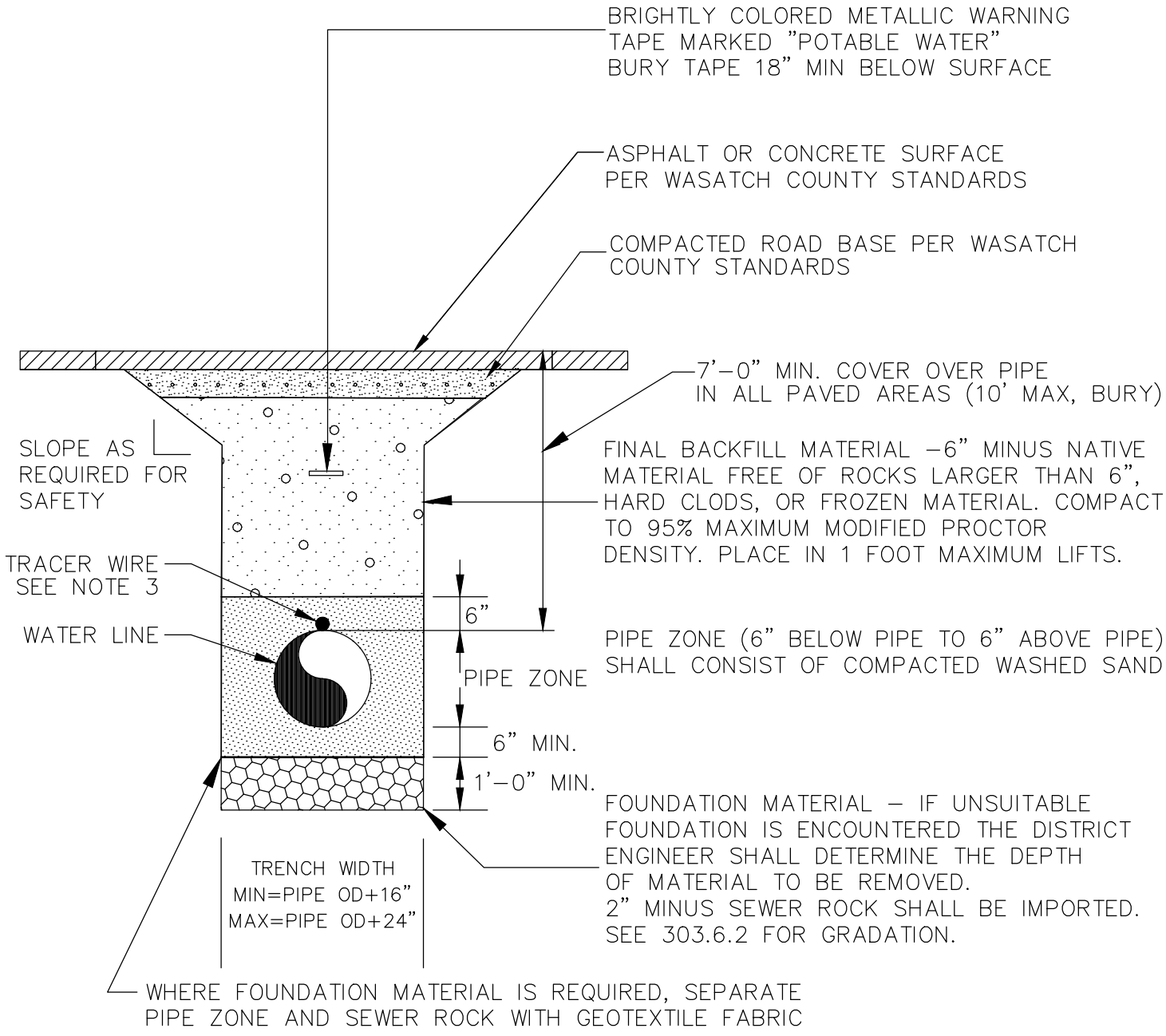
DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

LOW PRESSURE LATERAL STUB TO BUILDING CONNECTION

DWG. 300.26

Standard Drawings
Potable Water

Revised: May 2016



NOTES:

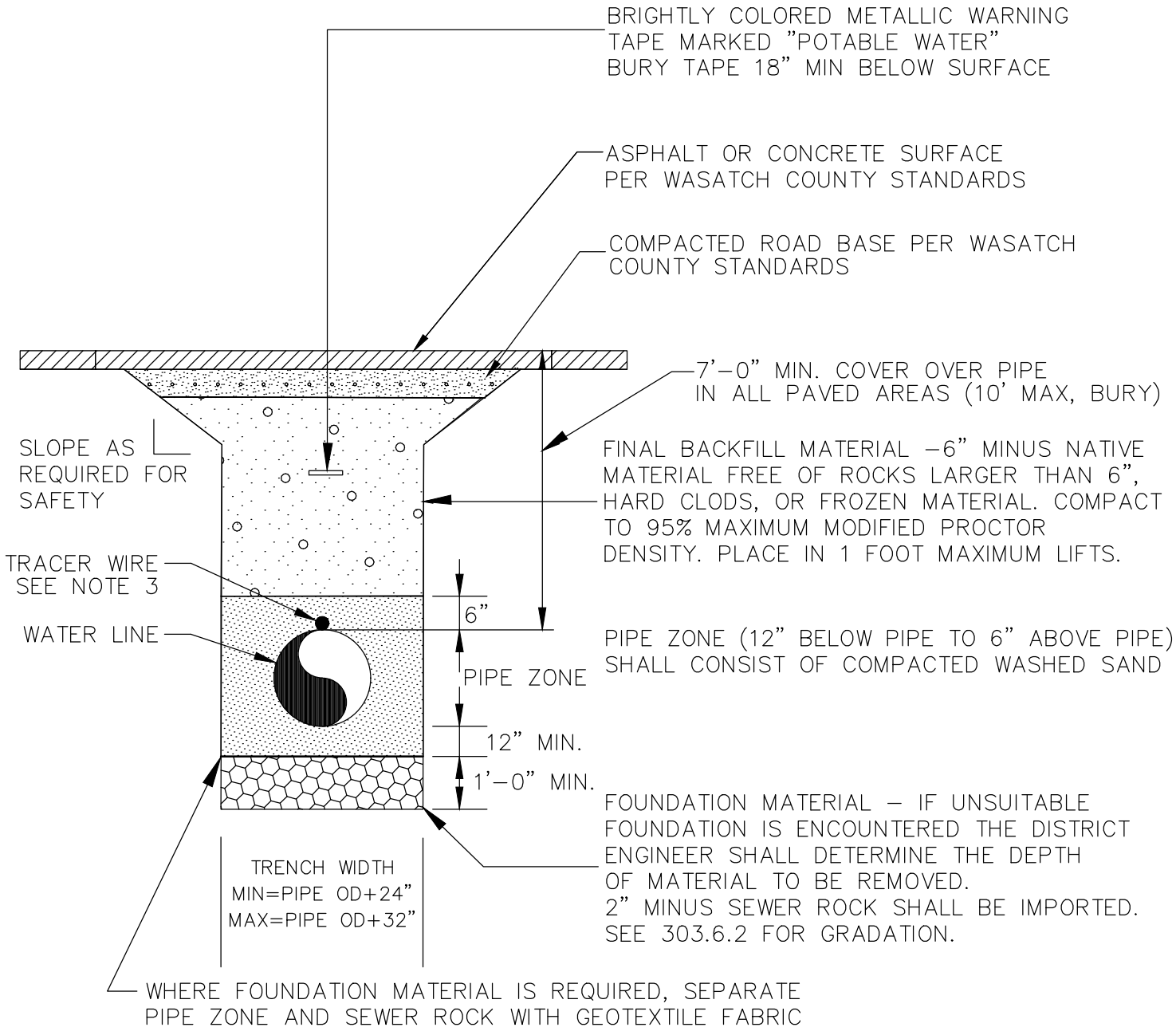
1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
3. TRACER WIRE SHALL BE #12 – GAUGE, 600 VOLT COPPER WIRE. PVC JACKETED FOR UNDERGROUND SERVICES. PROVIDE SURFACE CONNECTIONS AT ALL VALVE BOXES AND HYDRANTS. WIRE CONTINUITY WILL BE SUBJECT TO DISTRICT TESTING DURING AND AFTER CONSTRUCTION. CONTRACTOR SHALL FIX ANY DAMAGED LINES TO THE SATISFACTORY OF THE DISTRICT.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

WATER LINE DETAIL IN ROADWAY

DWG. 400.1



NOTES:

1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
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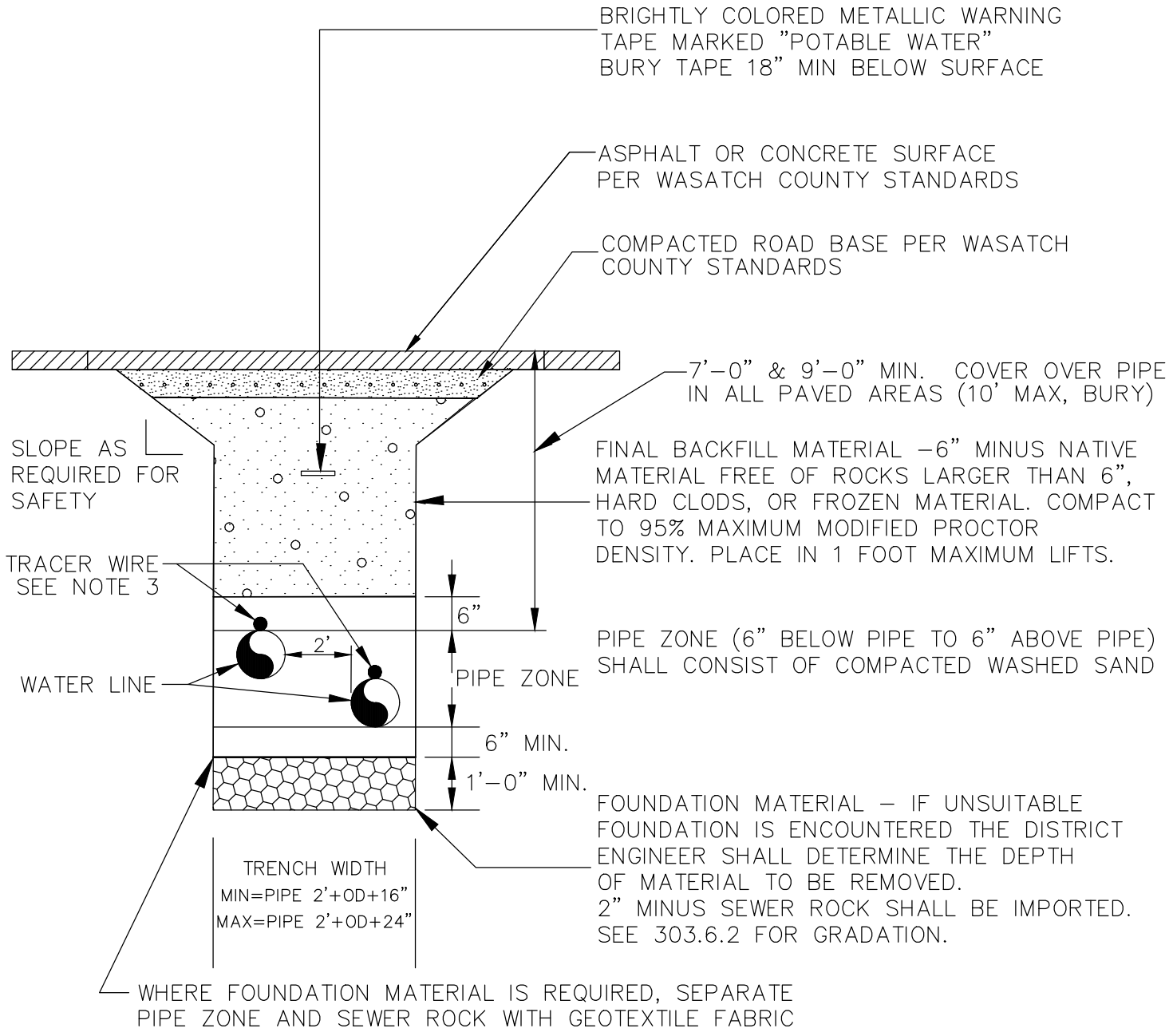
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

WATER LINE DETAIL IN ROADWAY - ROCK TRENCH

DWG. 400.1A



NOTES:

1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
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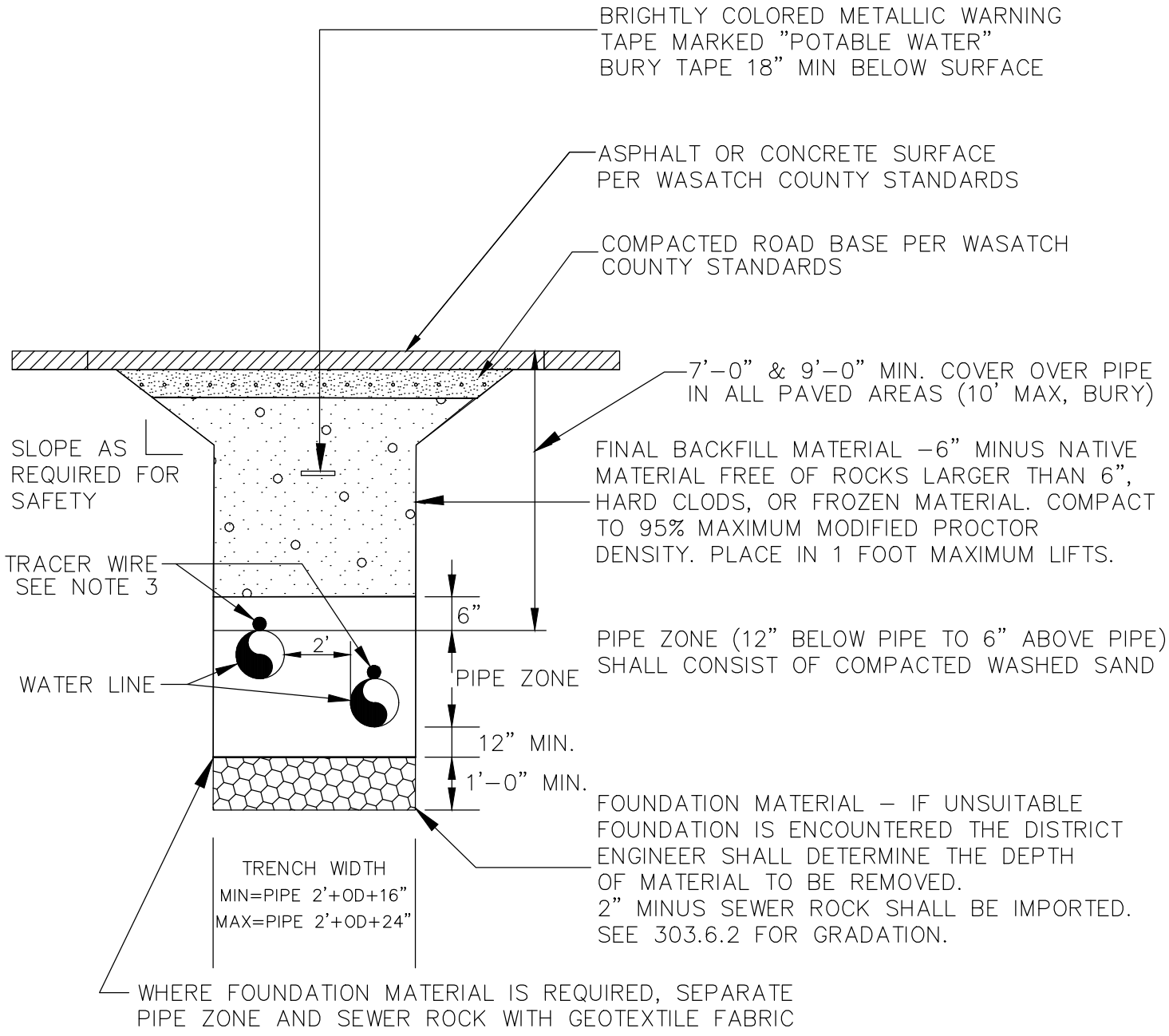
Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

DUAL WATER LINE DETAIL IN ROADWAY

DWG. 400.1B



NOTES:

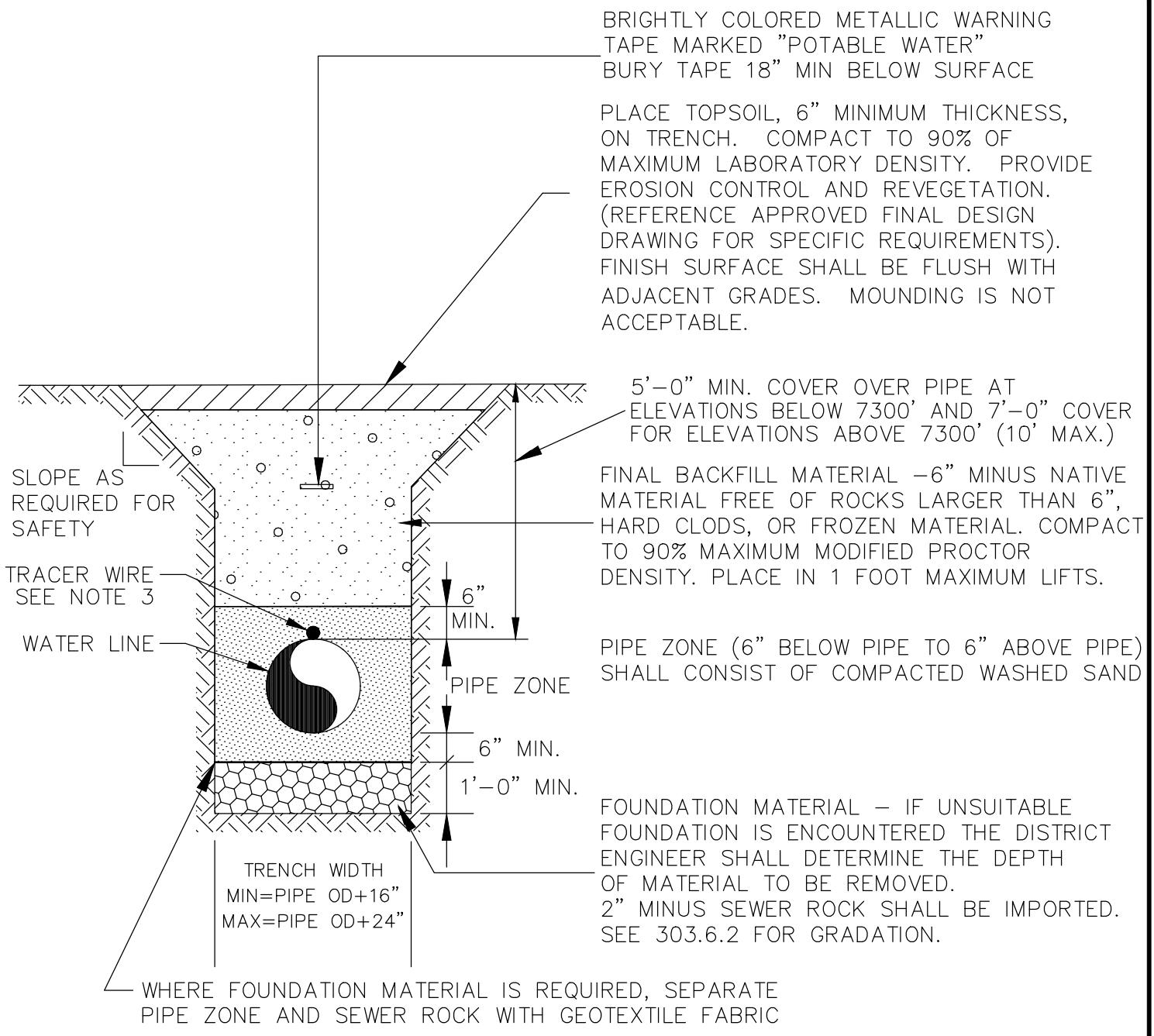
1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
3. TRACER WIRE SHALL BE #12 - GAUGE, 600 VOLT COPPER WIRE. PVC JACKETED FOR UNDERGROUND SERVICES. PROVIDE SURFACE CONNECTIONS AT ALL VALVE BOXES AND HYDRANTS. WIRE CONTINUITY WILL BE SUBJECT TO DISTRICT TESTING DURING AND AFTER CONSTRUCTION. CONTRACTOR SHALL FIX ANY DAMAGED LINES TO THE SATISFACTORY OF THE DISTRICT.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

DUAL WATER LINE DETAIL IN ROADWAY - ROCK TRENCH

DWG. 400.1C



NOTES:

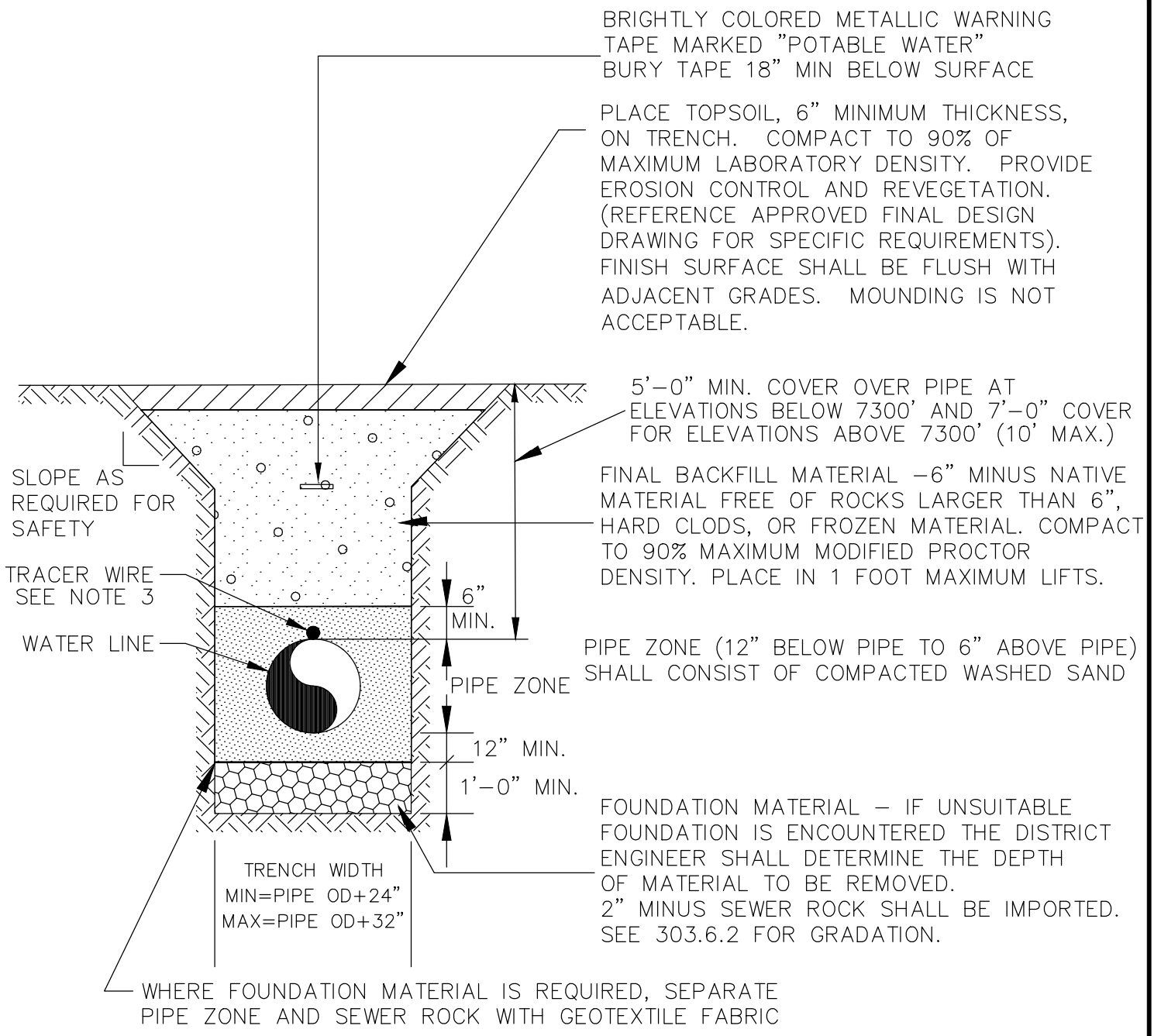
1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
3. TRACER WIRE SHALL BE #12 - GAUGE, 600 VOLT COPPER WIRE. PVC JACKETED FOR UNDERGROUND SERVICES. PROVIDE SURFACE CONNECTIONS AT ALL VALVE BOXES AND HYDRANTS. WIRE CONTINUITY WILL BE SUBJECT TO DISTRICT TESTING DURING AND AFTER CONSTRUCTION. CONTRACTOR SHALL FIX ANY DAMAGED LINES TO THE SATISFACTORY OF THE DISTRICT.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

WATER LINE DETAIL NOT IN ROADWAY

DWG. 400.2



NOTES:

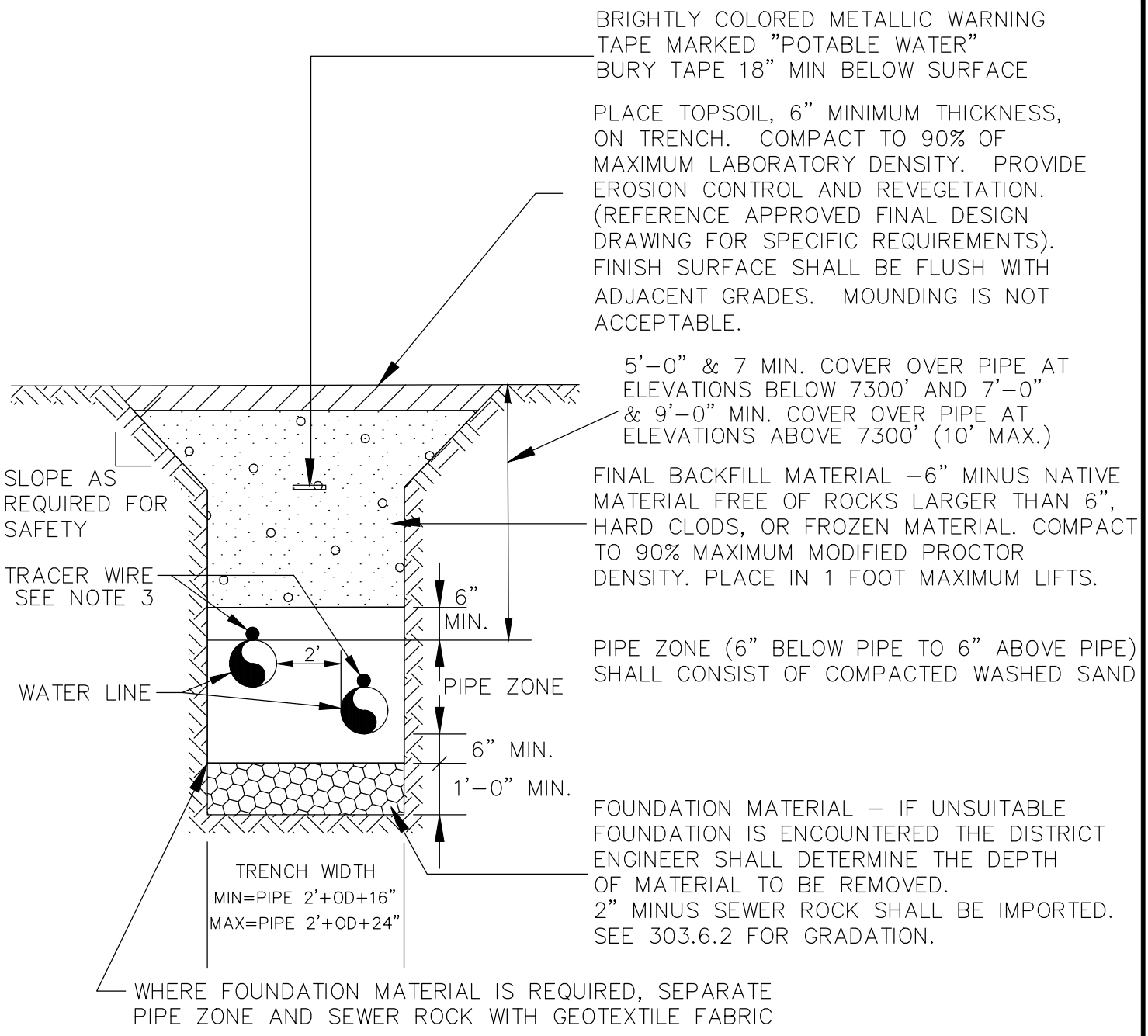
1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
3. TRACER WIRE SHALL BE #12 - GAUGE, 600 VOLT COPPER WIRE. PVC JACKETED FOR UNDERGROUND SERVICES. PROVIDE SURFACE CONNECTIONS AT ALL VALVE BOXES AND HYDRANTS. WIRE CONTINUITY WILL BE SUBJECT TO DISTRICT TESTING DURING AND AFTER CONSTRUCTION. CONTRACTOR SHALL FIX ANY DAMAGED LINES TO THE SATISFACTORY OF THE DISTRICT.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

WATER LINE DETAIL
NOT IN ROADWAY - ROCK TRENCH

DWG. 400.2A



NOTES:

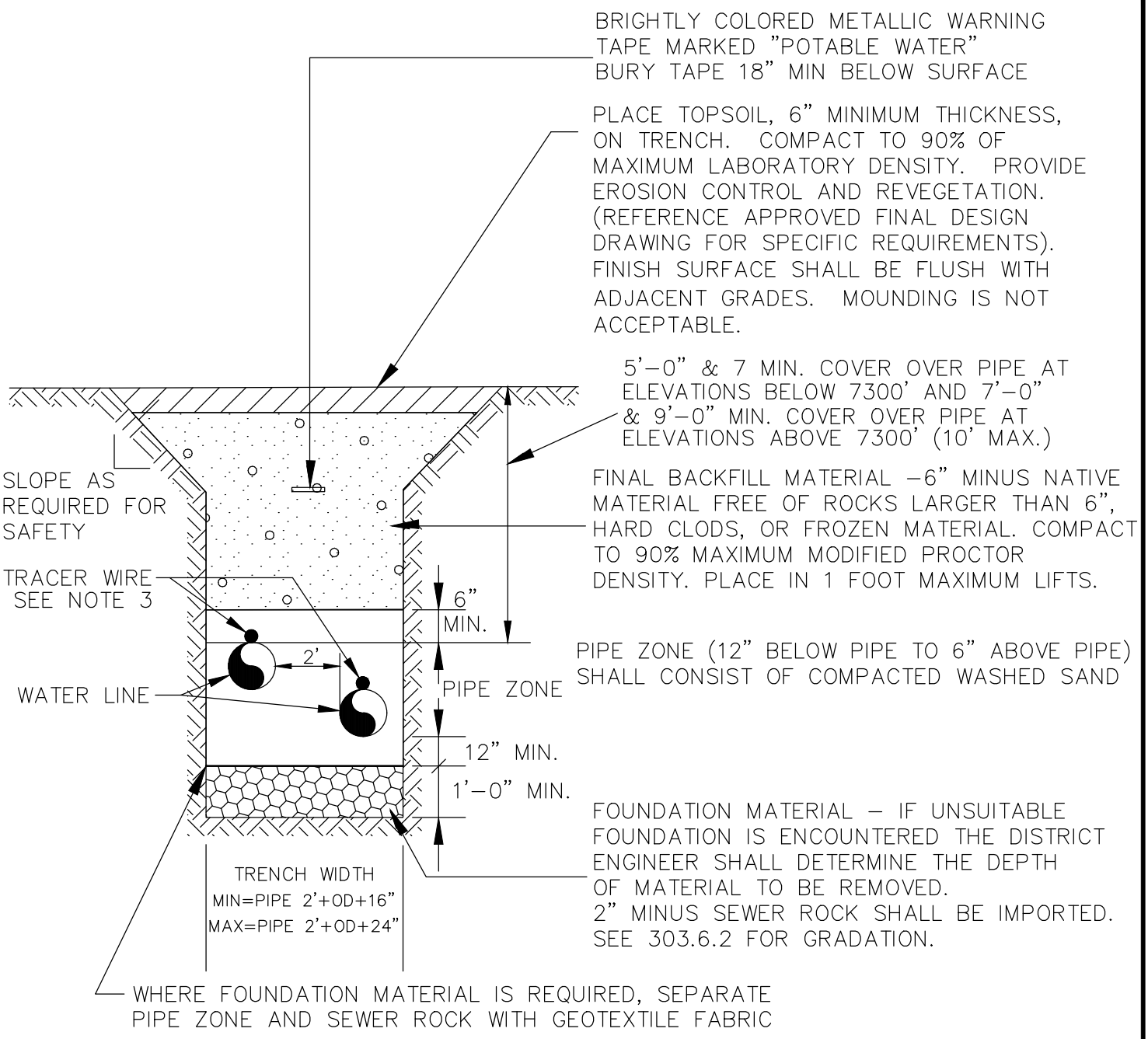
1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
3. TRACER WIRE SHALL BE #12 - GAUGE, 600 VOLT COPPER WIRE. PVC JACKETED FOR UNDERGROUND SERVICES. PROVIDE SURFACE CONNECTIONS AT ALL VALVE BOXES AND HYDRANTS. WIRE CONTINUITY WILL BE SUBJECT TO DISTRICT TESTING DURING AND AFTER CONSTRUCTION. CONTRACTOR SHALL FIX ANY DAMAGED LINES TO THE SATISFACTORY OF THE DISTRICT.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

DUAL WATER LINE DETAIL NOT IN ROADWAY

DWG. 400.2B



NOTES:

1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
3. TRACER WIRE SHALL BE #12 - GAUGE, 600 VOLT COPPER WIRE. PVC JACKETED FOR UNDERGROUND SERVICES. PROVIDE SURFACE CONNECTIONS AT ALL VALVE BOXES AND HYDRANTS. WIRE CONTINUITY WILL BE SUBJECT TO DISTRICT TESTING DURING AND AFTER CONSTRUCTION. CONTRACTOR SHALL FIX ANY DAMAGED LINES TO THE SATISFACTORY OF THE DISTRICT.

Jordanelle

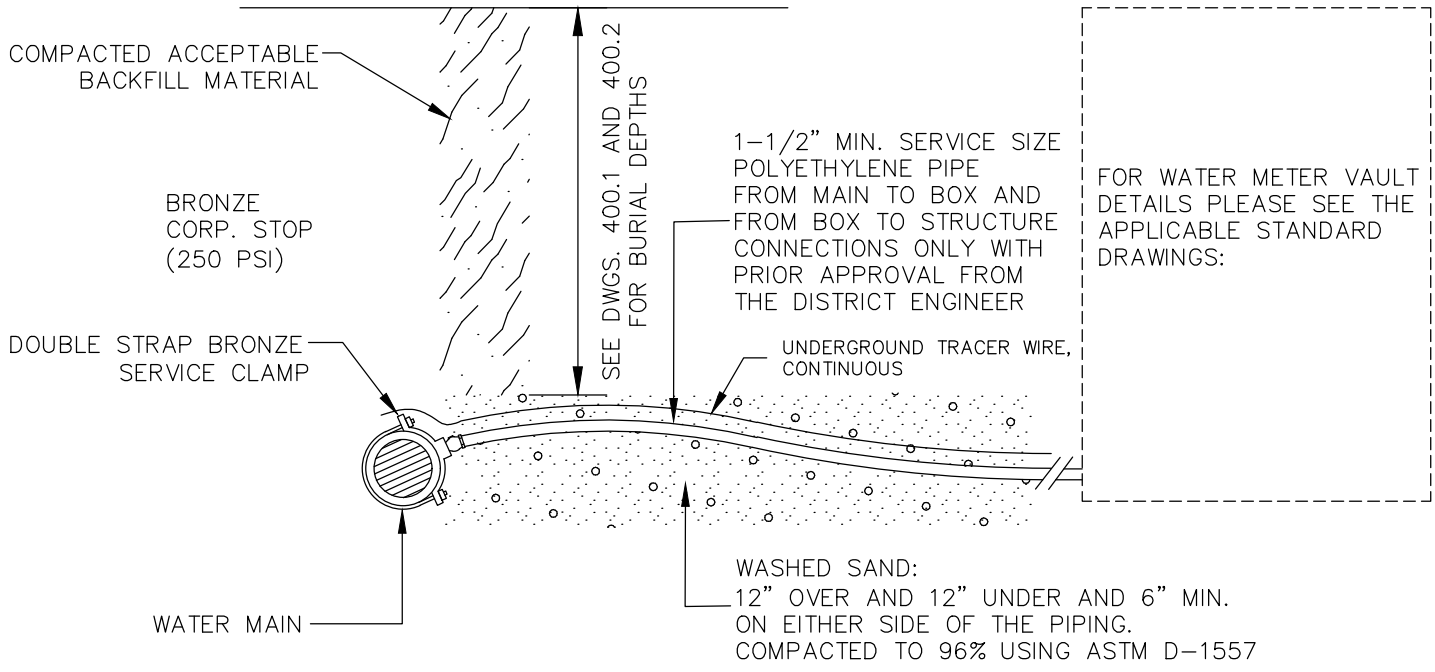
DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

DUAL WATER LINE DETAIL
NOT IN ROADWAY - ROCK TRENCH

DWG. 400.2C

NOTES:

1. METER BOX SHALL BE SET PLUMB.
2. THREADS ON SERVICE CLAMP SHALL MATCH THREADS ON CORPORATION STOP.
3. REFER TO WRITTEN SECIFICATIONS FOR ADDITIONAL DETAILS.
4. METERS ARE TO BE INSTALLED IN AN APPROVED LANDSCAPE AREA; NOT IN SIDEWALK, ASPHALT OR DRIVEWAY, UNLESS APPROVED BY THE DISTRICT ENGINEER.
5. NO SWEAT FITTINGS ARE ALLOWED.
6. COMPRESSION TYPE CONNECTIONS SHALL BE USED FOR ALL CONNECTIONS.

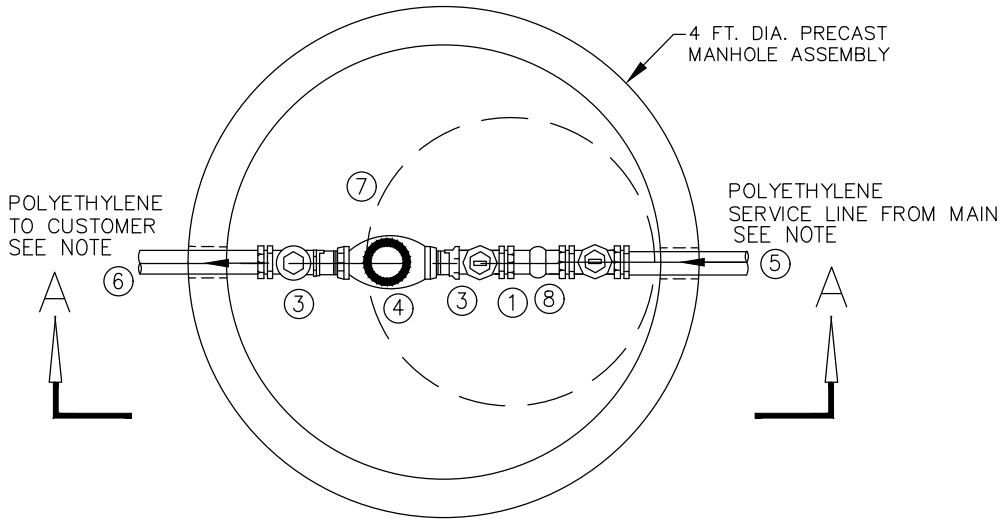


Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

TYPICAL WATER SERVICE CONNECTION

DWG. 400.3



PLAN VIEW

PARTS LIST / DESCRIPTION

① 1–1/2" x 1" REDUCER BUSHING

② COMPACTED SOIL EVEN WITH THE TOP OF LID, RADIALLY OUT THREE FEET MINIMUM AND PROVIDING DRAINAGE AWAY FROM THE LID.

③ FORD VBHH74W–18 OR VBHC74W–18 METER SETTER

④ 1" METER BY DISTRICT

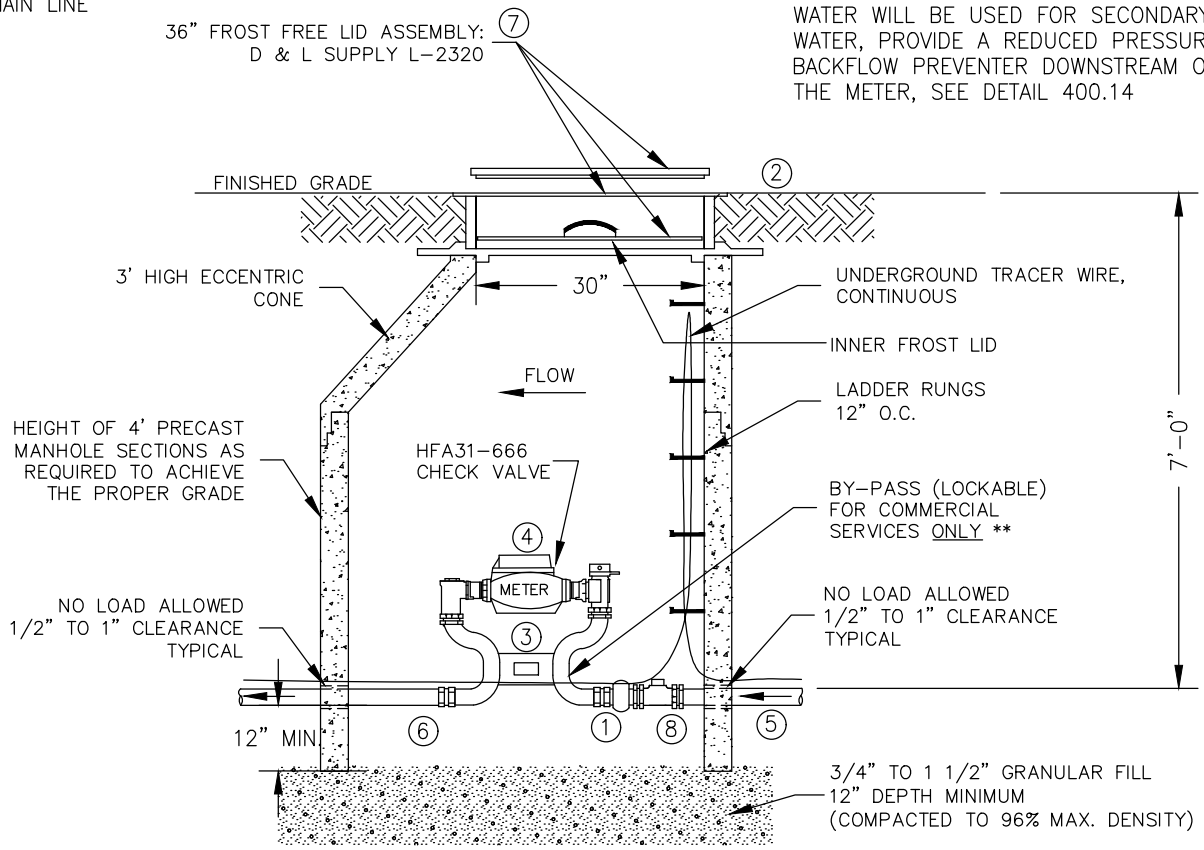
⑤ 1–1/2" POLYETHYLENE FROM MAIN LINE

⑥ 1" POLYETHYLENE SERVICE MAIN

⑦ D&L SUPPLY L–2320 FROST FREE LID ASSEMBLY. FOR METERS LOCATED IN TRAFFIC AREAS, USE D & L SUPPLY A–1017–R1

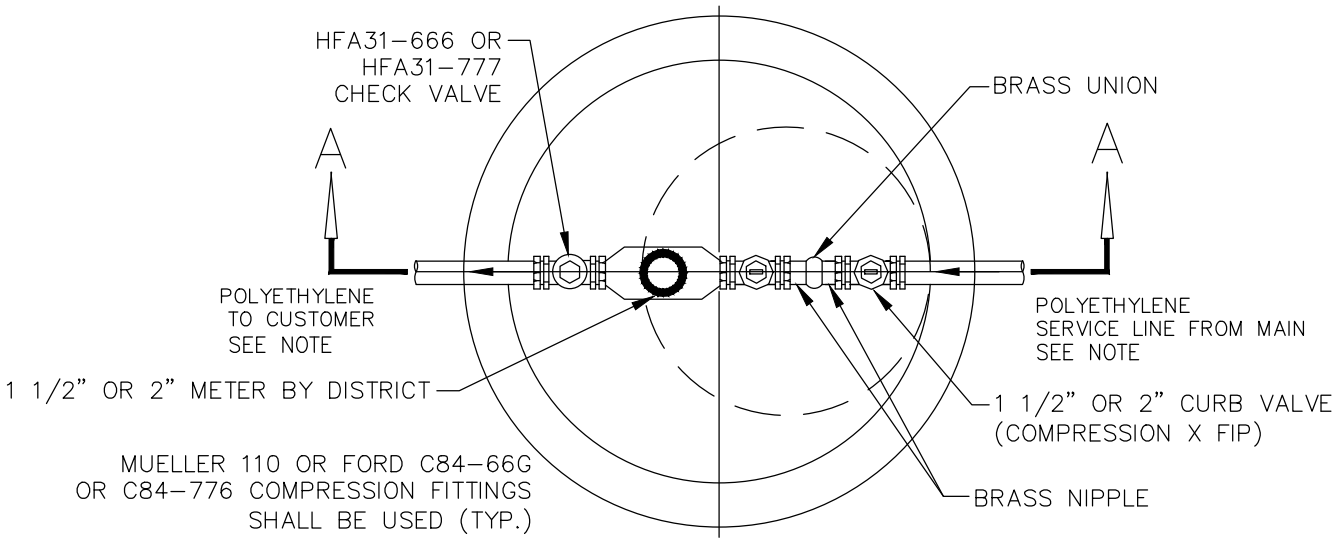
⑧ 1–1/2" BRONZE NIPPLES

NOTE:
FOR LOCATIONS WHERE CULINARY WATER WILL BE USED FOR SECONDARY WATER, PROVIDE A REDUCED PRESSURE BACKFLOW PREVENTER DOWNSTREAM OF THE METER, SEE DETAIL 400.14

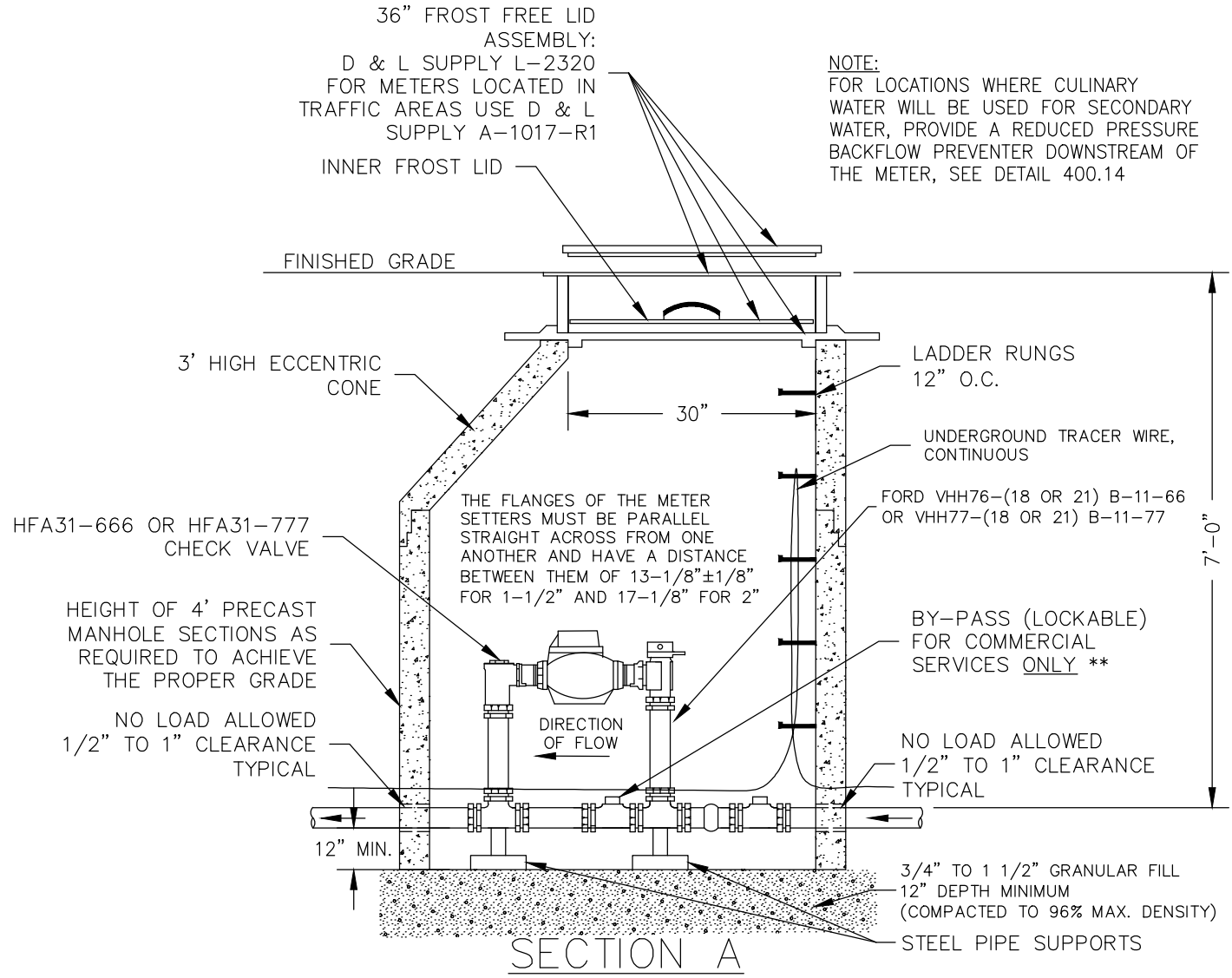


SECTION A

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	METER BOX DETAIL SINGLE 1" METER ONLY	DWG. 400.4

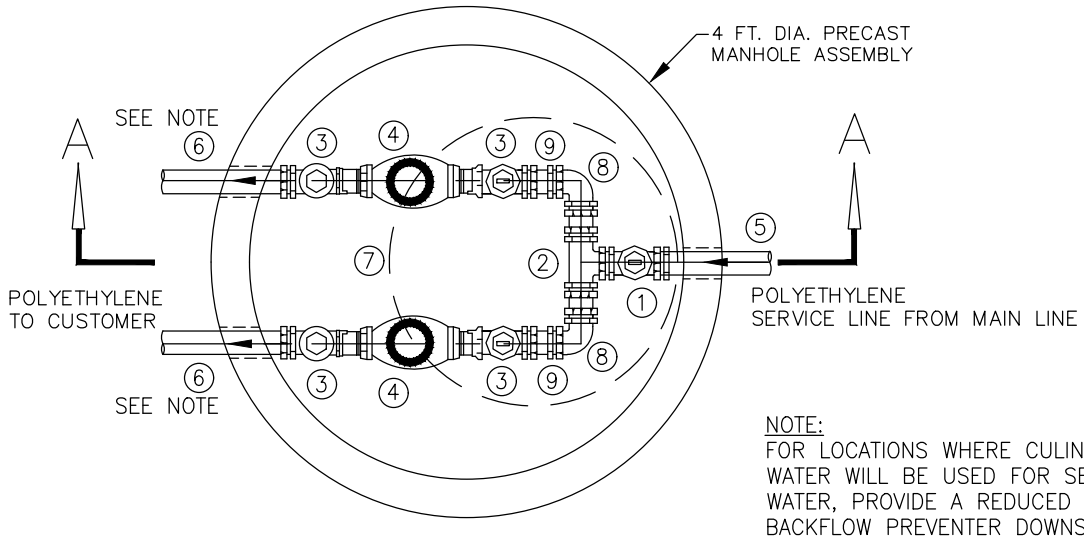


PLAN VIEW



SECTION A

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	METER VAULT DETAIL 1-1'2" OR 2" METER	DWG. 400.5

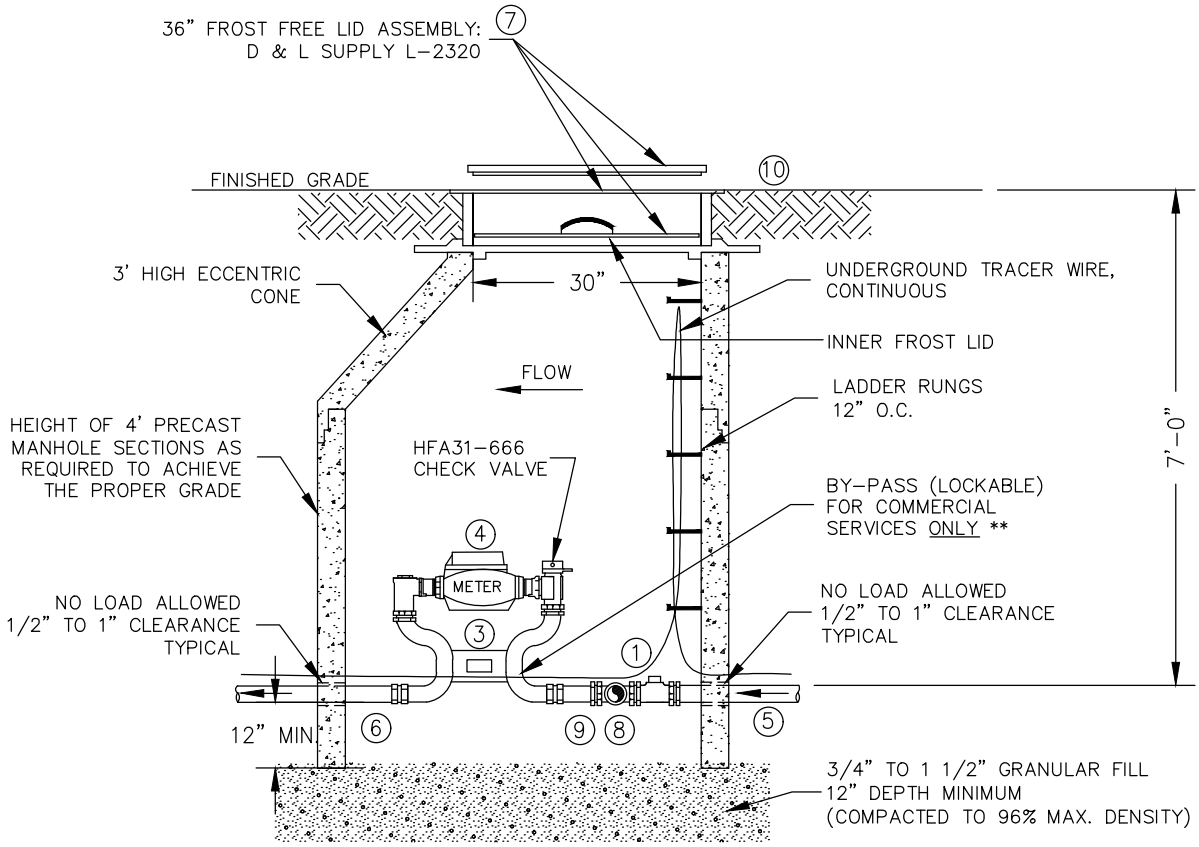


PLAN VIEW

NOTE:
FOR LOCATIONS WHERE CULINARY WATER WILL BE USED FOR SECONDARY WATER, PROVIDE A REDUCED PRESSURE BACKFLOW PREVENTER DOWNSTREAM OF THE METER, SEE DETAIL 400.14

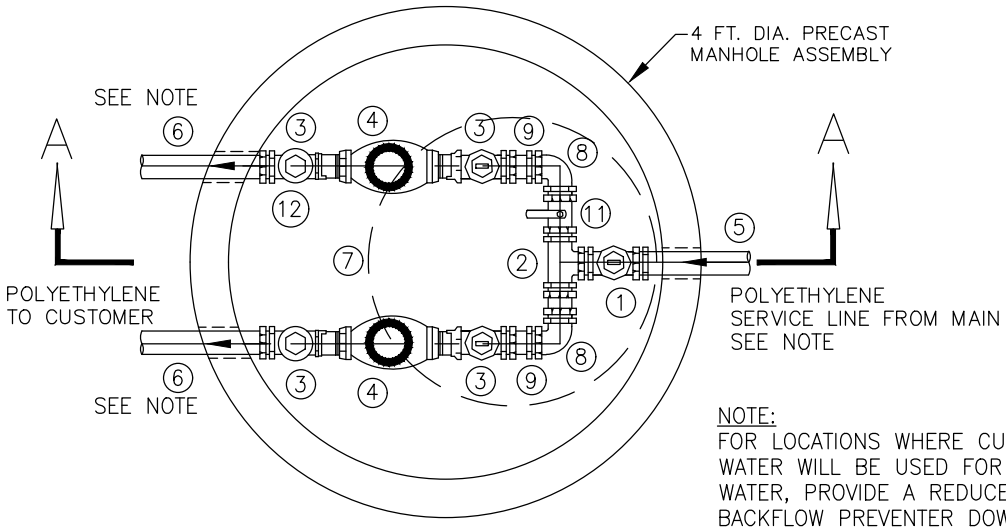
PARTS LIST / DESCRIPTION

1. MUELLER 1–1/2" MARK II ORASEAL VALVE 3 H–15209
2. BRONZE 1–1/2" x 1–1/2" x 1–1/2" TEE
3. FORD VBHH72W–18 OR VBHC72W–18 METER SETTER
4. 1" METER BY DISTRICT
5. 1–1/2" POLYETHYLENE FROM MAIN LINE
6. POLYETHYLENE SERVICE MAIN
7. D&L SUPPLY L–2320 FROST FREE LID ASSEMBLY. FOR METERS LOCATED IN TRAFFIC AREAS, USE D & L SUPPLY A–1017–R1
8. 1–1/2" BRONZE NIPPLES AND 90° ELBOWS
9. 1–1/2" x 1" REDUCER BUSHING
10. COMPACTED SOIL EVEN WITH THE TOP OF LID, RADIALLY OUT THREE FEET MINIMUM AND PROVIDING DRAINAGE AWAY FROM THE LID.



SECTION A

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	METER BOX DETAIL FOR DUAL 1" METERS	DWG. 400.7

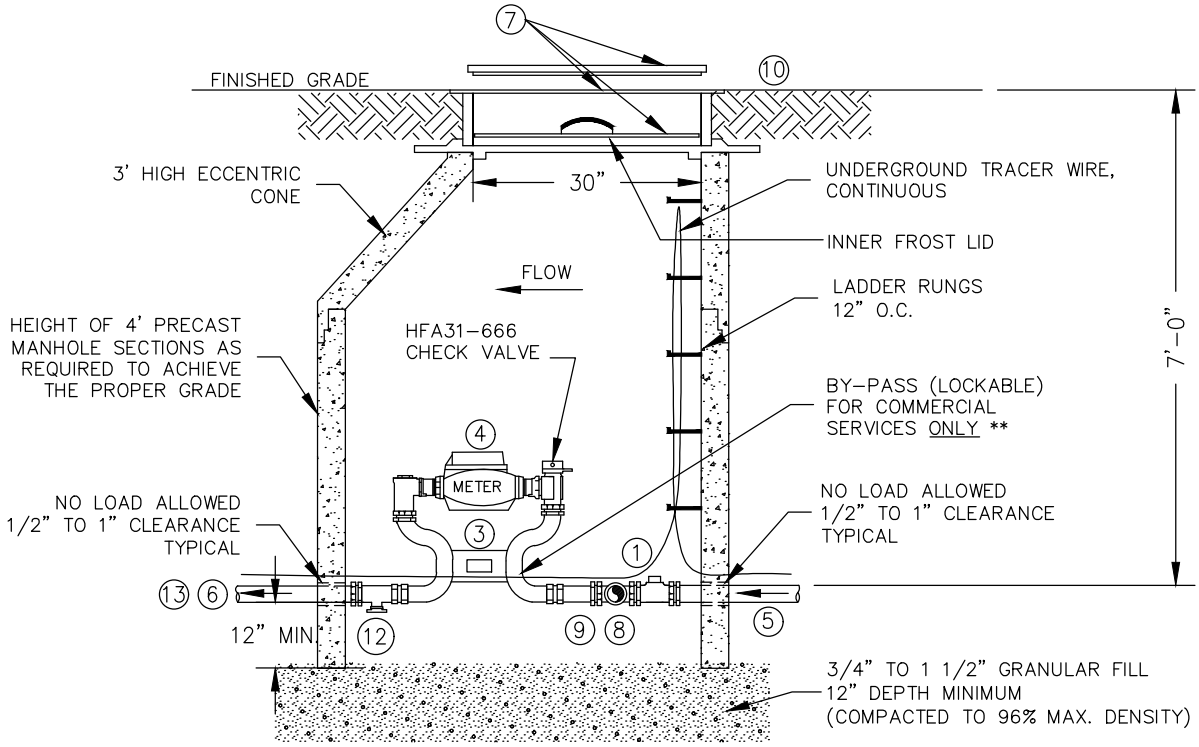


PLAN VIEW

NOTE:
FOR LOCATIONS WHERE CULINARY WATER WILL BE USED FOR SECONDARY WATER, PROVIDE A REDUCED PRESSURE BACKFLOW PREVENTER DOWNSTREAM OF THE METER, SEE DETAIL 400.14

PARTS LIST / DESCRIPTION

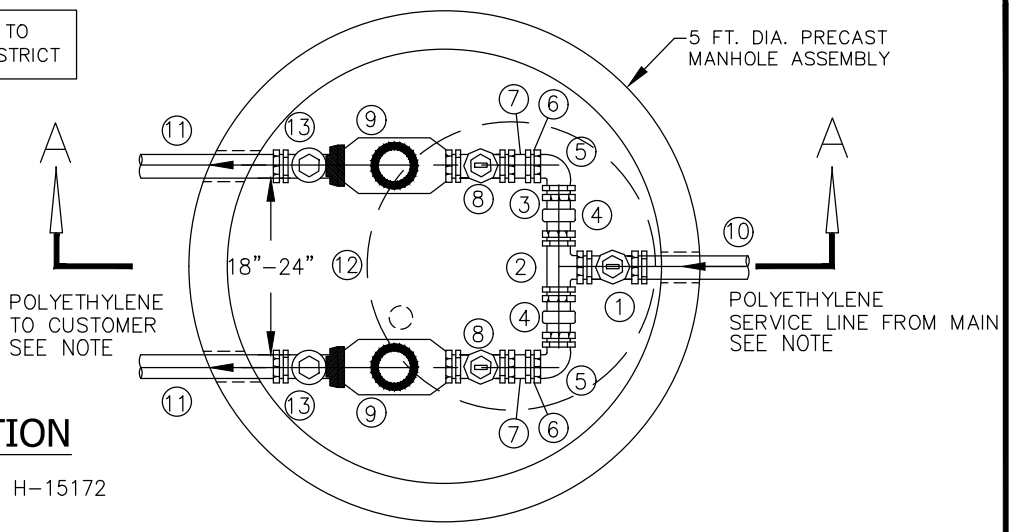
1. MUELLER 1–1/2" MARK II ORASEAL VALVE 3 H–15209
2. BRONZE 1–1/2" x 1–1/2" x 1–1/2" TEE
3. FORD VBHH72W–18 OR VBHC72W–18 METER SETTER
4. 1" METER BY DISTRICT
5. 1–1/2" POLYETHYLENE FROM MAIN LINE
6. 1" POLYETHYLENE SERVICE MAIN
7. D&L SUPPLY L–2320 FROST FREE LID ASSEMBLY. FOR METERS LOCATED IN TRAFFIC AREAS, USE D & L SUPPLY A–1017–R1
8. 1–1/2" BRONZE NIPPLES AND 90° ELBOWS
9. 1–1/2" x 1" REDUCER BUSHING
10. COMPACTED SOIL EVEN WITH THE TOP OF LID, RADIALLY OUT 3 FEET MINIMUM AND PROVIDING DRAINAGE AWAY FROM THE LID.
11. 1–1/2" BRONZE BALL VALVE
12. 1"X1"X1/2" THD BRASS TEE WITH A KING MODEL 24181 1/2" MALE PIPE THREAD DRAIN AT A 30° ANGLE FROM STRAIGHT DOWN OR APPROVED EQUIVALENT



SECTION A

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	METER BOX DETAIL-FOR DUAL 1" METERS CULINARY & IRRIGATION APPLICATIONS	DWG. 400.7A

2" COMPONENTS MAY BE REDUCED TO 1-1/2" WITH THE APPROVAL OF DISTRICT

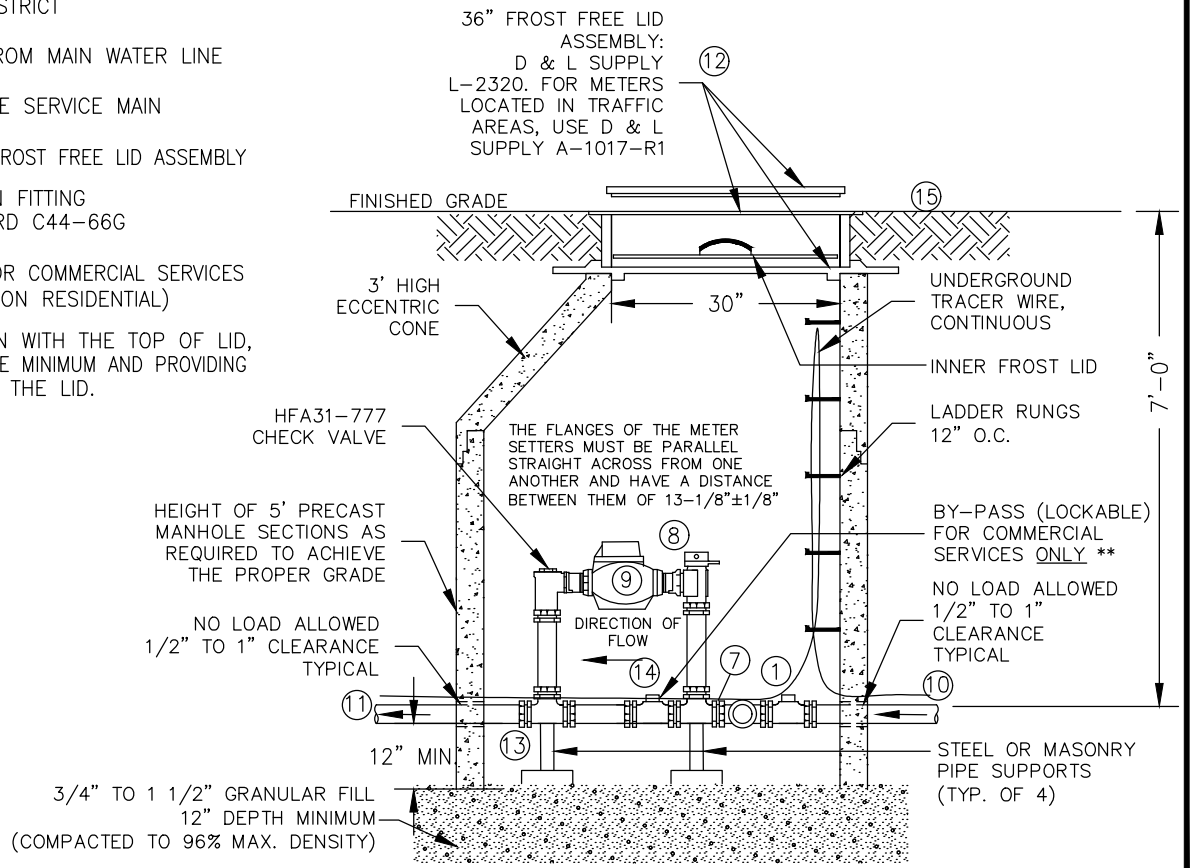


PLAN VIEW

PARTS LIST / DESCRIPTION

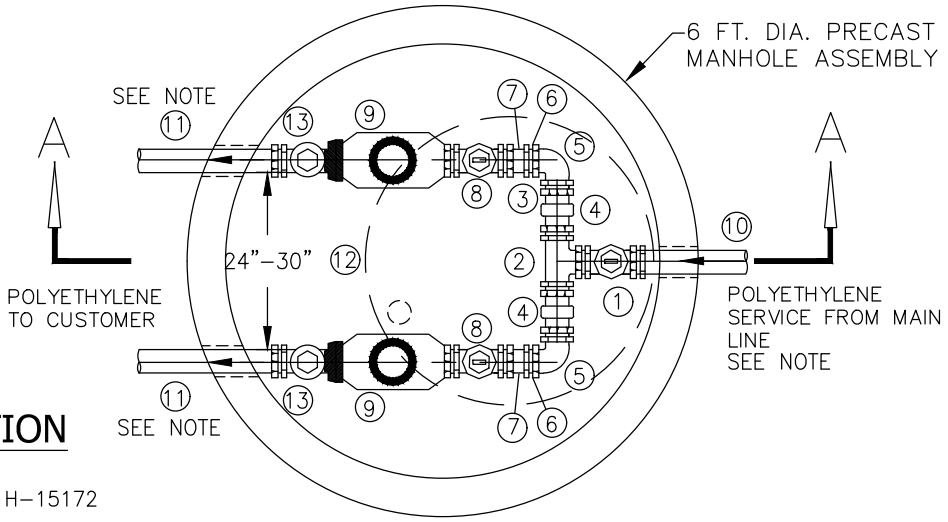
1. MUELLER 2" MARK II ORASEAL VALVE # H-15172
2. 2" X 2" X 2" BRONZE TEE
3. 2" BRONZE NIPPLE (CENTER SETTERS IN VAULT)
4. 2" BRONZE UNION
5. 2" BRONZE 90° ELBOW
6. 2" X 1-1/2" BRONZE BUSHING
7. 1-1/2" X 2" BRONZE NIPPLE
8. FORD VHH76 - (18 OR 21) B-11-66 METER SETTER WITH HFA31-666 CHECK VALVE
9. 1-1/2" METER BY DISTRICT
10. 2" POLYETHYLENE FROM MAIN WATER LINE
11. 1-1/2" POLYEHTYLENE SERVICE MAIN
12. D&L SUPPLY L-2320 FROST FREE LID ASSEMBLY
13. 1-1/2" COMPRESSION FITTING MUELLER 110 OR FORD C44-66G
14. LOCKABLE BY-PASS FOR COMMERCIAL SERVICES (ONLY (NO BY-PASS ON RESIDENTIAL)
15. COMPACTED SOIL EVEN WITH THE TOP OF LID, RADIALLY OUT THREE FEE MINIMUM AND PROVIDING DRAINAGE AWAY FROM THE LID.

NOTE:
FOR LOCATIONS WHERE CULINARY WATER WILL BE USED FOR SECONDARY WATER, PROVIDE A REDUCED PRESSURE BACKFLOW PREVENTER DOWNSTREAM OF THE METER, SEE DETAIL 400.14



SECTION A

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	METER BOX DETAIL FOR DUAL 1-1/2" METERS	DWG. 400.8

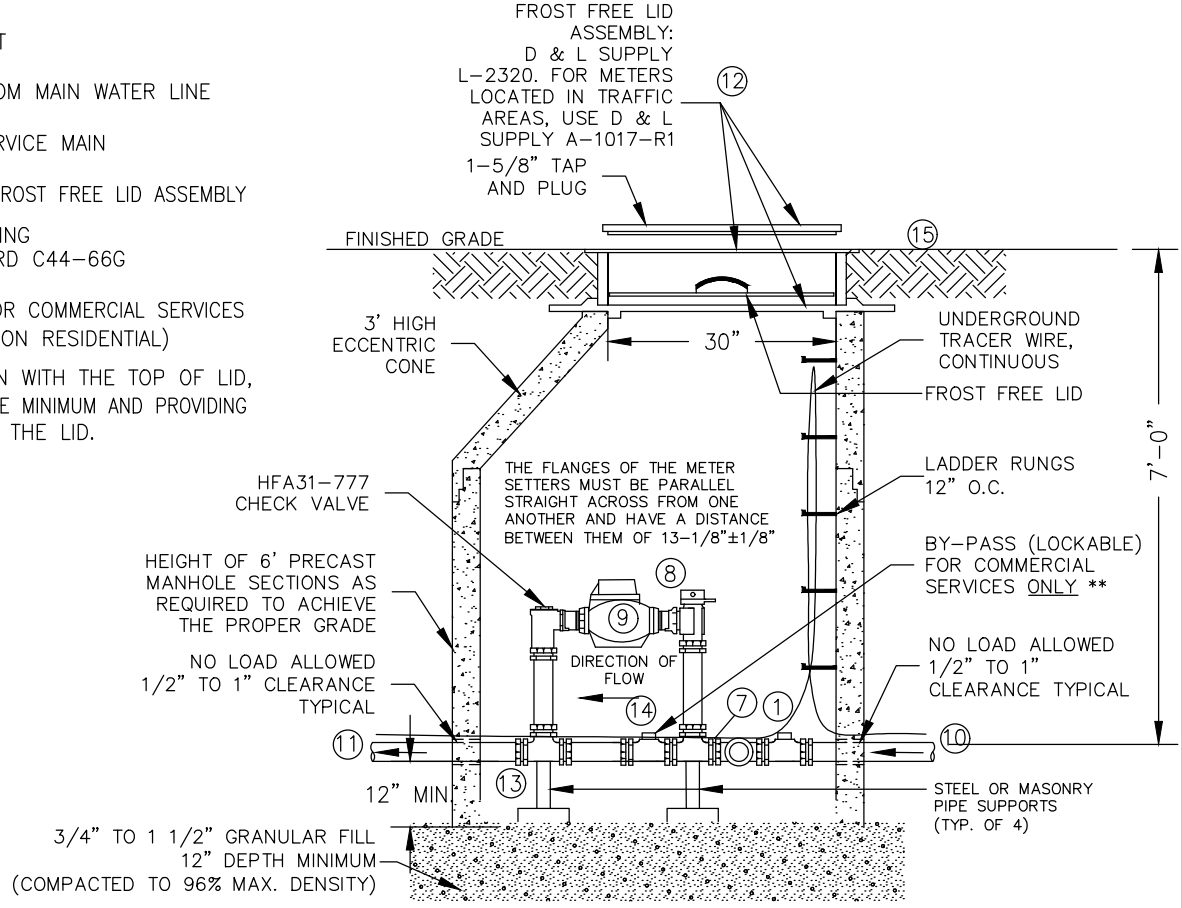


PLAN VIEW

PARTS LIST / DESCRIPTION

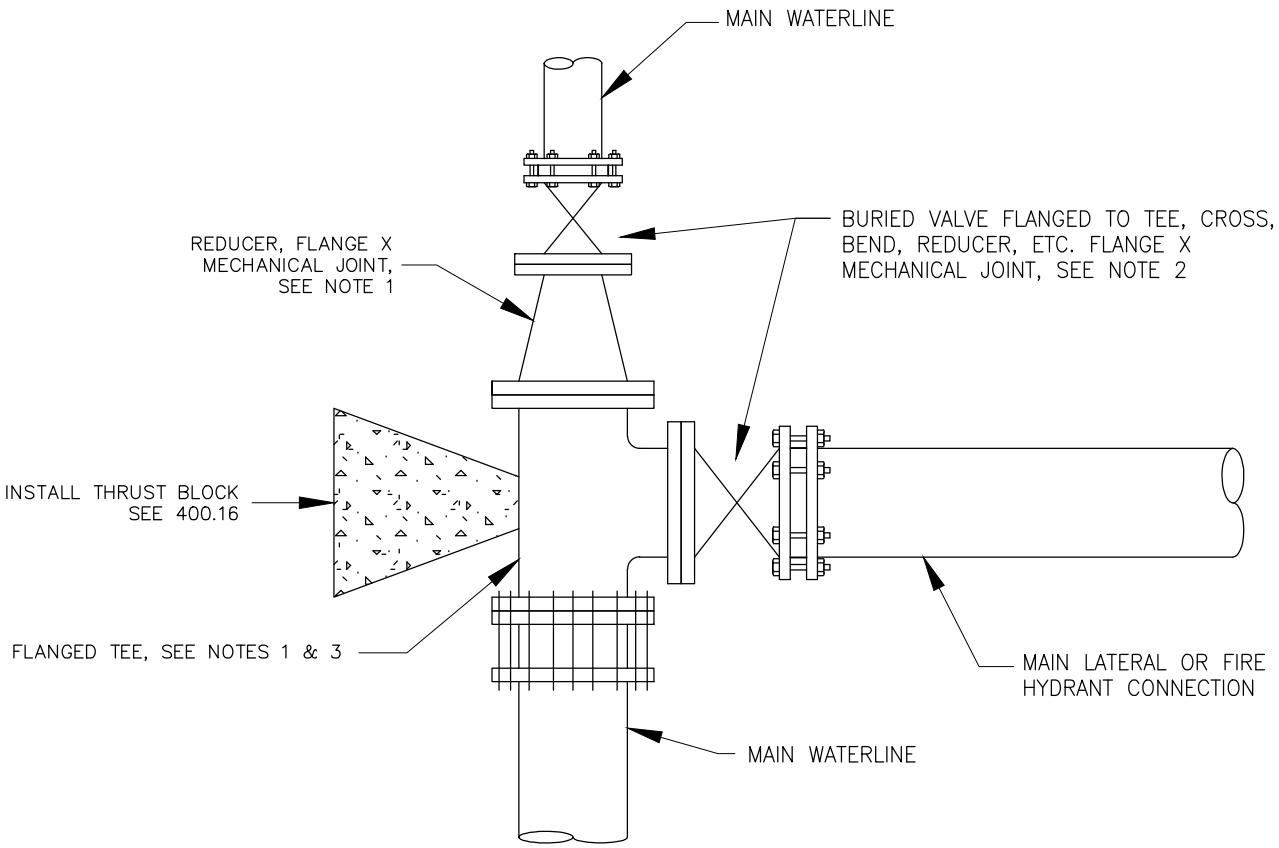
1. MUELLER 2" MARK II ORASEAL VALVE # H–15172
2. 2" X 2" X 2" BRONZE TEE
3. 2" BRONZE NIPPLE (CENTER SETTERS IN VAULT)
4. 2" BRONZE UNION
5. 2" BRONZE 90° ELBOW
6. 2" BRONZE BUSHING
7. 2" X 2" BRONZE NIPPLE
8. FORD VHH77 – (18 OR 21) B–11–77 METER SETTER WITH HFA31–777 CHECK VALVE
9. 2" METER BY DISTRICT
10. 2" POLYETHYLENE FROM MAIN WATER LINE
11. 2" POLYETHYLENE SERVICE MAIN
12. D&L SUPPLY L–2320 FROST FREE LID ASSEMBLY
13. 2" COMPRESSION FITTING MUELLER 110 OR FORD C44–66G
14. LOCKABLE BY–PASS FOR COMMERCIAL SERVICES (ONLY (NO BY–PASS ON RESIDENTIAL)
15. COMPACTED SOIL EVEN WITH THE TOP OF LID, RADIALLY OUT THREE FEE MINIMUM AND PROVIDING DRAINAGE AWAY FROM THE LID.

NOTE:
FOR LOCATIONS WHERE CULINARY WATER WILL BE USED FOR SECONDARY WATER, PROVIDE A REDUCED PRESSURE BACKFLOW PREVENTER DOWNSTREAM OF THE METER, SEE DETAIL 400.14



SECTION A

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	METER BOX DETAIL FOR DUAL 2" METERS	DWG. 400.9



NOTES:

1. FITTINGS SHOWN IN DETAILS ARE GENERALIZED AND MAY NOT EXIST IN ALL CONNECTIONS. INSTALL FITTINGS (REDUCERS, VALVES, ETC.) AS REQUIRED IN DESIGN DRAWINGS.

2. PROVIDE RESTRAINED JOINTS WHERE WATERLINE MUST BE PUT INTO SERVICE BEFORE THRUST BLOCKS HAVE HAD ADEQUATE TIME TO CURE. ALL MECHANICAL JOINTS SHALL BE INSTALLED WITH MEGALUG FOLLOWERS.

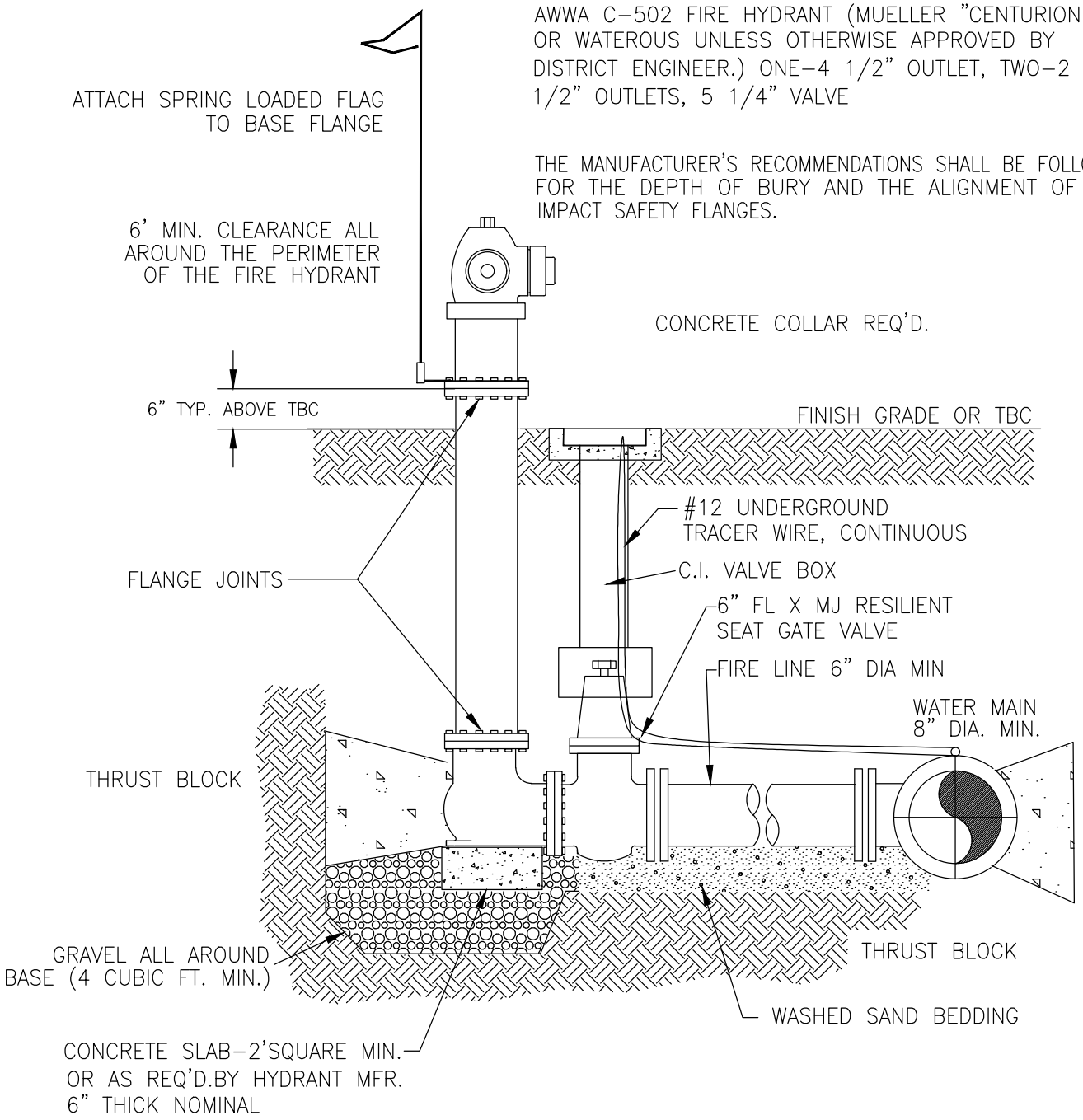
3. AS APPROVED BY THE DISTRICT ENGINEER, A HOT TAP CONNECTION TO AN EXISTING WATERLINE MAY BE PERFORMED. WHERE THIS IS THE CASE, CONTRACTOR SHALL PROVIDE A HOT TAP CONNECTION INSTEAD OF CUTTING IN A NEW VALVE AND TEE AT NO ADDITIONAL COST TO THE OWNER.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

TYPICAL BURIED VALVE INSTALLATION

DWG. 400.10



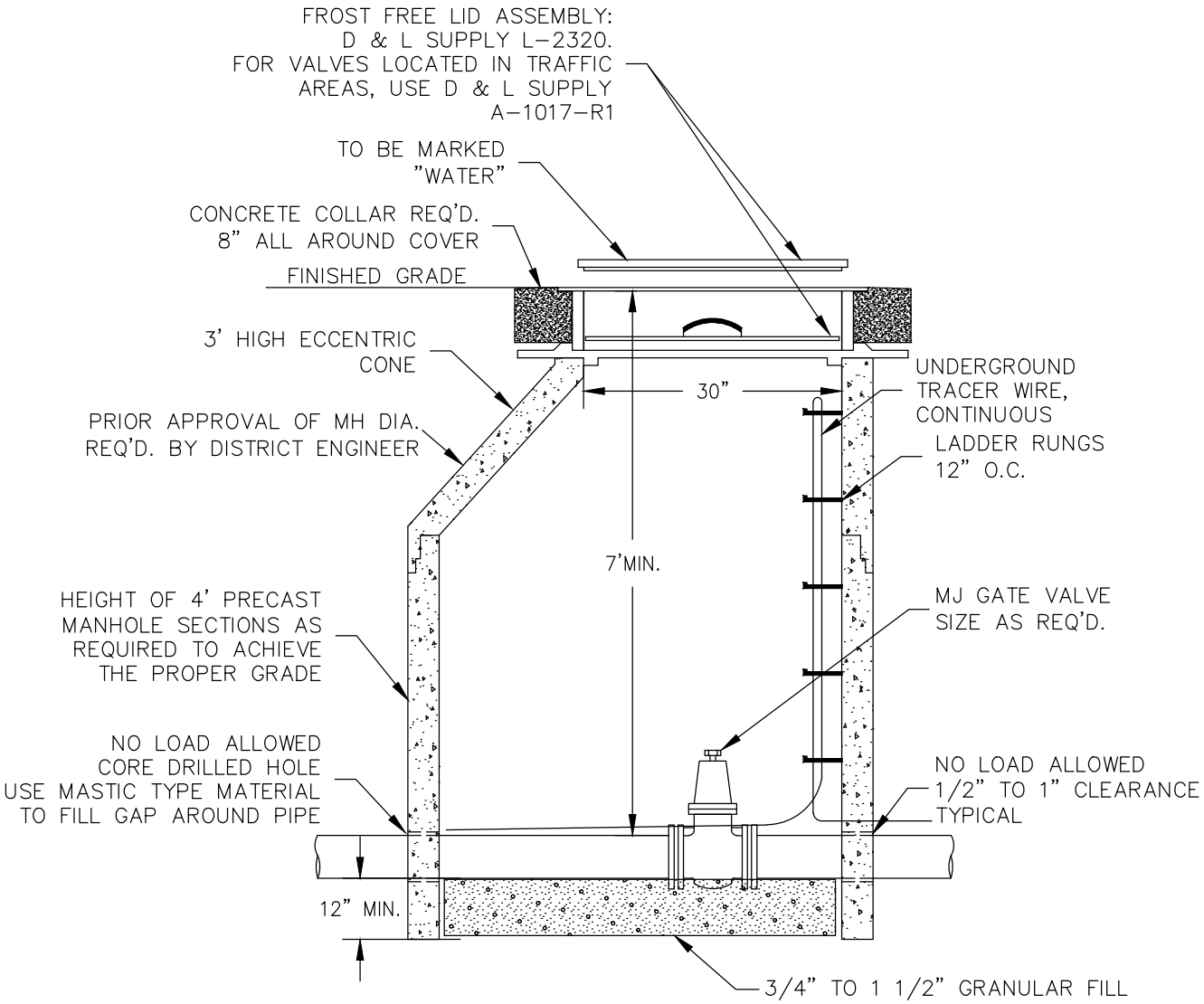
1. ALL FIRE HYDRANTS SHALL BE LOCATED AS SHOWN ON THE APPROVED PLANS.
2. ALL FIRE HYDRANTS SHALL STAND PLUMB WITH THE PUMPER NOZZLE FACING THE STREET.
3. HYDRANT WEEP HOLES SHALL BE PLUGGED IN AREAS OF FLUCTUATING GROUND WATER.
4. THE VALVE SHALL BE LOCATED FLANGED TO THE HYDRANT ASSEMBLY.
5. FOR DETAILED INFORMATION SEE SPECIFICATIONS.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

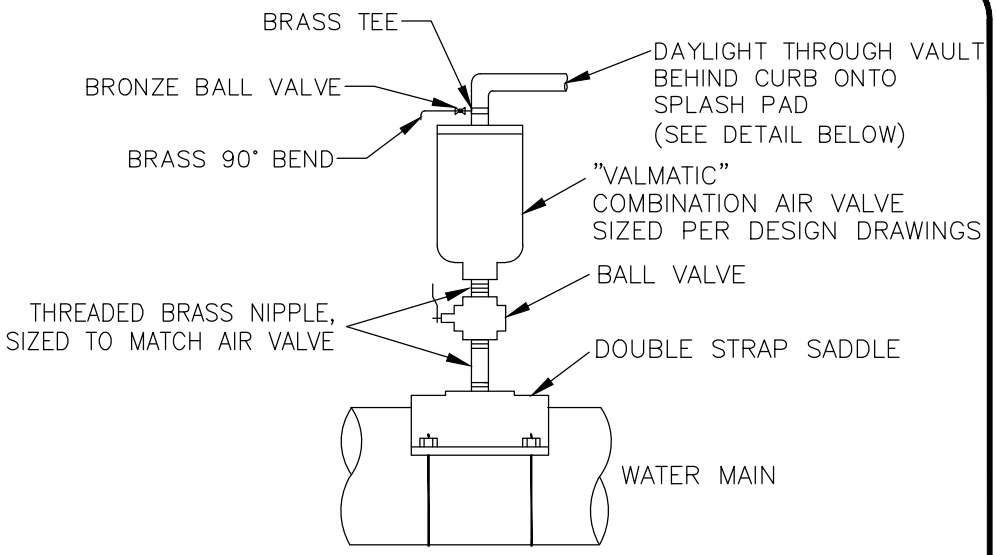
FIRE HYDRANT DETAIL

DWG. 400.11



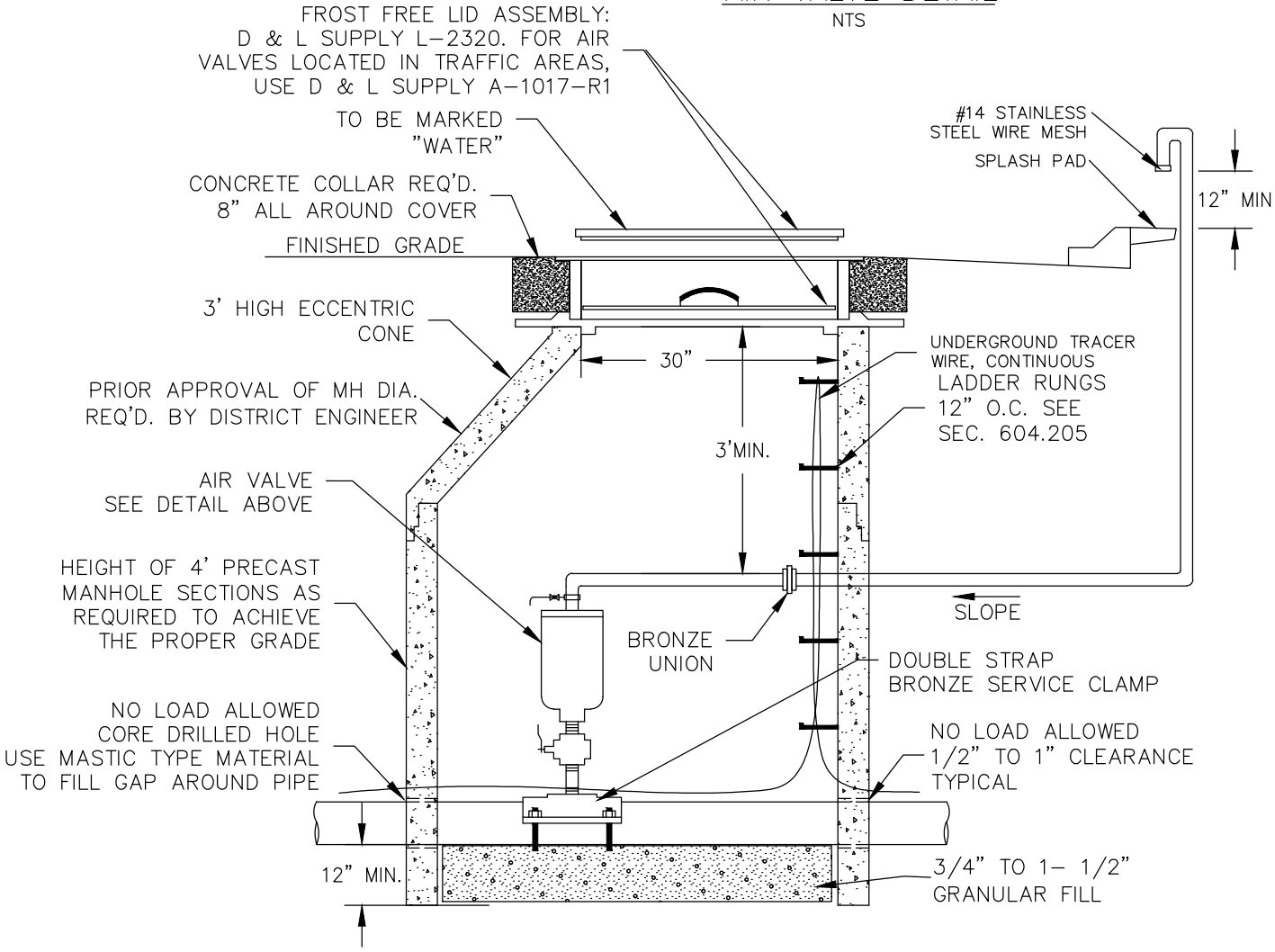
GATE VALVE IN MANHOLE

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	GATE VALVE IN MANHOLE	DWG. 400.12



AIR VALVE DETAIL

NTS

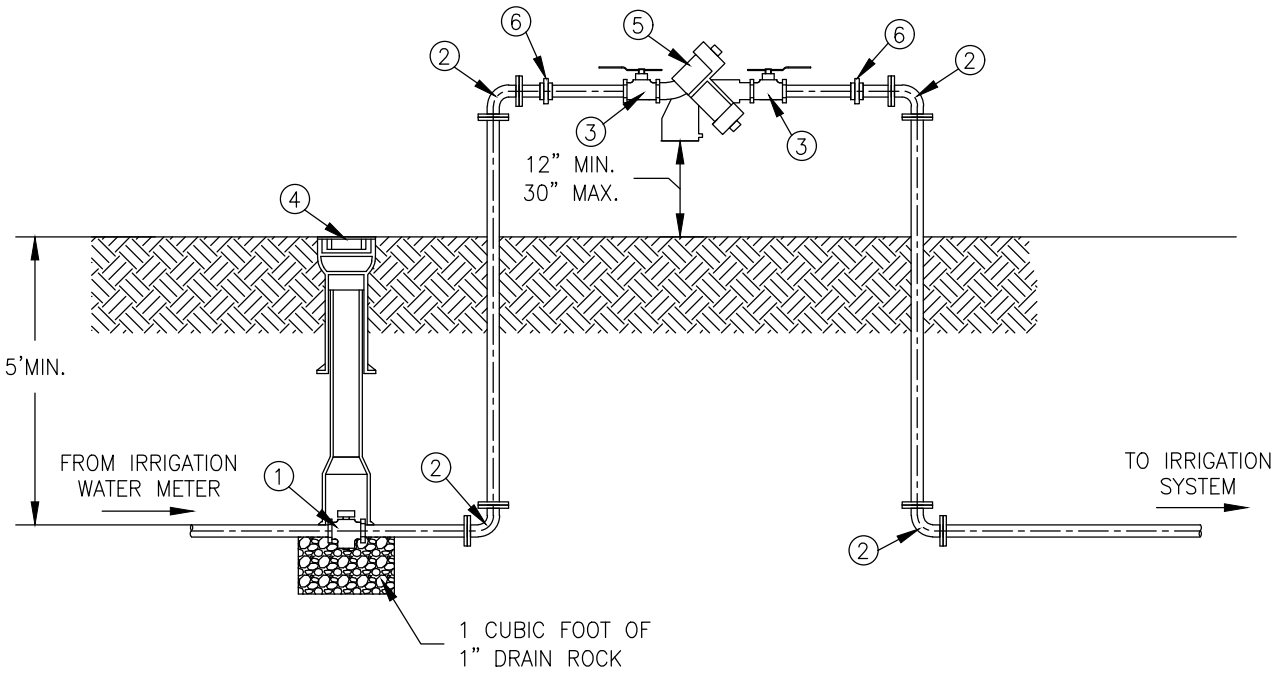


AIR RELEASE VALVE MANHOLE

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	AIR RELEASE VALVE MANHOLE W/ CURB & SPLASH PAD DRAIN	DWG. 400.13

PARTS LIST / DESCRIPTION

1. MUELLER 2" THD X THD BRASS STOP & WASTE VALVE. MODEL #MH10284K
2. 2" DIA SHC 80 GALV STEEL 90° BEND (THD x THD)
3. 2" THD X THD MATCO–NORCA FULL PORT BRASS BALL VALVE. MODEL #2/16 758T08
4. VALVE BOX: 2 PIECE, CAST IRON, SCREW ADJUSTABLE SLEEVE, 5 1/4" SHAFT WITH A DROP LID. LID TO BE MARKED "IRRIGATION"
5. WATTS 909 REDUCED PRESSURE ZONE BACKFLOW ASSEMBLY
6. 2" DIA SCH 80 GALV STEEL UNION



NOTE:
BACKFLOW ASSEMBLY SHALL BE TESTED WITHIN 10 DAYS AFTER INSTALLATION AND ANNUALLY EVERY YEAR AFTER. RESULTS SHALL BE SUBMITTED TO THE DISTRICT FOR APPROVAL.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

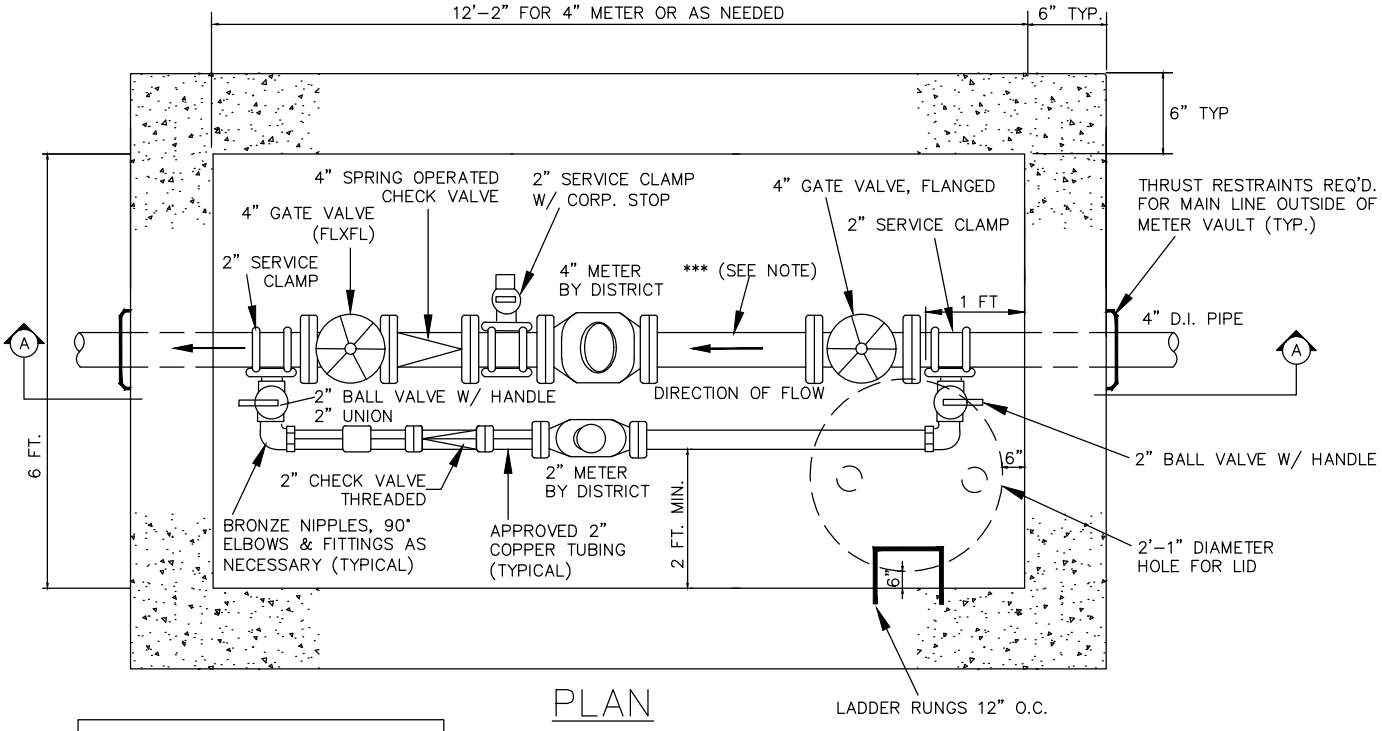
TYPICAL 3/4" TO 2" REDUCED PRESSURE BACKFLOW PREVENTER INSTALLATION

DWG. 400.14

BEFORE ANY CONSTRUCTION ON A 4" WATER METER VAULT

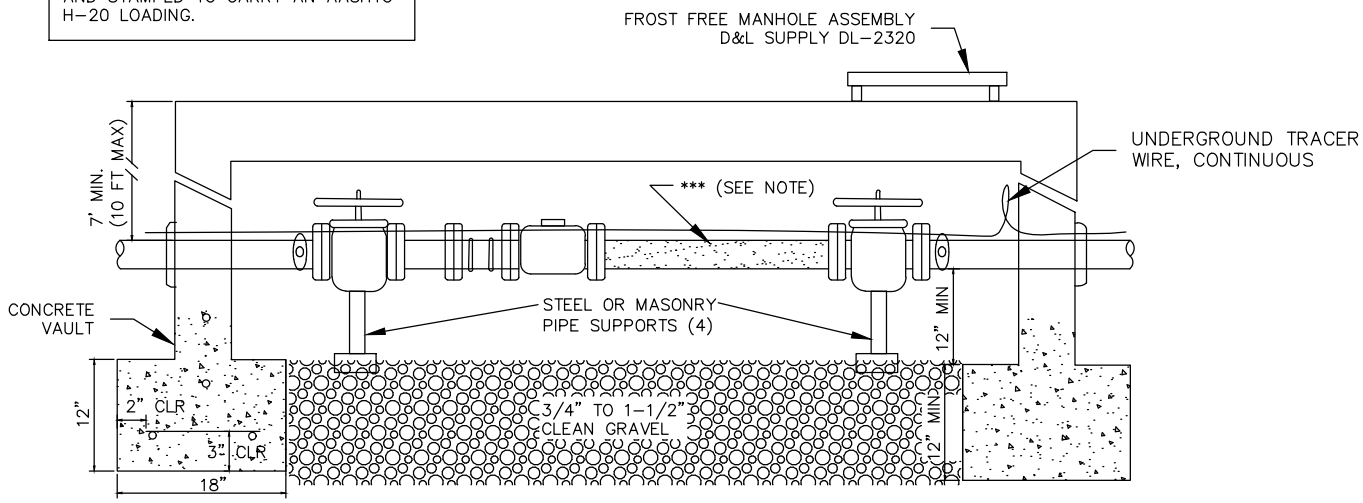
1– FIRST THE SIZE OF THE METER NEEDS TO BE APPROVED BY DISTRICT ACCORDING TO HYDRAULIC AND FIRE PROTECTION NEEDS
2– AFTER THE SIZE OF THE METER HAS BEEN DETERMINED DISTRICT MUST BE CONTACTED SO THE TYPE OF WATER METER CAN BE DETERMINED. THE TYPE OF WATER METER WILL DETERMINE THE DIMENSIONS OF THE PIPING AND METER VAULT. THE TYPE IS DETERMINED BY CALCULATIONS OF AVAILABLE WATER AND DEMAND. THERE IS ALSO A REQUIREMENT FOR A TURBULENCE CALMING SPOOL. SEE BELOW. ****
3– IF DISTRICT HAS THE CORRECT SIZE METER AVAILABLE THE METER CAN BE CHECKED OUT FROM THE WATER DEPARTMENT FOR A MAXIMUM OF FIVE (5) DAYS WHILE SIZING THE PIPING.** WATER METERS MUST BE RETURNED TO DISTRICT WATER DEPARTMENT AFTER THE FIVE (5) DAY LOAN PERIOD.
4– **WATER METERS MAY NOT BE INSTALLED ON A TEMPORARY OR PERMANENT BASIS UNTIL THERE HAS BEEN APPROVAL FROM DISTRICT'S OFFICE AND A BILLING PAYMENT AGREEMENT HAS BEEN SIGNED AT THE DISTRICT OFFICE.

**** A DUCTILE IRON SPOOL OF THE SAME DIAMETER AS THE LINE AND FIVE (5) TIMES THE DIAMETER OF THE PIPE IN LENGTH (FLANGE BY FLANGE) SHALL BE INSERTED BETWEEN THE HOT SIDE GATE VALVE AND THE WATER METER



PLAN

THE METER VAULT SHALL BE DESIGNED AND STAMPED TO CARRY AN AASHTO H–20 LOADING.



SECTION A

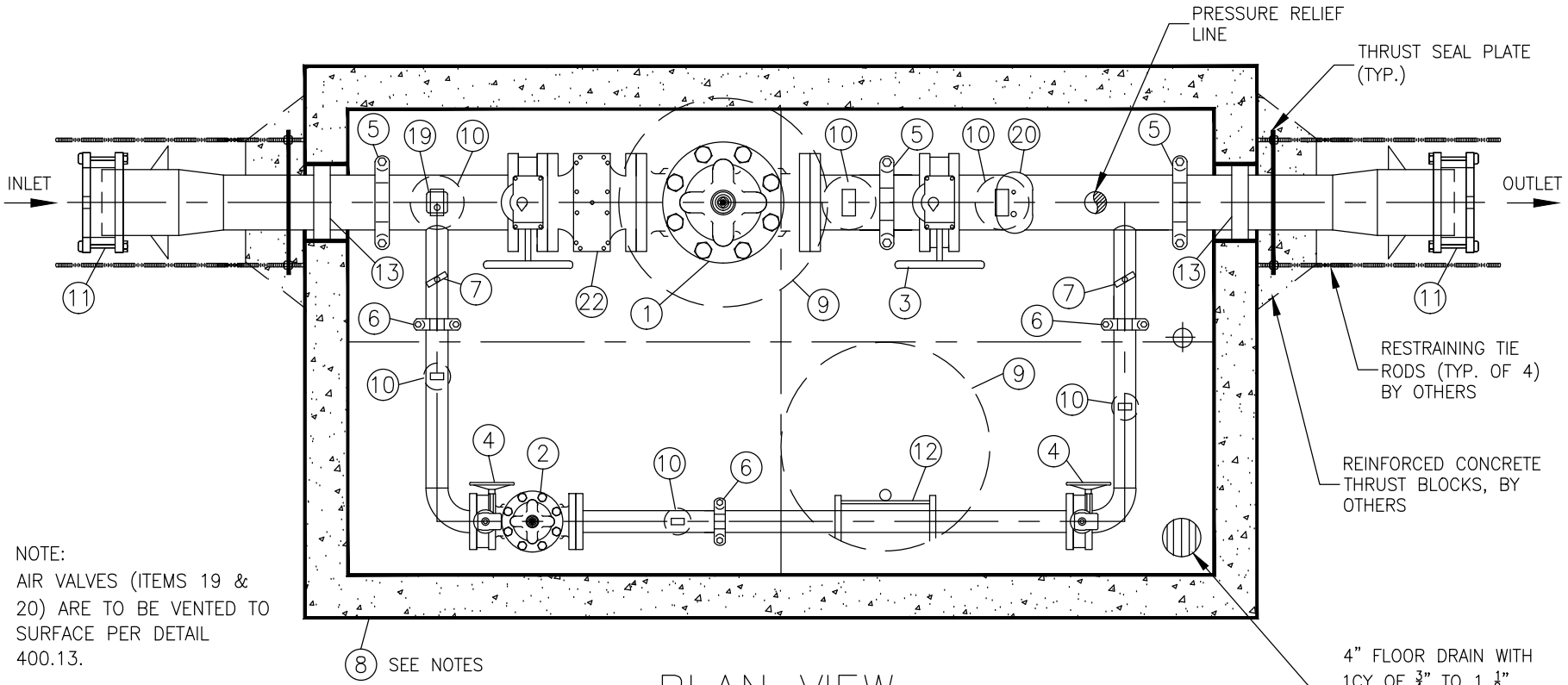
Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	METER VAULT & BYPASS DETAIL FOR 4" & 6" METERS ONLY	DWG. 400.15

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
BOWEN COLLINS	

PRV MECHANICAL DETAILS

DWG. 400.15A

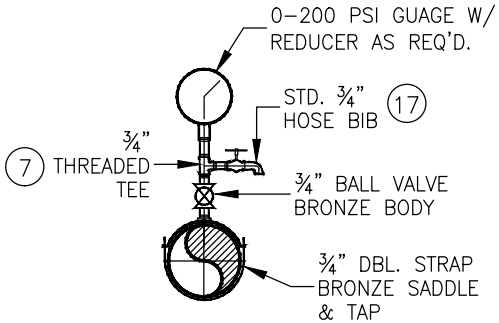


NOTE:
AIR VALVES (ITEMS 19 & 20) ARE TO BE VENTED TO SURFACE PER DETAIL 400.13.

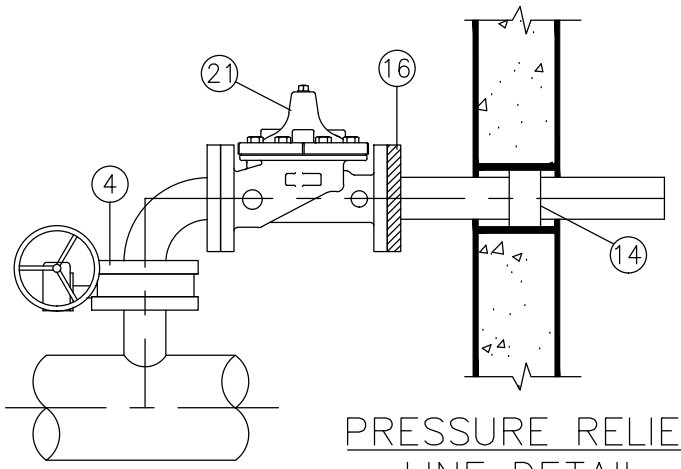
PLAN VIEW

FLOOR TO CENTERLINE OF MAIN PIPING

NOTE:
PRV INSTALLATION SHALL CONSIST OF A PRE-ASSEMBLED PACKAGE BY HYDEC, INC., INCLUDING PRECAST CONCRETE VAULT, PIPES, VALVES, PIPE SUPPORTS, COUPLINGS AND ALL OTHER NECESSARY APPURTENANCES. SIZES OF VALVES AND FITTINGS WILL BE DETERMINED FOR EACH SPECIFIC INSTALLATION. VAULTS SHALL BE DESIGNED FOR STANDARD H-20 LOADS WHEN LOCATED WITHIN A ROADWAY OR FOR H-20 INTERMITTENT LOADS WHERE NOT LOCATED WITHIN A ROADWAY.
CONTACT: HYDEC – MIKE LANDERS (925) 803-4646, (415) 302-1883, MIKE@HYDECINC.COM



PRESSURE GAUGE DETAIL



PRESSURE RELIEF LINE DETAIL

BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION
1	1	CLA–VAL 90G–01YBCSKOKCX. Pressure Reducing Valve and Pressure Sustaining Valve with Strainers, Flow Control, Shut–off Cocks, Flow Stabilizer, Stainless Steel Trim, Flg x Flg (Submittal Req'd.)
2	1	CLA–VAL 90G–01YBCSKOKCX. Pressure Reducing Valve and Pressure Sustaining Valve with Strainers, Flow control Shut–off Cocks, Flow Stabilizer, Stainless Steel Trim, Flg x Flg (Submittal Req'd.)
3	2	Butterfly Valve c/w Handwheel Actuator – Wafer
4	3	Butterfly Valve c/w Handwheel Actuator – Wafer
5	3	VICTAULIC Coupling
6	3	VICTAULIC Coupling
7	2	½" Pressure Gauge, Grade B, 0–200 psi, Threaded w/ Stem Valve, See Detail
8	1	Precast Concrete Vault c/w White Latex Interior & Black Tar Exterior. Vault in Accordance with DISTRICT Standards: A. Concrete is to be 6 ½ Bag Mix, 4,000 psi B. Reinforcing Steel is to be ASTM A615, Grade 40 C. Waterproof Outside Wall and Top Slab per UBC Code for Buried Foundations
9	2	Frost Free Lid Assembly D & L Supply L–2320 for vaults located in traffic areas use D & L supply A–1017 R–1
10	6	Adjustable Pipe Supports
11	2	SMITH BLAIR Transition Coupling
12	1	Lane Ladder Assembly c/w Bracket
13	2	Pipe Seal Assembly
14	2	Pipe Seal Assembly
15	1	Hose Bib Assembly
16	1	VICTAULIC Flange Adaptor
17	2	¾" Hose Bibb, with Hand Wheel, I.P. Thread, See Detail
18	1	Pipe Seal Assembly
19	1	APCO Air Release Valve c/w Isolation Ball Valve
20	1	Cla–Val 361–CAV564.3 Combination Air Valve c/w Isolation Ball Valve
21	1	CLA–VAL 50A–01BKCX Pressure Relief Valve c/w DI Body, SS Trim – Flgd
22	1	CLA–VAL X43H Basket Strainer DIST – #300 Flgd

STANDARD FABRICATION & FINISHING SPECIFICATION

FABRICATED STEEL PIPE & FITTINGS TO BE SCHEDULE NO. 40 STEEL PIPE. FOR SIZES TO 10" AND ⅜" WALL FOR 12" AND LARGER.

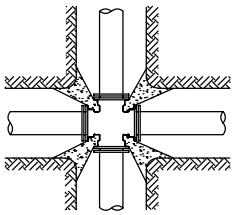
ALL PIPE, INSIDE WETTED SURFACES TO BE SANDBLASTED, EPOXY LINED AND COATED TO AWWA C–210 AND NSF–61 SPECIFICATION. FINISH COATING WILL BE BLUE ENAMEL.

Jordanelle

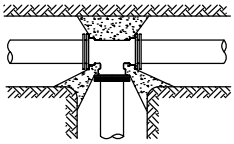
DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

PRV MECHANICAL NOTES

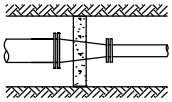
DWG. 400.15B



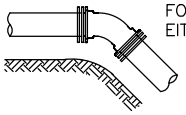
CROSS



TEE

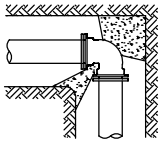


REDUCER

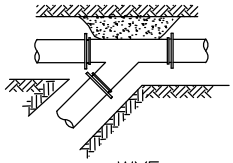


RESTRAINED JOINTS REQ'D. SEE NOTE 7 FOR REQ'D DISTANCE EITHER SIDE OF BEND

VERTICAL BEND



90° ELBOW



WYE

NOTES:

1. CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH OR STRUCTURAL BACKFILL APPROVED BY ENGINEER. PLACE VISQUEEN BARRIER BETWEEN CONCRETE AND PIPE.
2. KEEP CONCRETE CLEAR OF JOINT AND ACCESSORIES.
3. REQUIRED BEARING AREAS AT FITTINGS SHALL BE AS SHOWN IN ADJACENT TABLE TO CONFORM TO TEST PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED IN THE SPECIFICATIONS.
4. BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS TYPICAL DETAIL.
5. ALL BURIED PIPING EXCEPT FLANGED, SCREWED, SOCKET WELD PVC OR WELDED STEEL PIPE SPECIFIED TO BE PRESSURE TESTED SHALL BE PROVIDED WITH CONCRETE THRUST BLOCKS AT ALL DIRECTION CHANGES UNLESS OTHERWISE NOTED.
6. THRUST BLOCKS SHALL NOT BE LOCATED OR SIZED TO ENCASE ADJACENT PIPES OR FITTINGS.
7. INSTALL RESTRAINED DUCTILE IRON MECHANICAL JOINTS ON VERTICAL BENDS. INSTALL RESTRAINED TYPE JOINTS ON ALL PIPE JOINTS EACH SIDE OF VERTICAL BENDS, A MINIMUM OF 50 FEET FOR 45° BEND, 24 FEET FOR A 22.5° BEND, AND 12 FEET FOR A 11.25° BEND. CONTRACTOR RESPONSIBLE TO VERIFY DISTANCES WITH RESTRAINED JOINT SUPPLIER FOR REQUIRED TEST PRESSURES ON THE PIPE.
8. BEARING AREAS ARE BASED ON TEST PRESSURE OF 150 P.S.I. AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 POUNDS PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES USE THE FOLLOWING EQUATION:

BEARING AREA = (TEST PRESSURE/150) X (2000/SOIL BEARING STRESS) X (TABLE VALUE)

MINIMUM BEARING AREA IN SQUARE FEET

FITTING SIZE	TEE,WYE PLUG OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED ON RUN		45° BEND	22 1/2° BEND	11 1/4° BEND	45° VERT BEND * (CU. YDS)
			A1	A2				
4"	1.4	1.9	1.9	1.4	1.0	1.0	1.0	1.0
6"	2.8	4.0	4.0	2.8	2.1	1.1	1.0	2.1
8"	4.8	6.8	6.8	4.8	3.7	1.9	1.0	3.6
10"	7.3	10.3	10.3	7.3	5.6	2.8	1.4	5.5
12"	10.3	14.5	14.5	10.3	7.9	4.0	2.0	7.8
16"	17.8	25.2	25.2	17.8	13.6	7.0	3.5	13.5
18"	22.4	31.7	31.7	22.4	17.1	8.7	4.4	16.9
20"	27.5	38.9	38.9	27.5	21.0	10.7	5.4	20.8
24"	39.2	55.4	55.4	39.2	30.0	15.3	7.7	29.6

VALUES LISTED ARE FOR 150 PSI TEST PRESSURE & 2000 PSF SOIL BEARING STRESS

WATER SUPPLY/TRANSMISSION LINE THRUST BLOCKING (TYTON JOINT PIPE)

Jordanelle

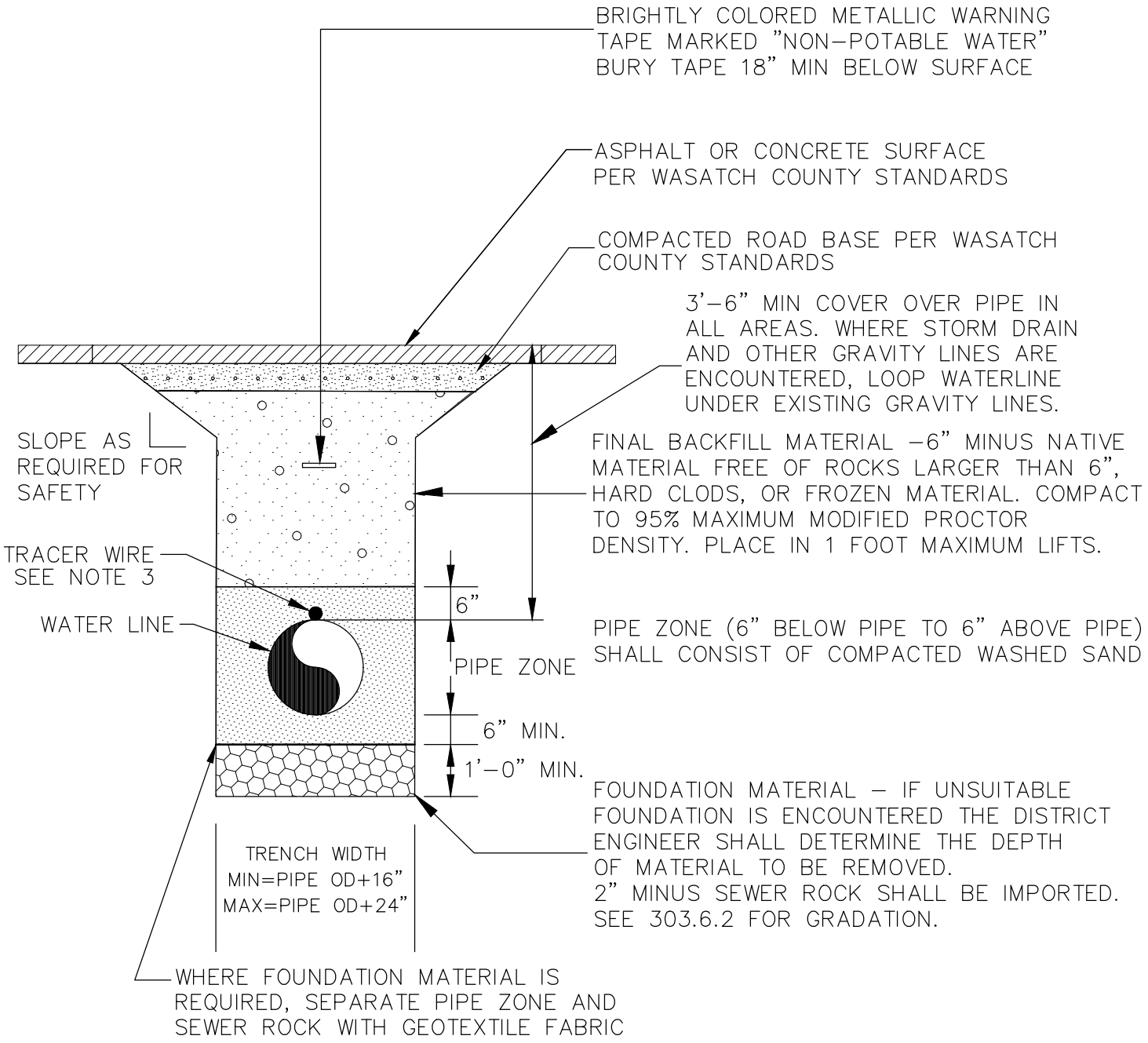
DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

THRUST BLOCK DETAILS

DWG. 400.16

Standard Drawings
Irrigation Water

Revised: May 2016



NOTES:

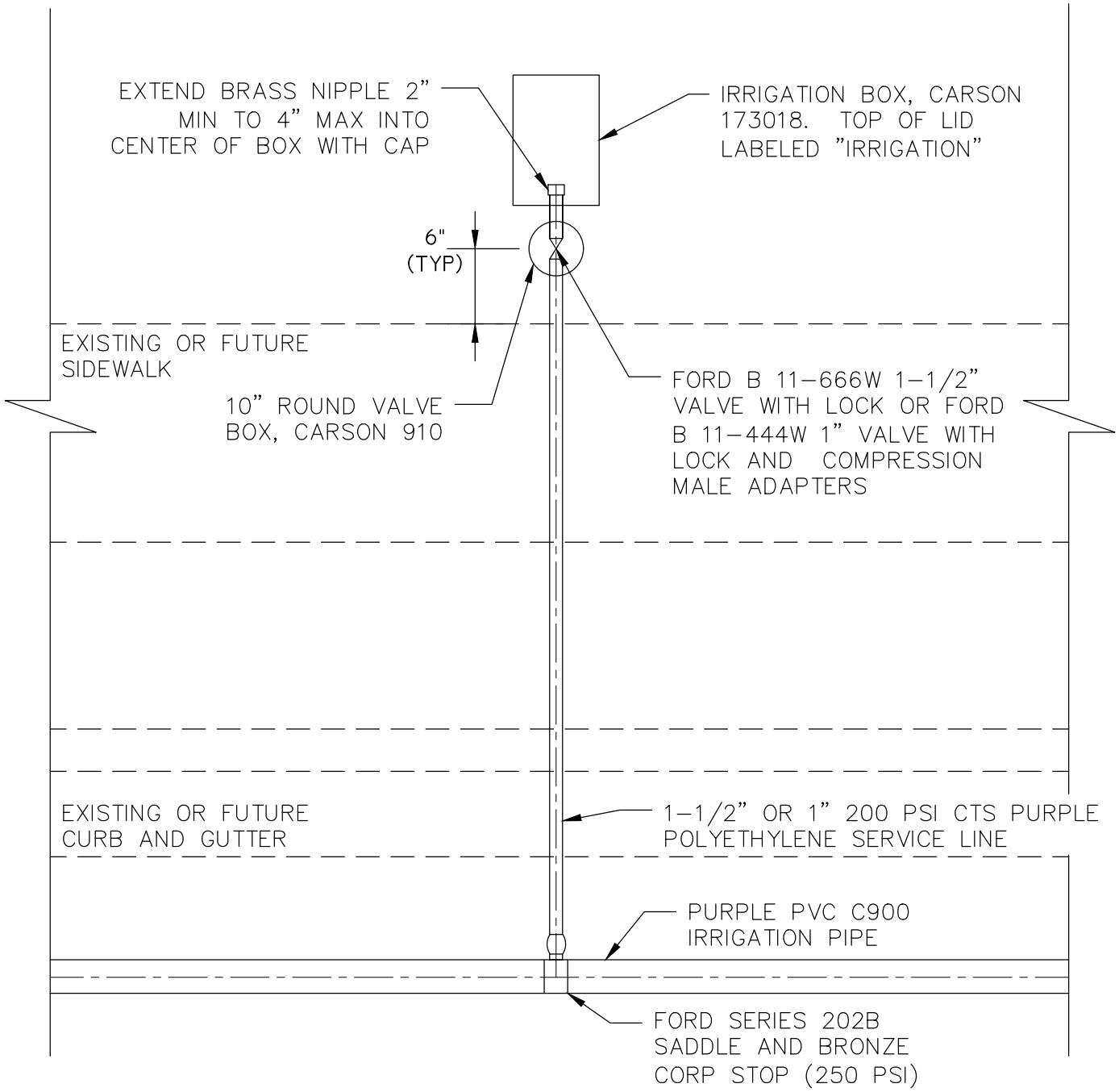
1. SEE SPECIFICATIONS FOR SPECIFIC MATERIAL REQUIREMENTS
2. BACKFILL UNDER WALKS, TRAILS, ETC. SHALL BE STRUCTURAL FILL COMPACTED TO 96% OF MAXIMUM MODIFIED PROCTOR DENSITY.
3. TRACER WIRE SHALL BE #12 - GAUGE, 600 VOLT COPPER WIRE. PVC JACKETED FOR UNDERGROUND SERVICES. PROVIDE SURFACE CONNECTIONS AT ALL VALVE BOXES AND HYDRANTS. WIRE CONTINUITY WILL BE SUBJECT TO DISTRICT TESTING DURING AND AFTER CONSTRUCTION. CONTRACTOR SHALL FIX ANY DAMAGED LINES TO THE SATISFACTORY OF THE DISTRICT.

Jordanelle

DRAWN BY:	JC
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
	BOWEN COLLINS

IRRIGATION LINE DETAIL

DWG. 500.1



NOTES:

1. 1" OR 1-1/2" SERVICE CONNECTION TO MAIN: USE FORD SERIES 202B BRONZE SADDLE SERVICE CLAMP. A RIGID LINER SHALL BE USED INSIDE OF TUBING AT THE COMPRESSION FITTING ON 1" OR 1-1/2" SINGLE SERVICE LINE ONLY.
2. ALL FITTINGS SHALL BE COMPATIBLE WITH SERVICE SIZES.
3. SERVICE LINE INSTALLATION AT AN EXISTING CURB & GUTTER AND SIDEWALK WITH PLANTER STRIP SHALL HAVE THE UTILITY BOX LOCATED BEHIND THE SIDEWALK.
4. SERVICE LINE INSTALLATION AT AN EXISTING MONOLITHIC CURB, GUTTER AND SIDEWALK SHALL HAVE THE UTILITY BOX LOCATED BEHIND THE SIDEWALK.
5. SERVICE LINE LOCATION FOR AREAS WITH NO CURB, GUTTER AND SIDEWALK TO BE DETERMINED BY THE DISTRICT.
6. EXTEND TRACER WIRE INTO UTILITY BOX.
7. OWNER SHALL PURCHASE THE METER AND FITTINGS FROM THE DISTRICT AT THE TIME THE CULINARY METER IS PURCHASED. INSTALLATION BY DISTRICT.

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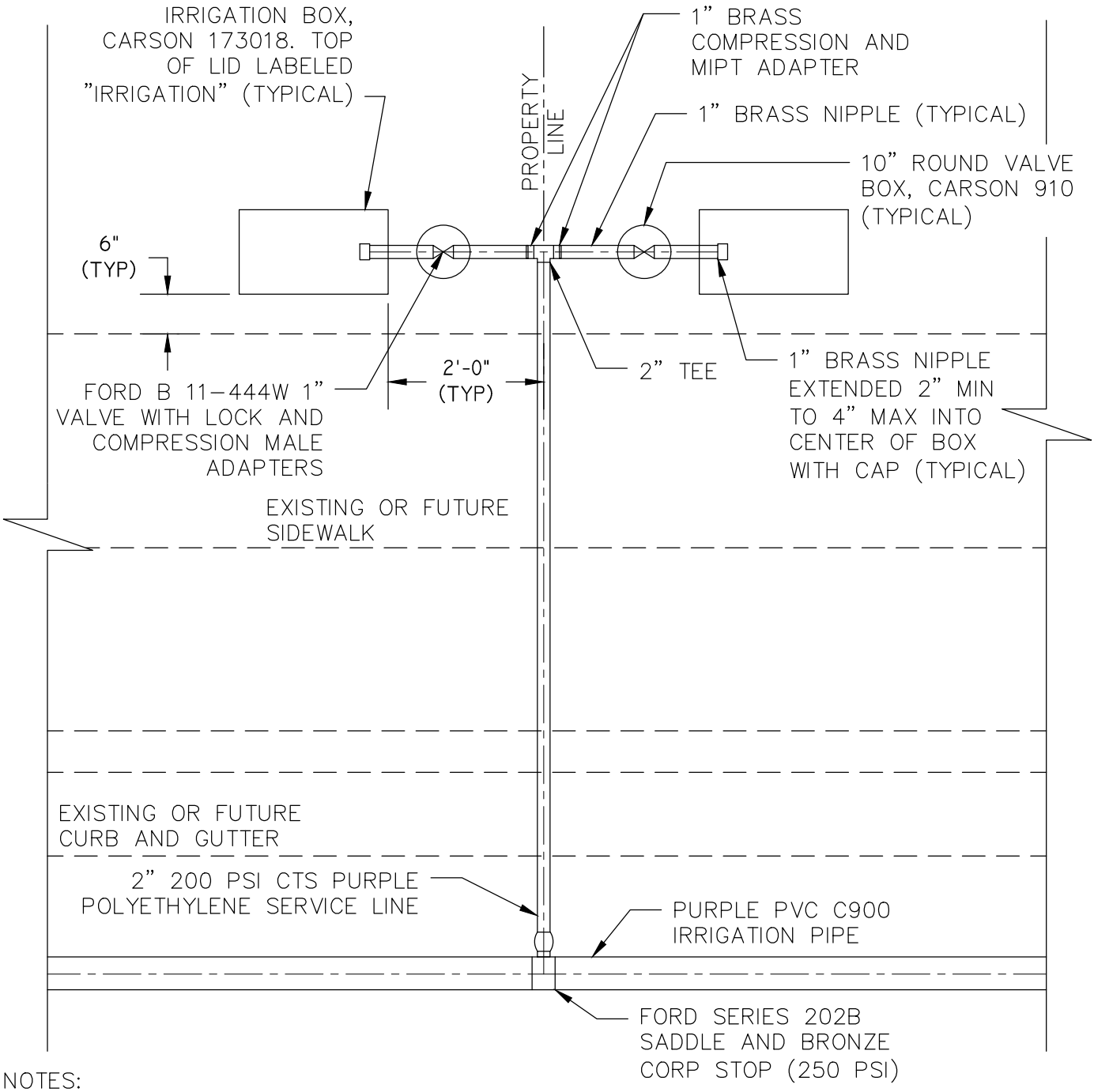
REV. DATE:	MAY 2016
	BOWEN COLLINS

SINGLE 1" OR 1-1/2" SERVICE CONNECTION DETAIL

DWG. 500.2



NOTES:

1. 2" SERVICE CONNECTION TO MAIN: USE FORD SERIES 202B BRONZE SERVICE CLAMP. RIGID LINER WILL BE REQUIRED INSIDE OF TUBING AT COMPRESSION FITTING ON 2" OR 2-1/2" SERVICE LINES.
2. FOR 1" DUAL SERVICE USE 2" CONNECTION TO MAIN.
3. ALL FITTINGS SHALL BE COMPATIBLE WITH SERVICE SIZES.
4. SERVICE LINE INSTALLATION AT AN EXISTING CURB & GUTTER AND SIDEWALK WITH PLANTER STRIP SHALL HAVE THE UTILITY BOX LOCATED BEHIND THE SIDEWALK.
5. SERVICE LINE INSTALLATION AT AN EXISTING MONOLITHIC CURB, GUTTER AND SIDEWALK SHALL HAVE THE UTILITY BOX LOCATED BEHIND THE SIDEWALK.
6. SERVICE LINE LOCATION FOR AREAS WITH NO CURB, GUTTER AND SIDEWALK TO BE DETERMINED BY THE DISTRICT.
7. EXTEND TRACER WIRE INTO UTILITY BOX.
8. OWNER SHALL PURCHASE THE METER AND FITTINGS FROM THE DISTRICT AT THE TIME THE CULINARY METER IS PURCHASED. INSTALLATION BY DISTRICT.

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REV. DATE:	MAY 2016
	BOWEN COLLINS

DOUBLE 1" SERVICE CONNECTION DETAIL

DWG. 500.3

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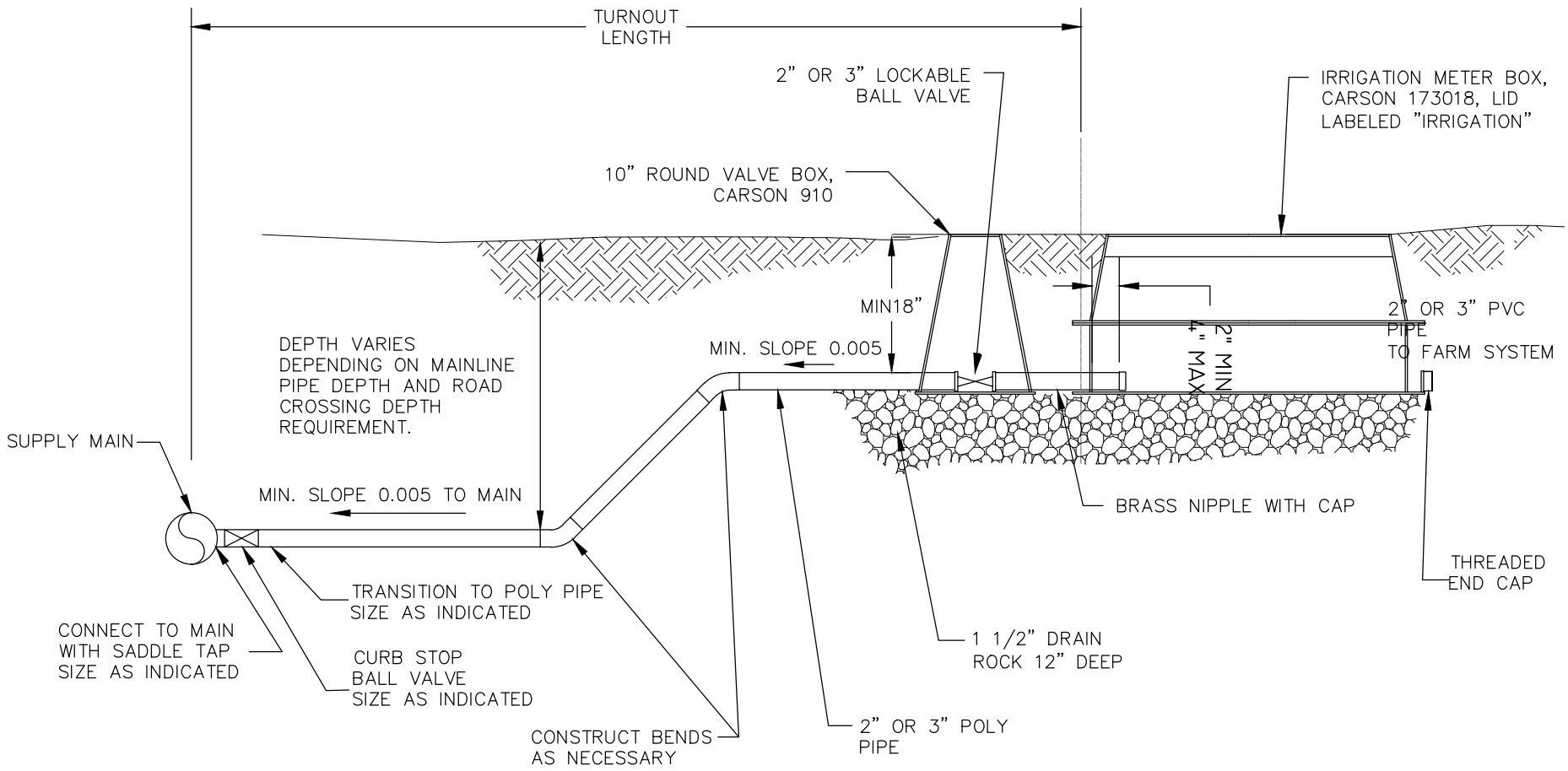
REV. DATE:	MAY 2016
BOWEN COLLINS	

2" OR 3" METER TURNOUT

DWG. 500.4



NOTES

1. ALL FITTINGS SHALL BE COMPATIBLE WITH SERVICE SIZES.
2. EXTEND TRACER WIRE INTO UTILITY BOX.
3. OWNER SHALL PURCHASE THE METER AND FITTINGS FROM THE DISTRICT AT THE TIME THE CULINARY METER IS PURCHASED. INSTALLATION BY DISTRICT.

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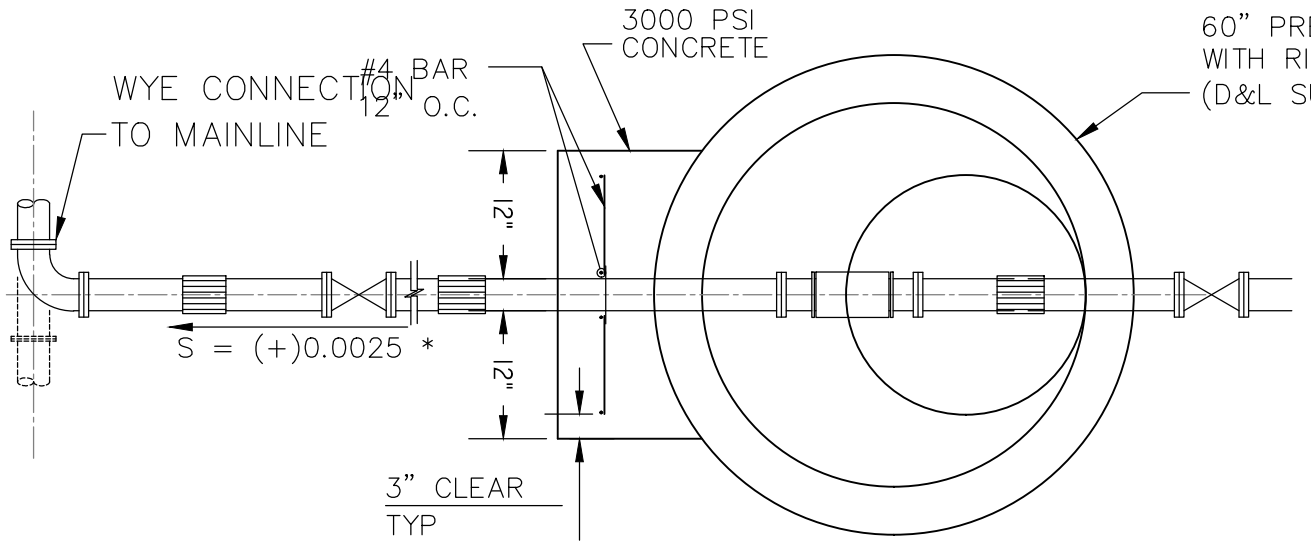
REV. DATE:	MAY 2016
BOWEN COLLINS	

4" OR LARGER METER TURNOUT

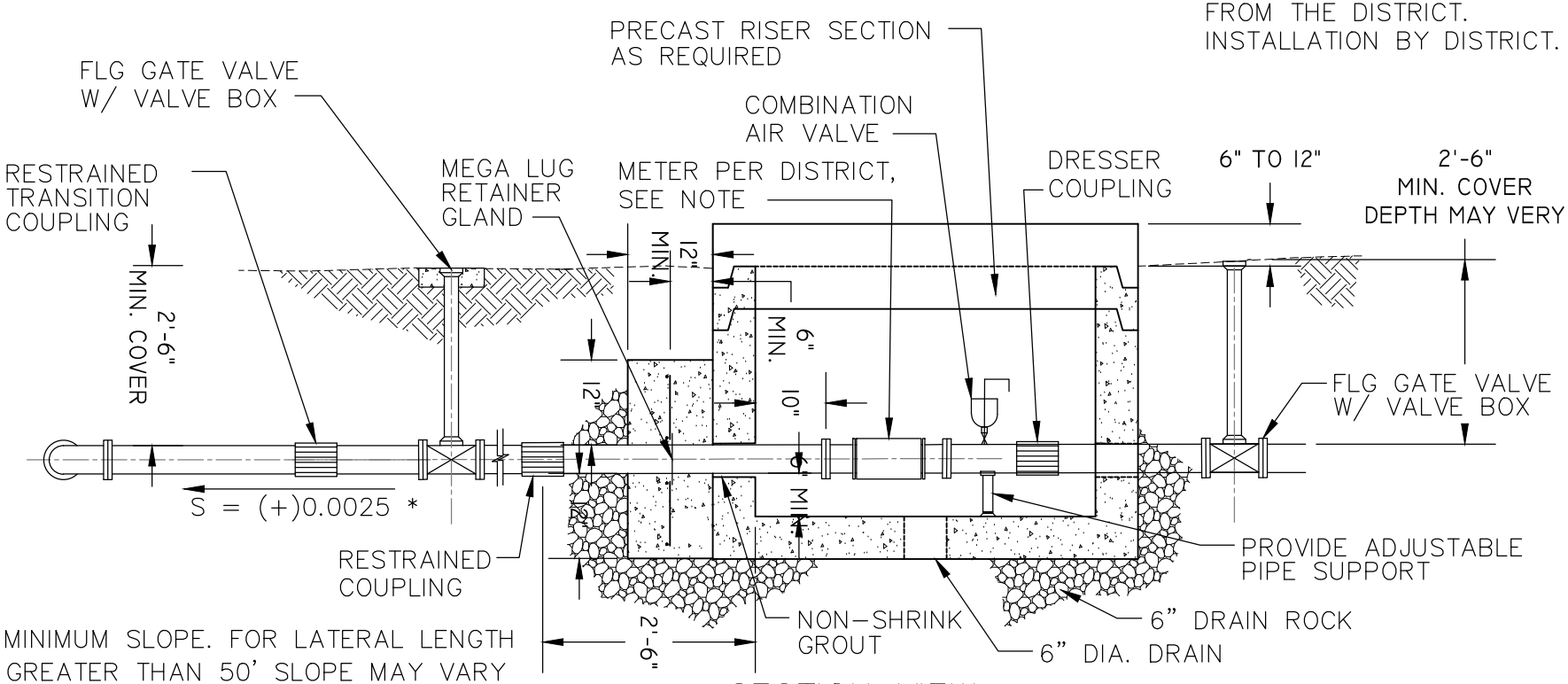
DWG. 500.5



PLAN VIEW

NOTES

1. POWER REQUIRED AT THE METER. CONTRACTOR RESPONSIBLE FOR COORDINATING AND INSTALLING THE POWER AS REQUIRED FOR THE METER. CONTRACTOR SHALL COORDINATE WITH THE DISTRICT FOR METER POWER REQUIREMENTS.
2. EXTEND TRACER WIRE INTO UTILITY BOX.
3. OWNER SHALL PURCHASE THE METER AND FITTINGS FROM THE DISTRICT. INSTALLATION BY DISTRICT.



SECTION VIEW

* MINIMUM SLOPE. FOR LATERAL LENGTH GREATER THAN 50' SLOPE MAY VARY TO MAINTAIN MINIMUM 2.5' OF COVER.

Jordanelle

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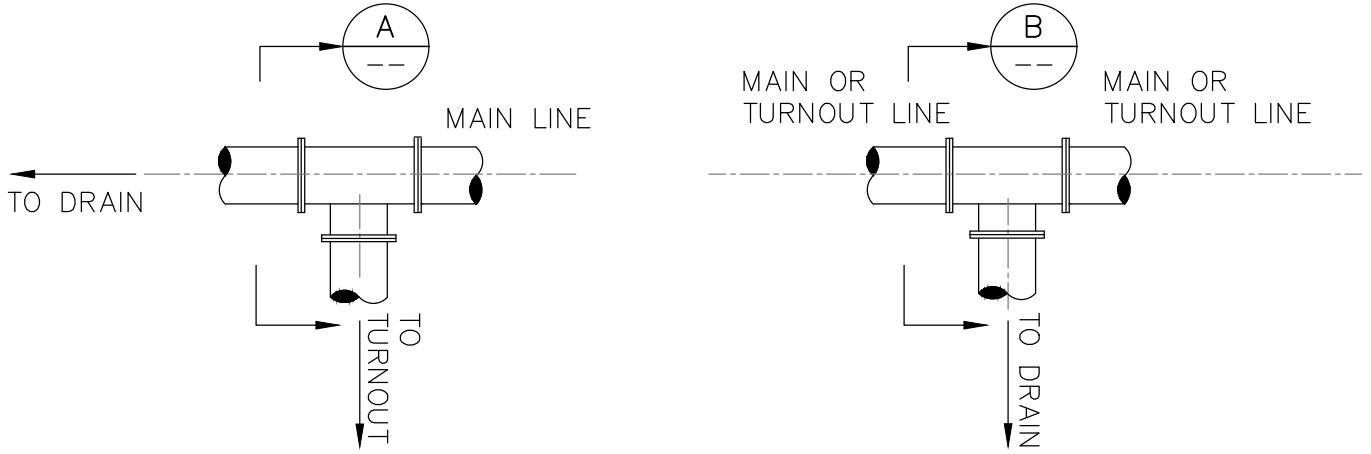
CHECKED BY:	EN/LS
REV. DATE:	MAY 2016
BOWEN COLLINS	

DRAIN TO DAYLIGHT

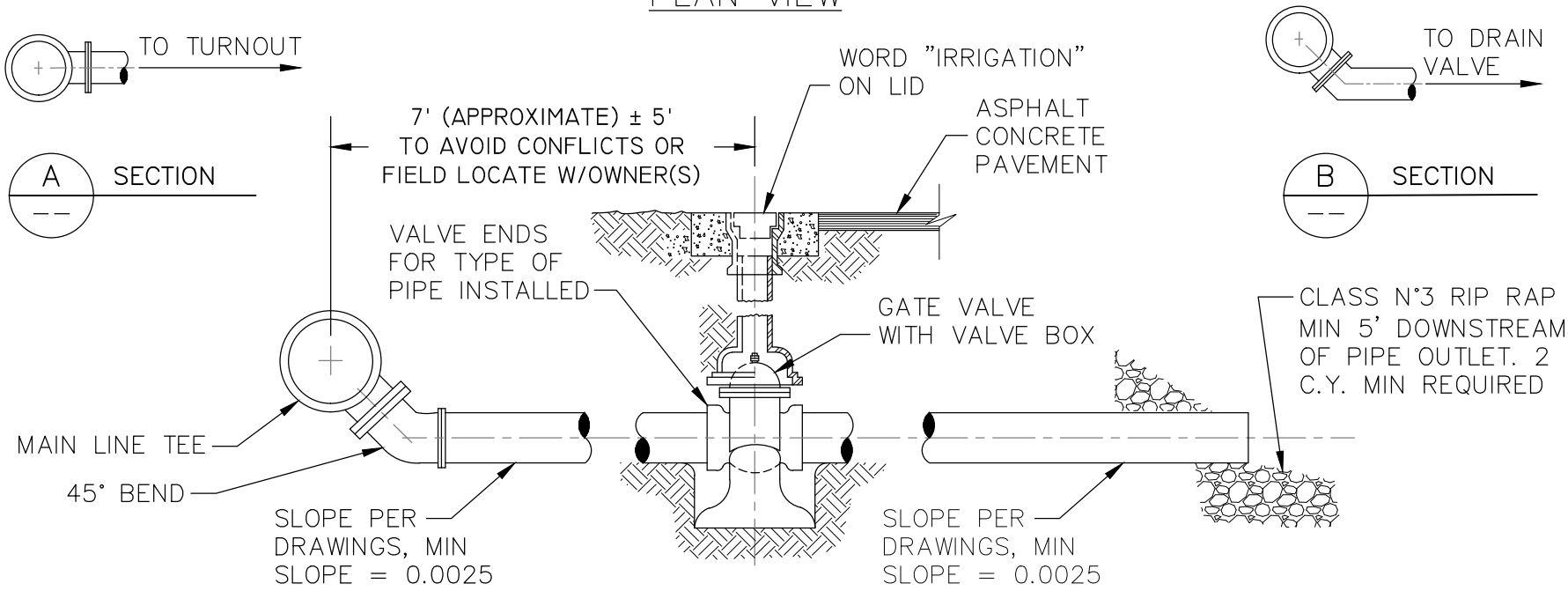
DWG. 500.6



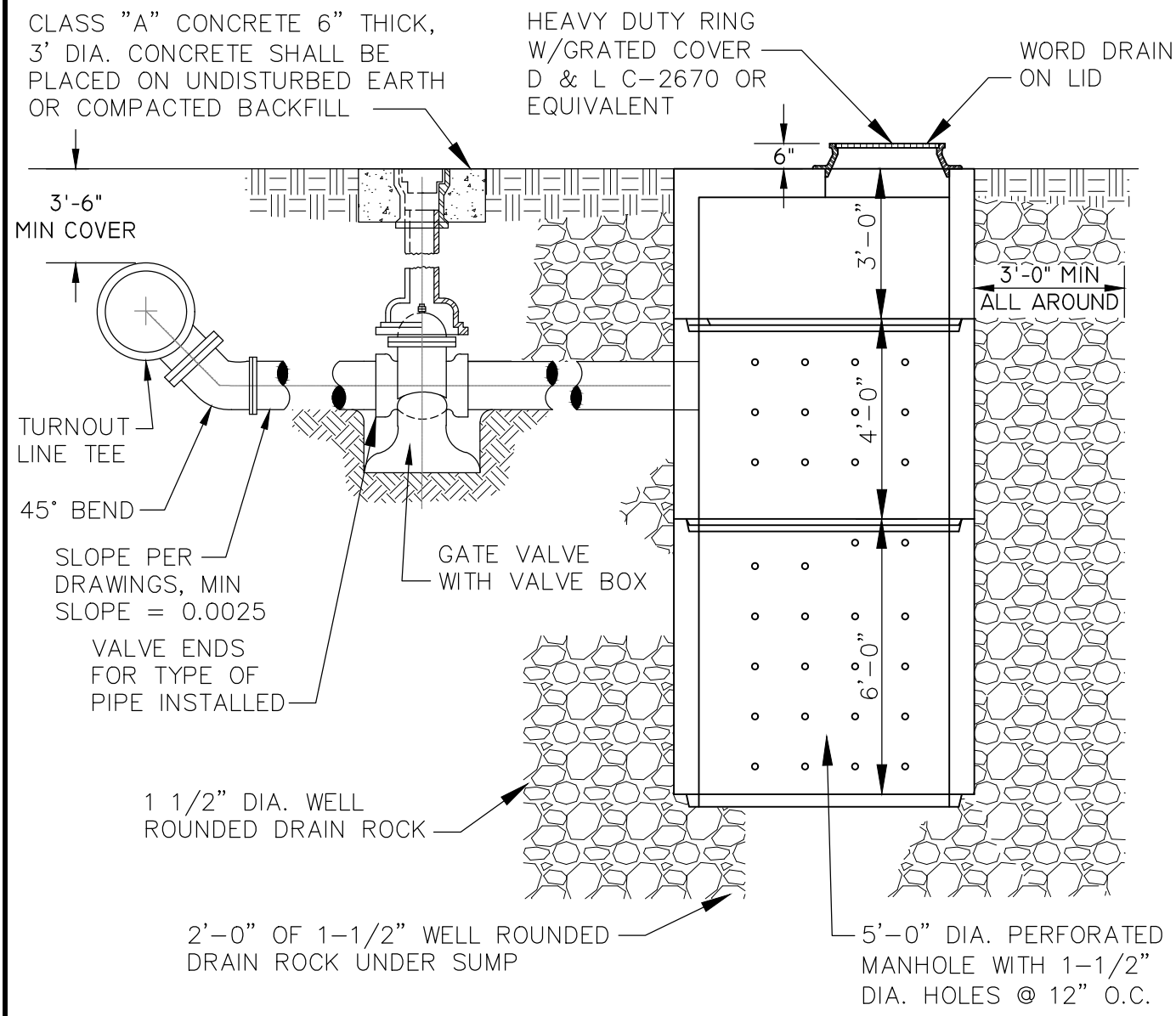
FOR END OF LINE DRAINAGE

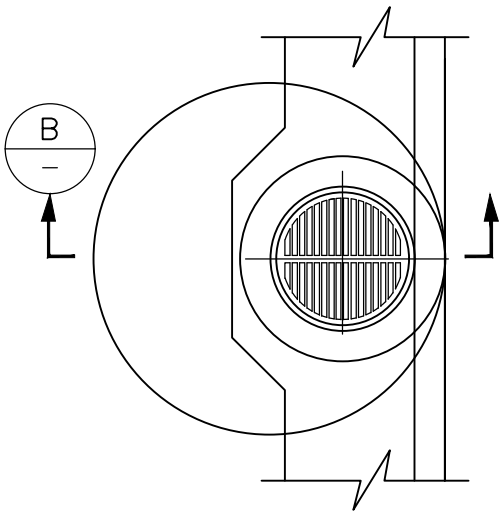
FOR MID – LINE DRAINAGE OR AT TURNOUT

PLAN VIEW

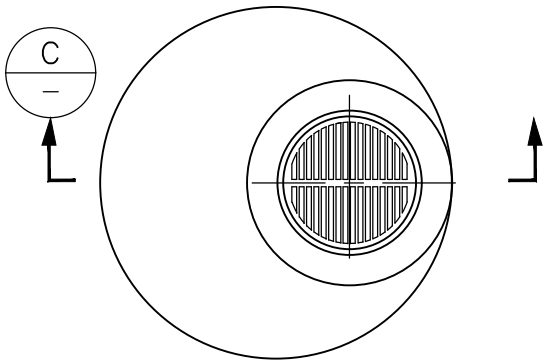


SECTION VIEW





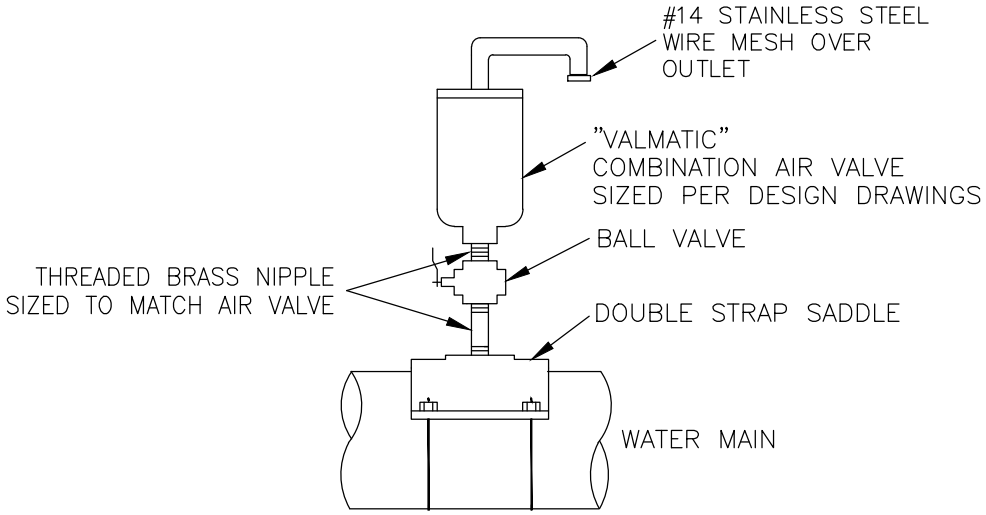
CURB & GUTTER PLAN VIEW



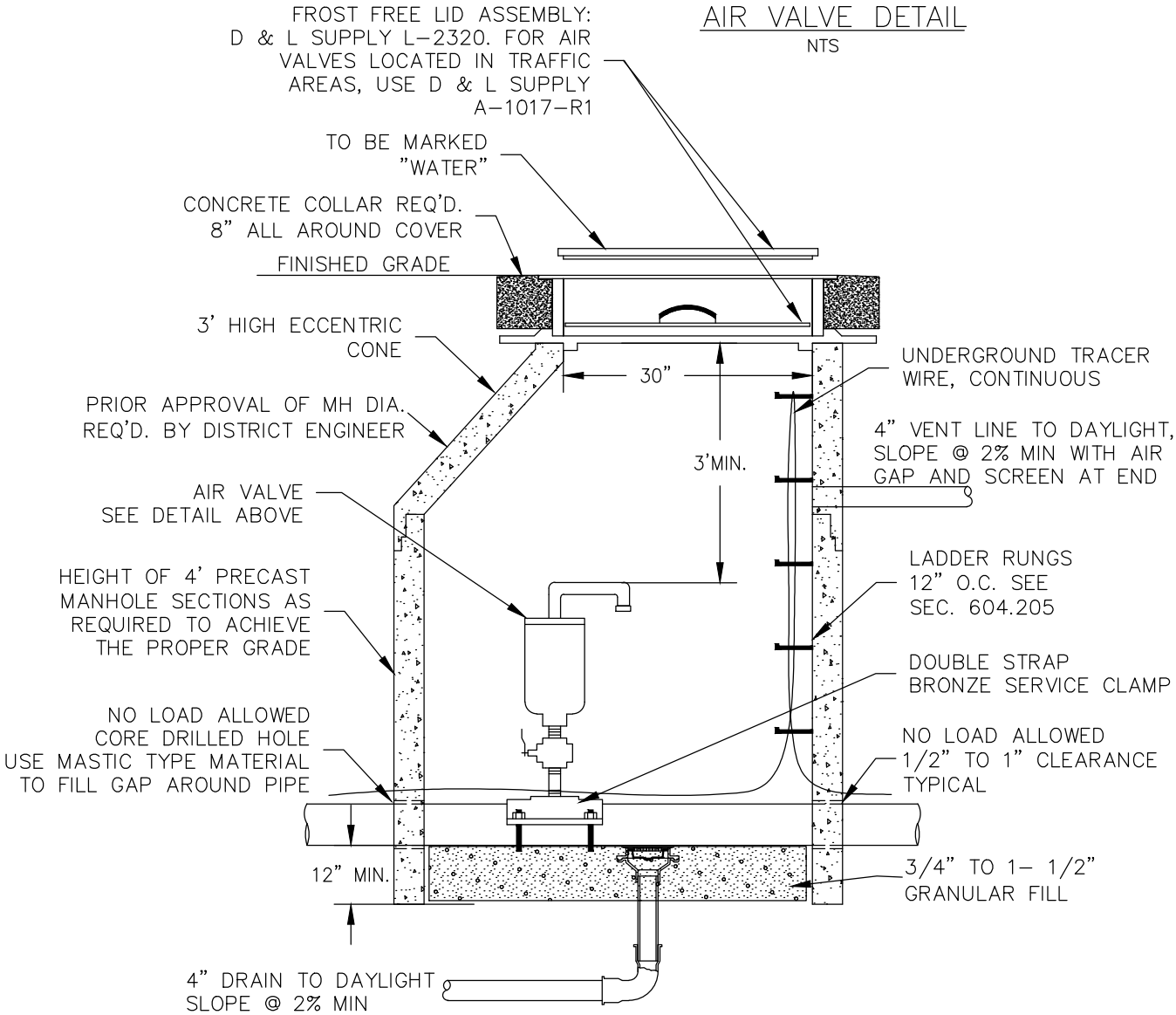
OPEN FIELD PLAN VIEW

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	DRAIN TO SUMP	DWG. 500.7

NOTE:
THIS DETAIL MAY ONLY BE USED IN SPECIAL CASES AND AS APPROVED BY THE UTAH DIVISION OF DRINKING WATER



AIR VALVE DETAIL
NTS



AIR RELEASE VALVE MANHOLE

Jordanelle	DRAWN BY: JC CHECKED BY: EN/LS REV. DATE: MAY 2016 BOWEN COLLINS	AIR RELEASE VALVE MANHOLE	DWG. 500.8