

**STANDARD TECHNICAL SPECIFICATIONS AND CONSTRUCTION  
DETAILS  
for  
WATER SYSTEM EXTENSIONS  
for the  
Hart County Water and Sewer Authority**

**JUNE 2023**



**Hart County Water  
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## SECTION 02225

### EARTHWORK FOR UTILITIES

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

Work under this section shall include all operations necessary for excavating, backfilling and compaction of material necessary for the construction of pipelines and all appurtenant facilities including sewage pump station, concrete saddles, pipe protection, etc., and for the disposal of waste and unsuitable materials.

##### 1.02 RELATED WORK

- A. Section 02270 – Temporary Erosion Control
- B. Section 02931 - Grassing

##### 1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), Annual Book of Standards
  1. ASTM D2167, Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
  2. ASTM D1556, Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
  3. ASTM D 2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  4. AWWA C600, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
  5. AWWA C605, Standard for Underground Installation of PVC Pressure Pipe and Fittings for Water
  6. AWWA C150, American National Standard for the Thickness Design of Ductile-Iron Pipe
  7. ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes
- B. Occupational Safety and Health Administration (OSHA), Code of Federal Regulations 29 CFR Part 1926, Subpart P – Excavation, latest revision.

## 1.04 GENERAL

Elevations of the existing ground and the elevations of existing grades of structures are believed to be reasonably correct, but do not purport to be absolutely so, and, together with any schedule of quantities are presented only as an approximation. The CONTRACTOR shall satisfy himself, however, by actual examination of the site of the WORK as to the existing elevations and the amount of work required under this section. If the CONTRACTOR is not willing to accept any ground surface elevations indicated upon the Drawings for payment, he shall so notify the ENGINEER prior to starting any excavation work.

## PART 2 PRODUCTS

### 2.01 BEDDING AND HAUNCHING STONE

- A. Class IA or IB aggregate materials shall be in accordance with ASTM D 2321 and ASTM C33 for gravity sewer, wet trench conditions, under roads, structures and driveways.
- B. For PVC water line and forcemain, CONTRACTOR shall use reused or imported Class II, III or IVA materials in accordance with ASTM D2321. Materials shall be free of stone, clods, broken rock, or concrete larger than 1.5 inches in largest dimension, organic matter, rubbish, or other unsuitable material for all other trench conditions not mentioned in Paragraph 2.01.A, unless otherwise directed by ENGINEER or OWNER.

### 2.02 INITIAL BACKFILL

Reused or imported earth free of stone, clods, broken rock, or concrete, or organic matter, rubbish, or other unsuitable material.

*Soil types* shall be in accordance with ASTM D2487, and the Unified Soil Classification System. Backfill Classification shall be in accordance with ASTM D2321. **Suitable Subsoil:** Reused and/or imported free of stone larger than 3 inch size, and debris. For backfill supporting structures and piping, Unified Soil Classification System (USCS) Groups GW and GP compacted to 97% Modified Proctor per ASTM D-1557. For backfill under roadways, pavement and sidewalks, USCS Groups GW and GP compacted to 98% Standard Proctor, Groups GM, GC, SW, SP, and SM compacted to 98% Standard Proctor, USCS Group SC compacted to 99% Standard Proctor, and USCS Groups ML and CL compacted to 100% Standard Proctor per ASTM D-698. For backfill not supporting any type of structure, paving, or sidewalk, Groups GW, GP, GM, and GC compacted to 90% Standard Proctor, Groups SW, SP, and SM compacted to 91% Standard Proctor, Groups ML, and CL compacted to 92% Standard Proctor, and Groups OL, MH, CH, and OH compacted to 93% Standard Proctor per ASTM D-698. **Unsuitable soil:** USCS Groups MH, CH, OL, OH, and PT.

### 2.03 FINAL BACKFILL

Reused or imported earth free of stone, clods, broken rock, or concrete larger than 3 inches in largest dimension, or organic matter, rubbish, or other unsuitable material.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Verify bedding and backfill material to be used are acceptable. Do not use frozen material.
- B. Verify areas to be backfilled are free of debris, snow, ice, or water, and surfaces are not frozen.

### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. When necessary, compact subgrade surfaces to density requirements for backfill material.

### 3.03 SHEETING, SHORING AND BRACING

- A. CONTRACTOR shall be responsible for supporting and maintaining all excavations required even to the extent of sheeting and shoring the sides and ends of excavations with timber or other supports. All sheeting, shoring and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and to conform with OSHA 29 CFR 1926, Subpart P – Excavations, latest revision.
- B. Excavations adjacent to existing or proposed utilities, buildings and structures, or in paved streets or alleys shall be sheeted, shored and braced adequately to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpinning of adjacent utilities and structures shall be done when necessary to maintain utilities and structures in safe condition. The CONTRACTOR shall be held liable for any damage resulting to such utilities, structures or pavements as a result of his operations.
- C. The need and adequacy of sheeting, shoring, bracing, or other provisions to protect men and equipment in a trench or other excavation shall be the sole and exclusive responsibility of CONTRACTOR.
- D. Moving trench boxes or sheeting: When using moveable trench support, care should be taken so not to disturb the pipe location, joints, or embedment. Removal of any trench protection below the top of the pipe and within the dimensions of the trench shown on the construction details (for Class 2, 4, and 5 Bedding) shall be prohibited after pipe embedment is compacted. Therefore, moveable trench supports shall only be used in wide trench construction where supports extend below the top of the pipe, or on a shelf above the pipe installed in a narrow trench in accordance with construction details. Any voids left in the embedment material by support removal shall be carefully filled with Class IA or IB aggregate materials and compacted.

### 3.04 EXCAVATION

- A. Trench Excavation
  - 1. Trench excavation shall consist of the removal of materials necessary for the construction of pipelines and all appurtenant facilities including collars, concrete

saddles, and pipe protection called for on Drawings.

2. Excavation for pipelines shall be made in open cut unless otherwise shown on Drawings. Trenches shall be cut true to lines and grades shown on Drawings. Minimum pipe cover shall be 36" measured from the top of pipe to the ground surface unless otherwise noted on drawings.
  3. Use of motor-powered trenching machine will be permitted but full responsibility for the preservation, replacement, and/or repair of damage to any existing utility services and private property shall rest with CONTRACTOR.
  4. Bell holes for bell and spigot pipe and/or mechanical joint pipe shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length upon the bottom of the trench or bedding material.
  5. Pipe trenches shall not be excavated more than 400 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.
  6. Unless otherwise specified herein or shown on Drawings, wherever pipe trenches are excavated below elevation shown on Drawings, CONTRACTOR, at his own expense, shall fill the void thus made to proper grade with bedding and haunching material in accordance with Part 2.01A.
  7. In all cases where materials are deposited along open trenches they shall be placed so that no damage will result to the WORK and/or adjacent property in case of rain or other surface wash.
  8. Remove soft, spongy, or otherwise unstable materials encountered at elevation of pipe which will not provide a firm foundation for the pipe. Extend bedding depth as necessary to reach firm materials.
- B. Any unauthorized excavation shall be corrected at the CONTRACTOR's expense.
  - C. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.
  - D. Grade top perimeter of excavation to prevent surface water run-off into excavation.
  - E. Notify ENGINEER of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
  - F. Trench widths shall be in accordance with construction details for Class 2, 4, and 5 Bedding.

### 3.05 DEWATERING

- A. CONTRACTOR shall provide and maintain at all times during construction, ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the WORK. Dewatering shall be accomplished by methods which will ensure a dry excavation and preservation of final lines

and grades of bottoms of excavations. Methods of dewatering may include sump pumps, well points, deep wells, or other suitable methods which do not damage or weaken structures, foundations, or subgrades. Shallow excavations may be dewatered using open ditches provided such ditches are kept open and free-draining at all times. Dewatering methods used shall be acceptable to ENGINEER. Footing pits or trenches shall be protected by small earth dikes and plastic covers when they are left open in rainy weather.

- B. When significant (more than 30 L.F. continuously in a trench) ground water is encountered in soils containing fines, the CONTRACTOR shall notify the ENGINEER. In these areas, the trench shall be lined with an approved filter fabric between the bedding and haunching material and the trench walls to reduce the affects of migration of fines which can diminish pipe support.
- C. Unless specifically authorized by ENGINEER, groundwater encountered within the limits of excavation shall be depressed to an elevation not less than twelve (12) inches below the bottom of such excavation before pipe laying or concreting is started and shall be so maintained. No concrete structures shall be exposed to unequal hydrostatic forces until the concrete has reached its specified 28-day strength. Water shall not be allowed to rise above bedding during pipe laying operations. CONTRACTOR shall exercise care to prevent damage to pipelines or structures resulting from flotation, undermining, or scour. Dewatering operations shall commence when ground or surface water is first encountered and shall be continued until such times as water can safely be allowed to rise in accordance with provisions of this section.
- D. Standby pumping equipment shall be kept on the job site. A minimum of one standby unit (one for each ten in the event well points are used) shall be available for immediate installation should any pumping unit fail. Installation of well points or deep wells shall be adequately sized to accomplish the WORK. Drawings or design of proposed well point or deep well dewatering systems shall be submitted to ENGINEER for review.
- E. CONTRACTOR shall not operate dewatering devices (i.e., pumps, etc.) before the hour of 8:00 AM and after the hours of 8:00 PM in a residential area unless otherwise approved by ENGINEER or OWNER.
- F. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with foundation backfill at no cost to OWNER. Foundation backfill shall be placed in bottom of trench to within 6" of the bottom of pipe. Six (6) inches of bedding stone shall be placed over the top of the foundation backfill.
- G. CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. Conveyance of water shall be such as to not interfere with construction operations or surrounding property owners. No water shall be drained into WORK built or under construction without prior consent of ENGINEER. CONTRACTOR will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.
- H. Storm water runoff shall be controlled by means of temporary erosion control methods specified in Section 02270, as shown on Drawings, or as directed by ENGINEER.

- I. Water shall be disposed of in such a manner as not to be a menace to public health and in accordance with applicable Environmental Protection Agency, Corps of Engineers, and State Environmental Protection Division standards and permits.

### 3.06 BEDDING/BACKFILLING

- A. The backfilling of trenches shall be started immediately after construction of same has been viewed by the Project Observer. Bedding shall be aggregate and backfill material shall be earth or aggregate in accordance with Part 2 and the Drawings. Material shall be deposited in the initial horizontal layer to the spring line of the pipe (before compaction) on each side of the pipe. The initial layer shall be thoroughly tamped or rammed around the pipe until the initial layer's density is equal to the density of the adjacent undisturbed soils. The second bedding material layer shall be deposited horizontally to a depth to provide a cover of not less than 12 inches over top of pipe. The remainder of the backfill shall be placed in horizontal layers 18 inches (maximum) in depth. The second and subsequent bedding/backfill layers shall be compacted by compaction tools to a density equal to the density of the adjacent undisturbed soils, except under roads, structures, and driveways.
- B. Compact aggregate and soil backfill under roads, parking lots, structures, and driveways to a minimum of 95% of maximum dry density at not less than 2% below nor more than 2% above the optimum moisture content as determined by ASTM D 698. The top 12 inches shall be compacted to 100 percent of maximum dry density. Consolidation by saturation or ponding will not be permitted.
- C. All backfilling shall be done in such a manner that the pipe or structure over or against which it is being placed will not be disturbed or injured. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be removed and repaired to the satisfaction of OWNER and then re-backfilled.
- D. Backfilling shall not be done in freezing weather except by permission of the ENGINEER, and shall not be done with frozen material or upon frozen materials.
- E. All backfilling shall be left with smooth, even surfaces, properly graded and shall be maintained in this condition until final completion and acceptance of the work. Where directed by the ENGINEER, the backfill shall be mounded slightly above the adjacent ground.
- F. Leave stockpile areas completely free of excess fill materials. After construction and cleanup, stockpile areas shall be seeded in accordance with provisions specified in Section 02931.
- G. Use "Class 5" bedding in all wet trenches and under roads/driveways, regardless of pipe material. Use "Class 5" bedding for all PVC gravity sewer.
- H. Use "Class 4" bedding for PVC waterline, and DIP gravity sewer. For PVC waterline only and in dry trench conditions only. Reused earth free of stone, clods, broken rock, or concrete or organic matter, rubbish or other unsuitable material may be used for bedding material in lieu of aggregate material.
- I. Use "Class 2" bedding for DIP waterline/pressure lines.



### 3.07 SUBSURFACE OBSTRUCTIONS

- A. In excavating, backfilling, and laying pipe, care must be taken not to remove, disturb, or injure any existing water, telephone, gas pipes, storm drainage pipe, headwalls or catch basins, or other conduits or structures, without the approval of the ENGINEER. If necessary, the CONTRACTOR at his own expense, shall sling, shore up, and maintain such structures in operation, and shall repair any damage to them. Before final acceptance of the work, he shall return all such structures to as good condition as before the work started.
- B. The CONTRACTOR shall give sufficient notice to the interested utility of his intention to remove or disturb any pipe, conduit, etc., and shall abide by their regulations governing such work. In the event that any subsurface structure becomes broken or damaged in the execution of the work, the CONTRACTOR shall immediately notify the proper authorities, and shall be responsible for all damage to persons or property caused by such breaks. Failure of the CONTRACTOR to promptly notify the affected authorities shall make him liable for any needless loss so far as interference with the normal operation of the utility.
- C. When pipes or conduits providing service to adjoining buildings are broken during progress of the work, the CONTRACTOR shall repair them at once.
- D. Delays such as would result in buildings or residences being without services overnight or for a needlessly long period during the day will not be tolerated. Should it become necessary to move the position of a pipe, conduit or structure, it shall be done by the CONTRACTOR in strict accordance with the instructions given by the ENGINEER or the utility involved.
- E. The OWNER or the ENGINEER will not be liable for any claim made by the CONTRACTOR based on underground obstructions being different from that indicated in these CONTRACT DOCUMENTS or plans.

### 3.08 BORROW EXCAVATION

Wherever the backfill of excavated areas or the placement of embankments or other fills require material not available at the site, suitable material shall be obtained from other sources. This may require the opening of borrow pits at points not immediately accessible to the WORK. In such cases, CONTRACTOR shall make arrangements with the property owner and shall pay all costs incident to the borrowed material including royalties, if any, for the use of the material. Before a borrow pit is opened, the quality and suitability of the material to be obtained shall be approved by the ENGINEER. Any soil tests required for approval of the borrowed material proposed, shall be at the OWNER's expense.

### 3.09 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

- A. Materials removed by excavation, which are suitable for the purpose, shall be used to extent possible for backfilling pipe trenches and for making embankment fills, subgrades or for such other purposes as may be shown on Drawings. Materials not used for such purposes shall be considered waste material and shall be disposed of at the CONTRACTOR's expense.
- B. Waste materials shall be spread in uniform layers and neatly leveled and shaped. Spoil banks shall be provided with sufficient and adequate openings to permit surface drainage of adjacent lands.

- C. Unsuitable materials, consisting of rock, wood, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material so designated by the ENGINEER, shall be removed from the work site and disposed of by CONTRACTOR at his expense.
- D. No waste material shall be dumped on private property unless written permission is furnished by owner of property and unless required permits are issued from the local jurisdiction.

### 3.10 TESTING

- A. Compaction of fill and backfill to the specified moisture-density relationship of soils shall be verified by in-place density tests using ASTM D 2167, D1556 or other ASTM in-place density tests approved by the ENGINEER. Maximum density determination and in-place density tests shall be performed by a soils technician employed by the OWNER. Frequency and location of tests shall be adequate to ensure proper compaction has been achieved.
- B. CONTRACTOR shall assist soils technician with excavation of test pits to the elevations required by OWNER or ENGINEER.
- C. Areas not meeting the required compaction shall be recompact until the desired degree of compaction is achieved. All costs associated with re-testing failed areas of compaction shall be paid for by the CONTRACTOR.

### 3.11 PROTECTION

Protect excavation by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in of loose soil into excavation. Protection shall be in accordance with OSHA 29 CFR 1926, Subpart P-Excavations, latest revision.

### 3.12 FINAL GRADING

- A. After other earthwork operations have been completed, sites of all structures and embankments shall be graded to finished grade as shown on the Drawings. Grading operations shall be so conducted that materials shall not be removed or loosened beyond required limits. Finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from use of hand tools. If CONTRACTOR is able to obtain required degree of evenness by means of mechanical equipment, he will not be required to use hand labor methods. Slopes and ditches shall be neatly trimmed and finished.
- B. Unless otherwise specified or shown on the Drawings, all finished ground surfaces shall be graded and dressed to present a surface varying not more than plus or minus 0.10 foot. Any finished surfaces resulting in inadequate drainage or washouts shall be corrected by the CONTRACTOR at his expense.

### 3.13 SETTLEMENT

- A. CONTRACTOR shall be responsible for all settlement of backfill, fills, and embankments which may occur during warranty period.
- B. CONTRACTOR shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from ENGINEER or OWNER.

### 3.14 DUST CONTROL

The CONTRACTOR shall use all means necessary to control dust on and near work areas and on and near all off-site borrow areas when dust is caused by construction operations during performance of work. The CONTRACTOR shall thoroughly moisten all surfaces as required to prevent dust being a traffic hazard and a nuisance to the public and neighbors.

END OF SECTION

## SECTION 02300

### BORING AND JACKING

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

WORK covered in this section includes furnishing all labor, materials, accessories, equipment and service required to properly complete sewer pipeline construction using tunneling or boring and jacking under railroads and state, county, or city highways and streets, as described herein and/or shown on Drawings.

##### 1.02 RELATED WORK

- A. Section 02225 - Earthwork for Utilities
- B. Section 02660 - Water Distribution Systems

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

- A. Boring and Jacking
  1. Steel casing pipe, sizes 12 inches through 24 inches shall be spiral or straight seam welded steel pipe conforming to ASTM A 139, Grade A. Minimum wall thickness of steel pipe for railroad crossings shall be 0.375 inches. Minimum wall thickness of steel pipe for roadway crossings shall be 0.250 inches.
  2. Steel casing shall be bituminous coated on the outside with Koppers Bitumastic No. 50 coal tar. Minimum thickness shall be 3/32 inches thick.
- B. Carrier Pipe: As specified under Section 02660 (Water Distribution Systems), Section 02732 (Sanitary Sewer Force Mains), Section 02736 (Sanitary Sewer), and/or as shown on Drawings. Carrier pipe must be ductile iron for all cased bores and free bores under county roads.

#### PART 3 EXECUTION

##### 3.01 GENERAL

- A. Any solidification of embankments, boring heading, or sides shall be CONTRACTOR's responsibility and shall be done at his own expense.
- B. Trench excavation; all classes and types of excavation; the removal of rock, muck, debris; the excavation of all working pits; and backfill requirements of Section 02225 are included under this section.
- C. Adequate sheeting, shoring, and/or bracing for embankment operating pits and other

appurtenances shall be placed and maintained to ensure that WORK proceeds safely and expeditiously.

- D. CONTRACTOR shall maintain and operate pumps, well points, and drainage system equipment to keep work dewatered at all times.
- E. Bored installations shall be a bored-hole diameter essentially the same as the outside diameter of casing pipe to be installed.
- F. Casing pipe shall be jacked into boring as soon as possible after boring is made. Lengths of casing pipe as long as practical shall be used. Joints between sections shall be completely welded as recommended for joining the particular type of pipe.
- G. Once jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of CONTRACTOR.
- H. Care shall be taken to ensure that casing pipe installed by boring and jacking or open cut method will be at the proper alignment and grade.
- I. Open cut installations, where permitted, shall be in accordance with details and procedures shown on Drawings.
- J. Ends of casing shall be sealed with a seamless synthetic rubber seal as manufactured by APS, Inc. or approved equivalent.
- K. After casing pipe is installed, the carrier pipe shall be installed exercising care to protect its coating and lining and maintain its joint integrity. Carrier pipe shall be concentric and be placed in proper horizontal and vertical alignment using prefabricated pipe collars spaced radially around pipe and secured to remain firmly in place. Spacing of such collars shall be no greater than ten (10') feet on center longitudinally in casing pipe.
- L. Carrier pipe shall have restrained joints inside casing.

### 3.02 HIGHWAY/ROADWAY/RAILROAD CROSSINGS

- A. CONTRACTOR shall be responsible for the coordinating and scheduling of all construction work within State, County highway, City, or railroad rights-of-way prior to, during and after pipeline installation.
- B. All railroad crossings (except those in streets where it would not be practical to do so) shall be prominently marked at right-of-way lines on both sides of track by durable, weatherproof signs located over the centerline of the pipe. Signs shall show the following: name and address of OWNER, contents of pipe, pressure in pipe, pipe depth below grade at point of sign and emergency telephone number.
- C. Installation Projects Under Highways: CONTRACTOR shall review and coordinate traffic plans and signage with ENGINEER, and shall make satisfactory arrangements to detour traffic around/through that section of highway where construction is in progress with minimal inconvenience to the public. CONTRACTOR shall provide suitable flagmen, watchmen, safety devices, and other services and facilities as may be required by the Georgia

Department of Transportation.

- D. WORK along or across state and/or county, railroad and city rights-of-way shall be under the supervision of ENGINEER and Georgia Department of Transportation, and applicable railroad company representative.
- E. Pipelines installed under State Routes and railroads shall be encased with steel casing pipe. Pipelines installed under paved crossroads within the rights-of-way shall be free-bored or encased with steel casing pipe, unless otherwise specified on the drawings. The overbored area for those pipes which are free-bored shall be completely backfilled with sand or grout.
- F. Unless otherwise shown, encasement shall extend 6 feet beyond the highway embankment or back or side ditch. On curbed portions of conventional highways, casing pipe shall extend to back of curb or sidewalk as a minimum.
- G. For open trench cut installations, CONTRACTOR shall be responsible for scheduling and coordinating all construction work. WORK at one particular crossing shall be completed with the trench backfilled, compacted, and a temporary crushed stone surface provided for traffic before any work is started on another such crossing.
- H. Installations shall be done to leave free flows in drainage ditches, pipes, culverts, or other surface drainage facilities of the highway, street, or its connections.
- I. Where sodding is disturbed by excavation or backfilling operation, such areas shall be replaced by mulch sodding on slopes 5 percent or less. Slopes over 5 percent shall be replaced with block sodding. No separate payment shall be made for sodding which shall be included in the bid prices for installation of pipe.
- J. Trench excavation within the right-of-way, but not under pavement, shall be backfilled as described in Section 02225 (Earthwork for Utilities).
- K. Surplus material shall be removed from the right-of-way and the excavation finished flush with surrounding ground.
- L. Grout backfill shall be used for unused bores or abandoned pipes.
- M. Boring, jacking, or driving of casing pipes under existing roadways shall be accomplished without jetting, sluicing, or wetboring.
- N. No excavated materials or equipment shall be placed on the pavement or shoulders of roadways without the express approval of ENGINEER.
- O. In no instance will CONTRACTOR be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadways.

END OF SECTION

## SECTION 02645

### FIRE HYDRANTS

#### PART 1 GENERAL

##### 1.01 SUMMARY

CONTRACTOR shall furnish all labor, equipment, and materials and install at location indicated on CONTRACT DRAWINGS, or as directed, fire hydrants as necessary or required for proper completion of the work under this Contract.

##### 1.02 REFERENCES

American Water Works Association (AWWA), Section C502, standard for Dry-Barrel Fire Hydrants (Latest Edition)

#### PART 2 PRODUCTS

##### 2.01 MATERIALS

- A. Hydrants shall be manufactured in full compliance with AWWA C502, 200 psi. working pressure, and as herein amended.
- B. Hydrants shall be Mueller A-423 or M&H 129.
- C. Hydrants shall be three-way, post type, dry top traffic model with compression main valve opening against and closing in the direction of normal water flow.
- D. Internal main valve diameter shall be minimum of 5¼".
- E. Hydrants shall have name of manufacturer, year manufactured, and nominal valve size in legible, raised letters cast on barrel of bonnet.
- F. Dry Top Bonnet
  - 1. Shall be constructed with moisture-proof lubrication chamber which provides automatic lubrication of threads and bearing surfaces each time hydrant is operated.
  - 2. Assembly shall be comprised of top "O" ring serving as dirt and moisture barrier and a lower "O" ring which shall serve as a pressure seal.
- G. Operating Nut
  - 1. Shall be of regular pentagon shape measuring 1½" point to flat, i.e. National Standard, and shall open by turning counter-clockwise (left).

2. Nozzle caps shall have same cross-section as operating nut and shall come with heavy duty, non-kinking chains.
3. Chains shall be securely affixed to hydrant upper barrel and permit free turning of caps.

H. Traffic Design

1. Hydrant barrel sections shall be connected at groundline in a manner that will prevent damage to hydrant when struck by vehicle.
2. Main valve rod sections shall be connected at groundline by frangible coupling.
3. Standpipe and groundline safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing top operating components and top section of hydrant standpipe.

I. Main valve shall be made of synthetic rubber and formed to fit the valve seat accurately.

J. Main Valve Seat

1. Shall be of bronze and assembly into hydrant shall involve bronze to bronze thread engagement.
2. Two (2) "O" ring seals shall be provided as positive pressure seal between the bronze seat ring and shoe.
3. Valve assembly pressure seals shall be obtained without employment of torque compressed gaskets.
4. Hydrants shall be designed to allow removal of all operating parts through hydrant barrel by means of single, light weight disassembly wrench without excavation.

K. Drain

1. Mechanism shall be designed to operate automatically with the operation of main valve and shall allow a momentary flushing of drain ports.
2. Minimum of two (2) internal and two (2) external bronze lined drain ports shall be required in main valve assembly to drain hydrant barrel.
3. Inlet connection shall be cast iron inlet elbow and shall have 6" mechanical joint connection.
4. Barrel extension sections shall be available in 6" increments complete with rod, extension coupling and necessary flanges, gaskets and bolts so that extending hydrant can be accomplished without excavating.
5. No lead will be allowed in nozzle installation.



6. Hydrants shall be tested in strict accordance with AWWA C502 at supplier's expense. Certificate of compliance shall be furnished to OWNER upon request.
- L. Fire hydrants shall have two 2½" diameter hose connections and one 4.5" diameter pumper connection. Standard hose threads shall be provided.

## 2.02 SPARE PARTS

CONTRACTOR shall provide the OWNER with two (2) sets of maintenance wrenches and five (5) breakaway repair kits for each type of hydrant provided.

## PART 3 EXECUTION

### 3.01 SETTING HYDRANTS

- A. Hydrants shall be placed at locations indicated on CONTRACT DRAWINGS in manner to provide complete accessibility and so that possibility of damage from vehicles and injury to pedestrians will be minimized.
- B. Hydrants to be installed so the finish grade is at the hydrant bury line.
- C. Extension required to bring hydrant to proper grade shall be furnished and installed by CONTRACTOR at his expense.
- D. Fire hydrant assembly shall consist of the ductile iron tee, gate valve, 6" ductile iron lead pipe, and hydrant. Pipe restrainer shall be used to restrain assembly. Pipe restrainers shall be Anchore Coupling type or MJ Field-Lok fittings as manufactured by U. S. Pipe or approved equivalent. PVC IS NOT ALLOWED FOR HYDRANT ASSEMBLY.

### 3.02 PAINTING, COATING AND LUBRICATING

- A. Iron parts of hydrant shall be thoroughly cleaned inside and outside.
- B. Unless otherwise stipulated or directed, surface shall be coated or painted with, or dipped in, an asphalt or bituminous base paint or coating, except for the exterior portion above the groundline.
- C. Exterior of hydrant valve above finished groundline shall be thoroughly cleaned and painted in shop with two (2) coats of epoxy primer. Then two (2) coats of enamel shall be applied at factory. Color shall be "safety yellow".
- D. Bronze, threaded and contact moving parts shall, during shop assembly, be lubricated and protected by coating of rust proof compound to prevent damage in shipment.

END OF SECTION

## SECTION 02660

### WATER DISTRIBUTION SYSTEMS

#### PART 1 GENERAL

##### 1.01 SUMMARY

WORK covered by this Section consists of furnishing and installing water distribution pipes and appurtenances, including, but not limited to, reaction blocking, testing, and disinfection.

##### 1.02 RELATED WORK

Section 02225 - Earthwork for Utilities

##### 1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM), Annual Book Standards.
  - 1. ASTM D 2122, Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
  - 2. ASTM F 477, Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- B. American Water Works Association (AWWA) Standards.
  - 1. AWWA C104, Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  - 2. AWWA C110, Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and other Liquids.
  - 3. AWWA C111, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
  - 4. AWWA C151, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or other Liquids.
  - 5. AWWA C153, Standard for Ductile-Iron Compact Fittings, 3 in. through 24 in. and 54 in. through 64 in., for Water Service.
  - 6. AWWA C509, Standard for Resilient – Seated Gate Valves for Water Supply Service.
  - 7. AWWA C550, Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.
  - 8. AWWA C600, Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances.
  - 9. AWWA C651, Standard for Disinfecting Water Mains.

10. AWWA C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.

#### 1.04 SUBMITTALS

Submit manufacturer's certifications for all pipe, valves, and fittings shipped to the job site. The certifications shall state that all specified tests have been made and the results thereof comply with the requirements of this Specification. Each certificate shall be signed for the manufacturer by a person having legal authority to bind the manufacturer.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. CONTRACTOR shall be responsible for safe unloading, storage and care of material furnished by or to him until it has been incorporated into work.
- B. Unload pipe, fittings, or valves by lifting with hoists or skidding to avoid damage.
  1. Pipe shall not be unloaded by rolling or dropping off trucks.
  2. Pipe handled on skidways shall not be skidded or rolled against pipe already on ground.
- C. Unload material at site of work, near place where it will be placed in trench.
  1. Materials shall be placed so as to least interfere with traffic.
  2. Provide signs, lights, and barricades as necessary to protect public.
- D. Handle material carefully to prevent breakage and to avoid damage to coatings and linings.
  1. Keep interior of pipe, fittings, and valves, free of dirt or foreign matter at all times.
  2. Do not place materials in drainage ways or ditches.
- E. Materials that cannot be placed along site of the work shall be stored at CONTRACTOR's expense. OWNER's storage yards may be utilized if available.

#### 1.06 SITE CONDITIONS

Water used for construction, testing, or disinfection will be furnished by OWNER through connections to OWNER's water system made by CONTRACTOR upon approval by OWNER. **CONTRACTOR WILL COORDINATE THIS USAGE AND COST WITH OWNER.**

## PART 2 PRODUCTS

All water distribution piping mains shall be new unused. All materials used and come into contact with drinking water during its distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61).

### 2.01 DUCTILE IRON PIPE

- A. Shall conform to latest requirements of AWWA C151.
- B. Shall be cement mortar lined in accordance with AWWA C104 standard thickness.
  - 1. Unless otherwise specified, pipe shall have push-on compression type joints conforming to AWWA C111 or AWWA C153.
  - 2. Unless otherwise specified, pressure class shall be 350 psi.
- C. Ductile iron pipe for minor creek crossings shall be connected with restrained joints.
- D. Ball-Joint Pipe
  - 1. Shall be manufactured for river crossing applications.
  - 2. Joints shall be boltless.
  - 3. Joints shall be restrained.
  - 4. Joint shall provide up to 15° deflection.

### 2.02 PLASTIC PIPE (PVC)

- A. 3" Diameter and Smaller
  - 1. Polyvinyl Chloride (PVC) pipe 3" diameter and smaller shall conform to requirements of ASTM D-2241.
  - 2. Pipe shall be pressure Class 315 (SDR 13.5).
  - 3. PVC plastic extrusion compound shall meet requirements of ASTM D-1784 for Class 112454-B (PVC 1120).
  - 4. Pipe and couplings shall bear National Sanitation Foundation Testing Laboratories, Inc., seal of approval for potable water use.
- B. 4" Diameter and Larger
  - 1. Polyvinyl chloride (PVC) pipe 4" diameter and larger shall meet requirements of AWWA C900.
  - 2. All PVC pipes shall be Pressure Class 235 (DR18) C900 PVC as indicated with

outside diameter (OD) dimensions of ductile iron pipe.

3. Joints

- a) Shall be made with elastomeric gaskets.
- b) Bell end pipe using elastomeric gaskets shall meet requirements of ASTM D 2122.
- c) Elastomeric gasket couplings shall meet requirements of AWWA C900 (latest revision) for the specified pipe class and shall meet the requirements of ASTM F477.

4. Provide marking on pipe exterior as specified in AWWA C900.

2.03 DUCTILE IRON FITTINGS

- A. Fittings for ductile iron pipe and PVC pipe shall be ductile iron and shall conform to requirements of AWWA C110 or AWWA C153 and shall be cement mortar lined in accordance with AWWA C104 standard thickness.
- B. Joints shall conform to AWWA C111.
- C. Fittings shall be mechanical joint unless otherwise specified on Drawings.
- C. Gaskets for PVC pipe shall be duct tip transition type compatible with type of pipe used.

2.04 RESTRAINED JOINTS – DIP and PVC

- A. DIP Push-on application – restrained joints shall be “Fast-Grip Gasket” by ACIPCO or “Field-Lok Gasket” by U. S. Pipe.
- B. DIP Mechanical joint restraints shall be “Mega-Lug 1100 Series” by EBBA Iron Sales, MJ-Field-Lok Series DI by U. S. Pipe or approved equal.
- C. PVC Push-on application restrained joints shall be of the inner bell circumferential type by “Diamond Lok-21”, “Eagle Loc 900”, or approved equal.
- D. PVC mechanical joint restraints shall be “Mega-Lug 2000 PV Series” by EBBA Iron Sales, MJ Field Lok Series PV by U.S. Pipe or approved equal.
- E. Joint preparation and installation shall be in accordance with manufacturer’s recommendations.

2.05 GATE VALVES

- A. Shall conform to requirements of AWWA C509 for resilient seated gate valves, ductile iron body, with bonded epoxy coating conforming to AWWA C550.
- B. Shall be designed for 250 psi working pressure and 500 psi hydrostatic test pressure.

- C. Shall be of iron body, bonded epoxy, and shall have non-rising bronze stem, and shall be wrench operated.
- D. Valves shall open by turning counterclockwise.
- E. Operating nuts shall be standard two inches square.
- F. Suitable stem guides shall be provided, where required.
- G. Shall be furnished with mechanical joint suitable for connection to pipe into which it will be installed for buried service.
- H. Shall be furnished with flanged joint suitable for connection to pipe into which it will be installed for non-buried service.
- I. Valves shall be manufactured by Mueller, American Flow Control, U. S. Pipe and Foundry Co. or approved equal.
- J. Small Gate Valves: Valves smaller than 3 inches shall conform to level of quality and manufacturing standards established for valves 3 inches and larger by respective AWWA Standards.
- K. Valve box alignment device shall be the BoxLok as manufactured by Emma Sales, L.L.C. or approved equal.

#### 2.05 AIR RELEASE VALVES

- A. Shall be float operated and incorporate a simple lever mechanism to enable the valve to automatically release accumulated air from a fluid system while that system is pressurized and operating.
- B. Internal parts shall be stainless steel.
- C. The air release valve shall be Crispin-PL10, Type N with 3/16" orifice.

#### 2.06 AIR RELEASE AND AIR & VACUUM VALVES

- A. Shall be constructed to exhaust air during filling, release small amounts of accumulated air during operation, and open upon impending vacuum to admit air.
- B. Shall exhaust air up to sonic velocity without blowing shut.
- C. The air release and air & vacuum valve shall be Crispin UL20, 2" orifice or approved equal.

#### 2.07 VALVE MARKERS

Shall be furnished with each valve installed as indicated on the drawings, with exception of fire hydrant valves.

## 2.08 VALVE BOXES AND COVERS

- A. Shall be provided with valves.
- B. Shall be of adjustable screw type, of length required with a minimum 6" of adjustment allowed and installed as shown on standard details of Drawings.
- C. Shaft shall be 5¼ inch diameter with base to be minimum of 8¾ inch diameter by 9-inch height inside.
- D. Base size and extension piece shall be as required for each individual size of valve and depth.

## 2.09 TAPPING VALVES

- A. Valves and tapping sleeves shall be furnished at locations indicated on Drawings, together with necessary appurtenances.
- B. Tapping machines and competent supervision shall be provided for making of tap. Tap shall be performed in the presence of ENGINEER or OWNER.
- C. Tapping sleeves shall be properly sized to fit existing pipe and shall be of stainless-steel split sleeve type with ends suitable for connection into pipeline into which it will be installed. Tapping sleeve shall be Ford style FTSS, Mueller H304SS, or approved equal.
- D. Valves furnished with sleeves shall conform to requirements herein above for gate valves, except for modifications required to permit use of full-size cutter through valves.
- E. Outlet of valves shall be mechanical joint for joining with water mains.
- F. After tap is completed, the "cut out" section of pipe or "coupon" shall be tagged, labeled as to date and location, and submitted to Owner.
- G. Tapping sleeves shall be pressure tested immediately after installation as per the testing requirements of this section.

## 2.10 DETECTION WIRE AND TAPE

- A. Detection wire shall be size #12 AWG solid copper with a minimum 30 mil polyethylene insulation designed for direct burial for PVC and ductile iron pipe. All splices shall be made with waterproof connectors.
- B. Detection wire shall be installed along pipe and duct taped to the pipe every 20 feet and shall be continuous where ductile iron is used at bores, storm drain crossing, etc.
- C. Detection tape for both PVC and ductile iron pipe:
  - 1. Minimum of 2 inches wide.
  - 2. Non-metallic inert, bonded layer of plastic or mylar.
  - 3. Highly resistant to alkalis, acids or other destructive chemical components encountered in soils.

4. "Blue" colored and bearing the imprint "CAUTION: WATERLINE BURIED BELOW".
5. Shall be installed 18 inches above pipe.

## PART 3 EXECUTION

### 3.01 ALIGNMENT AND GRADES

- A. Pipe and appurtenances shall be installed at locations shown on the Drawings and to position, alignment, and grade shown thereon, or in event of conflict, as directed by ENGINEER.
- B. Depth of Pipes
  1. Shall be 36 inches measured from finished grade to top of pipe unless otherwise specified for pipes larger than 2 inch in diameter. Depth of pipes shall be 24" for waterlines 2" in diameter and similar.
  2. Where obstructions are encountered, depth may be greater than 36 inches.
  3. Depths less than 36 inches may be used only when approved by ENGINEER in writing for waterlines larger than 2 inches in diameter.
- C. Valves shall be installed with stems vertical.
- D. Pipe Curvatures shall be within horizontal or vertical permissible deflection at joint, as specified by manufacturer or AWWA Specification C600.

### 3.02 INSTALLING PIPE

- A. General
  1. Pipe and appurtenances shall be installed only when trench conditions are suitable.
  2. Trenches must be dry.
  4. Proper implements, tools, and facilities shall be provided by CONTRACTOR for safe and convenient performance of the work.
  4. All trench excavation and backfilling shall be in conformance with Section 02225.
- B. Installation
  1. Lower pipe, fittings, valves, and hydrants carefully into trench piece by piece by means of derrick, ropes, or other suitable tools or equipment.
  2. Prevent damage to water main materials and protective coatings and linings.
  3. Do not drop or dump water line materials into trench.



4. Carefully examine pipe and fittings for cracks and other defects while suspended above trench immediately before installation in final position. Defective pipe or fittings shall be clearly marked and shall be removed from site.
5. Clean bell and spigot ends of each piece of pipe thoroughly before pipe is laid.
6. Prevent foreign material from entering pipe while it is being placed in line.
  - a) Provide protective covering for ends of pipe until connection is made to adjacent pipe, if necessary.
  - b) No debris, tools, clothing, or other materials shall be placed in pipe during laying operations.
7. As each length of pipe is placed in trench, spigot end shall be centered in bell and pipe forced home and brought to correct line and grade.
  - a) Pipe shall be secured in place with approved backfill material tamped around it.
  - b) Precautions shall be taken to prevent dirt from entering joint space.
8. Open ends of pipe shall be closed by watertight plug, or other means approved by ENGINEER, at times when pipe laying is not in progress. If water is in trench, plug shall remain in place until trench is pumped completely dry. Water shall not be allowed to run into pipe at any time during construction.
9. Lay pipe with bell ends facing in direction of laying, unless directed otherwise by ENGINEER. Where pipe is laid on grade of 10 percent or greater, laying shall start at bottom and shall proceed upward with bell ends of pipe upgrade.

### 3.03 CUTTING PIPE

Cut pipe for inserting valves, fittings, or closure pieces in neat and workmanlike manner without damage to pipe or lining and as per manufacturer's requirements.

### 3.04 JOINTING

- A. Jointing of pipe, fittings, and valves shall be made in strict compliance with manufacturer's printed instructions.
- B. Mechanical Joints
  1. Thoroughly clean outside of spigot and inside of bell.
  2. Clean gasket.
  3. Tighten nuts with torque limiting wrench.
  4. Nuts spaced 180 degrees apart shall be tightened alternately in order to produce equal pressure.

C. Push-On Joints

1. Furnish and install adapters if required to join bells and spigots of different sizes.
2. Thoroughly clean inside of bell and outside of spigot end.
3. Insert and lubricate gasket using lubricant furnished or recommended by pipe manufacturer.
4. Spigot end of pipe shall be entered into socket with care used to keep joint from contacting ground.
5. Complete joint by forcing plain end to bottom of socket with forked tool or jack-type tool.

D. Restrained Joints

1. Restrained joints shall be installed in areas shown on drawings and in accordance with manufacturer's recommendations.

3.05 SETTING VALVES AND FITTINGS

- A. Valves, fittings, plugs, and caps shall be set and joined to pipe in manner specified above for cleaning, laying and joining pipe.
- B. Valves shall be set plumb, and a valve box shall be provided for every valve.
  1. Valve box shall not transmit shock or stress to valves and shall be centered and plumb over wrench nut of valve, with box cover flush with surface of finished pavement or such other level as may be directed.
  2. **FOR INSTALLATION WHERE THERE ARE ROADSIDE DITCHES, VALVES AND VALVE BOXES SHALL BE PLACED ON THE BACK SIDE OF THE DITCH AT LEAST FIVE (5) FEET FROM THE CENTERLINE OF THE DITCH.**
- C. Backfill around valves shall be carefully tamped in 6 inch layers for full depth of trench with valve box in place.
- D. Provide concrete pad at surface as indicated on Drawings.

3.06 ANCHORAGE

- A. Plugs, caps, tees, bends, and valves, unless otherwise specified, shall be provided with reaction blocking.
- B. Reaction blocking shall be concrete of a mix not leaner than 1 part cement to 2-1/2 parts sand and 5 part stone and having a compressive strength of not less than 3,000 psi after 28 days.
- C. Blocking shall be placed between solid, unexcavated earth and fitting to be anchored; area of bearing on pipe and on ground in each instance shall be that shown on Drawings or as directed by ENGINEER.

- D. Blocking shall, unless otherwise shown or directed, be so placed that pipe and fitting joints will be accessible for repair.
- E. Metal harness of tie rods or clamps of adequate strength to prevent movement may be used instead of concrete blocking if approved by ENGINEER in writing.
- F. Steel rods or clamps shall be galvanized.

### 3.07 CONNECTION TO EXISTING MAINS

- A. CONTRACTOR shall coordinate with officials of existing water system regarding connections to existing mains. Tap connections shall be performed in the presence of the OWNER.
- B. Connection to existing mains shall be made at such time as to minimize disruption of water service to public.
- C. Approximate locations of required connections to existing mains are shown on Drawings, but it is CONTRACTOR's responsibility to ascertain exact locations of these mains.
- D. Connections to existing mains shall be made in a complete and workmanlike manner using proper fittings and specials to suit actual conditions.
- E. Existing pipes which are cut or damaged by CONTRACTOR shall be repaired, reconnected, and returned to service in equal or better condition.

### 3.08 STREAM AND UTILITY CROSSINGS

- A. Where indicated on CONTRACT DRAWINGS, or required by conditions encountered, pipe shall be placed beneath stream beds or ditches, around, over, or under sewers, culverts, gas mains, telephone ducts, water mains, or other structures.
  - 1. Do not pass pipe through any drainage pipe, culvert, sewer, or manhole.
  - 2. Provide minimum of 48 inches under stream beds or ditches, unless approved by ENGINEER in writing.
  - 3. Provide minimum of 6 inch earth or sand cushion between proposed water line and any other utility or structure, or as indicated on drawings.
- C. Where water lines are installed below free flowing streams and storm drainage ditches, ductile iron pipe shall be used for minimum of three feet either side of streambed, unless otherwise indicated on plans. Ductile iron pipe shall be connected with restrained joint.
- D. When water lines are installed under wet weather ditches and when approved by ENGINEER, ductile iron pipe is not required.
- E. Where water line crosses or parallels a sewer line, a minimum of 18-inch vertical clearance (edge to edge) and 10-foot horizontal clearance shall be maintained.

### 3.09 HYDROSTATIC TESTS

- A. Pressure and leakage tests will be required on each section of line between valves and shall be conducted in accordance with AWWA C600 and/or C605.
- B. When a section of pipe of a length deemed adequate by ENGINEER is ready for testing, line shall be thoroughly blown free of air and prepared for testing.
- C. Procedure
  - 1. Furnish and install corporation stops at high points on line to release air as line is filled with water. (No additional payments will be made for taps necessary for air release.)
  - 2. Furnish suitable pump, connections, and necessary apparatus including means for accurately measuring water introduced into line during testing.
  - 3. Test pressure shall not be less than 1.25 times the stated working pressure of the pipeline measured at the highest elevation along the test section. Test pressure shall not be less than 200 psi or 1.5 times the stated working pressure at the lowest elevation (whichever is greater) of the test section. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less as specified by the manufacturer.
    - a) Test pressures shall be as directed by the ENGINEER.
    - b) Test shall be conducted for a minimum of 2 hours.
    - c) Pressure shall not vary by more than 5 psi during test.
  - 4. Testing Allowance
    - a) The testing allowance is the maximum amount of water that may be added into the pipeline section during hydrostatic testing in order to maintain  $\pm 5$  psi of the test pressure.
    - b) The maximum allowable makeup water shall be based on the following formula:
$$L = \frac{S \times D \times (P^{0.5})}{133,200}$$
Where L is the testing allowance of makeup water in gallons per hour; S is test length in feet, D is the pipe diameter in inches and P is the average test pressure in pounds per square inch.
    - c) No pipe installation shall be accepted if the amount of makeup water required exceeds the amount determined in the formula above.
  - 5. Locate, remove, and replace any defective pipe, valves, fittings or hydrants.
  - 6. Repeat tests until results are satisfactory to the ENGINEER.

### 3.10 DISINFECTION

- A. Pipe, fittings, valves, and appurtenances which have been exposed to contamination by construction shall be thoroughly cleaned, chlorinated, drained, and flushed in accordance with AWWA C651.
- B. Procedure
  - 1. Flush line prior to disinfection. Flushing shall produce minimum velocity of 2.5 feet per second in pipe.
  - 2. Disinfect pipe using liquid chlorine or hypochlorite to produce a dosage of 50 mg/L for a 24 hour contact period.
  - 3. After 24 hour contact period, flush chlorinated water from line until chlorine concentration of water leaving main is no higher than that generally prevailing in system and is deemed acceptable by the OWNER.
  - 4. Disposal of the heavily chlorinated water shall be in accordance with AWWA C651. The environment to which this water will be discharged shall be inspected. If there is any question that the water will damage the environment, a reducing agent shall be used to neutralize the chlorine.
  - 5. CONTRACTOR shall have sample analyzed for bacteriological quality by a certified laboratory.
- C. Repeat disinfection procedure until bacteriological analysis results are acceptable to OWNER and Health Department. NOTE: OWNER ONLY REQUIRES ONE (1) SET OF ACCEPTABLE RESULTS BE OBTAINED.
- D. Water mains and appurtenances must be completely installed, flushed, disinfected, and satisfactory bacteriological sample results received prior to permanent connections being made to the existing water system, or service connections activated to individual water customers. Sanitary construction practices must be followed during installation of the final connection, so that there is no contamination of the new or existing water main with foreign matter or groundwater.

### 3.11 CLEAN-UP AND RESTORATION

- A. Before work shall be considered complete, material not used and rubbish of every character must be removed from job site.
- B. Fences and other private or public facilities and structures disturbed must be in essentially a good condition as existed before work was done.
- C. Subsequent settlement of pavement or backfill, or erosion over or in trenches shall be replaced or repaired by CONTRACTOR and surface brought to grade.
- D. Special precautions shall be taken to prevent storm water erosion of trenching.
- E. Storm water culverts and structures shall be kept cleaned of mud, debris, and silt caused by construction.

- F. Any and all items disturbed by construction shall in every case be restored to their original conditions, as closely as possible, after completion of construction.

END OF SECTION

## SECTION 02665

### WATER SERVICE CONNECTIONS

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

WORK covered by this Section consists of furnishing all materials and installation of all single residence and small commercial service connections to the water system.

##### 1.02 RELATED WORK

Section 02660 - Water Distribution System

##### 1.03 REFERENCES

- A. Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, 1/2 inch through 3 inch, for Water (AWWA C901).
- B. Standard Specification for Seamless Copper Water Tube (ASTM B88)
- C. Cold Water Meters - Displacement Type (AWWA C700).
- E. Specifications for Gray-Iron Castings (ASTM A-48-74).

#### PART 2 PRODUCTS

##### 2.01 SERVICE TUBING

- A. Up to 2" diameter shall be DR9, rated for 200 PSI, Polyethylene service tubing, copper tubing size. Joints are not allowed. Detection wire must be installed from inside the meter box to the corporation stop on the main line.
- B. Tubing O.D. shall be compatible with accessories specified herein below.
- C. Services greater than 2" diameter shall be specified on drawings.

##### 2.03 METER BOXES

- A. Meter boxes shall be furnished by the Owner and installed by the Contractor.

##### 2.04 ACCESSORIES

- A. Shall be compatible with pipe and service tubing furnished.
- B. Service saddles for DIP shall be Smith-Blair 313 wide stainless single strap or approved equal. Service saddles for PVC smaller than 6" shall be Smith-Blair 327 hinged bronze or approved equal. Service saddles for 6 inch and larger PVC shall be Smith-Blair 315 wide stainless single strap or approved equal.

- C. Corporation stop shall be Ford FB1000 rated for 300 psi working pressure or approved equal.
- D. Backflow preventor shall be a Mueller dual check, model H-14242 or approved equal.
- E. Curb stop shall be Ford Ball Valve Curb Stop with padlock wing rated for 300 psi working pressure or approved equal.

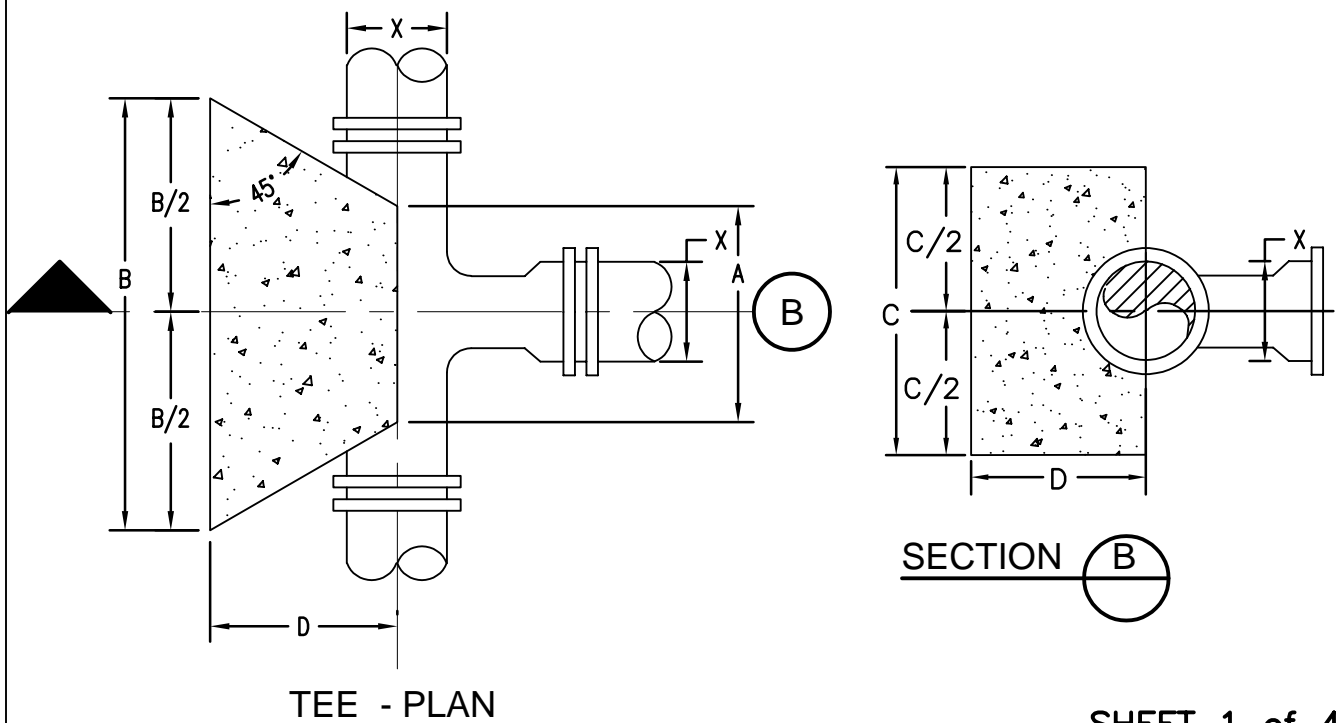
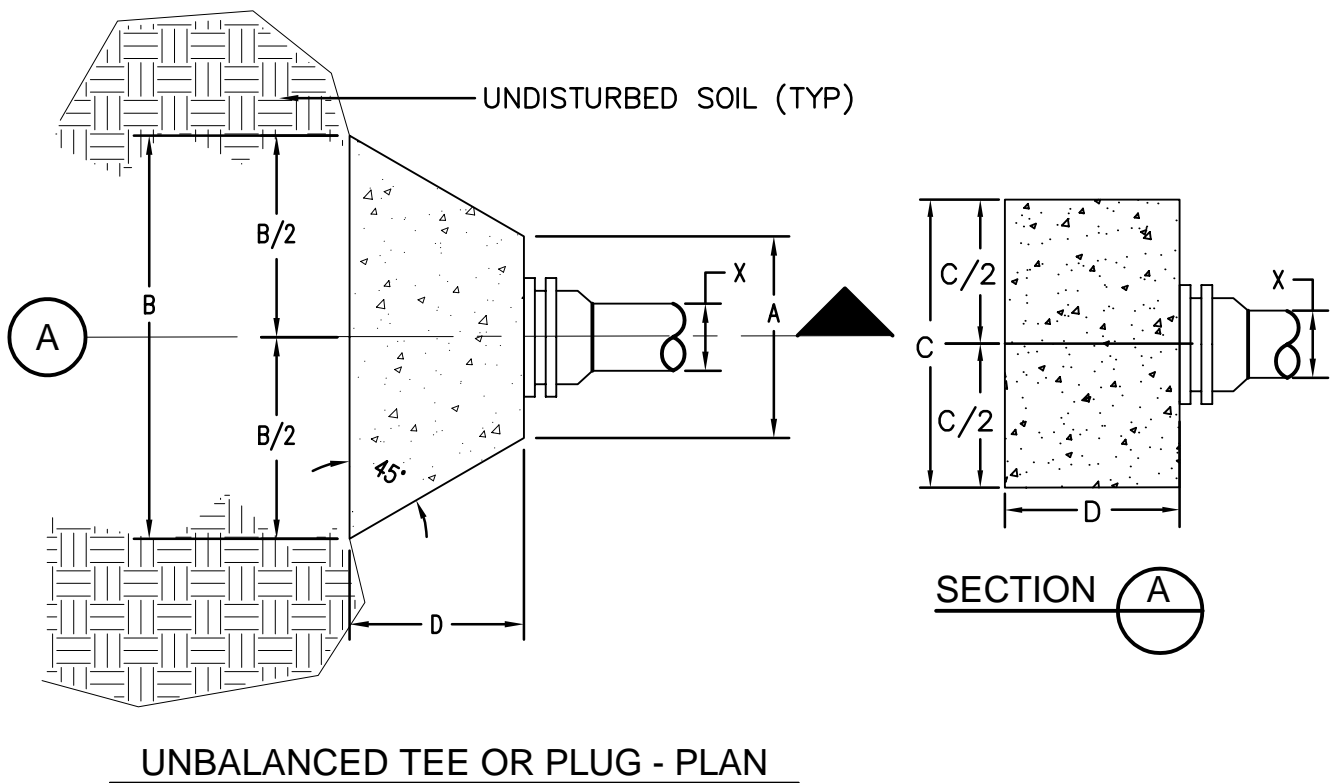
## PART 3 EXECUTION

### 3.01 GENERAL

- A. Service connections shall be installed in the same manner as water distribution mains, and in accordance with Section 02660 of these Specifications, except for depth which shall be 24 inches at the meter box.
- B. Meter boxes shall be placed as shown on the construction drawings or as directed by OWNER.
- C. Service connections shall be made where directed by the OWNER.
- D. Bore service tubing under pavement. No pavement cutting will be permitted.
- E. Disinfection shall be in strict accordance with AWWA C651. CONTRACTOR shall have sample analyzed for bacteriological quality by a certified laboratory.
- F. The backflow preventer shall be located on the customer side of the meter.
- G. All meters, fittings, piping and accessories shall be approved by the National Sanitation Foundation (NSF) seal of approval for potable water.

END OF SECTION





**NOTES:**

1. IN ADDITION TO THRUST BLOCK, MEGA-LUGS OR MJ-FIELD LOKS ARE ALSO REQUIRED ON ALL FITTINGS.
2. SEE SPECIFICATION SECTION 02660, WATER DISTRIBUTION SYSTEMS, FOR ADDITIONAL REQUIREMENTS.

**SHEET 1 of 4**

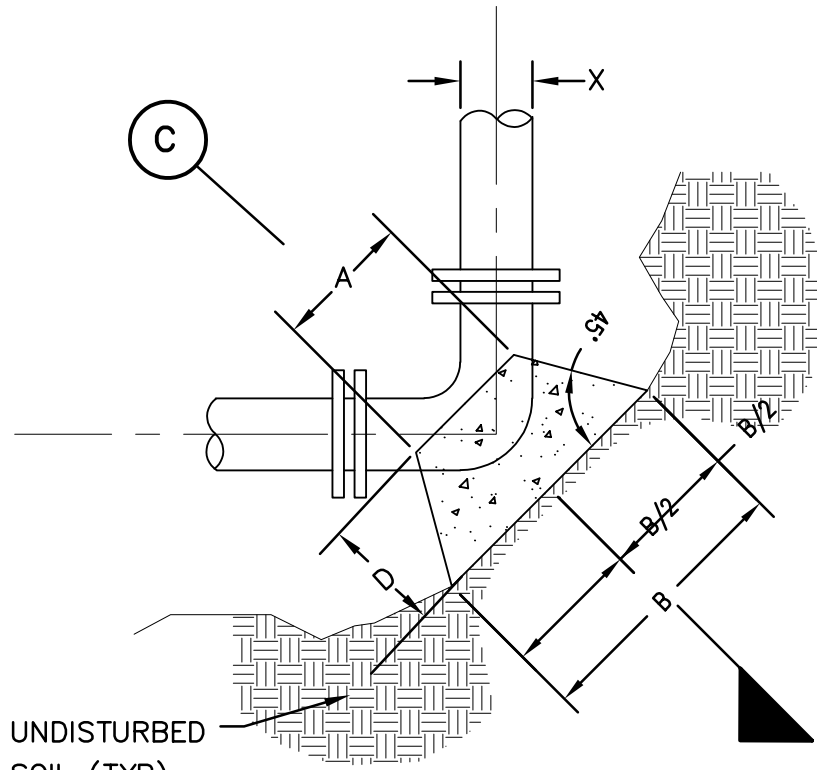
**EMI** ENGINEERING  
MANAGEMENT  
INCORPORATED

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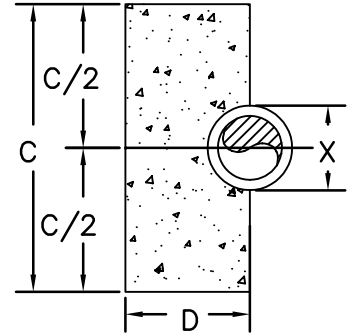
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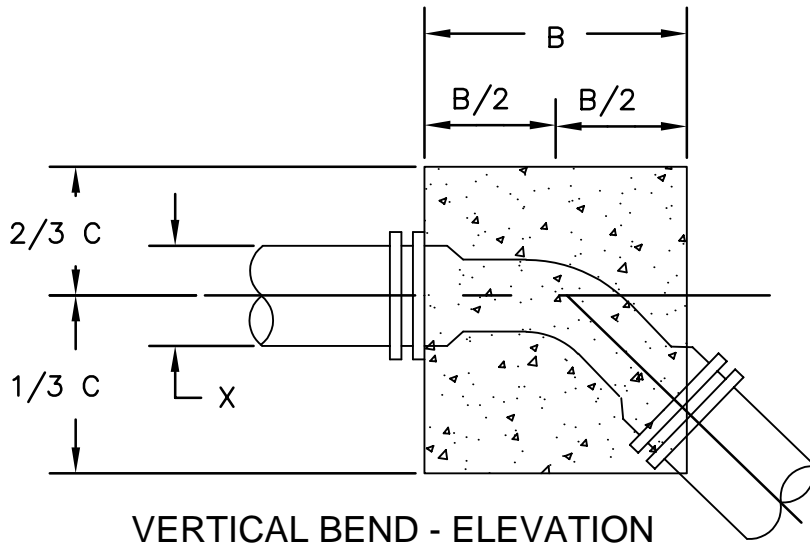
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**HORIZONTAL BEND - PLAN**



**SECTION C**



**VERTICAL BEND - ELEVATION**

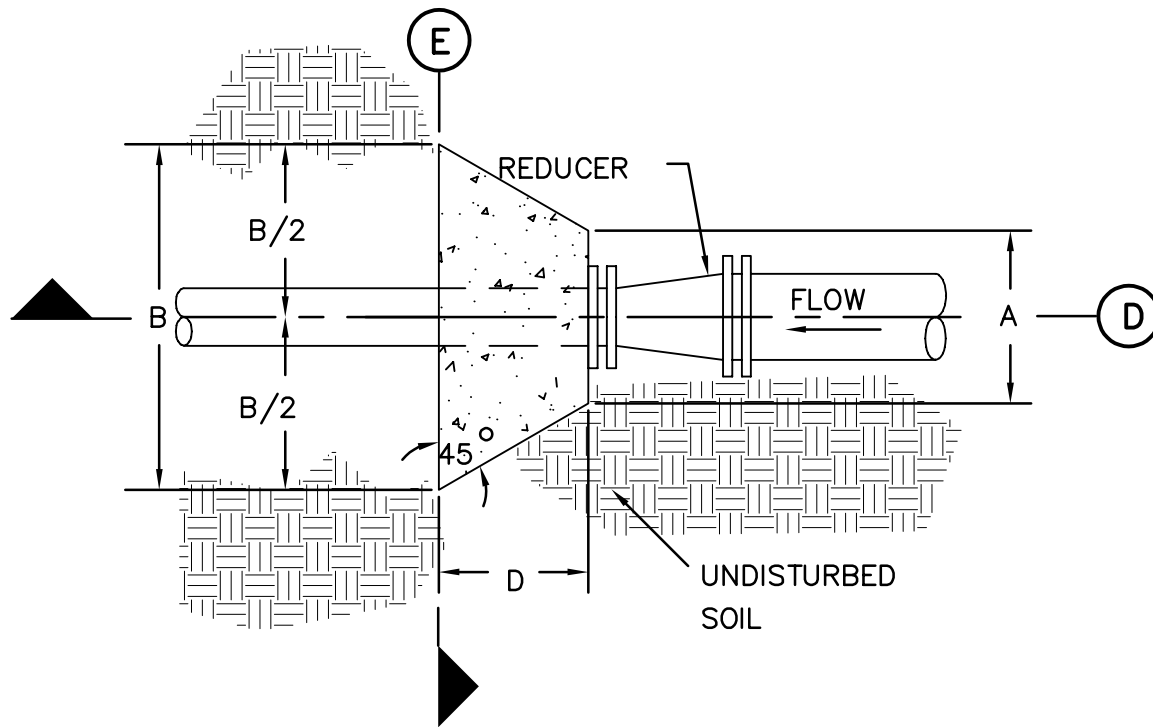
SHEET 2 of 4

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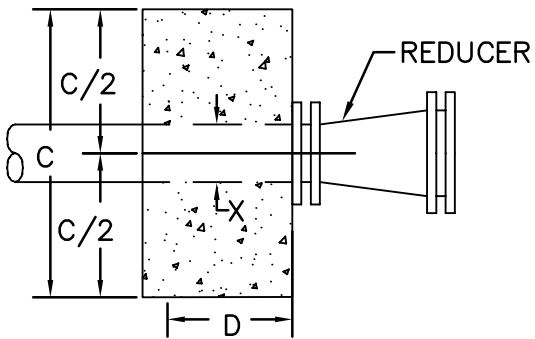
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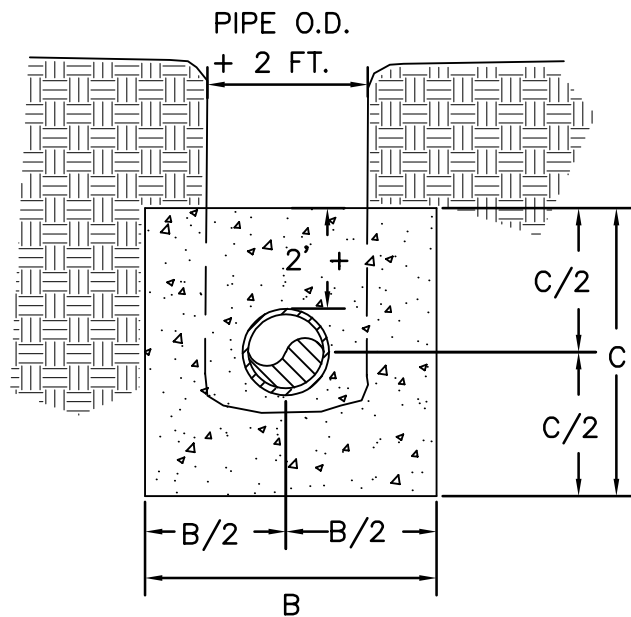
REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		



REDUCER - PLAN



SECTION D



SECTION E

SHEET 3 of 4

**EMI** ENGINEERING  
MANAGEMENT  
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303 SWANSON DRIVE  
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THRUST BLOCKING (3/4)

DETAIL NO.  
GP-1

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		

Line Pressure = 200 PSI Soil Pressure = 2000 PSF				
Pipe Size X	A	B	C	D
90 DEGREE BEND				
* 12"	1'-4"	4'-6"	3'-6"	2'-2"
* 10"	1'-3"	3'-4"	3'-4"	1'-4"
8"	1'-0"	3'-4"	2'-3"	1'-8"
6"	0'-11"	3'-4"	2'-3"	1'-6"
45 DEGREE BEND				
* 12"	1'-4"	3'-9"	3'-6"	1'-8"
10"	1'-3"	4'-0"	2'-3"	1'-11"
8"	1'-0"	3'-4"	2'-3"	1'-2"
6"	0'-11"	2'-2"	2'-0"	1'-0"

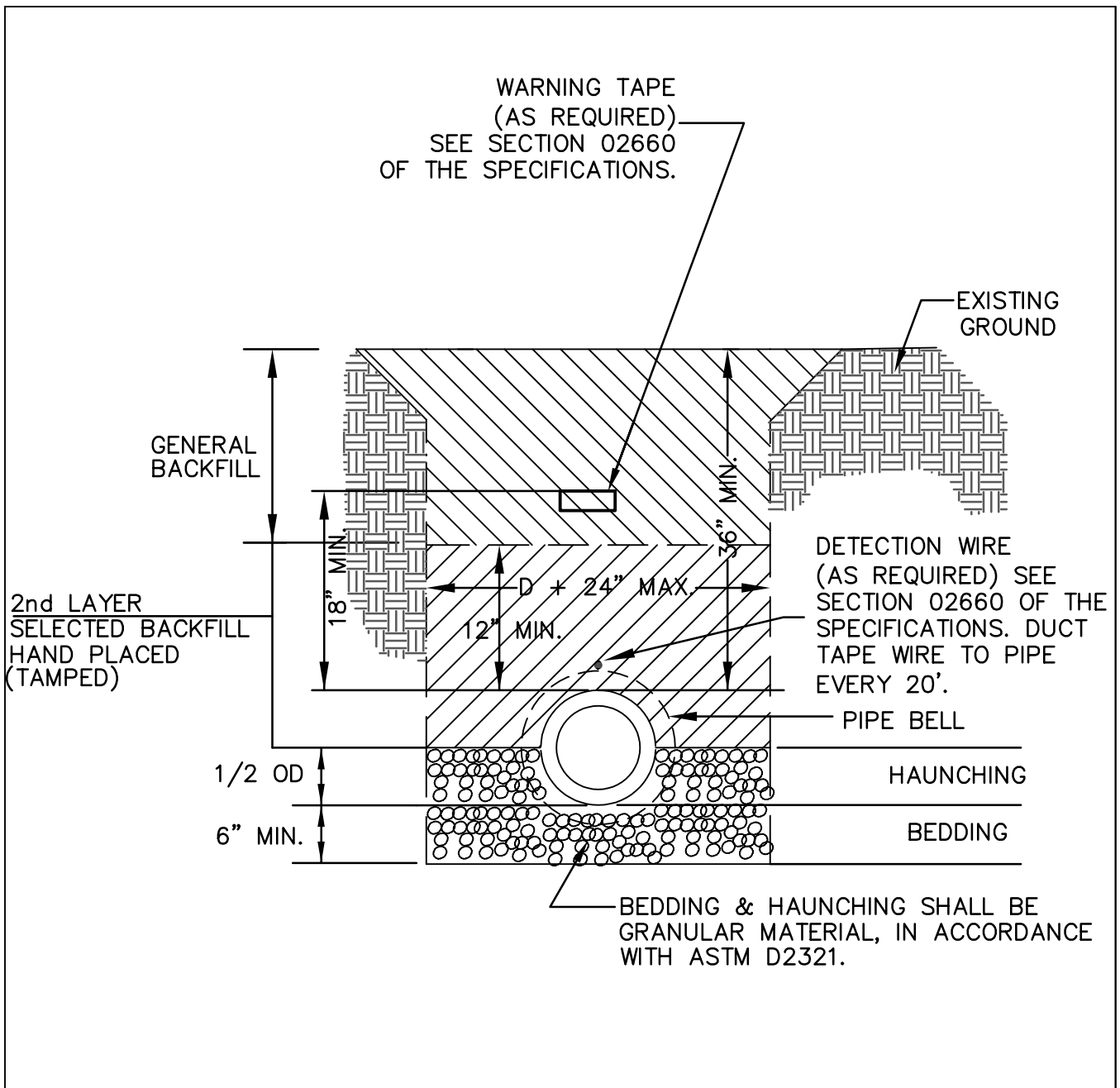
Line Pressure = 200 PSI Soil Pressure = 2000 PSF				
Pipe Size X	A	B	C	D
11 1/4 DEGREE BEND				
12"	1'-2"	2'-0"	2'-0"	1'-0"
10"	1'-0"	1'-8"	1'-8"	1'-0"
8"	0'-10"	1'-5"	1'-5"	1'-0"
6"	0'-9"	1'-0"	1'-0"	1'-0"
22 1/2 DEGREE BEND				
12"	1'-2"	3'-7"	2'-3"	1'-3"
10"	1'-0"	2'-7"	2'-3"	1'-0"
8"	0'-10"	1'-8"	2'-3"	1'-0"
6"	0'-9"	1'-9"	1'-3"	1'-0"

Line Pressure = 200 PSI Soil Pressure = 2000 PSF				
Pipe Size X	A	B	C	D
Unbalanced Tee & Plug				
* 12"	1'-8"	6'-0"	3'-6"	2'-4"
* 10"	1'-6"	4'-8"	3'-6"	1'-9"
8"	1'-4"	4'-4"	2'-3"	1'-8"
6"	1'-2"	2'-3"	2'-7"	1'-0"
Tee				
* 12"	1'-4"	6'-0"	3'-6"	2'-4"
* 10"	1'-3"	4'-8"	3'-6"	1'-9"
8"	1'-0"	4'-4"	2'-3"	1'-8"
6"	0'-11"	2'-3"	2'-7"	1'-3"

NOTES :

1. BLOCKING SHALL BE 3000psi CONCRETE ; "SACKCRETE" WILL NOT BE ALLOWED.
- 2.\* THE WATER LINE MUST BE LOWERED IN ORDER TO HAVE FIVE FEET (5') OF COVER AT THE BEND, TEE, REDUCER, OR PLUG AT ALL LOCATIONS WHERE THESE FITTINGS MAY BE UTILIZED.

SHEET 4 of 4



**NOTES:**

1. SEE SPECIFICATIONS SECTION 02225(EARTHWORK FOR UTILITIES) FOR BEDDING MATERIALS, BACKFILL MATERIALS, METHODS, AND ADDITIONAL REQUIREMENTS.
2. REGARDLESS OF TYPE OF PIPE, WHEN WET TRENCH CONDITIONS ARE ENCOUNTERED A MINIMUM OF CLASS 5 BEDDING SHALL BE REQUIRED.

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CLASS 5 BEDDING

DETAIL NO.  
GP-2

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		

WARNING TAPE  
(AS REQUIRED)  
SEE SECTION 02660  
OF THE SPECIFICATIONS.

EXISTING  
GROUND

GENERAL  
BACKFILL

2nd LAYER  
SELECTED BACKFILL  
HAND PLACED (TAMPED)

1/4 OD

6" MIN.

36" MIN.

D + 24" MAX.

12" MIN.

DETECTION WIRE  
(AS REQUIRED) SEE  
SECTION 02660 OF THE  
SPECIFICATIONS. DUCT  
TAPE WIRE TO PIPE  
EVERY 20'.

PIPE BELL

HAUNCHING

BEDDING

BEDDING & HAUNCHING SHALL BE  
GRANULAR MATERIAL, IN ACCORDANCE  
WITH ASTM D2321.

NOTES:

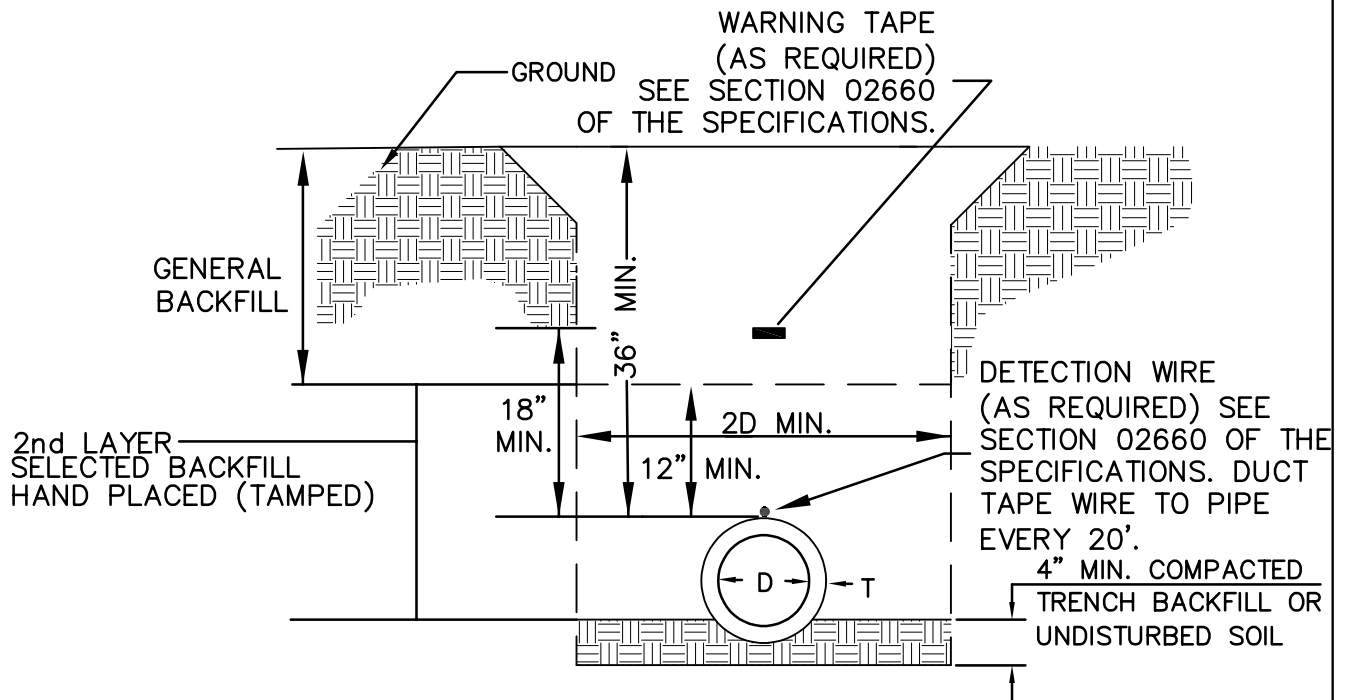
- SEE SPECIFICATIONS SECTION 02225(EARTHWORK FOR UTILITIES) FOR BEDDING MATERIALS, BACKFILL MATERIALS, METHODS, AND ADDITIONAL REQUIREMENTS.

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CLASS 4 BEDDING

DETAIL NO.  
GP-3

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		



NOTES:

1. SEE SPECIFICATIONS SECTION 02225(EARTHWORK FOR UTILITIES) FOR BEDDING MATERIALS, BACKFILL MATERIALS, METHODS, AND ADDITIONAL REQUIREMENTS.

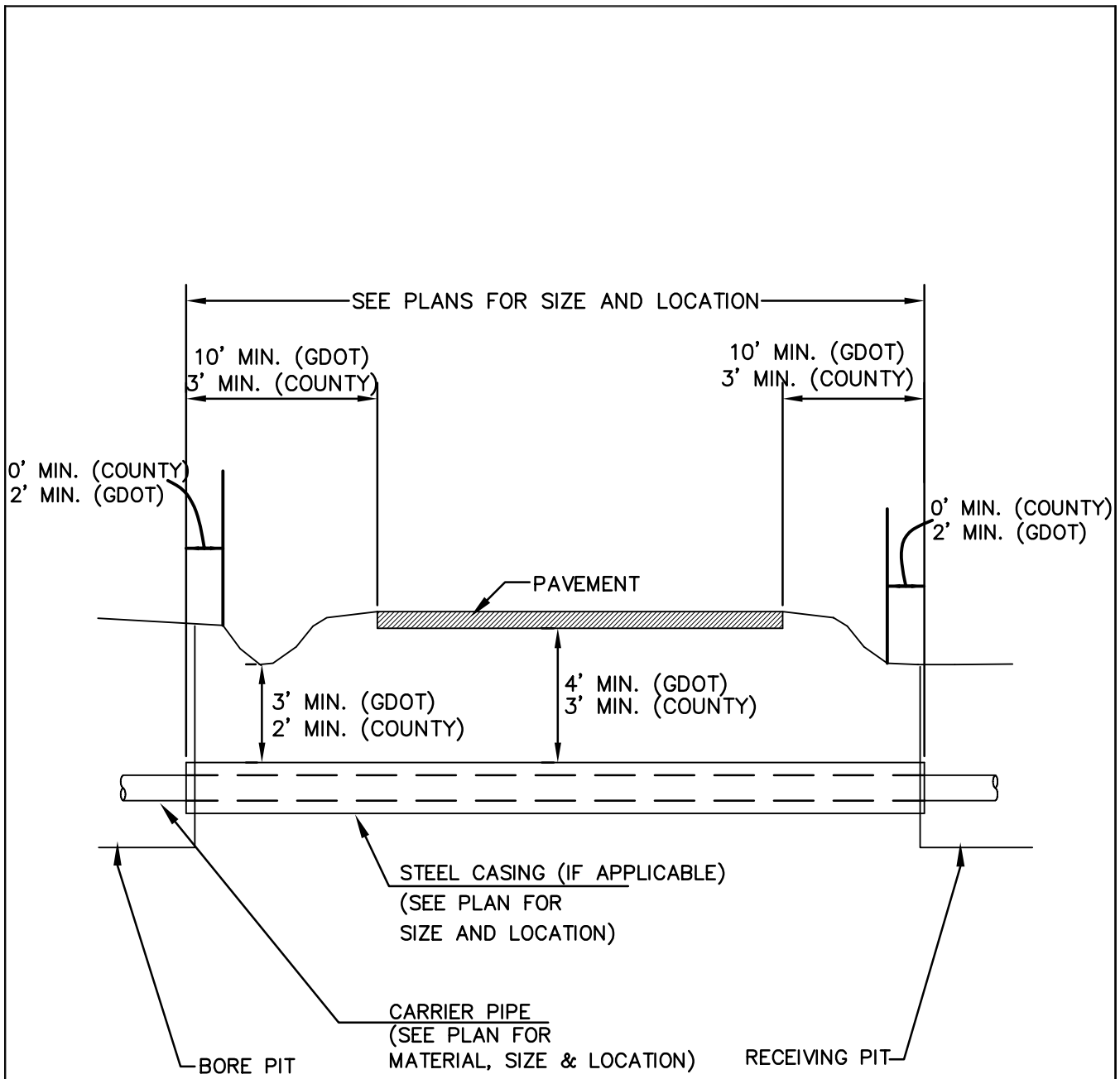
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CLASS 2 BEDDING

DETAIL NO.  
GP-4

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		



NOTES:

1. SEE SPECIFICATION SECTION 02300, BORING AND JACKING, FOR ADDITIONAL REQUIREMENTS.
2. CONTRACTOR SHALL USE RESTRAINED JOINTS INSIDE CASING.
3. TRACER WIRE TO BE CONTINUOUS THROUGH CASING.

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ROAD BORE

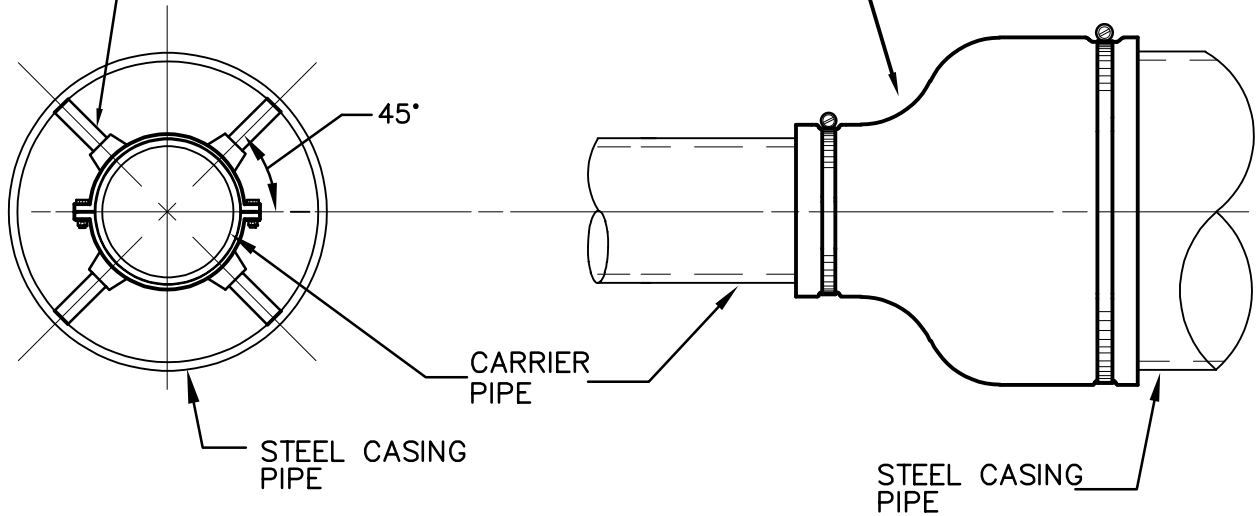
DETAIL NO.  
GP-5

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		



POLYETHYLENE CASING SPACER  
FOR PVC PIPE AND STAINLESS STEEL  
SPACER FOR DUCTILE IRON PIPE  
AS MFG. BY APS, INC. OR EQUIVALENT

SEAMLESS SYNTHETIC RUBBER  
SEAL, 1/8" MIN. THICKNESS  
W/STAINLESS STEEL BANDING  
STRAPS (2EA.) AS MFG.  
BY APS, INC. OR EQUIVALENT



SPACER DETAIL

END SEAL DETAIL

NOTES:

1. SPACERS REQUIRED AT EACH END OF CASING, AT BELLS AND IN THE MIDDLE OF EACH JOINT OF PIPE.

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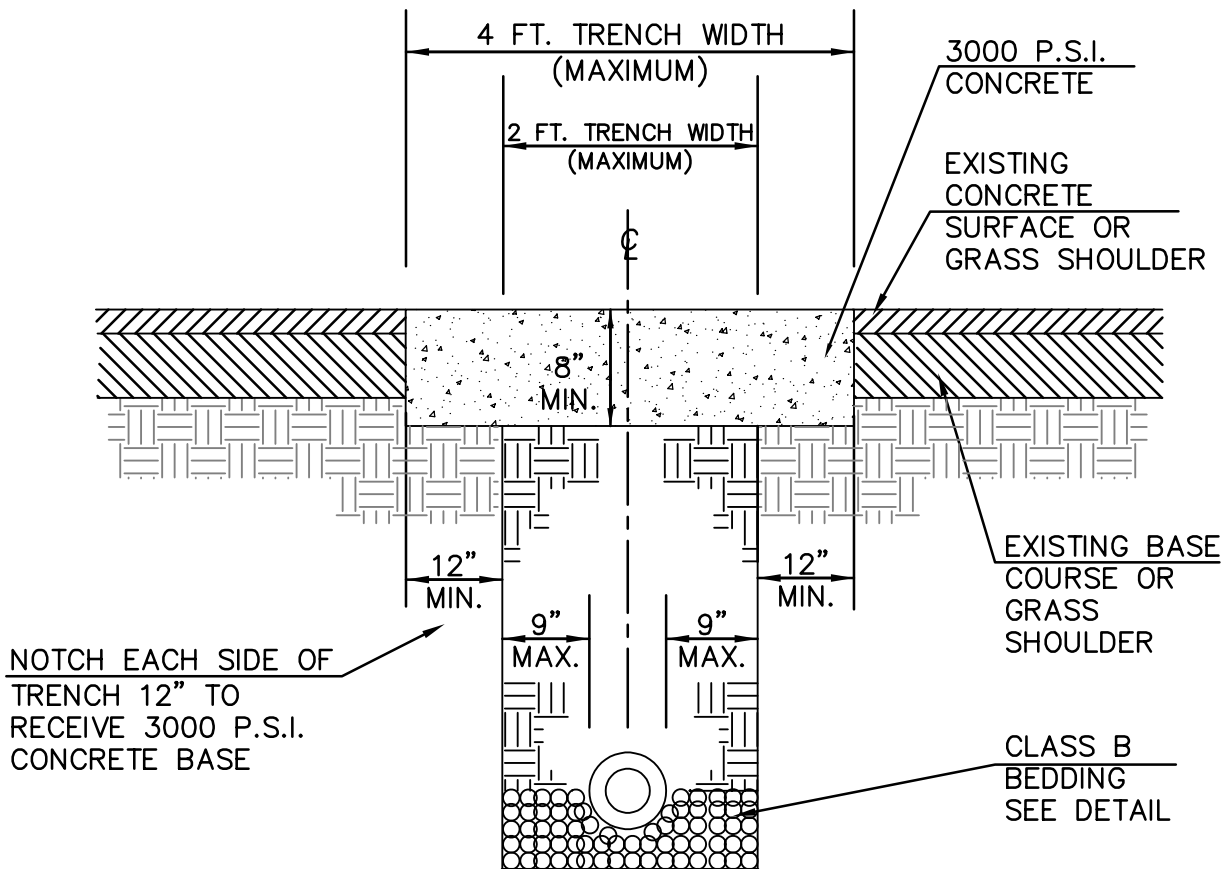
STEEL CASING

DETAIL NO.  
GP-6

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		

**GENERAL NOTES:**

1. PROVIDE STRAIGHT VERTICAL SAW CUTS TO A NEAT LINE AS DIRECTED BY FIELD ENGINEER.
2. CONTRACTOR TO UTILIZE STEEL RUNNING PLATES OR OTHER APPROVED METHODS DURING CURING OF CONCRETE. PLATES TO BE REMOVED UPON SATISFACTION OF FIELD ENGINEER.
3. WHEN INSTALLING PIPELINE AT EDGE OF ROAD LANE—WITHIN 3—FEET OF EDGE OF PAVEMENT, THIS PAVEMENT CUT AND REPLACEMENT MUST EXTEND AND INCLUDE THE ENTIRE WAY TO THE EDGE OF THE PAVEMENT.
4. SEE SPECIFICATION SECTIONS 02225 AND 02575 FOR ADDITIONAL INFORMATION AND PROCEDURES FOR PAVEMENT CUT AND REPAIR.
5. CONSTRUCTION METHODS AND MATERIALS SHALL BE IN ACCORDANCE WITH G.D.O.T. STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROADS AND BRIDGES, LATEST EDITION.



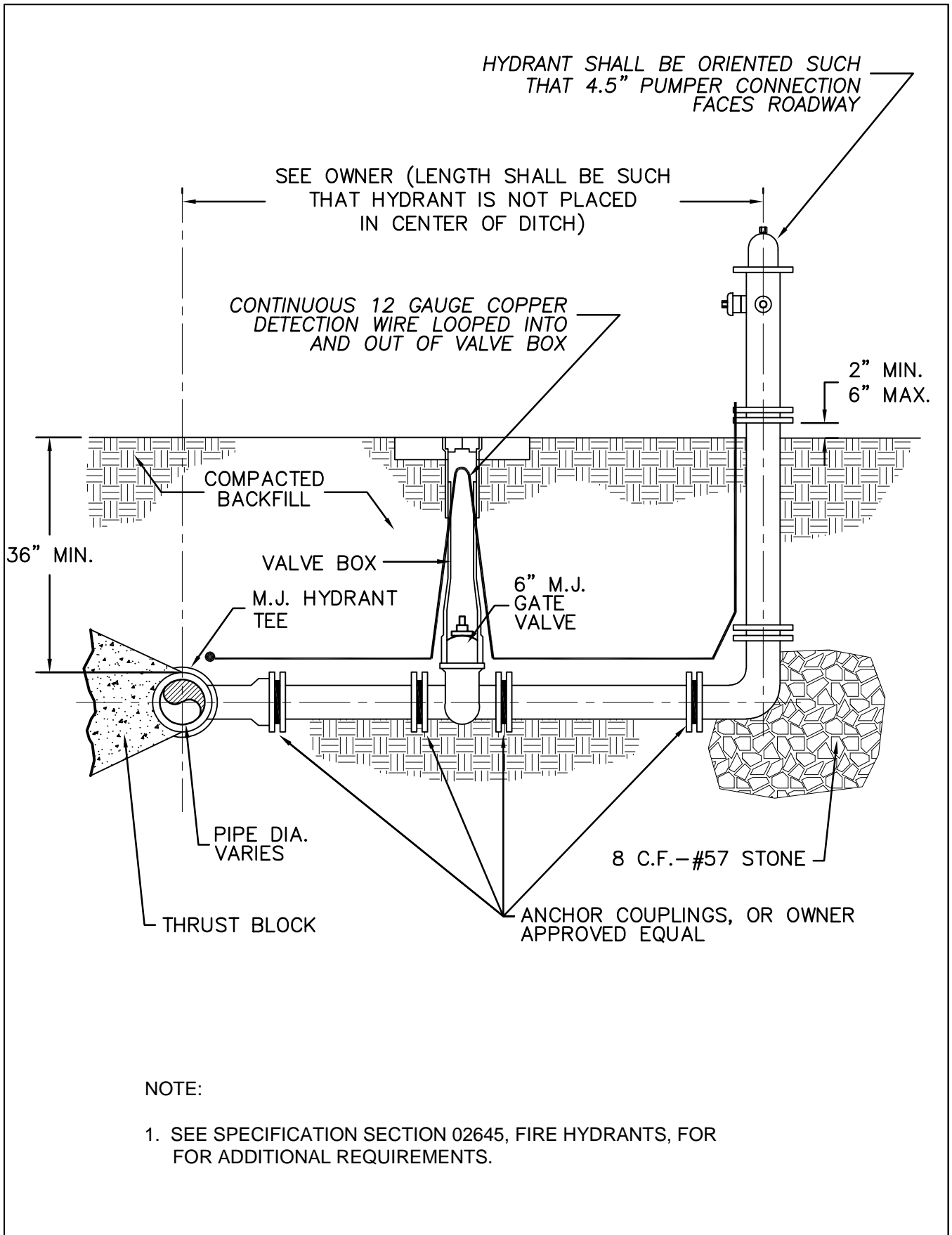
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**CONCRETE DRIVEWAY  
CUT/REPAIR**

**DETAIL NO.  
GP-50**

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		

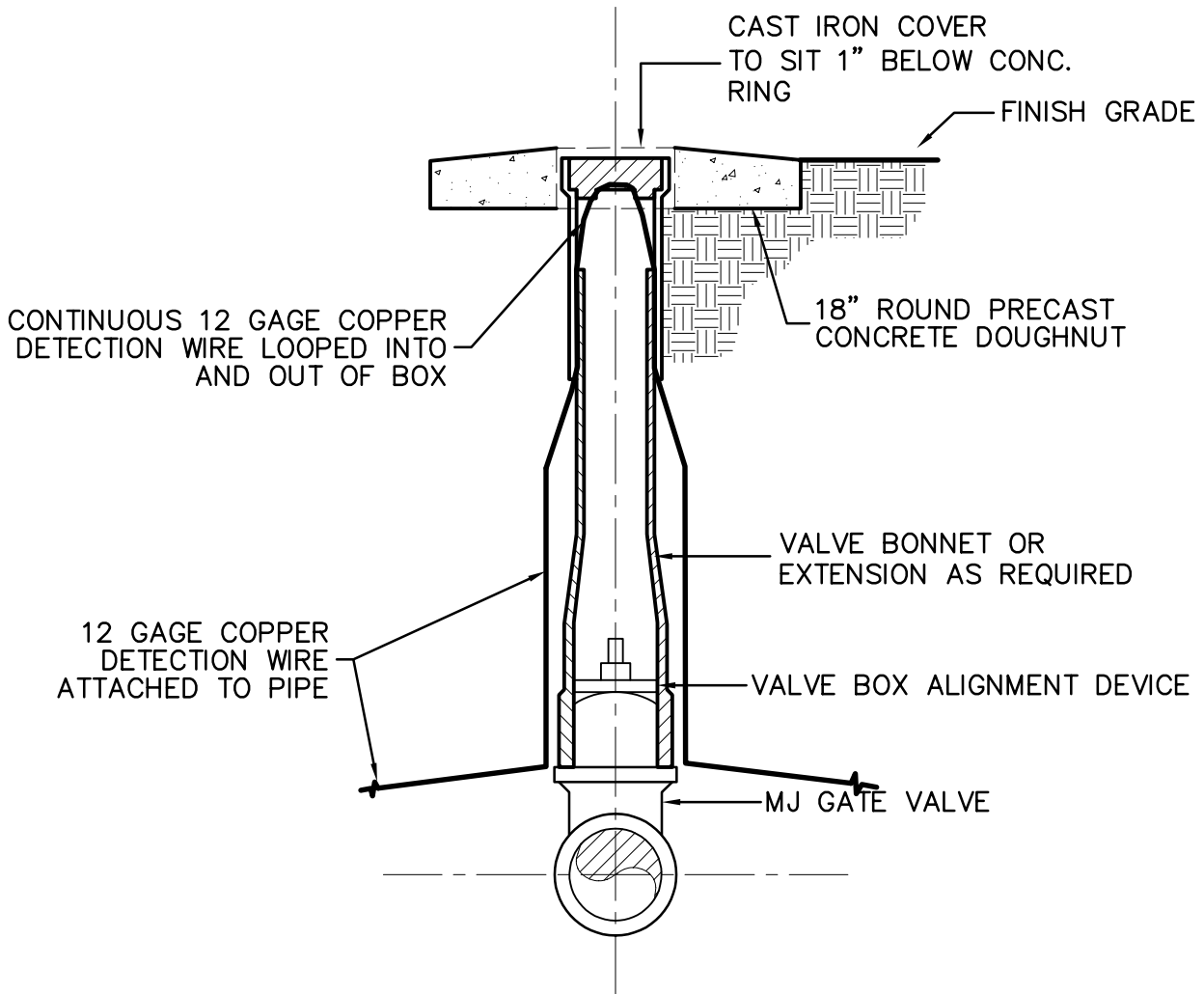


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FIRE HYDRANT

DETAIL NO.  
 W-1

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		



NOTES:

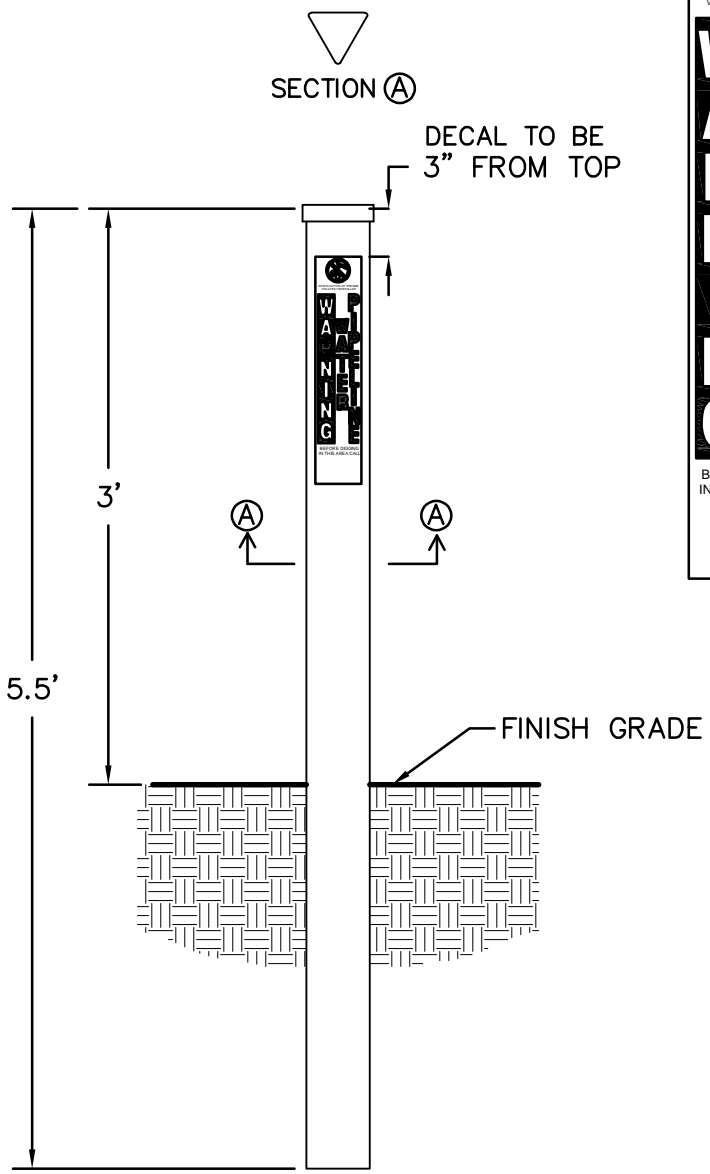
1. CAST IRON COVER TO BE STAMPED "WATER" FOR WATERLINE VALVES, "REUSE" FOR REUSELINE VALVES, AND "SEWER" FOR FORCEMAIN VALVES
2. SEE SPECIFICATION SECTION 02660, WATER DISTRIBUTION SYSTEMS, FOR ADDITIONAL REQUIREMENTS.
3. CONTRACTOR SHALL PROVIDE CONCRETE CAP BLOCKS UNDER BASE OF VALVE BOX FOR 2" VALVES TO PREVENT VALVE BOX FROM SITTING DIRECTLY ON THE PIPE.

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VALVE BOX

DETAIL NO.  
W-2

REV. NO.	BY	DATE
1	RB	06-28-06
2	KH	08-14-13
SCALE: N.T.S.		



APPROVED DECALS

NOTES:

1. VALVE MARKER SHALL BE RHINO TRI-VIEW OR APPROVED EQUAL.
2. VALVE MARKER SHALL BE BLUE FOR WATER VALVES, GREEN FOR FORCEMAIN VALVES, AND WHITE FOR REUSE VALVES.
3. DECAL SHALL BE 2-7/8" X 14" OR APPROVED EQUAL.

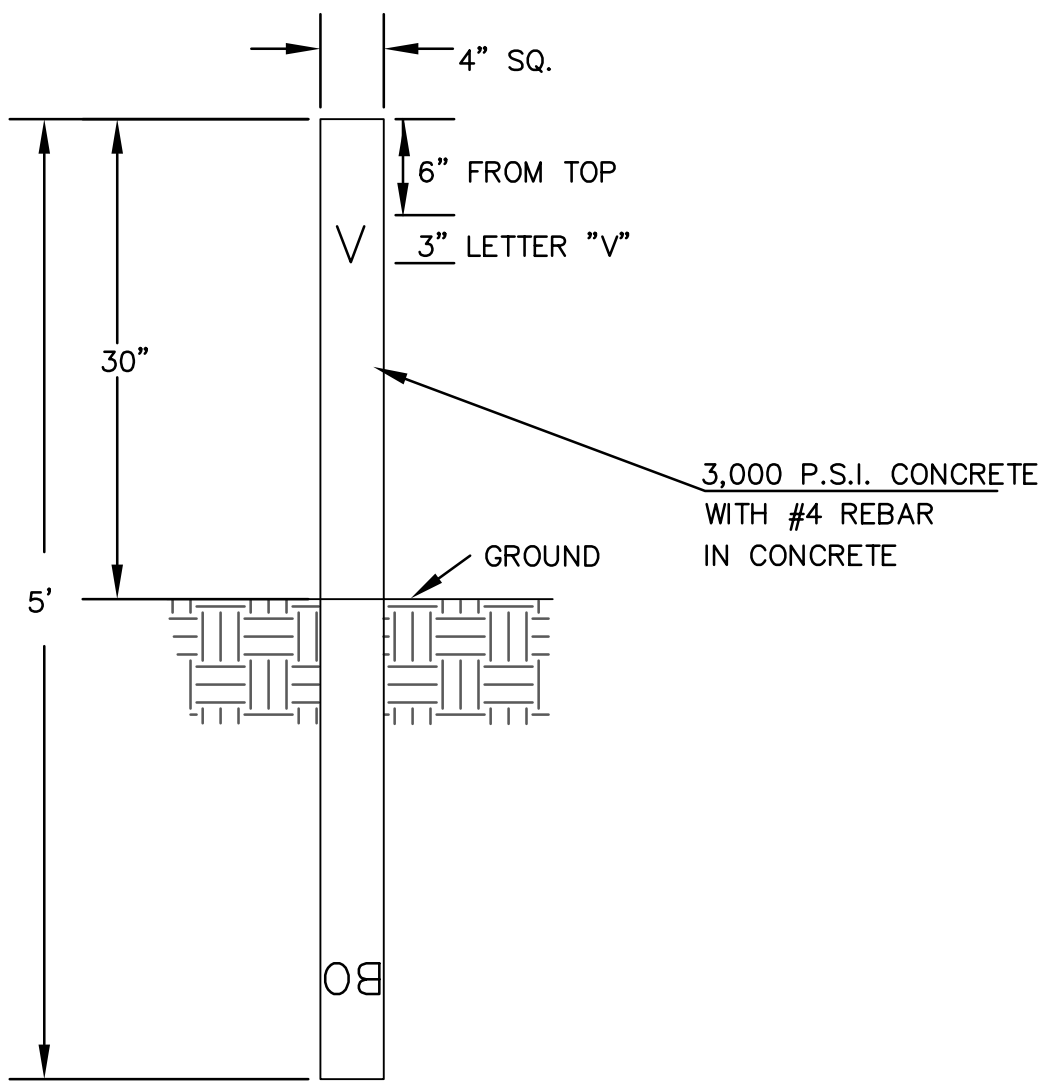
TO BE USED INSIDE GDOT RIGHT-OF-WAY ONLY

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VALVE MARKER-FLEXIBLE  
(GDOT RIGHT-OF-WAY)

DETAIL NO.  
W-3

REV. NO.	BY	DATE
1	RB	06-28-06
2	KH	08-14-13
SCALE: N.T.S.		

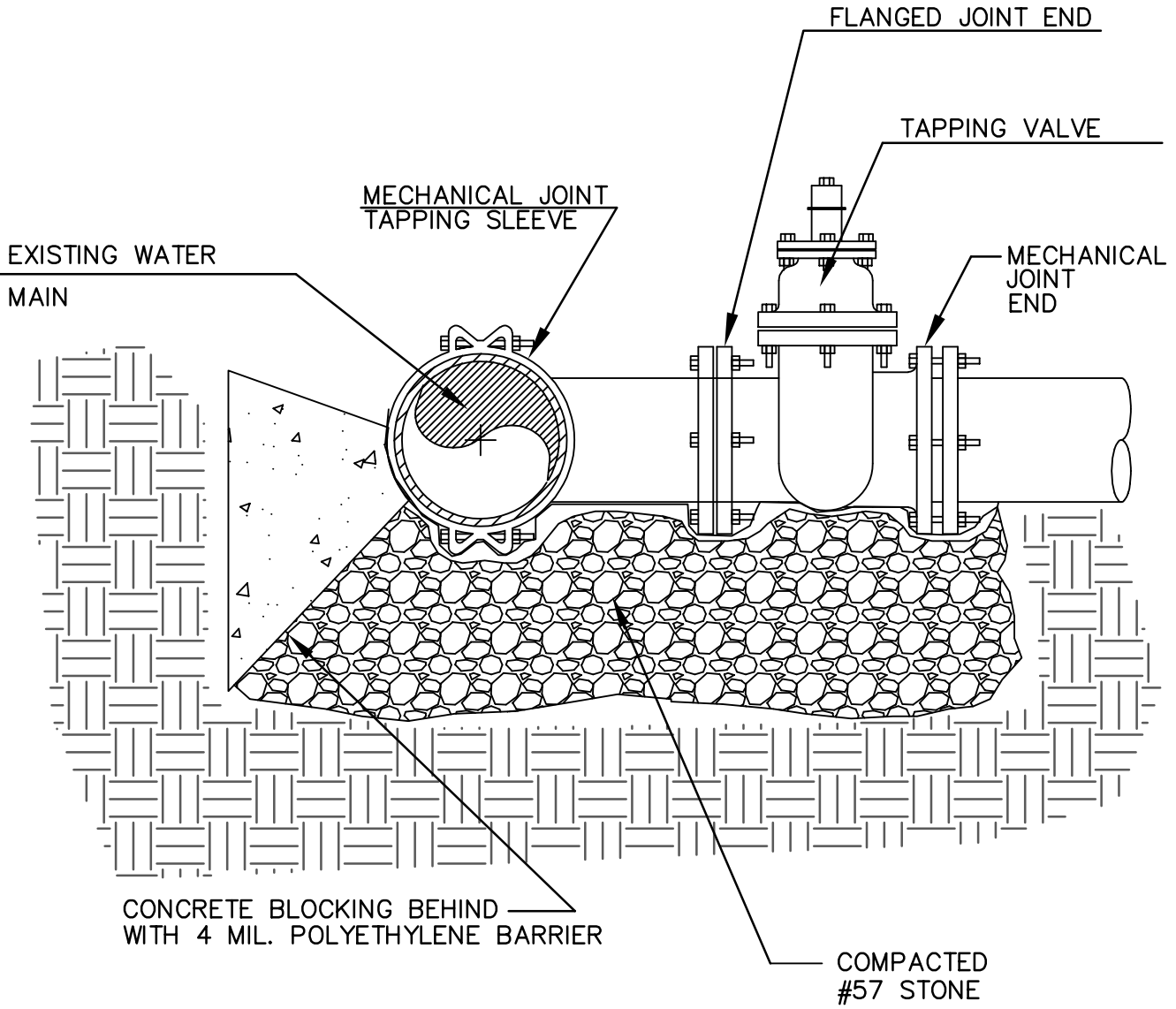


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VALVE MARKER-CONCRETE

DETAIL NO.  
W-4

REV. NO.	BY	DATE
1	RB	06-28-06
2	KH	08-14-13
SCALE: N.T.S.		



NOTES:

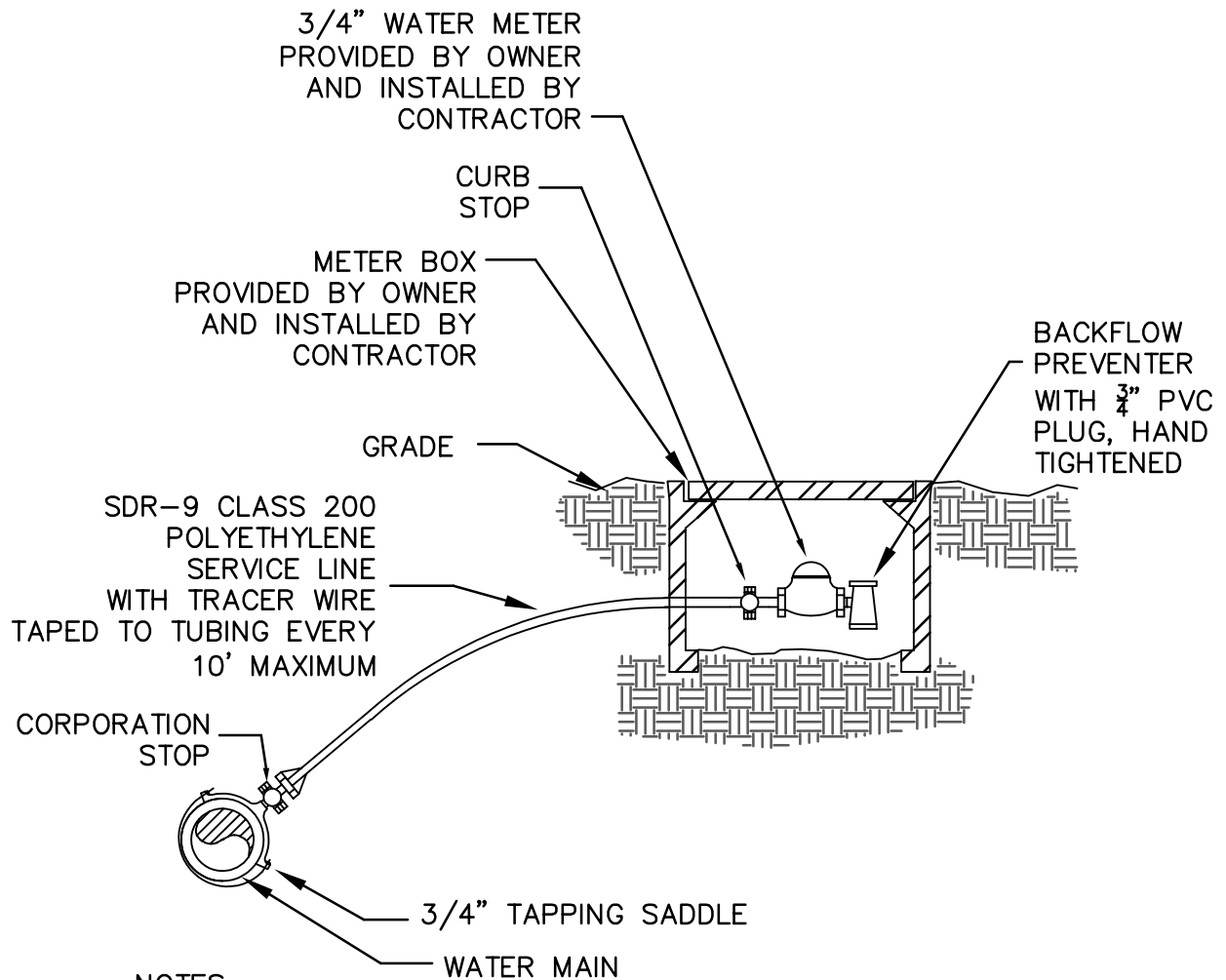
1. SEE SPECIFICATION SECTION 02660, WATER DISTRIBUTION SYSTEMS, FOR ADDITIONAL REQUIREMENTS.

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TAPPING SLEEVE & VALVE

DETAIL NO.  
W-5

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		



NOTES:

1. TERMINATE TRACER WIRE 12" INSIDE METER BOX
2. METER REGISTER SHALL BE CENTERED IN METER BOX.
3. TRACER WIRE SHALL BE WRAPPED AROUND CORPORATION STOP.

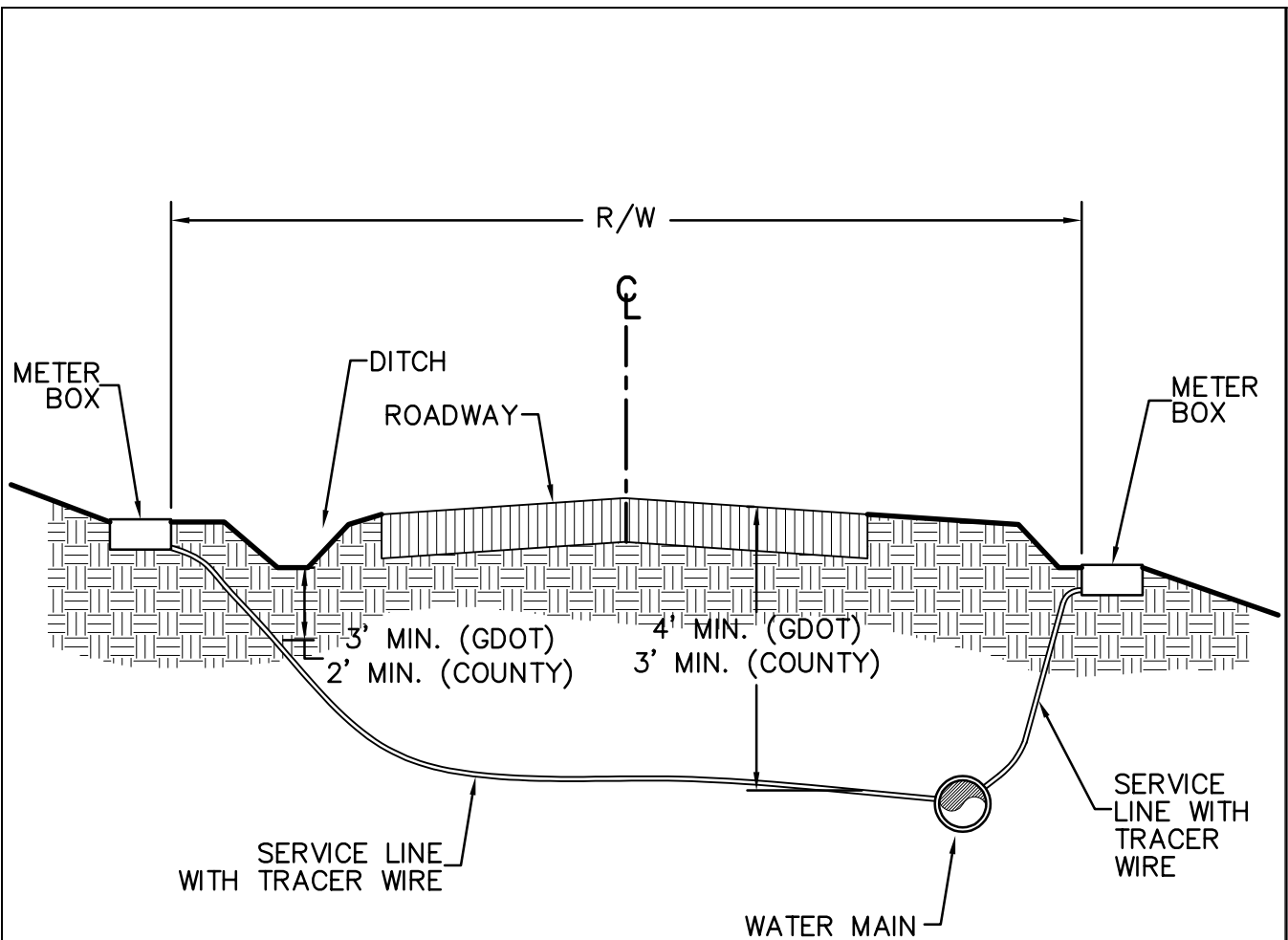
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RESIDENTIAL  
SERVICE CONNECTION  
WITH METER

DETAIL NO.  
W-9

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		





**NOTES:**

1. EXACT LOCATION TO BE DETERMINED BY OWNER.
2. TOP OF METER BOX TO FOLLOW SLOPE OF GROUND SURFACE.
3. METER BOXES TO BE PLACED ON BACK SIDE OF DITCH.
4. SEE SPECIFICATION SECTION 02665, WATER SERVICE CONNECTIONS, FOR ADDITIONAL REQUIREMENTS.

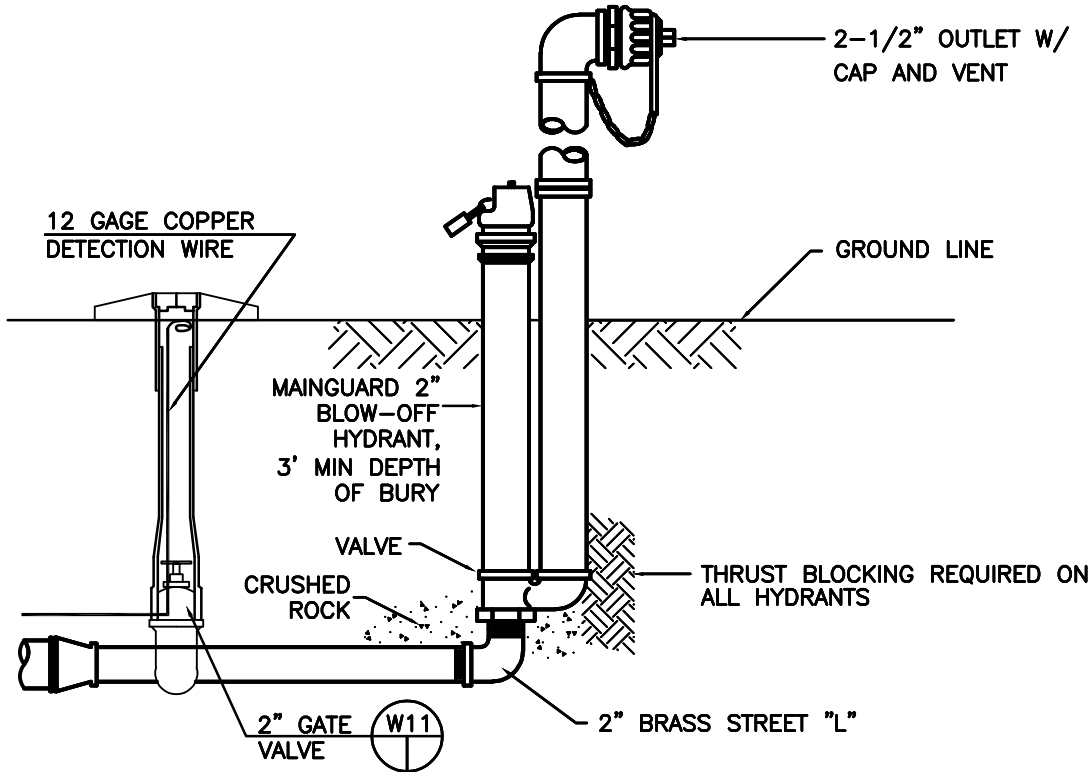
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SERVICE LINE  
INSTALLATION-  
UNDER ROAD

DETAIL NO.  
W-11

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		

MAINGUARD NO. 77 FLUSH HYDRANT



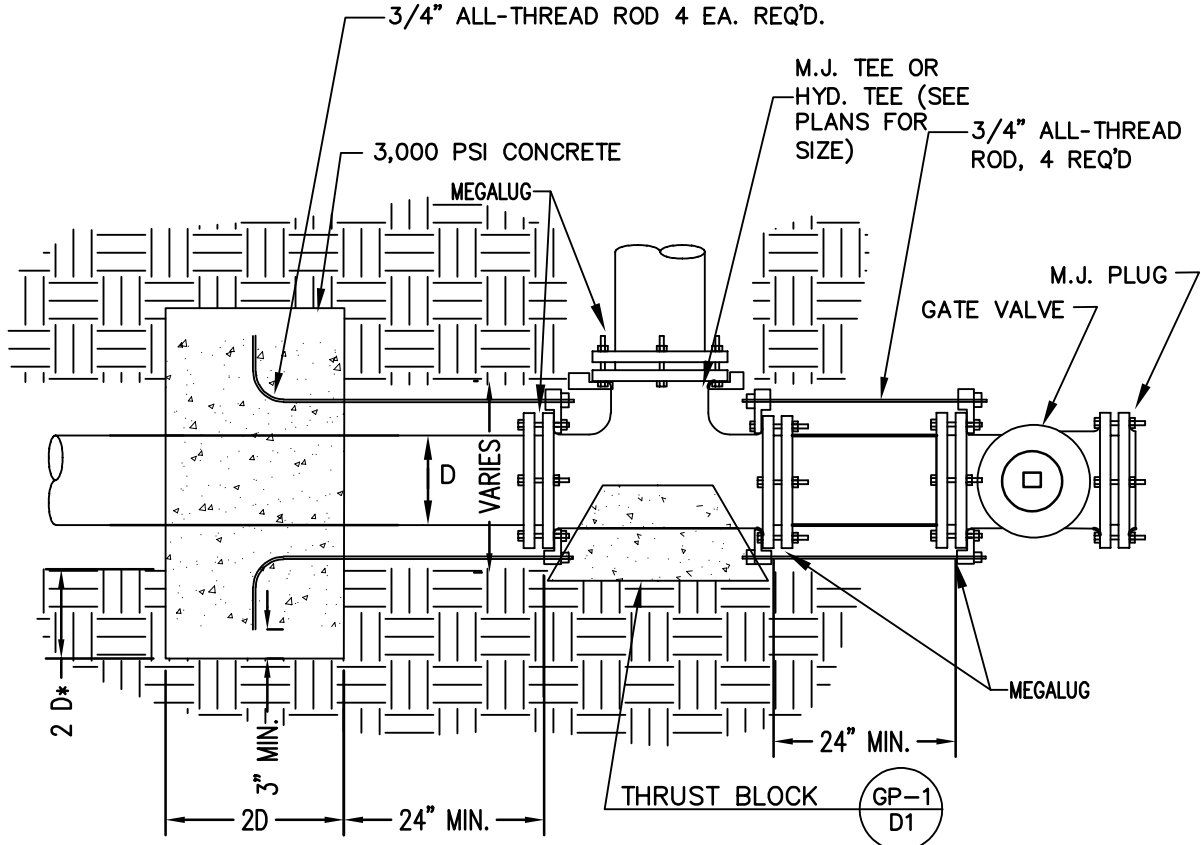
POST HYDRANTS SHALL BE NON-FREEZING, SELF-DRAINING TYPE WITH A MIN. 3' BURY. THESE HYDRANTS WILL BE FURNISHED WITH A 2" FIP INLET, A NON-TURNING OPERATING ROD, AND SHALL BE OPEN TO THE LEFT. ALL OF THE WORKING PARTS SHALL BE OF BRONZE TO BRONZE DESIGN, AND BE SERVICEABLE FROM ABOVE GRADE WITH NO DIGGING. THE OUTLET SHALL BE BRONZE AND BE 2-1/2" NST. HYDRANTS SHALL BE LOCKABLE TO PREVENT UNAUTHORIZED USE, AND SHALL HAVE A 150 PSI PRESSURE RATING AS MANUFACTURED BY KUPFERLE FOUNDRY CO. OR APPROVED EQUAL.

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**2" WATERLINE  
TERMINATION**

**DETAIL NO.  
W-20**

REV. NO.	BY	DATE
1	RB	06-28-06
SCALE: N.T.S.		



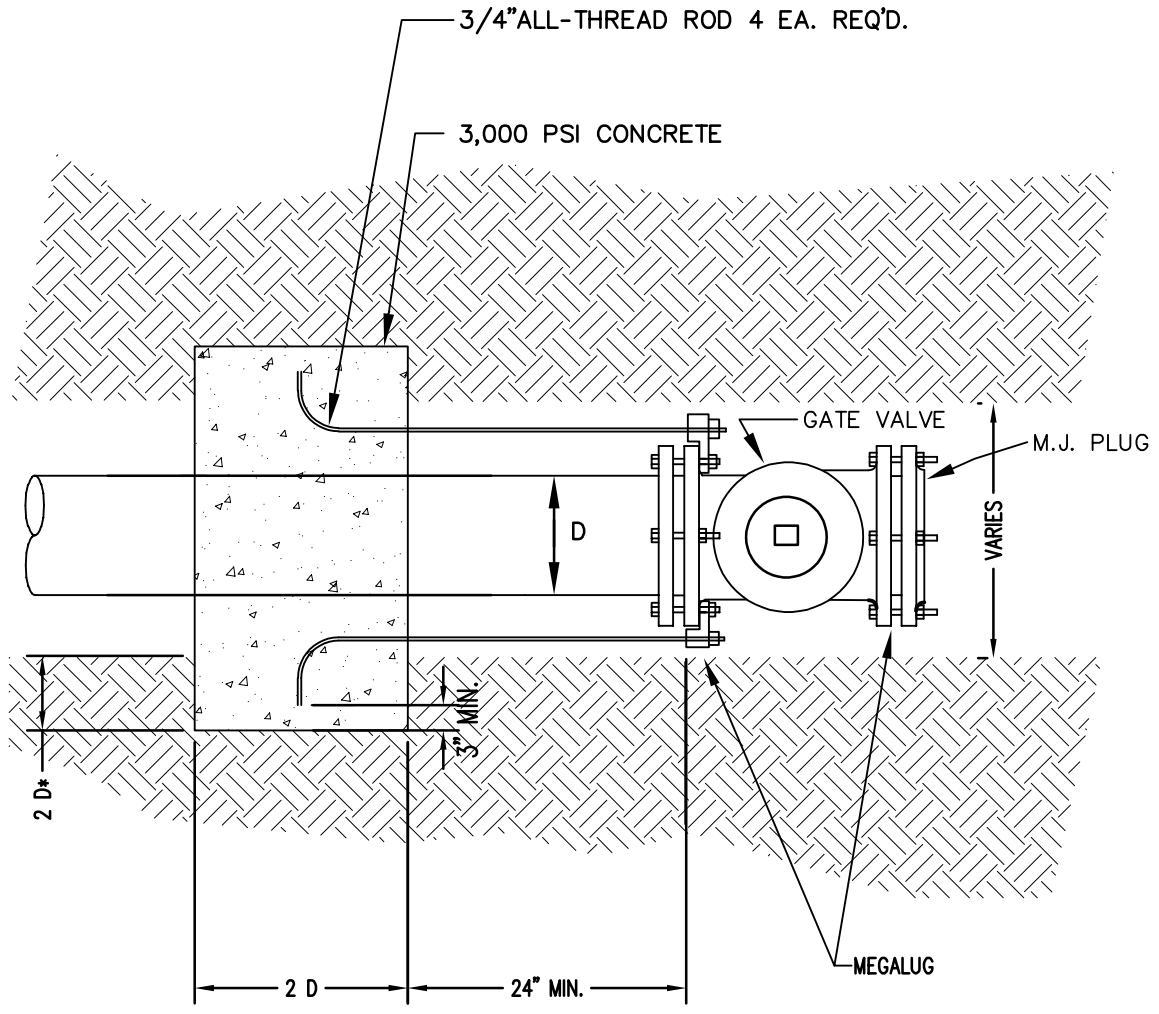
- \* DENOTES CONCRETE ANCHOR TO BE SET IN UNDISTURBED SOIL
- \* SEE DETAIL GP-1

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**LINE TERMINATION AT  
INTERSECTION WITH  
GATE VALVE & M.J. PLUG**

**DETAIL NO.  
W-50**

REV. NO.	BY	DATE
1	KH	8-14-13
SCALE: N.T.S.		



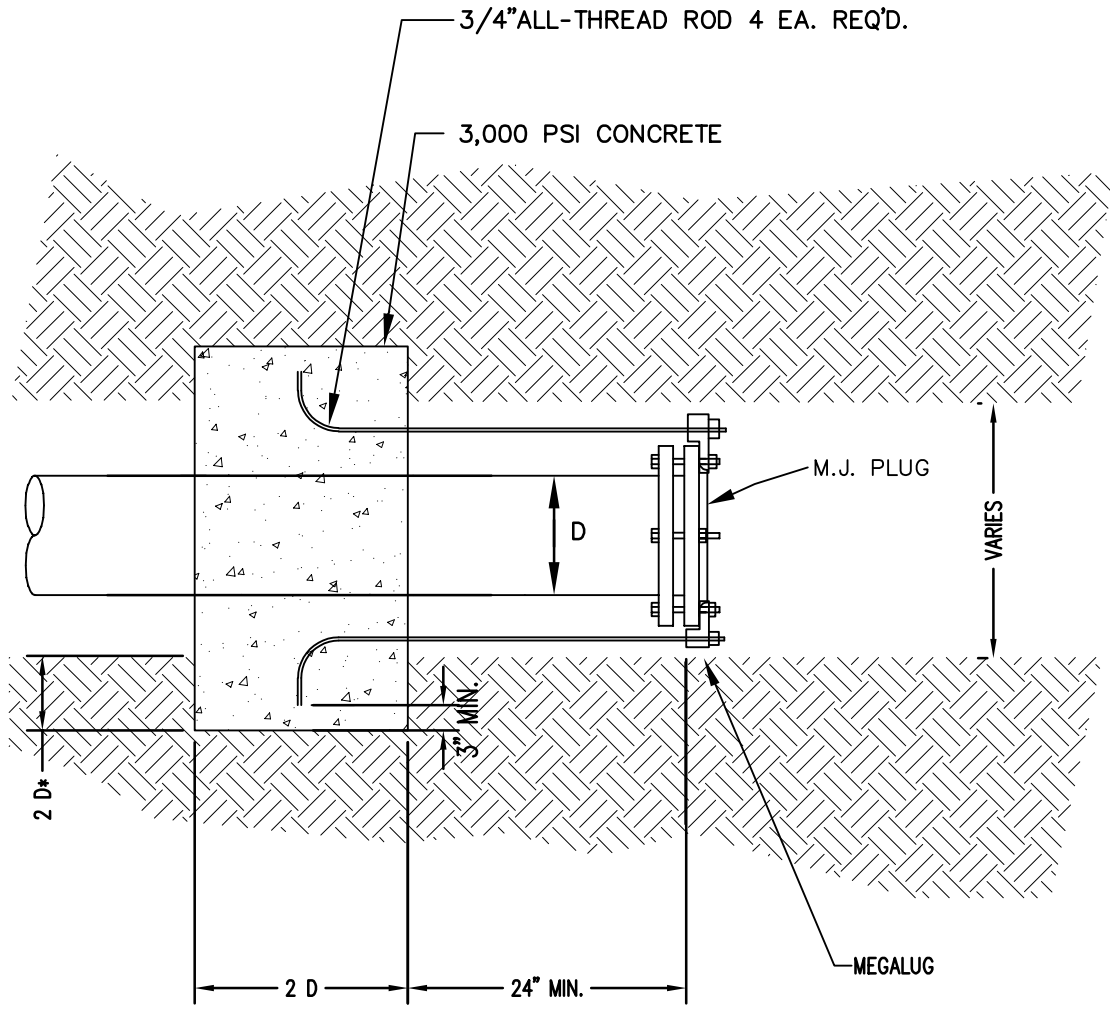
- \* DENOTES CONCRETE ANCHOR TO BE SET IN UNDISTURBED SOIL
- \* SEE DETAIL GP-1

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**LINE TERMINATION WITH  
GATE VALVE & M.J. PLUG**

**DETAIL NO.  
W-51**

REV. NO.	BY	DATE
1	KH	8-13-13
SCALE: N.T.S.		



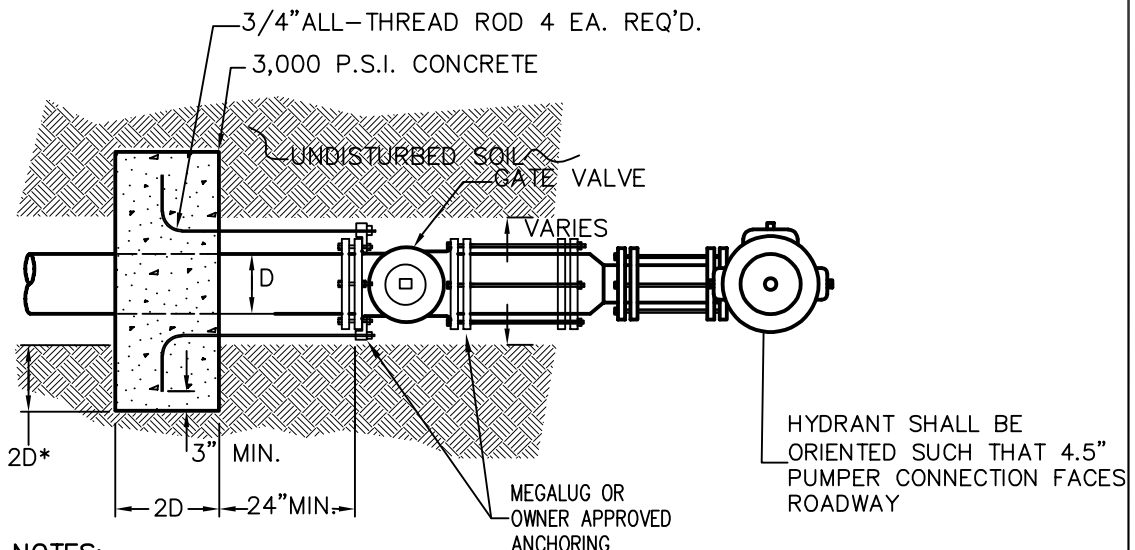
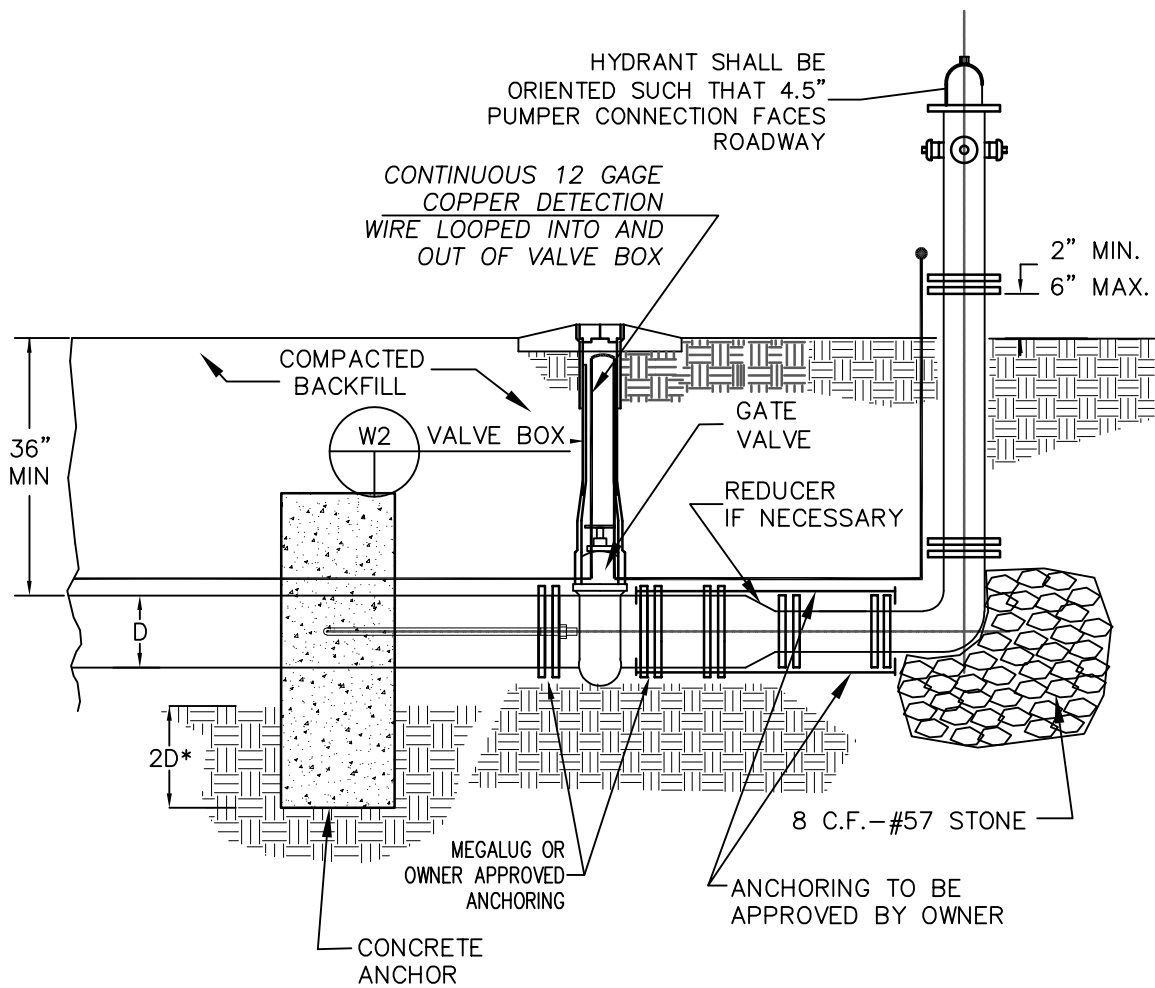
- \* DENOTES CONCRETE ANCHOR TO BE SET IN UNDISTURBED SOIL
- \* SEE DETAIL GP-1

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**LINE TERMINATION WITH  
M.J. PLUG**

**DETAIL NO.  
W-52**

REV. NO.	BY	DATE
1	KH	8-13-13
SCALE: N.T.S.		



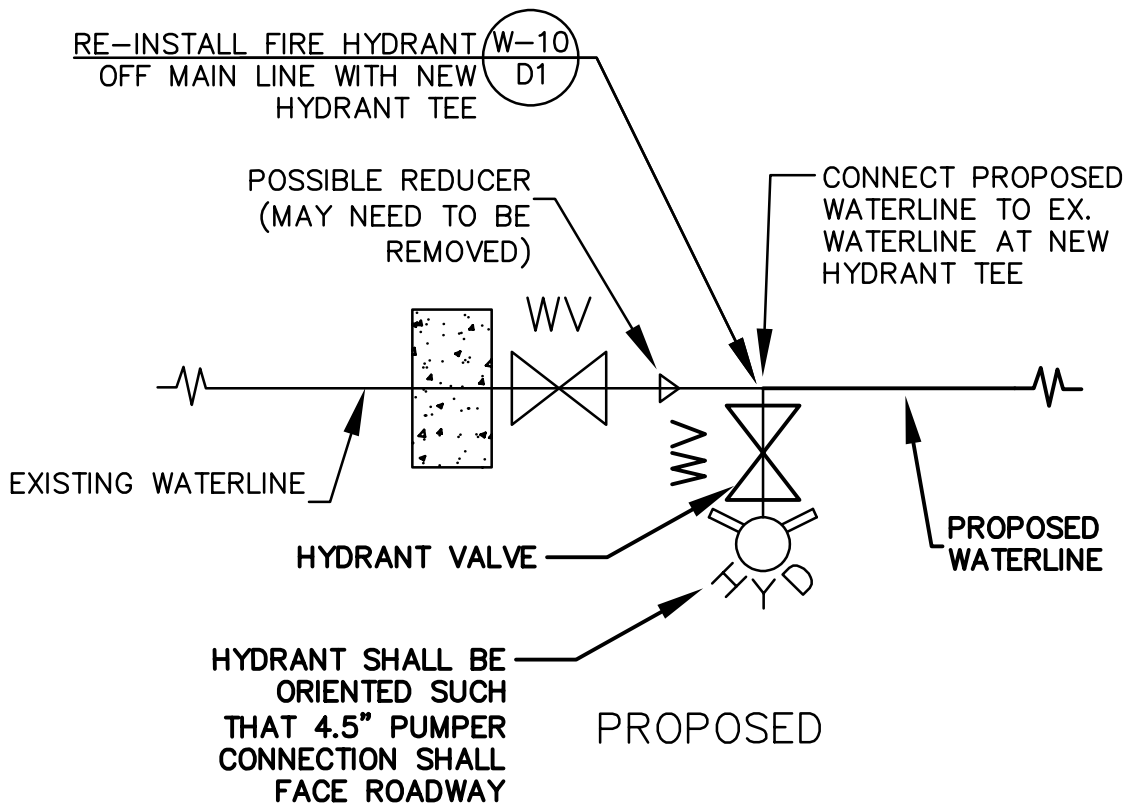
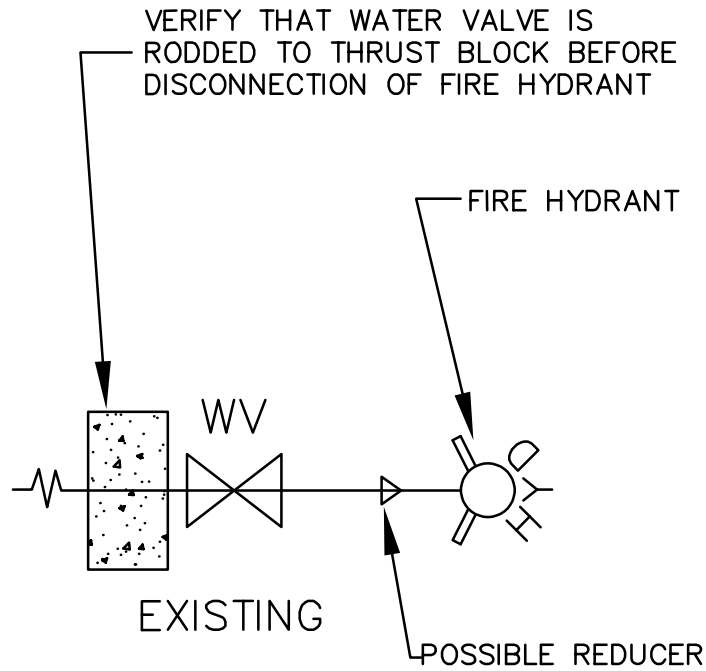
- NOTES:
1. GATE VALVE SIZE DETERMINED BY MAIN LINE SIZE.
  2. DEPTH OF CONCRETE ANCHOR TO BE X.
  3. \* DENOTES CONCRETE ANCHOR TO BE SET IN UNDISTURBED SOIL.
  4. SEE DETAIL GP-1

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LINE TERMINATION WITH  
FIRE HYDRANT

DETAIL NO.  
W-71

REV. NO.	BY	DATE
SCALE: N.T.S.		



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**CONNECTION TO  
EXISTING WATERLINE**

**DETAIL NO.  
W-99**

REV. NO.	BY	DATE
SCALE: N.T.S.		