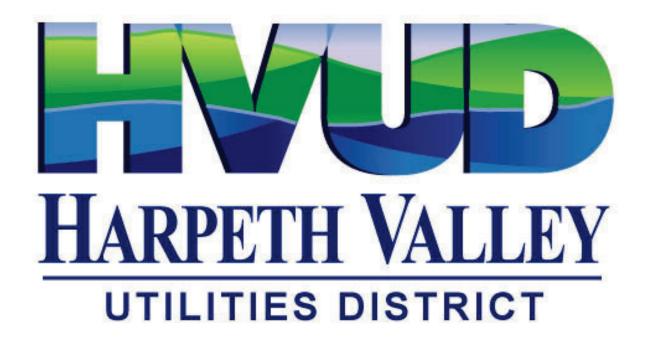
# STANDARD SPECIFICATIONS FOR WASTEWATER





WPN 25.0587
Harpeth Valley Utilities District
Specifications For Wastewater
APPROVED

THE DOCUMENT BEARING THIS STAMP HAS BEEN RECEIVED AND REVIEWED BY THE

TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION

**DIVISION OF WATER RESOURCES** 

AND IS HEREBY APPROVED BY THE COMMISSIONER

September 10, 2025

THIS APPROVAL SHALL NOT BE CONSTRUED AS CREATING A PRESUMPTION OF CORRECT OPERATION OR AS WARRANTING BY THE COMMISSIONER THAT THE APPROVED FACILITIES WILL REACH THE DESIGNED GOALS.

APPROVAL EXPIRES FIVE YEARS FROM ABOVE DATE

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# HARPETH VALLEY UTILITIES DISTRICT SPECIFICATIONS FOR WASTEWATER

These specifications give the minimum requirements for installation of water lines in the Harpeth Valley Utilities District. Any special construction problems or conditions not covered under these specifications shall be submitted to the District for approval.

The Standard Drawings are part of these specifications, and all construction shall conform to the details shown on these drawings.

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# HARPETH VALLEY UTILITIES DISTRICT OF DAVIDSON AND WILLIAMSON COUNTIES, TENNESSEE

# GENERAL GUIDELINES COVERING THE INSTALLATION OF SEWER MAINS AND APPURTENANCES

#### **AUGUST 2025**

# **PART 1 GENERAL GUIDELINES**

- 1.1. The purpose of these guidelines and specifications is to provide a guide to the Developers and their Engineers and Contractors to achieve an acceptable installation of sanitary sewer service to subdivisions and other projects that the District executes contracts with contractors. The word "District" refers to the Harpeth Valley Utilities District.
- 1.2. The inspection service provided by the District is limited only for the installation of sewer lines, pumping stations and their appurtenances. The District's inspection should not be construed to be comprehensive in nature. Inspection by the District does not relieve the Contractor's responsibility to comply with the specifications nor does it guarantee against any failure during the construction phase or the one-year warranty period due to inferior material or workmanship of the Contractor.
- 1.3. Harpeth Valley Utilities District reserves the right to approve engineering firms selected by the Developer for the preparation of plans and specifications. The District may require the developer to request design task orders from the District's design firm for projects.
- 1.4. No connection to an existing sewer shall be made until all lines have been completely tested and approved by the District Representative.
- 1.5. No utility plans will be reviewed until the development plans have received preliminary approval by the planning commission having jurisdiction.
- 1.6. One digital PDF set, including a vicinity map, shall be submitted to the District for the initial review. If the plans are in order, with no major changes, the Developer or his Engineer will submit a final digital PDF set of plans for approval.
- 1.7. After approval by the District, approval of the plans and specifications by the Metropolitan Planning Commission for projects in Davidson County, by the Williamson County Planning Commission for projects in Williamson County, and by the Tennessee Department of Environment and Conservation, Tennessee Department of Transportation, Railroads, Corps of Engineers, Tennessee Valley Authority, and any other agency having jurisdiction, is required before beginning construction. Two approved hard copies of the plans, a digital PDF set of plans and approval letter from the Tennessee Department of Environment and Conservation are to be provided to the District before any construction begins.
- 1.8. Sizes and locations of sewers, manholes, tees and stubs and all construction shall be in accordance with the plans approved by the District.

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- 1.9. Commercial developments that do not already require grease interceptors as determined by the District's Fats, Oils, and Grease (FOG) Control Program shall provide in the plans a space dedicated for a future grease interceptor that meets the requirements of the District's specifications.
- 1.10. Detailed plans and specifications shall be submitted by the Engineer employed by the Developer for any special condition or structures such as pump stations, creek crossings, etc., and shall be approved by the District and other agencies prior to the preconstruction conference.
- 1.11. Plan and profile sheets shall be furnished for review.
- 1.12. Permits for pavement cuts or crossing of public roads, including any special backfill and pavement repair as required by the agency having jurisdiction, are the responsibility of the Developer. A bond shall be provided to the District by the Developer to cover all costs of repair and maintenance for a period of one year from the date of acceptance of the project for all work performed in existing rights-of-way of all roads in Williamson County and all State highways. The amount of this bond shall be determined by the District after it receives all requirements for repairs from the Williamson County Highway Department or the Tennessee Department of Transportation.
- 1.13. Backfill requirements for utilities in proposed roads and adjacent to proposed roads must meet the requirements of the agency having jurisdiction of the roads upon completion of the project.
- 1.14. All applicable Federal and State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout.
- 1.15. If construction has not started within one year from the date of approval, utility plans shall be resubmitted to the State ad HVUD to renew approval.
- 1.16. Upon request by the District, laboratory and mill tests reports may be required on all pipes to assure that it meets the requirements of the District's specifications.
- 1.17. PDF digital shop drawings for pipe, manholes, etc. shall be submitted to the District a minimum of 14 calendar days prior to the preconstruction conference for review and approval after being thoroughly checked by the Contractor and stamped with his approval.
- 1.18. Manholes should generally be located in the center of one lane of the road.
- 1.19. The District reserves the right to relocate manholes and sewer lines on the construction plans to facilitate maintenance and to provide service for adjacent properties.
- 1.20. All sewer construction shall be in accordance with the latest specifications of the Harpeth Valley Utilities District and shall meet the requirements of the Tennessee Department of Environment & Conservation Division of Water Resources.

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- 1.21. All grading work shall be completed, all roads constructed to sub grade, and lot corners are to be marked prior to the installation of sewer mains.
- 1.22. The Contractor shall be responsible for locating and verifying the elevations of existing utilities prior to construction.
- 1.23. Contractor shall provide competent, suitably qualified personnel to survey, lay out and construct the work. Contractor shall always maintain good discipline and order at the site. Except as otherwise required for the safety or protection of persons or the work or the property at the site or adjacent thereto, all work at the site shall be performed during regular working hours and Contractor will not permit overtime work or the performance of work on Saturday, Sunday, or any legal holiday without the District's approval. A request to work outside regular working hours must be made two (2) working days prior to the time they propose to do this work.
- 1.24. The Developer's Engineer shall provide a complete set of Record Drawings (including private developments) upon completion of construction, and they shall include actual field angles between lines, all actual service lines and tee locations, the distance of cleanouts and the end of service lines to property corners and lines and reflect all alignment and grade changes. This record drawing must be completed and submitted prior to acceptance of the sewers into the public system and any connections being made thereto. The record drawings are to be submitted on the construction drawings. Submit one (1) copy on Mylar and a digital copy in both DWG and PDF format. These and a copy of the recorded plat shall be provided prior to the final inspection of the project.
- 1.25. Property service connections for sanitary sewer laterals shall be shown as follows:



#### Whereas:

A = The Lot number as listed on the recorded plat.

B = The horizontal distance from the center of the service tee to the center of the downstream manhole.

C = The horizontal distance from the center of the service tee to the end of the lateral.

D = The vertical distance from the top of the ground to the top of the lateral at the plug or property line.

1.26. The Contractor shall provide the District a set of construction cut sheets for all lines prior to the preconstruction meeting. If the cut sheets

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- 1.27. The binder pavement shall be placed prior to the semi-final inspection.
- 1.28. When the Developer completes the construction of lines a semi-final inspection will be held by the District and the Contractor. Upon completion of the "punch list" by the Contractor from this semi-final inspection, a final inspection with the Developer or his representative, the Contractor, and the District will be held.
- 1.29. A one-year warranty period will begin upon the date of acceptance of the project by the District.
- 1.30. All excavated areas prone to washing must be sodded.
- 1.31. On offsite work, all driveways and other private properties must be restored to their original condition or better.
- 1.32. In general, each gravity sanitary sewer service lateral shall include an inspection tee, which delineates public and private infrastructure, at a location on the property being served. The inspection tee shall be located no more than 10 feet away from a boundary line of the property being served except as otherwise approved by the District.
- 1.33. When a new sewer line is installed to serve an existing structure, the finished grade at its inspection tee shall be at least one foot below the lowest existing floor that is served by gravity sewer plumbing.
- 1.34. When a new sewer line is installed to service a future structure or structures, the finished grade at an inspection tee shall be one foot below the lowest proposed floor elevation that is to be served by gravity sewer plumbing.

#### **PART 2 INITIAL PLAN SUBMITTALS**

- 2.1. The plans must be submitted at least 30 days prior to the date on which action is desired. The initial submittal should include, but not be limited to the following:
  - A. Digital set of the plan in PDF format.
  - B. Preliminary plat.
  - C. Specifications.
  - D. Engineering reports including hydraulic calculations and design criteria used in sizing mains, pumping stations, and/or storage facilities.

# **PART 3 PRIVATE SEWERS**

- 3.1. The District will not accept or take ownership of sewer lines where:
  - A. Sufficient unencumbered right-of-way or easement cannot be provided to allow for the safe repair and maintenance of the sewer line.

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- B. A non-encased sewer line will be located beneath a stormwater detention pond or stormwater infiltration area (including areas of pervious pavement).
- C. A non-encased sewer line will be located beneath a retaining wall or other geotechnical engineered feature.
- D. The required depth of the sewer line will, in the sole opinion of the District, create unnecessary risks for repair and maintenance staff.
- 3.2. If the development is to move forward, but the District will not accept the proposed sewer lines, then the proposed sewer lines will need to be privately owned and maintained. A metering capable manhole must be installed anywhere a private sewer line connects to the public wastewater collection system. In general, all proposed sewer lines serving a single development shall be either public or private. The design and construction of all sewer lines, public as well as private lines which connect to the public system, must be approved by the District.

#### **PART 4 EASEMENTS**

- 4.1. When sanitary sewers are constructed outside a public right-of-way, easements must be provided with sufficient width to allow for proper operation and maintenance of the sanitary sewer mains, service laterals, and inspection tees. The minimum width of these easements shall be 20 feet and the maximum width shall be equal to twice the sewer depth plus five feet. The required easement width shall be determined by the District.
- 4.2. When a main is proposed in a developed area a minimum of 20 feet wide temporary construction easement on each side of the permanent easement must also be provided.
- 4.3. Easements for sanitary sewer line extensions may be provided in either of two ways.
  - A. Easement Document on forms provided by the District, which must include legal description of the easement(s), legal Owner's name, map and parcel, and must be signed by the Owner, and then notarized and recorded.
  - B. Record with Subdivision Plat If this method of recording easements is chosen, a preliminary plat of the subdivision must be provided at the time of plans submittal, which clearly defines the easements to be recorded.
- 4.4. All easements for offsite work must be obtained and recorded before construction can begin. In new subdivisions the letter of intent and preliminary plat showing the easements will be sufficient to start construction. However, the Final Plat must be recorded and delivered to the District prior to final inspection of the new facilities.
- 4.5. Special permits such as Aquatic Resource Alteration Permits, Railroad Crossings, T.V.A. crossings and State Highway crossings must be prepared by the Developer's Engineer. The District will submit the permit application to the railroad or state highway as applicable.

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#### PART 5 SEWER EXTENSION AND/OR SERVICE CONNECTION

- 5.1. The following are guidelines for the preparation of sanitary sewer extension plans and should not be construed as being the total requirements. The District may at its option require additions to be made in the plans where circumstances warrant.
  - A. Plans shall be drawn on a standard 24-inch x 36-inch sheet.
  - B. A cover sheet shall be made a part of all plans and shall incorporate a location map on an approximate scale not less than 1 inch = 1,200 feet, the name of the project and, the names, addresses and telephone numbers of the Developer and the Engineer.
  - C. All plans shall be stamped by a Tennessee Licensed Professional Engineer.
  - D. Sewer plans must be on plan and profile sheets, with existing and proposed contour lines shown in the plan portion and the lowest elevation of the sewer line beginning on the left side of the sheet in the profile.
  - E. Show all existing and proposed utilities, including sewer, gas, electric, telephone, cable TV, and storm sewers on the plans with measurements and/or details of proposed clearances of same.
  - F. Plans shall show the minimum or lowest finished floor elevations, which are to be served by gravity sewer plumbing, for all existing and proposed structures. The plans shall also show the invert and finished grade elevations of all service laterals' inspection tees.
  - G. The plan scale will be: Plan 1 inch = 50 feet or 1 inch = 100 feet, profile where applicable 1 inch = 5 feet or 1 inch = 10 feet vertical.
  - H. The minimum slopes for gravity sewers shall be as follows:

Sewer Size (inches)	Minimum Slope (feet per 100 feet)
8	0.40
12	0.22
15/16	0.15
18	0.12
24	0.08
30	0.06
36	0.05
42	0.042
48	0.032
54	0.027

- I. All sewer plans shall include at least one benchmark based on NAD 1983 Datum. Additional benchmarks shall be shown at approximately 1,500-foot intervals. The use of a manhole invert elevation or an assumed elevation will not be approved.
- J. Show the limits of all proposed easements.
- K. The direction of North should be clearly shown on all plans.
- L. Show all topographic features such as driveways, pavements, right-of-ways, property lines, storm drainage, structures, etc.
- M. Provide grading and drainage plans of subdivisions including typical section of roadway.
- N. Provide detailed drawings for unusual conditions such as stream crossing, etc.
- O. All property lines should be shown on the plans and each parcel should show the map and parcel number, lot number and/or house number.
- P. A connection must be provided for each parcel or proposed lot. The connection will be shown as a tee (machine made only) and a 6-inch service line extension. Hand-made tees and "Y" connections are not acceptable. When sewers are constructed by private Developers to serve proposed developments and are to be construed as public mains within the public right-of-way, the Developer will provide a 6-inch tee and 6-inch service line a minimum of 10 feet beyond right-of-way to serve all parcels of property which lie along said main extension (which can be provided gravity service by said main). When laying the mains in private property a tee and 10 feet of service line shall be provided for each existing parcel. An inspection tee assembly is to be installed by the plumber for each sewer lateral. The tee shall be of the same material as the service lateral. Install sewer taps in the center of each parcel or proposed lot if possible.
- 5.2. A maximum of three 6-inch service lines will be allowed into permanent end manholes, and a minimum 45-degree alignment differential must be maintained between them. At no time will an angle less than 90 degrees be permitted between them and the out or downstream sewer main. The service lines must enter the manhole within 1.9 feet of the base of the manhole and the invert must be properly shaped for them.
- 5.3. Special pipe considerations are as follows:
  - A. In areas which have been filled and the proposed pipe will be within the fill, C900 sewer pipe must be specified unless otherwise directed by the District.
  - B. If ductile iron or C900 sewer pipe is specified for any part of a sewer, then it must be specified from manhole to manhole including service laterals; jointing of two different type pipes between manholes will not be permitted.
  - C. Sewer depths greater than or equal to 15 feet:

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- 1. Sewers 12 inch in diameter or less proposed at depths greater than or equal to 15 feet but less than or equal to 20 feet will be constructed of C900 pipe and any service line risers from this depth also shall be C900 pipe.
- 2. Sewers 12 inch in diameter or less proposed at depths greater than 20 feet will be constructed of ductile iron pipe as well as any service line risers.
- 3. Sewers greater than 12 inch in diameter proposed at depths greater than or equal to 15 feet will be constructed of a material determined by the District.
- 4. Depth of pipe shall be as measured from the invert of the proposed pipe to finished grade. Sewers proposed at depths greater than 15 feet should be avoided whenever possible and first consideration given to other routes.
- D. All sanitary sewers shall have a minimum of 30 inches cover in private property and 48 inches in paved areas subject to vehicular traffic. Across drains and areas where cover is less than 2.5 feet, ductile iron pipe will be required with a concrete cap.
- E. The last reach of sewer line shall have a minimum slope of 0.60%.
- F. Where storm drains or other utilities cross over sanitary sewer there must be a minimum of 18 inches separation with PVC sewer pipe and 12 inches separation with ductile iron pipe.
- 5.4. Manholes shall be installed at the upper end of each line; at all changes in grades, size, or alignment; at all intersections; and at distances not greater than 400 feet for sewers 18 inches in diameter or less, 500 feet for sewers 24 inches and 30 inches in diameter, and 600 feet for sewers over 30 inches in diameter.
- 5.5. When sewers are proposed along drains and lie within a potential flood plain or lie adjacent to a drainage ditch or drainage structure in which there is a potential problem of storm water entering the sanitary sewer, the District will require approved watertight frames and covers be installed on the manholes.
- 5.6. Vent stack assembly will be required on watertight manholes at approximately 1,000 foot intervals.
- 5.7. When sewers are proposed to serve new subdivisions, both the existing and proposed contour elevations must be shown on the sewer plans. Copies of the subdivision grading and drainage plan and of the road plans (with a typical section of the proposed roadway) must be submitted with the sewer plans for review. The plans shall designate which roads are to be public and which are to be private, as well as designating which sewer lines are to be public.
- 5.8. Anytime sewer lines are proposed to serve property where the "Serviceability" of a lot or residence is questionable, the lot or residence must be identified with the following note: "The service tee is to be placed at the lowest possible elevation on the main line and the service line is to be laid on a minimum slope. The home builder is responsible for locating the elevation of the end of the service line and setting building finished floor elevations such that gravity service is available." This note is also to be put on the recorded plat identifying critical lots.

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- 5.9. The profiles of all drains adjacent to and within 25 feet of those crossing proposed sewers must be shown on the sewer plan profile.
- 5.10. The Developer is required to include easements to allow for the extension of lines across the property being developed to allow service to be available to the adjoining properties. The District may require extension of lines in these easements by the Developer.
- 5.11. Pump Stations will only be considered with prior approval of the District and will only be considered if gravity service is not available. Whenever wastewater pumping stations are proposed, the following information must be submitted:
  - A. Complete design criteria for the proposed pumping station including, but not limited to, the following:
    - 1. Selection of submersible pumps manufactured by Ebara, Flygt, Sulzer or an approved equal. Submittal information must be provided.
    - 2. Hydraulic calculations showing the system head on the selected pump curve.
    - 3. Topographic and hydraulic profile of the force main.
    - 4. Topographic map with the drainage area clearly defined and the acreage shown. Pump Stations must be designed to serve the entire drainage area in which it is proposed and must be designed to be installed at the lower end of the drainage area.
    - 5. Complete information concerning the proposed area of service, including the number and type of proposed units.
    - 6. Complete anticipated flow data based on the Tennessee Department of Environment and Conservation design criteria.
    - 7. Complete details of possible alternate gravity sewers to serve the same area, including cost estimates of both type systems.
    - 8. Pump station shall be designed in accordance with TDEC requirements.
  - B. If a low-pressure grinder sewer system is proposed, the developer must demonstrate a need for the pressure system due to the unique features of the development. This must include a present worth analysis that is acceptable to the District
  - C. The pump station site, of a size approved by the District, shall be deeded to the District in fee simple prior to acceptance by the District.
  - D. All wastewater pumping stations that are not a low-pressure grinder pump shall include the following:
    - 1. Pump station shall have a drive that is a minimum of 12 feet wide and have a turn-around. Turn-around size and location must be approved by the District. Both shall have heavy traffic concrete surface and a minimum 8-inch stone base.

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- 2. The station shall be enclosed in an 8-foot-high chain link fence with 3 strands of barb wire and a 12-foot wide double-gate (two 6-foot-wide sections) for access. The fencing material shall be vinyl coated galvanized fence; in no instance will a painted fence be allowed.
- 3. The station site shall be heavy traffic concrete with a minimum of 18 inches of stone base extending 1 foot beyond the fence.
- 4. The pump station shall include a Porta-Con pump coupler system manufactured by Precision Systems. The purpose of the Porta-Con is to facilitate the connection of an emergency pump to a fixed suction pipe located in the wet well and a fixed by-pass pipe to the force main. The pipes shall be equipped with 6-inch diameter camlock fitting encased in an aluminum box and located no more than 10 feet apart.
- 5. The pump station shall have an emergency generator sized sufficiently for all design conditions connected with an automatic transfer switch.
- 6. The pump station shall include a control panel with a remote telemetry system that will allow monitoring from existing supervisory control and data acquisition system (SCADA) at the Harpeth Valley Utilities District. The control panel shall have terminals, relays, and ancillaries for interface with SCADA. HVUD will provide a list of those items to be monitored.
- 7. The pump station may need to be equipped with a Bioxide Chemical Feed System, if determined by HVUD that hydrogen sulfide and other odors will exceed the allowable levels at the proposed development.
- E. Special contracts are required for pump stations.

# PART 6 PRE-CONSTRUCTION CONFERENCE

6.1. Before beginning any construction, the Developer shall contact the District and execute a contract with the District paying all fees as required. After this contract is executed and before beginning any construction, the Developer or his Engineer shall schedule a preconstruction conference to be held between the Contractor, Developer, Developer's Engineer, and the District and their Engineer. At this meeting, the Contractor will be informed of the District's policies and any special requirements. Listed below is a <a href="CHECK LIST">CHECK LIST</a> of items relating to the project:

# A. BEFORE Pre-Construction Conference:

- 1. Developer is to coordinate conference.
- 2. Developer, or his engineer, is to have project plans approved by all agencies.
- 3. Developer is to have a contract with the utility contractor, in order to determine the administration, engineering, and inspection fees.

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- 4. Developer to submit a copy of Contractor's contract both off-site and on-site to the District.
- 5. Contractor is to have shop drawings approved by the District. (The District may waive these requirements on pump stations or plants).
- 6. Shop drawings, including but not limited to, pipe, manholes, castings, valves and valve boxes, fittings, and service pipe will not be reviewed unless they have been checked by the contractor and stamped by him to indicate that they meet the specifications.
- 7. Developer must sign a contract with the District and produce a check to the District for tapping privilege fees, and other administrative fees (All Contracts are subject to final approval by Harpeth Valley Utilities District's Board of Commissioners).
- B. Developer is to have at conference:
  - 1. Must have plans that have been approved by the District, the Tennessee Department of Environment and Conservation, and a copy of the States approval letter.
- C. To Attend Conference:
  - 1. The Developer.
  - 2. The Developer's Engineer.
  - 3. The Developer's Contractor.
  - 4. Representative of Harpeth Valley Utilities District.

# PART 7 ABILITY TO PERFORM

- 7.1. The Developer shall be asked to establish to the satisfaction of the District that the Contractor, including all subcontractors, proposed to be used on any project which is to be approved by the District is one who has the ability to perform the Contract and meets at least the minimum standards set forth. Such factors as judgment, skill, and integrity will play an important part in the overall determination. Although additional criteria may be used, a responsible Contractor must at least:
  - A. Have adequate financial resources or the ability to secure such resources;
  - B. Have the necessary experience, organization, and technical qualifications and have or show proof that he can acquire the necessary equipment to perform the proposed Contract;
  - C. Be able to comply with all required performance schedules or completion dates, taking into account all existing commitments;
  - D. Have a satisfactory record of performance, integrity, judgment, and skills;

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- E. Be otherwise qualified and eligible to receive an award under the applicable laws and regulations; and
- F. Maintain a permanent place of business.
- G. The District reserves the right to approve all contractors and subcontractors.
- 7.2. The Developer may be required to furnish the District information sufficient to show that the proposed Contractor and its subcontractors and supplies currently meet these minimum standards.

# **PART 8 FINAL INSPECTION**

- 8.1. Before a final inspection is scheduled, the following must take place:
  - A. Project Engineer must submit to the District the "as built" plan.
  - B. A copy of the recorded plat shall be provided.
  - C. The Project Inspector will coordinate a semi-finial inspection and prepare a punch list of items if there are any that need attention.
  - D. Binder pavement must be in place in road sections.
  - E. When the lists of deficiencies, if any, are corrected, the Project Inspector will arrange for the District's Inspection Manager to set up a final inspection.
  - F. After the final inspection and all deficiencies have been corrected, the District shall send the Developer a letter stating their Approval.

#### **PART 9 ANNUAL INSPECTION**

9.1. Twelve (12) months following acceptance of the sewer infrastructure, a follow-up inspection will be made to determine if any failures/ deficiencies have occurred as a direct result of the Contractor's work and/or materials. Present at this inspection will be a Representative(s) of the District, and the Developer and/or Contractor. The Developer and/or Contractor will be responsible for correction of all failures/deficiencies that have occurred during the first year after acceptance.

# **PART 10 EROSION CONTROL**

10.1. It is the Contractor's responsibility to ensure that construction activities do not harm the Waters of Tennessee. It is the Developer's and/or Contractor's responsibility to take all measures necessary to provide temporary pollution control provisions. The Developer and/or Contractor shall ensure that State and local storm water regulations are met. The Developer and Contractor shall also ensure that the requirements of Tennessee General Permit No. TNR100000, Storm Water Discharges from Construction Activities, are met.

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#### **PART 11 JOBSITE SAFETY**

11.1. Neither the professional activities of the Engineer nor the presence of the Engineer or his or her employees and sub consultants or the District's personnel at a construction site, shall relieve the General Contractor and any other entity of their obligations, duties and responsibilities including, but not limited to, construction means, methods, sequence, techniques or procedures necessary for performing, superintending or coordinating all portions of the work of construction in accordance with the contract documents and any health or safety precautions required by any regulatory agencies. Neither the Engineer nor the district and their personnel have authority to exercise any control over any construction contractor or other entity or their employees in connection with their work or any health or safety precautions. The District agrees that the General Contractor is solely responsible for jobsite safety. The District also agrees that the District, the Engineer, and the Engineer's consultants shall be indemnified and shall be made additional insured under the General Contractor's general liability insurance policy.

# PART 12 INTERPRETATION OF THESE STANDARDS AND DESIGN CRITERIA

12.1. Interpretations of these Standard Specifications or the determination of any other standards and design criteria not covered under these Standards shall be at the discretion of the General or Assistant General Manager of the Harpeth Valley Utilities District. The decision of the General or Assistant General Manager shall be based on past practices, traditional policies, widely accepted professional principles and practices of the industry.

**END OF SECTION** 

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# **UNCLASSIFIED EXCAVATION FOR UTILITIES**

#### **PART 1 GENERAL**

1.1. The work called for by this section shall consist of clearing and grubbing, loosening, loading, removing, and disposing of, in the specified manner, all wet and dry materials (including rock) encountered that must be removed for construction purposes; furnishing, placing, and maintaining all sheeting, shoring, bracing, and timbering necessary for the proper protection and safety of the work, the workmen, the public, and adjacent property and improvements; the dewatering of trenches and other excavations; the preparation of satisfactory pipe beds; the backfilling and tamping of trenches, foundations, and other structures; the preparation of fills and embankments; the removal of unsuitable material from outside the normal limits of excavation and, where ordered by the District, their replacement with suitable materials; and all other grading or excavation work incidental to or necessary for the work. This work shall be performed as specified below.

#### **PART 2 PRODUCTS**

Not Used

#### PART 3 EXECUTION

#### 3.1. PREPARATION OF THE SITE

- A. Before starting construction, remove from the work site all vegetable growth (except as hereinafter excluded), debris, and/or other objectionable matter as well as any buildings and/or other structures that the drawings and/or the District specifically indicate are to be removed. Dispose of this refuse material in an acceptable manner.
- B. Take reasonable care during construction to avoid damage to vegetation. Where the area to be excavated is occupied by trees, brush, or other uncultivated vegetable growth, clear such growth from the area, and dispose of it in a satisfactory manner. Leave undisturbed any trees, cultivated shrubs, flowers, etc., situated within public rights-of-way and/or easements through private property but not located directly within excavation limits. Transplant small ornamental trees, cultivated shrubs, flowers, etc., located directly within excavation limits so they may be replaced during property restoration operations. Do not remove or disturb any tree larger than six inches in diameter without the permission of the District. Take special precautions (including the provision of barricades and the temporary tying back of shrubbery and tree branches) for the protection and preservation of such objects throughout all stages of construction; the Contractor will be held liable for any damage that may result to said objects from excavation or construction operations. Trim any limbs or branches of trees broken during construction operations with a clean cut, and paint with an approved tree pruning compound. Treat tree trunks receiving damage from equipment with a tree dressing.
- C. If the area to be excavated is occupied by trees, brush, or other vegetable growth, clear such growth and grub the excavated area, and remove all large roots to a depth of not less than 2 feet

below the bottom of the proposed construction. Dispose of the growth removed in a manner satisfactory to the District. Fill all holes or cavities created during this work that extend below the sub-grade elevation with suitable material, and compact to the same density as the surrounding material.

# 3.2. UNSUITABLE MATERIALS

A. Wherever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, sub-grade, or backfilling is encountered, remove it and continue excavation until suitable material is encountered. The material removed shall be disposed of in the manner described below. Then refill the areas excavated for this reason with 1 inch to 2 inch crushed stone up to the level of the lines, grades, and/or cross sections shown on the drawings. The top 6 inches of this refill shall be 1/2 inch to 3/4 inch crushed stone for bedding.

# 3.3. ROCKS AND BOULDERS

- A. Any material that is encountered within the limits of the required excavation that cannot be removed except by drilling and/or blasting, including rock, boulders, masonry, hard pan, chert, shale, street and sidewalk pavements, and/or similar materials, shall be considered as unclassified excavation.
- B. Should rock be encountered in the excavation, remove it by blasting or otherwise. Where blasts are made, cover the excavation with enough excavation material and/or timber or steel matting to prevent danger to life and property. The Contractor shall secure, at his own expense, all permits required by law for blasting operations and the additional hazard insurance required. Observe all applicable laws and ordinances pertaining to blasting operations.
- C. Excavate rock over the horizontal limits of excavation and to a depth of not less than 6 inches below the bottom of pipe up to 30 inches diameter and not less than 12 inches below the bottom of larger pipes if rock extends to such depth. Then backfill the space below grade with 1/2 inch to 3/4 inch crushed stone or other approved material, tamp to the proper grade, and make ready for construction.

# 3.4. DISPOSAL OF MATERIALS

- A. Whenever practicable, all materials removed by excavation that are suitable for backfilling pipe trenches or for other purposes shown on the drawings or directed by the District shall be used for these purposes. Any materials not so used shall be considered waste materials and disposed of by the Contractor as specified below.
- B. Waste materials may be deposited in spoil areas at approved locations. Do not leave in unsightly piles but instead spread in uniform layers, neatly level, and shape to drain. Seed as specified in Section 02485, Seeding.
- C. Once any part of the work is completed, properly dispose of all surplus or unused materials (including waste materials) left within the construction limits of that work. Leave the surface of the work in a neat and workmanlike condition, as described below.
- D. The disposal of waste materials shall be considered an integral part of the excavation work and

one for which no separate payment shall be allowed.

# 3.5. EXCAVATION FOR TRENCHES, MANHOLES AND STRUCTURES

- A. Unclassified excavation for pipelines shall consist of the excavation necessary for the construction of water, sewer, and other pipes and their appurtenances (including manholes, inlets, outlets, headwalls, collars, concrete saddles, and pipe protection) that are called for by the drawings. It shall include clearing and grubbing where necessary, backfilling and tamping pipe trenches and around structures, and disposing of waste materials, all of which shall conform to the applicable provisions set forth elsewhere in these specifications.
- B. Unless the construction of lines by tunneling, jacking, or boring is called for by the drawings or specifically authorized by the District, make excavation for pipelines in open cut and true to the lines and grades shown on the drawings or established by the Developer's Engineer on the ground. From the bottom of the trench to 1 foot above the top of the pipe cut the bank of trenches between vertical parallel planes equidistant from the pipe centerline. The horizontal distance between the vertical planes (or, if sheeting is used, between the inside faces of that sheeting) shall vary with the size of the pipe to be installed, but shall be a minimum of 8 inches and a maximum of 12 inches on each side of the pipe. Any cut made in excess of 12 inches on both sides of the pipe may be cause for the District to require stronger pipe and/or a higher class of bedding. From a distance of 1 foot above the top of the pipe to the surface of the ground, comply with all OSHA standards.
- C. Provide a minimum of 6 inches of 1/2 inch to 3/4 inch crushed stone for bedding for all sewer pipes.
- D. Shape the bottom of all trenches to provide uniform bearing for the bottom of the pipe barrel.
- E. Excavate bell holes for bell and spigot pipe at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper jointing of the pipe. Do not excavate bell holes more than 2 joints ahead of pipe laying.
- F. Excavation for manholes, inlets, and other incidental structures shall not be greater in horizontal area than that required to allow a 2 foot clearance between the outer surface of the structure and the walls of the adjacent excavation or of the sheeting used to protect it. The bottom of the excavation shall be true to the required shape and elevation shown on the drawings. No earth backfilling will be permitted under manholes, inlets, headwalls, or similar structures. Should the Contractor excavate below the elevations shown or specified, he shall, at his own expense, fill the void with either concrete or clean 1/2 inch to 3/4 inch crushed stone.
- G. Do not excavate pipe trenches more than 200 feet ahead of the pipe laying, and perform all work so as to cause the least possible inconvenience to the public. Construct temporary bridges or crossings when and where the District deems necessary to maintain vehicular or pedestrian traffic.
- H. In all cases where materials are deposited along open trenches, place them so that in the event of rain no damage will result to the work and/or to adjacent property.
- I. Excavation for manholes and other structures may be performed with non-vertical banks except

beneath pavements or adjoining existing improvements. Do not permit the horizontal area of the excavation to exceed that required to allow a 2 foot clearance between the outer surface of the structure and the banks of the excavation or the sheeting used to protect the embankments. The bottom of the excavation shall be true to the required shape and elevation shown on the drawings.

J. Where concrete pipe cradle is shown on the Drawings, excavate the bottom of the trench to a minimum depth of 5 inches or 1/4 the inside diameter of the pipe, whichever is greater. Concrete cradle shall conform to the details on Standard Drawing 111. Where concrete protection or concrete cap is called for on the Drawings, it shall conform to the details on Standard Drawings 112 or 120, as applicable.

# 3.6. DEWATERING OF EXCAVATION

A. Provide and keep in operation enough suitable pumping equipment whenever necessary or whenever directed to do so by the District. Give special attention to excavations for those structures that, prior to proper backfilling, are subject to flotation from hydrostatic uplift.

# 3.7. BORROW EXCAVATION

- A. Whenever the backfill of excavated areas or the placement of embankments requires more material than is available from authorized excavations, or whenever the backfill material from such excavations is unsuitable, than obtain additional material from other sources. This may require the opening of borrow pits at points accessible to the work. In such cases, make suitable arrangements with the property owner and pay all incidental costs, including any royalties, for the use of the borrowed material. Before a borrow pit is opened, the quality and suitability of its material shall be approved by the District.
- B. Excavate borrow pits in such a way that the remaining surfaces and slopes are reasonably smooth and that adequate drainage is provided over the entire area. Construct drainage ditches wherever necessary to provide outlets for water to the nearest natural channel, thus preventing the formation of pools in the pit area. Leave the sides of borrow pit cuts at a maximum slope of 2:1 unless otherwise directed by the District.
- C. Properly clear and grub borrow pits, and remove all objectionable matter from the borrow pit material before placing it in the backfill.
- D. The takings of materials from borrow pits for use in the construction of backfill, fills, or embankments shall be considered an incidental part of the work.

# 3.8. BACKFILLING

- A. Begin backfilling after the line construction is completed and then inspected and approved by the A/E. On each side of the line, from the bottom of barrel to 1 foot above the top of the pipe, the backfill material shall consist of clean 1/2 inch to 3/4 inch crushed stone. Properly consolidate the backfill material. Backfill in proposed streets shall meet the requirements of Metro Davidson, or Williamson County.
- B. From 1 foot to 2 foot above the top of the pipe, use backfill material consisting of earth or

granular material with individual stones not exceeding 2 inches in diameter. From 2 feet above the pipe upward, the backfill material may contain broken stones that make up approximately 3/4 of the backfills total volume. However, if this type of backfill is used, there must be enough spalls and earth materials to fill all voids completely. The maximum dimension of individual stones in such backfill shall not exceed 6 inches, and the backfill material shall be placed and spread in even layers not more than 12 inches deep. At locations beneath or closely adjacent to existing pavement or at locations of improvements subject to damage by displacement, backfill material shall consist of clean 1/2 inch to 3/4 inch crushed stone properly consolidated. In other areas, including areas beneath or closely adjacent to proposed pavement, the backfill for the upper portion of the trenches may be placed without tamping, but shall be compacted to a density equivalent to that of adjacent earth material as determined by laboratory tests. Use special care to prevent the operation of backfilling equipment from causing any damage to the pipe.

- C. If earth material for backfill is too dry to allow thorough compaction, then add enough water so that the backfill can be properly compacted. Do not place earth backfill material that is too wet or otherwise unsuitable.
- D. Wherever excavation has been made within easements across private property, within the top 2 feet backfill material shall consist of 1.5 feet of fine loose earth free from large clods, vegetable matter, debris, stone, and/or other objectionable materials, covered with 6 inches (0.5 foot) of topsoil.
- E. For low pressure sewer pipes within easements, all backfill shall consist of fine loose earth (topsoil) free from large clods, vegetable matter, debris, stone or other objectionable materials.
- F. Wherever trenches have been cut across or along existing pavement, temporarily pave the backfill of such trenches by placing 12 inches of Class A, Grade D, crushed stone and 3 inches of cold mix at the top of the backfill. Maintain this temporary pavement either until the permanent pavement is restored or until the project is accepted by the District.
- G. Conduct backfilling around manholes, inlets, outfalls, and/or structures in the same manner as specified above for pipelines except that even greater care is necessary to prevent damage to the utility structure.
- H. Wherever pipes have diameters of 12 inches or less, do not use power operated tampers to tamp that portion of the backfill around the pipe within 1 foot above the pipe.
- Perform backfilling so as not to disturb or injure any pipe and/or structure against which the backfill is being placed. If any pipe or structure is damaged and/or displaced during backfilling, open up the backfill and make repairs as necessary.
- J. Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the District requiring that the Contractor's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.

# 3.9. MAINTENANCE

A. Seed and maintain in good condition all excavated areas, trenches, fills, embankments, and

channels until final acceptance by the District.

B. Maintain trench backfill at the approximate level of the original ground surface by periodically adding backfill material wherever necessary and whenever directed to do so by the District. Continue such maintenance until one year after final acceptance of the project, or until the District issues a written release.

#### 3.10. SLOPES

A. Neatly trim all open cut slopes, and finish conforming either to the slope lines shown on the drawings or the directions of the District. Leave the finished surfaces of bottom and sides in reasonably smooth and uniform planes like those normally obtainable with hand tools, though the Contractor will not be required to use hand methods if he is able to obtain the required degree of evenness with mechanical equipment. Conduct grading operations so that material is not removed or loosened beyond the required slope.

**END OF SECTION** 

# FINISH GRADING

#### **PART 1 GENERAL**

- 1.1. The work called for by this section shall include, but not necessarily be limited to, finish grading and the spreading and shaping of topsoil to the finished contour elevations indicated by the Drawings.
- 1.2. Refer to other sections for work related to that specified under this heading. Coordinate this work with that specified by other sections for timely execution.

# **PART 2 PRODUCTS**

#### 2.1. TOPSOIL

A. Use stripped topsoil that has been stockpiled as specified elsewhere. If the quantity of topsoil on the job is inadequate, furnish enough additional topsoil. Topsoil furnished shall be natural, fertile, friable soil possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain toxic substances that may be harmful to plant growth. Topsoil shall be without admixture of subsoil and shall be cleaned and reasonably free from clay lumps, stones, stumps, roots, or similar substances 2 inches or more in diameter, debris, or other objects that are a hindrance to planting operations. Such material shall be subject to testing.

#### **PART 3 EXECUTION**

- 3.1. Do not begin work until the earth is dry enough to be tillable.
- 3.2. Inspect sub-grades to see that they generally conform to the standards called for elsewhere in these specifications, particularly with regard to the approximate depths required for the work. After work is completed, inspect it to ensure that all finish grading complies with design requirements.
- 3.3. Place finished grade stakes wherever necessary to bring the work accurately to the elevations required by the Drawings.
- 3.4. Finish grade all areas outside the building line to the depths required for the work as follows:
  - A. Grade uniformly with rounded surfaces at the tops and bottom of abrupt changes of planes.
  - B. Hand grade steep slopes and areas that are inaccessible for machine work.
  - C. Protect graded areas from undue erosion, and repair and regrade areas where erosion does occur.

Section 02260 Finish Grading

- D. Refill areas where noticeable settlement has occurred.
- E. Finish grade areas that are to receive topsoil up to 6 inches below the finished contour elevations called for by the Drawings or, over rock, to 12 inches below the finished contour elevations.
- 3.5. Place topsoil uniformly over disturbed areas that do not receive other work as follows:
  - A. Obtain approval of the finish grading from the District before starting to place topsoil.
  - B. Scarify sub-grade to a depth of 3 inches.
  - C. Place the topsoil to a depth of 6 inches when lightly rolled or, on rock, to a depth of 12 inches.
  - D. Level the topsoil so that it slopes uniformly and has no water pockets.
  - E. Carefully rake the topsoil by hand to remove all clods, roots, sticks, stones over 1 inch in diameter, and other foreign materials from the surface.
- 3.6. Dispose of excess excavated materials and debris away from the site.

**END OF SECTION** 

Section 02260 Finish Grading

#### RIP-RAP

#### **PART 1 GENERAL**

1.1. This item consists of furnishing and placing riprap slope protection in accordance with the Drawings and Specifications.

#### **PART 2 PRODUCTS**

2.1. The riprap material shall be durable and of hard natural stone, free from cracks, seams, or other defects that would tend to cause increased deterioration because of freezing and thawing or other natural causes. Riprap material shall be reasonably well graded from the minimum size stone. At least 90 percent of the riprap stone shall be not less than 8 inches wide by 12 inches long by 12 inches deep and shall be approximately rectangular in shape. Fragments or spalls shall be used to fill the voids between the larger rocks. The inclusion of appreciable quantities of dirt, sand, clay, or rock fines will not be accepted. All materials considered for use as riprap shall be approved by the District.

#### **PART 3 EXECUTION**

- 3.1. Earth surface on which riprap is to be placed shall be trimmed and graded so as to provide for the thickness of riprap shown on the Drawings. Surfaces that are below grade shall be brought to grade by fillings with well compacted materials similar to the adjacent materials. Prior to placement of riprap, the prepared earth foundation will be inspected and no materials shall be placed thereon until approved by the District.
- 3.2. Place riprap to the full course thickness at 1 operation and in such a manner as to avoid serious displacement of the underlying materials. Deliver and spread the material so that the mass of pieces in place shall be reasonably well graded, with the larger pieces uniformly distributed and the smaller pieces and spalls filling the voids between the larger pieces. The finished riprap shall be free from objectionable concentration of large or small pieces.
- 3.3. A tolerance of +12 inches or -6 inches from slope lines and grades shown on the Drawings will be permitted in the finished surface of the riprap, except that the extreme minus tolerance shall not be continuous over an area exceeding 200 square feet.

**END OF SECTION** 

Section 02271 Rip-Rap

# **SEEDING**

#### **PART 1 GENERAL**

- 1.1. This work shall be performed in all disturbed areas not receiving such site improvements as buildings, roads, walks, sod, planting, etc., and shall include, but not necessarily be limited to, all seed bed preparation, the supplying and placing of soil additives, seed, and mulch wherever required by the drawings or directed by the District, and maintenance.
- 1.2. Unless otherwise approved in writing by the District, seeding operations shall be limited to the following planting periods:
  - A. Spring March 1 through May 30
  - B. Fall August 15 through October 31
- 1.3. Refer to other sections for items affecting seeding. Coordinate this work with that specified by other sections for timely execution.

#### **PART 2 PRODUCTS**

#### 2.1. GRASS SEED

A. Kentucky 31 Fescue (Festuca Elatior) and annual rye meeting the requirements of the State Department of Agriculture and furnished in new bags or bags that are sound and not mended; no "below standard" seed accepted. Where lawns or fields have special grass, then replace in kind.

# 2.2. FERTILIZER

A. Commercially manufactured; Grade 10-10-10; furnished in standard containers that are clearly marked with the name, weight, and guaranteed analysis of the contents and that ensure proper protection in transportation and handling; and in compliance with all local, state, and federal fertilizer laws.

# 2.3. AGRICULTURAL LIMESTONE

A. Containing a minimum of 85% calcium carbonate and magnesium carbonate combined, 85% of which passes a No. 10 mesh sieve

# 2.4. MULCH

A. Stalks of rye, oats, wheat, or other approved grain crops properly cured prior to baling, air dried, and reasonably free of noxious weeds and weed seeds or other material detrimental to plant growth.

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Section 02486		Seeding

#### PART 3 EXECUTION

- 3.1. Perform all seeding and related work as a continuous operation. Sow seed as soon as the seed bed has been prepared and perform subsequent work in a continuous manner.
- 3.2. Before beginning seeding operations in any area, complete the placing of topsoil and final grading, and have the work approved by the District.
- 3.3. Scarify, disk, harrow, rake, or otherwise work each area to be seeded until the soil has been loosened and pulverized to a depth of not less than 2 inches. Perform this work only when the soil is in a tillable and workable condition.
- 3.4. Apply fertilizer and agricultural limestone uniformly over the sod bed at the rates shown below. Immediately prior to placing sod, water the sod bed until it is saturated to a depth of 1 inch, and keep it moist until the sod is placed.
  - A. Fertilizer: 40 pounds per 1,000 square feet
  - B. Agricultural Limestone: 80 pounds per 1,000 square feet
- 3.5. Sow seed uniformly with a rotary seeder, wheelbarrow seeder, or hydraulic equipment or by other satisfactory means.
- 3.6. The seeding rate shall be 5 pounds per 1,000 square feet for Kentucky 31 Fescue (Festuca Elatior).
- 3.7. When seeding during March 1 through April 1 and October 1 through November 20, add an additional 3 pounds per 1,000 square feet of annual rye grass.
- 3.8. Perform no seeding during windy weather or when the ground surface is frozen, wet, or otherwise un-tillable.
- 3.9. When seeding with mulch is specified, spread the mulch material evenly over the seeded areas immediately following the seeding operation at the specified rate below:
  - A. Mulch Rate: 2 bales (100 pound minimum) per 1,000 square feet
- 3.10. The mulch rate may be varied by the District, depending on the texture and condition of the mulch material and the characteristics of the area seeded. Cover all portions of the seeded areas with a uniform layer of mulch so that approximately 25% of the ground is visible.
- 3.11. No equipment, material storage, construction traffic, etc., will be permitted on newly seeded ground.
- 3.12. Dispose of all surplus materials.

Section 02486 Page 2 of 3 Seeding

# **PART 4 INSPECTIONS**

4.1. The District shall inspect the seeding within 60 days after installation and determine if it is acceptable.

# **PART 5 GUARANTEE**

- 5.1. Secure an acceptable growth of grass in all areas designated for seeding, and maintain these areas during the full warranty period.
- 5.2. An area is considered acceptable if it is represented by a minimum of 100 seedlings per square foot of the permanent species of grass representative of the seed mixture. If an acceptable growth is not obtained on the first planting, reseeding and remulching will be required.
- 5.3. If the planting is less than 50% successful, rework the ground, refertilize, reseed, and remulch.

**END OF SECTION** 

Section 02486 Seeding

# SODDING

#### **PART 1 GENERAL**

- 1.1. This work shall include all soil preparation and the storage, transportation, placing, and maintenance of sod at all locations shown on the drawings or as directed by the District.
- 1.2. Temporary storage of sod is permitted; however, take care to maintain the sod in a live, growing condition. Sod shall be rejected if it is permitted to decay or dry out to the extent that, in the judgment of the District, its survival is doubtful. Dispose of rejected sod as directed at no expense to the District.
- 1.3. Set sod between October 1 and April 1 when the soil is in a workable condition.
- 1.4. Do not set sod out of season unless soil conditions are favorable and written permission is obtained from the District.
- 1.5. Refer to other sections for items affecting sodding. Coordinate this work with that specified by other sections for timely execution. The Contractor shall be wholly responsible for the scheduling, ordering, receiving, storing, and installing of all sodding materials.

#### **PART 2 PRODUCTS**

# 2.1. SOD

A. Kentucky 31 Fescue (Festuca Elatior); new sod consisting of live, dense, well rooted growth; well suited for the intended purpose and soil conditions; completely free of noxious weeds and grasses (Bermuda grass, quack grass, Johnson grass, Canada thistle); and containing less than 5 plants of objectionable weeds per 100 square feet if nursery grown or 10 such plants if field grown.

# 2.2. FERTILIZER

A. Commercially manufactured; Grade 10-10-10; furnished in standard containers that are clearly marked with the name, weight, and guaranteed analysis of the contents and that ensure proper protection in transportation and handling; and in compliance with all local, state, and federal fertilizer laws.

# 2.3. AGRICULTURAL LIMESTONE

A. Containing a minimum of 85% calcium carbonate and magnesium carbonate combined, 85% of which passes a No. 10 mesh sieve

Section 02486 Sodding

#### PART 3 EXECUTION

- 3.1. Before beginning sodding operations in any area, complete the placing of topsoil and final grading, and have the work approved by the District.
- 3.2. Scarify each area to be sodded a minimum of 2 inches.
- 3.3. Apply fertilizer and agricultural limestone uniformly over the sod bed at the rates shown below. Immediately prior to placing sod, water the sod bed until it is saturated to a depth of 1 inch, and keep it moist until the sod is placed.
  - A. Fertilizer: 40 pounds per 1,000 square feet
  - B. Agricultural Limestone: 80 pounds per 1,000 square feet
- 3.4. Place sod as soon as practical after its removal from point of origin. Keep it moist while displaced.
- 3.5. Place sod by hand so that the edges are in close contact and in a position to break joints with the long dimension perpendicular to the slope. Fit and pound the sod into place with a 10 inch by 10 inch wood tamp or other similar implements.
- 3.6. Immediately after placing the sod, thoroughly wet and roll it.
- 3.7. Two weeks after the sod is installed, top dress and thoroughly water it. Top dressing shall consist of the following:
  - A. 1/2 to 1 pound: 38 percent urea formaldehyde per 1,000 square feet.
  - B. 20 pounds: 6-12-12 per 1,000 square feet.
- 3.8. No equipment, material storage, construction traffic, etc., will be permitted on newly sodded areas.
- 3.9. Dispose of all surplus materials.

#### **PART 4 INSPECTIONS**

4.1. The District shall inspect the sod within 30 days after installation and determine if it is acceptable.

#### **PART 5 GUARANTEE**

5.1. Establish an acceptable growth of the specified sod on all areas indicated on the drawings or as directed by the District. An area is considered acceptable if the majority of each piece of sod is alive and healthy and generally free from weeds, insects, and disease.

**END OF SECTION** 

\_\_\_\_\_ Page 2 of 2 \_\_\_\_\_\_ Section 02486 Sodding

#### **PAVEMENT REPAIR**

#### **PART 1 GENERAL**

- 1.1. The work specified by this section shall consist of repairing or replacing all damaged pavement, whether public or private. Dirt shoulders, roads, streets, drives, and walks are to be restored to their original condition as an incidental part of the installation of utilities. Repair damaged base on either side of a trench wherever necessary. Trim the oxidation surface to neat straight lines outside of the trench wall, and repave the entire area as specified below and as shown on the drawings or on the standard drawings.
- 1.2. These specifications make reference to the current edition of the standard specifications of the Tennessee Department of Transportation (TDOT). Even though the weather limitations, construction methods, and materials specifications contained in the TDOT specifications may not be explicitly repeated in these specifications, they shall, wherever applicable to the work called for by this section, be considered as implied and therefore adhered to. However, the various subsections "Basis for Payment" contained in the TDOT specifications shall not be considered applicable.
- 1.3. The repair of trenches in streets and roads, including shoulders, under the jurisdiction of the Metropolitan Government shall be made in accordance with and under the direction of the Engineering Division, Nashville Department of Transportation and Multimodal Infrastructure, and the District. Roads in Williamson County shall be repaired in accordance with the Williamson County Highway Department regulations and the District.
- 1.4. Refer to other sections for work related to that covered by this section.

# **PART 2 PRODUCTS**

- 2.1. MINERAL AGGREGATE BASE
  - A. Class A, Grading D crushed stone "PUGMILL MIX" (Section 303, subsection 903.05)
- 2.2. BITUMINOUS PRIME COATS
  - A. Cutback asphalt, Grade RC-250, or emulsified asphalt, Grade AE-P (Section 402, Subsections 904.02 and 904.03)
- 2.3. CRUSHED STONE CHIPS
  - A. Size 6 or Size 7 (Subsection 903.14)
- 2.4. DOUBLE BITUMINOUS SURFACE
  - A. For both courses, either cutback asphalt, Grade RC-800 or RC-3000, or emulsified asphalt, Grade RS-2 (Subsections 904.02 and 904.03)

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# 2.5. ASPHALTIC CONCRETE BINDER

A. Grading B or C, as directed by the District (Section 307)

#### 2.6. BITUMINOUS TACK COAT

A. Grade AE-3 (Section 403, Subsection 904.03)

# 2.7. ASPHALTIC CONCRETE SURFACE

A. Grading E (Section 411)

# 2.8. QUICK DRY TRAFFIC MARKING PAINT (WHITE AND YELLOW):

A. Subsection 910.05.

#### PART 3 EXECUTION

# 3.1. SUBGRADE

- A. Before any base material is installed, compact the sub-grade of the area to be paved to 95% of optimum density as determined by ASTM D698 (Standard Proctor).
- B. The backfill material shall contain no topsoil or organic matter. For all areas where sub-grade has been prepared, test for uniformity of support by driving a loaded dump truck at a speed of 2 to 3 mph over the entire surface. Make further improvements on all areas that show a deflection of 1 inch or more. When completed, the finished sub-grade shall be hard, smooth, stable, and constructed in reasonably close conformance with the lines and grades that existed prior to beginning construction.
- C. When a base course is compacted, cut back the surface course of the existing pavement a minimum of 1 foot beyond the limit of the joint between the old and new base course or as shown on the standard drawings. Take special care to ensure good compaction of the new base course at the joint. Apply and compact the surface to conform to the existing pavement so that it will have no surface irregularity.

# 3.2. BASE

A. Install a mineral aggregate base of the type specified above in accordance with Section 303 of the TDOT specifications. The maximum compacted thickness of any one layer shall be 6 inches, and the total thickness of the base shall be that indicated by the standard drawings or as shown on the plans.

# 3.3. SEAL COAT SURFACE

A. Uniformly apply a bituminous prime coat of either emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, over the entire width of the area to be surfaced at a rate of 0.3 gallon per square yard. Immediately after application, uniformly cover the entire area with Size 7 crushed stone chips at a rate of 12 pounds per square yard.

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#### 3.4. DOUBLE BITUMINOUS SURFACE

- A. Apply the first course at a rate of 0.38 to 0.42 gallon per square yard with either emulsified asphalt, Grade RS-2, or cutback asphalt, Grade RC-800 or RC-3000, and then immediately cover with Size 6 crushed stone chips at a rate of 33 to 37 pounds per square yard. After this is rolled, apply the second course at a rate of 0.30 to 0.35 gallon per square yard, and at once uniformly cover with Size 7 chips at a rate of 20 to 25 pounds per square yard. Then roll the entire area.
- B. After the application of the cover aggregate, lightly broom or otherwise maintain the surface for a period of 4 days, or as directed by the District. Maintenance of the surface shall include the distribution of cover aggregate over the surface to absorb any free bitumen and cover any areas deficient in aggregate. Sweep excess material from the entire surface with rotary brooms. Sweep the surface at the time determined by the District.

# 3.5. ASPHALTIC CONCRETE BINDER

A. If the asphaltic concrete surface course is to be placed directly on the mineral aggregate base, place a bituminous prime coat as described above. If, however, the surface course is to be placed on a binder course, then apply a bituminous tack coat of the sort specified above under PRODUCTS at a rate of 0.05 to 0.10 gallon per square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs, gutters, walls, walks, trees, etc.; if such splashing does occur, remove it immediately. After the prime or tack coat has been properly cured, apply the asphaltic concrete to the thickness shown on the drawings or standard drawings. Apply the surface course as described above for the binder course.

#### 3.6. SMOOTHNESS

A. The finished surfaces shall conform to the lines and grades that existed prior to construction. No deviations, variations, or irregularities exceeding 1/4 inch in any direction when tested with a 12 foot straightedge will be permitted in the finished work, nor will any depressions that will not drain. Correct all such defects.

# 3.7. SAMPLING AND TESTING

- A. Submit to the District test reports made by an independent testing laboratory on the crushed stone aggregate, bituminous materials, and asphaltic concrete design mixes, and obtain his approval of these reports before starting paving operations.
- B. Tests shall be made on the completed elements of the pavement to ascertain the compacted thickness of the base and surface courses. If sections with deficient thicknesses are found, the full section for a reasonable distance on each side of the deficiency shall be refused. Remove and reinstall all such sections. Patch all test holes in connection with thickness tests.
- C. When making surface tests, furnish one man to mark all surface defects for corrections.

**END OF SECTION** 

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#### **MANHOLES**

#### **PART 1 GENERAL**

- 1.1. Manholes shall be precast or fiberglass with concentric cones. When a force main enters the new sewer lines, the manhole and the next two downstream shall be made of fiberglass. When a force main ties to an existing manhole, the existing manhole and the next two downstream shall be coated with an epoxy coating system, unless otherwise approved or directed by the District.
- 1.2. Refer to other sections for items affecting manholes. Coordinate this work with that specified by other sections for timely execution.

#### **PART 2 PRODUCTS**

# 2.1. CONCRETE MASONRY

A. Reinforced or plain, meeting the applicable requirements of Section 03303, Concrete for Utility Lines.

# 2.2. EPOXY COATING SYSTEM

A. When required the coating system shall meet the applicable requirements of the District.

#### 2.3. CASTING ADJUSTMENT

A. Use precast concrete adjusting ring with minimum thickness of 2 inches meeting ASTM C478 or EJ Infra-Riser when approved by the District.

# 2.4. MORTAR

A. Composed of one part Portland cement and two parts sand (volumetric measure) thoroughly mixed in a tight box, with water added gradually and mixed continually until mortar has attained the proper consistency for use in brick masonry; prepared only in such quantities as needed for immediate use; mortar mixed for more than 30 minutes, re-tempered, or previously set will not be allowed.

#### 2.5. GRAY IRON CASTINGS

A. Cast iron conforming to the requirements of Class 30B, ASTM latest revision; made accurately to the required dimensions; sound, smooth, clean, and free from blisters and other defects; not plugged or otherwise treated to remedy defects; machined so that covers rest securely in the frames with no rocking and are in contact with frame flanges for the entire perimeter of the contact surfaces; thoroughly cleaned subsequent to machining and before rusting begins; and with the actual weight in pounds stenciled or printed by the manufacturer on each casting in white paint. Castings shall be John Bouchard 1150, EJ 2111A or approved

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equal. Watertight castings shall be equivalent bolt-down versions. Refer to Standard Drawing 109.

# 2.6. PLASTIC GASKET FOR PRECAST MANHOLE

A. Preformed plastic gasket shall meet or exceed all requirements of FS SS-S-00210, 210-A, "Sealing Compound, Preformed Plastic for Pipe Joints," Type I, rope formed. The sealing compound shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents, irritating fumes, or obnoxious odors. The compound shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength. It shall be supplied in extruded rope form of suitable cross section and in such sizes as to seal the joint space when the manhole sections are installed. The sealing compound shall be protected by a suitable removable 2-piece wrapper, which shall be designed so that half may be removed longitudinally without disturbing the other half in order to facilitate application of the sealing compound. Also refer to Standard Drawing 106. The flexible plastic gasket shall also meet the requirements of the following tables:

Composition	Test Method	Minimum	Maximum
Bitumen (Petroleum Plastic Content)	ASTM D4	50	70
Ash Inert Mineral Matter	AASHTO T111	30	50
Volatile Matter	ASTM D6		2.0

Property	Test Method	Minimum	Maximum
Specific Gravity at 77°F	ASTM D71	1.20	70
Ductility at 77°F (cm)	ASTM D113	5.0	
Softening Point	ASTM D36	320°F	
Penetration at 77°F (155 gms) 5 sec.	ASTM D217	50	120

# 2.7. LADDER BARS

A. An aluminum alloy weighing 2.2 pounds or a minimum 3/8-inch diameter steel reinforcing rod encapsulated in polypropylene plastic. Width shall be 12 inches. The steps shall be aligned in each manhole section so as to form a continuous ladder with rungs equally spaced vertically in the assembled manhole at a maximum design distance of 12 inches. Steps are to be placed in a manner such that the steps are not placed over any pipes entering the manhole. Where the placement of ladder bars in the cone section would cause interference with the 24-inch clear opening, such ladder bars shall be omitted. Also refer to Standard Drawing 108.

# 2.8. PRECAST MANHOLE COMPONENTS

A. Manholes must meet the requirements of the Standard Drawing 101 and ASTM C478. The manhole sidewall shall be of a length such that a minimum of 2-inch concrete adjusting ring and a maximum of 6-inch concrete adjusting ring shall be placed on top of the unit to bring the casting to grade.

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- B. Precast manholes are to be manufactured by Old Castle, Jarrett Concrete Products, Barger Precast, ICast, or LB Foster CXT / VanHooseCo.
- C. Xypex Admix C-Series RED, Masterlife 300D, Conseal ConBlock CDA Red, or approved equal shall be added to the concrete mix at the time of batching. Dosage rate and sequence procedures shall be determined by manufacturer and manhole supplier. Manhole supplier shall submit this information to the District as part of review. Color dye shall be incorporated into the admixture which shall be visible in the finished manhole as verification of its presence. Manhole supplier shall also provide certification that admixture was added at the proper dosage.

### 2.9. EXTERNAL JOINT WRAP

- A. All manhole joints shall be sealed with a minimum 9-inch wide exterior joint wrap that meets or exceeds the requirements of ASTM C-877, type II or III.
- B. External joint seals shall be manufactured by Cretex, Conseal, Press-Seal, or approved equal.

### 2.10. MANHOLE CONNECTORS

- A. New Concrete Manholes A resilient connector molded from a neoprene compound meeting the requirements set forth in ASTM C443. The connector shall be Kor-N-Seal I with toggle style connector or PSX Direct Drive.
- B. New Fiberglass Manholes: Each connection is to be molded into and stubbed a minimum of 1 foot out of the new fiberglass manhole, matching the proposed types of pipe material.
- C. Existing Concrete Manholes: When connections are required on existing manholes, the manhole shall be cored and a resilient connector as specified for new manholes shall be used. If the material of the existing manhole is such that a clean core cannot be made, then a waterstop gasket of polyisoprene compound that meets or exceeds the requirements of ASTM C443, with stainless steel take-up clamps may be used with the prior approval of the District. The gasket shall be Style WS-25 (1-1/2 inches 6 inches) and WS-30 (for 8 inches and larger) manufactured by Press Seal Gasket Corp., or equal.
- D. Existing Fiberglass Manholes: When connections are required on existing manholes the manhole shall be cored and an inserta-tee be installed. The inserta-tee shall be made by Fowler Manufacturing Company, Inc., and sizes ranging from 4 inches thru 12 inches.

### 2.11. MATERIAL TESTING

A. All precast reinforced concrete manhole risers, bases, and tops specified herein shall be tested and inspected by a commercial testing laboratory approved by the District prior to delivery to the site, and all materials that fail to conform to these specifications shall be rejected. After delivery to the site, any materials that have been damaged in transit or are otherwise unsuitable for use in the work shall be rejected and removed from the site. Supply certified copies in duplicate of the inspection and acceptance reports of the testing laboratory to the District before using the materials. The commercial testing laboratory shall

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be engaged and paid for by the Contractor. Submit a certificate from the manufacturer of the castings indicating that they meet all applicable requirements of these specifications.

# 2.12. FIBERGLASS MANHOLES

- A. Fiberglass reinforced polyester manholes shall be manufactured from commercial grade polyester resin or other suitable polyester or vinyl ester resins, with fiberglass reinforcements. Manholes shall be a one piece unit as manufactured by L. F. Manufacturing, Inc.
- B. The resins used shall be a commercial grade unsaturated polyester resin.
- C. The reinforcing materials shall be commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric, or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.
- D. Reinforcing materials used on the surface exposed to the contained substance shall be a commercial grade chemical-resistant glass that will provide a suitable bond with the resin and leave a resin rich surface.
- E. Fillers, when used, shall be inert to the environment and wetwell construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirements of this specification.
- F. Fabrication: The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.
- G. The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delamination, blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth. Surface pits shall be permitted up to 6 square feet if they are less than 3/4 inch in diameter and less than 1/16 inch deep.
- H. The following defects will not be permitted:
  - 1. Exposed Fibers: Glass fibers not wet out with resin.
  - 2. Resin Runs: Runs of resin and sand on the surface.
  - 3. Dry Areas: Areas with glass not wet out with resin.
  - 4. Delamination: Separation in the laminate.
  - 5. Blisters: Light colored areas larger than 1/2 inch in diameter.
  - 6. Crazing: Cracks caused by sharp objects.

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- 7. Pits or Voids: Air pockets.
- 8. Wrinkles: Smooth irregularities in the surface.
- 9. Sharp Projection: Filter or resin projections necessitating gloves for handling.
- I. Physical Requirement: Load rating. The complete manhole shall have a minimum dynamic-load rating of 16,000 ft-lbs when tested in accordance with ASTM D3753. To establish this rating, the complete wetwell shall not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs and shall not deflect vertically downward more than 1/4 inch at the point of load application when loaded to 24,000 lbs.
- J. The manhole cylinder shall have minimum pipe-stiffness values shown in Table 1 and exhibit the properties shown in Table 2 when tested in accordance with ASTM D3753.

Table 1: Stiffness Requirements

Length (ft)	F/AY (psi)
10 to 20	2.01
21 to 30	3.02
31 to 40	5.24

Table 2: Physical Properties

Hoop Direction Axial Direction			
a. Tensile Strength (psi)	18,000	5,000	
b. Tensile Modulus (psi)	0.8 x 10 <sup>6</sup>	0.7 x 10 <sup>6</sup>	
c. Flexural Strength (psi)	26,000	4,500	
d. Flexural Modulus (psi)			
(no ribs – 48" & 60")	1.4 x 10 <sup>6</sup>	0.7 x 10 <sup>6</sup>	

K. Testing shall be performed as specified in ASTM D3753 latest edition, Section 8.

# 2.13. METERING MANHOLE

A. Metering manhole shall meet the same requirements as fiberglass manholes and Standard Drawing 103.

# **PART 3 EXECUTION**

- 3.1. Dewater sufficiently to maintain the ground water level at or below the bottom of the manhole foundation prior to and during placement of the foundation.
- 3.2. Obtain an adequate foundation for all manhole structures by removing and replacing unsuitable material with well graded granular material, by tightening with coarse rock, or by such other means as provided for foundation preparation of the connected sewers or as directed by the District. Wherever water is encountered at the site, place all cast-in-place

\_\_\_\_\_ Page 5 of 8 \_\_\_\_\_ Section 02600 Manholes bases on a one-piece waterproof membrane to prevent any movement of water into the fresh concrete.

- 3.3. For monolithic manhole bases, carefully level the base stone and place the base section on this prepared base so it is fully and uniformly supported in true alignment and elevation.
- 3.4. Thoroughly wet and then completely fill all lift holes with mortar. Trim all protruding mastic between precast elements and between the manhole casting and the manhole riser on the inside of the manhole and smooth over these joints with mortar internally.

### 3.5. EXTERIOR JOINT WRAP

- A. Clean the surface with a brush and remove any dirt, debris, or concrete high points which could keep the joint wrap from adhering to the concrete. If necessary, a compatible joint primer can be applied to improve adhesion. When using a primer, allow the primer to dry before placing sealant.
- B. Remove the release paper from the adhesive side and apply wrap to the concrete. Continue around the joint by removing the release paper as the roll of joint wrap is unrolled. Press the wrap firmly by hand against the entire surface as it is applied to assure full contact.
- C. Where joining two sections or where ends meet together, provide an overlap of approximately 2-inches and firmly press the overlapping strip onto the end of the underlying strip to seal the joint.
- 3.6. Carefully set the cast iron frame for the cover at the required elevation, and properly bond it to the masonry with preformed plastic gasket or cement grout. Wherever manholes are constructed in paved areas, tilt the top surface of the frame and cover so as to conform to the exact slope, crown, and grade of the existing adjacent pavement. Wherever manholes are constructed in new subdivision streets, set the top surface of the frame and cover so as to conform to the exact slope, crown, and grade of the proposed finished surface.
- 3.7. Manhole inverts shall be constructed at the plant to the approximate cross section of the sewers connected to them. Make any necessary changes in cross sections gradually from side to side of the manhole; make changes in direction of flow of the sewers to a true curve of as large a radius as is permitted by the size of the manhole.
- 3.8. All connections of the sewer pipe to new manhole sidewalls shall be made with resilient connectors. Openings in the manhole sidewall for the pipe shall be precast or cored to provide required size and location. The hole shall be manufactured to allow for lateral and vertical movement, as well as angular adjustments through 20 degrees. A resilient connector between the manhole and pipes shall be installed in the precast or cored openings. An external band made entirely of corrosion resistant stainless steel shall be used to effect the seal around the pipe.
- 3.9. The void between the pipe and the connector shall be filled with an approved material.

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- 3.10. A minimum slope of 0.2 foot drop across the bottom of the manhole must be provided to maintain cleaning and the hydraulic gradient. Slope across bottom of manhole shall not exceed 0.5 foot.
- 3.11. Where the difference in the invert elevation of two or more sewers intersecting in one manhole is 24 inches or more, construct a drop manhole. Drop manholes shall be similar in construction to standard manholes except that a drop connection of pipe and fittings of the proper sizes and materials shall be constructed outside the manhole and supported by 4,000 psi concrete as indicated by the Standard Drawing 110.
- 3.12. Place backfill by hand around the manhole and to a distance of at least one pipe length into each trench, and tamp the downstream side with clean 1/2 inch to 3/4 inch crushed stone up to an elevation of 12 inches above the crown on all entering pipes. Continue backfilling in accordance with the requirements for trench backfilling.
- 3.13. All lifting holes shall be filled and pointed with non-shrink grout for concrete manholes.
- 3.14. All manholes are to be vacuum tested immediately after assembly or construction and before backfilling. No standing water shall be allowed in the manhole excavation which may affect the accuracy of the test.
  - A. All pipes and other openings into the manhole shall be suitably plugged in such a manner as to prevent displacement of the plugs while the vacuum is pulled. Service lines at manholes may be vacuum tested in lieu of air testing at the option of the Contractor.
  - B. The Contractor is required to furnish all equipment necessary for these tests including the manhole sealing apparatus, gauges, pump plugs, and personnel shall be in accordance with equipment specifications and instructions provided by the manufacturer.
  - C. The test head shall be placed in the cone section of the manhole.
  - D. A vacuum of 10 inches of mercury shall be drawn. The time for the vacuum to drop to 9 inches of mercury shall be recorded.
  - E. Acceptance for 4 foot diameter manholes shall be defined as when the time to drop to 9 inches of mercury meets or exceeds the following:

Manhole Depth	Diameter	Time to Drop 1-inch HG
10 ft. or less	4 ft.	75 seconds
10 ft. to 15 ft.	4 ft.	90 seconds
15 ft. to 25 ft.	4 ft.	105 seconds

- F. For manholes 5 foot in diameter, add an additional 15 seconds and for manholes 6 foot in diameter, add an additional 30 seconds to the time requirements for 4 foot diameter manholes.
- G. If the manhole fails the test, necessary repairs shall be made and the vacuum test repeated until the manhole passes the test.

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Н.	If the manhole joint mastic is displaced enough to leave a void between the sections during
	the vacuum test, the manhole shall be disassembled, and the seal replaced.

- I. A second vacuum test will be required after the manhole casting has been set and the binder placed around it.
- J. Regardless of the outcome of the vacuum tests, any visual or audio defects are to be repaired.

**END OF SECTION** 

Section 02600 Manholes

#### **SECTION 02620**

# PRECAST CONCRETE GREASE INTERCEPTORS

### **PART 1 GENERAL**

- 1.1. This specification covers design, installation and testing guidelines and acceptable manufacturers for precast concrete grease interceptors and related appurtenances.
- 1.2. The requirement for a grease interceptor and its volumetric capacity in gallons shall be determined by the District in accordance with the District's Fats, Oils, and Grease (FOG) Program.

### 1.3. REFERENCE STANDARDS

- A. American Society of Testing Materials (ASTM)
  - 1. A48 Gray Iron Castings
  - 2. C890 Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
  - 3. C891 Installation of Underground Precast Concrete Utility Structures
  - 4. C923 Resilient Connectors between Reinforced Concrete Structures and Pipes
  - 5. C990 Joints for Concrete Pipes, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
  - 6. C1173 Flexible Transition Couplings for Underground Piping Systems
  - 7. C1613 Precast Concrete Grease Interceptor Tanks
  - 8. D5926 PVC Gaskets for Drain, Waste, and Vent, Sewer, and Sanitary Plumbing Systems
- B. Where materials and methods are indicated in these specifications as being in conformance with a standard specification, it shall refer in all cases to the latest edition of the specifications and shall include all interim revisions. Listing of a standard specification without further reference indicates that the particular material or method shall conform with such listed specification unless otherwise specified herein.

# **PART 2 PRODUCTS**

Section 02620

# 2.1. GREASE INTERCEPTORS

- A. Structural Requirements:
  - 1. Grease interceptor tanks shall be designed to meet the structural design requirements of ASTM C1613.

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	Precast Concrete Grease Intercentors

- 2. Grease interceptor tanks shall be monolithic precast concrete structures. Sectional precast concrete grease interceptors will not be considered for acceptance by the District if a sectional joint exists at or below the crown of the inlet piping core of the structure.
- Grease interceptor tanks shall be designed so that they will not collapse or rupture when subjected to anticipated earth and hydrostatic pressures when the tanks are either full or empty. The structural design shall take into consideration the number, placement, and size of all openings.
- 4. Grease interceptor tanks shall be designed to accommodate HS-20 live loads.
- 5. The concrete's minimum compressive strength for design shall be 4,000 psi at 28 days of age. The concrete cover for reinforcing bars, mats, and/or fabric shall not be less than 1-inch.

# B. Physical Design Requirements:

- 1. The air scum volume above the liquid shall be at least 9-inches high for entire surface above the maximum liquid depth.
- 2. The minimum liquid depth shall be 42-inches and the maximum liquid depth shall be 72-inches. Tank length shall be greater than width.
- 3. Grease interceptor tanks shall have a solid concrete baffle wall the full width of the interceptor, monolithically cast, that extends from the floor to within a maximum of 1-inch and a minimum of 6-inches from the ceiling. Baffle wall shall be located such that 2/3 of the tank's total volumetric capacity is on the tank's inlet compartment and 1/3 of the total volumetric capacity is on the outlet compartment.
- C. The baffle wall shall have an inverted 90 degree sweep fitting 6-inches in diameter. The bottom of the sweep shall be placed in the vertical position in the inlet compartment 12-inches above the floor. The sweep shall rise to the horizontal portion, which shall extend through the baffle wall into the outlet compartment. The baffle wall opening shall be a minimum 20-inches and maximum 24-inches from the floor, precast or cored and sealed to the sweep utilizing a Polylok Inc. Type VI Boot Seal or approved equal meeting the requirements of ASTM C923.
- D. Grease interceptors shall be manufactured by Jarrett Concrete Products and Supply, Inc. (all sizes), Oldcastle Precast (1,000 and 1,500 gallon monolithic base models, or approved equal.

# 2.2. INLET AND OUTLET PIPING

- A. All piping shall be a minimum of schedule 40 PVC solvent welded.
- B. The inlet and outlet piping shall be equal in size and shall be 4-inches in diameter. Grease interceptor sidewall openings for inlet and outlet piping shall be precast or cored.

- C. Polylok Inc. Type VI Boot Seal or approved equal meeting the requirements of ASTM C923 shall be used to connect inlet and outlet piping to grease interceptor.
- D. The difference between the invert of the inlet pipe and the invert of the outlet pipe shall be a minimum of 2-inches and a maximum of 4-inches.
- E. The inlet and outlet piping shall have a tee of the same size installed in the vertical position with the top unplugged. Piping of the same size shall be installed in the top of the tee and shall extend to within 6-inches of the interceptor ceiling. Piping of the same size shall be installed in the bottom of the tee and extend to a point 2/3 the maximum liquid depth.
- F. The inlet and outlet piping tee and shall extend out horizontally from the grease interceptor wall and be located such that they are readily visible and accessible from the access openings.
- G. The inlet and outlet piping tee shall be located vertically to allow for adequate clearance when removing the access opening lids.

# 2.3. ACCESS OPENINGS

- A. There shall be two 24-inch raw openings, each designed to allow for mounting of adjusting rings to meet any surface grade. One raw opening each shall be located above the inlet and outlet tee.
- B. Precast concrete adjusting rings, plastic gaskets, cast iron frames and covers shall meet the applicable requirements of Section 02600, Manholes.
- C. Covers shall be labeled "GREASE" or "GREASE INTERCEPTOR".

### 2.4. ALTERNATES

- A. The District may approve the use of alternative style grease interceptors in accordance with its Fats, Oils, and Grease (FOG) Management Program. Sizing shall also be in accordance with the (FOG) Management Program.
- B. Alternate style grease interceptors shall be Schier Great Basin or Zurn Green Turtle.

# **PART 3 EXECUTION**

# 3.1. GENERAL

- A. Where possible, the location of the grease interceptor shall be located where it will cause minimum interference with traffic when accessed for inspection and cleaning purposes following installation.
- B. Dewater the excavation sufficiently to maintain the ground water level at or below the bottom of the tank foundation prior to and during placement of the foundation.

- C. Obtain an adequate foundation for the tank by removing and replacing unsuitable material with well graded and compacted granular stone, by tightening with coarse rock, or by such other means as directed by the District. Carefully level the base stone and place the tank on this prepared base so it is level and fully, uniformly supported. Base shall support the weight of the tank without settlement.
- D. Set the tank at an elevation such that it can be properly connected to the inlet and outlet piping while maintaining the required downward slope for laterals.
- E. No sanitary sewer piping shall be connected at any location to the grease interceptor inlet piping. Sanitary sewer shall bypass the grease interceptor, connect to and discharge to the grease interceptor effluent piping.
- F. Backfill with clean 1/2-inch to 3/4-inch properly consolidated crushed stone or other approved material to no less than 6-inches above the top inlet and outlet piping. Except in paved areas, backfill above this elevation shall be earth material free from large clods, vegetable matter, debris, stone, and/or other objectionable materials.
- G. Use special care to prevent the operation of backfilling from causing any damage to any piping.

### **PART 4 INSPECTION**

# 4.1. GENERAL

- A. Grease interceptors will be immediately rejected under the following circumstances:
  - 1. Grease interceptor manufacturer is not an approved manufacturer listed in these specifications or approved by the District in writing, prior to installation, as an approved equal.
  - 2. Grease interceptor's total volumetric capacity is less than the required capacity as determined by the District in accordance with its Fats, Oils, and Grease (FOG) Management Program.
  - 3. Grease interceptor tank does not comply with the structural or dimensional requirements of Section 2 of this specification.

### 4.2. WATERTIGHTNESS TESTING

- A. Watertightness testing shall only be performed in the presence of a District Representative.
- B. Testing for watertightness shall be performed using either vacuum testing or hydrostatic testing. Testing shall be performed once grease interceptor has been set in excavation pit, prior to backfilling.
  - 1. Vacuum Testing: Seal the empty tank and apply a vacuum to 4-inches (100 mm) of mercury. Hold the vacuum for 5 minutes. During this initial 5 minute period, the vacuum shall not drop more than 1/2-inch (13 mm) of mercury, which allows for a pressure

- equalization loss from equipment seating, and so forth. If the vacuum drops, it shall be brought back up to 4-inches (100 mm) of mercury and held for a further 5 minutes with no vacuum loss. If the tank fails the test, it shall be repaired and retested.
- 2. Hydrostatic Testing: Seal the tank and inlet/outlet piping, fill with water until level with the raw tank openings and let stand for 8-10 hours. If there is a measureable drop in the water surface elevation, refill the tank and let stand for another 8-10 hours. There shall be no further measurable drop in the water surface elevation. Tanks shall not be rejected for damp spots on the exterior concrete surface. If water is dripping in a steady stream, the tank shall be repaired and retested.
- C. Repairs of precast concrete grease interceptors, when required shall be performed by the manufacturer in a manner ensuring that the repaired grease interceptor tank will conform to the watertightness requirements of this specification. Repairs and/or replacement of precast concrete adjusting rings, plastic gaskets, cast iron frames and/or covers may be performed by the Contractor.
- D. Grease interceptor tanks shall be rejected if, after failing the watertightness testing and repairs have been made, the grease interceptor again fails the watertightness testing as described in this specification.

**END OF SECTION** 

#### **SECTION 02642**

# **PRESSURE SEWER VALVES**

### **PART 1 GENERAL**

1.1. Refer to other sections for work related to that specified under this heading.

# PART 2 PRODUCTS

#### 2.1. GATE VALVES

- A. Gate valves on sewer lines 24-inch and smaller shall be resilient seated, manufactured to meet or exceed the requirements of AWWA C509/C515 of latest revision and in accordance with the following specifications and shall be manufactured by American Darling, M&H, or Mueller.
- B. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
- C. The valves shall be non-rising stem with the stem made of bronze described in AWWA C509/C515. Provide 2 stem seals of the O-ring type.
- D. The stem nut, also made of bronze shall be independent of the gate.
- E. The sealing mechanism shall consist of a cast or ductile iron wedge gate fully encapsulated in synthetic rubber or urethane. The resilient sealing mechanism shall provide zero leakage at 200 psi working pressure when installed with flow in either direction.
- F. The valve body, bonnet, and bonnet cover shall be ductile iron or cast iron, ASTM A126, Class B, fully coated with fusion bonded epoxy, both interior and exterior.
- G. All valves shall be tested in strict accordance with AWWA C509/C515.
- H. Buried valves shall be mechanical joint and equipped with a 2-inch square operations nut and shall be complete with a valve box specified herein. Valves in structures shall be flanged and equipped with removable hand wheel operators. Valves shall open to the left. All buried valves with wrench nut over 10 feet deep shall have an extension stem projecting within 2 feet of the ground surface and the stem extension shall be centered in the valve box and anchored to prevent horizontal movement and pinned to the valve nut below. The valve manufacturer shall provide all glands, gaskets, and all the accessories necessary to install the valve.
- I. Gate valves 12 inches and larger may be required to be bevel gear design based on the depth of the sewer line.

### 2.2. PLUG VALVES

A. Valves shall be of 90-degree turn, non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on plans or as designated herein.

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- B. Port areas shall be at least 100 percent of full pipe area to provide clog-free operation and allow line pigging.
- C. Valve bodies shall be ASTM A-126 Class B cast iron. Bodies in 4-inch and larger valves shall be furnished with a 1/8-inch welded overlay seat of not less than 90 percent pure nickel, machined to mate with resilient faced plug. Valves which do not provide positive mating of resilient faced plug with nickel seat shall not be accepted. Seat area shall be raised, with raised surface completely covered with weld to insure that plug face contacts only nickel. Screwed-in or bolted-in seats shall not be acceptable.
- D. All exposed nuts, bolt springs, and washers shall be Type 316 stainless steel.
- E. True eccentric action shall be required and contact between seat and plug shall occur only in final 3 degrees of plug movement.
- F. Plugs shall be of ASTM A126 Class B cast iron. No bolt-on sections to plug shall be acceptable. Plug shall have a cylindrical seating surface eccentrically offset from center of plug shaft. Interference between plug face and body seat, with plug in closed position, shall be externally adjustable in field with valve in line under pressure. Valve bodies shall have a bolted bonnet for permitting removal of plug while body remains in-line.
- G. For all service applications except chemical and chemical sludge service, plug shall be completely coated with Buna-N compound.
- H. Valves shall have sleeve type bearings and shall be permanently lubricated sintered impregnated by 316 ASTM A-743 Grade CF-8M stainless steel. Bearings shall be designed not to exceed a stress 1/5 of compressive strength of material used, and stress shall not exceed 2,000 psi.
- I. Valve shaft seals shall be of multiple V-ring type or U-cop type and shall be externally adjustable and repackable without removing operator, bonnet, plug or actuator from valve under pressure. Both packing and bearing in upper and lower journals shall be protected by a shaft seal designed to minimize entrance of grit to earing or packing. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
- J. Plug shaft seal must be capable of being allowed to drain away from valve without any liquid entering operator.
- K. Valve pressure ratings shall be 175 psi through 12-inch and 150 psi for greater than 12-inch. Valves shall provide drip-tight shut off up to full pressure rating with pressure in either direction without use of structural ribs that extend beyond profile of plug. Each valve shall be given a hydrostatic and seat test with test results being certified in accordance with ANSI B16.1.
- L. Manual valves shall have lever or gear actuators and tee wrenches as indicated on plans. All valves 6-inches and larger shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into actuator. Actuator shaft and quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate

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valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change.

- M. All underground valves shall be equipped with standard square 2-inch nuts, O-ring seal, valve box, extended operator or wrench, and valve position indicator.
  - 1. Valves 8 inches or greater shall also be provided with worm gear operators.
  - 2. Gears shall be made of bronze or be mounted on bronze bearings.
  - 3. Actuators shall be packed with grease and sealed for temporary submergence in 20-feet of water.
  - 4. Extended work shafts shall be stainless steel.
- N. Valves shall be provided with adjustable stops.
- O. Unless otherwise specified, valves shall be installed so that when closed, plug is at upstream end of valve.
- P. In horizontal piping with plug shaft installed horizontally, plug shall be in upper part of valve body when open.
- Q. Valves shall open counterclockwise (left).
- R. Plug valves shall be manufactured by DeZurik, Mueller (Pratt), Val-Matic or approved equal.

### 2.3. AIR RELEASE VALVES

- A. Air release valves for sewage force mains shall be 2-inch or 3-inch in size and shall be manufactured by H-Tec Model 986-01, complete with 2-inch or 3-inch shut off valve. All piping, fittings, and appurtenances for air release valve assembly shall be stainless steel where applicable.
- B. MJ x MJ tapped ductile iron tee shall be used on pipe 12-inches and smaller.
- C. Refer to Standard Drawing 129.

### 2.4. VALVE BOXES

- A. All valve box castings shall be made accurately to the required dimensions, and shall be sound, smooth, clean and free from blisters and other defects. Defective castings which have been plugged or otherwise treated to remedy defects shall be rejected. Contact surfaces of frames and covers shall be machined so that the covers rest securely in the frames with no rocking and with the cover in contact with the frames for the entire perimeter of the contact surface.
- B. Install valve boxes on each proposed valve in accordance with the details shown on the Standard Drawing 207.

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C. All valve boxes shall be John Bouchard No. 8006, EJ No. V-8455 or Russco rectangular frame. All box covers shall have the word "SEWER" cast on the cover.

# 2.5. LOW PRESSURE PVC FORCE MAINS

- A. Ball Valves: Valves 1-1/2 inches through 3 inches shall be a true union PVC ball type. Working pressure at 70 degrees F shall be 150 pounds per square inch. Valves shall be supplied with O-ring seals and shall open to the left. The valve shall be as manufactured by Asahi/America, GF Plastic System, Inc., Hayward Manufacturing Company, Inc., or Nibco Chemtrol TU Series.
- B. Air Release Valves: Air release valves shall be manufactured by A.R.I., Model D-021.
- C. Valve Boxes: Boxes shall be of plastic as manufactured by Carson, Part No. MSBCF 1730-18 or Sigma. The boxes shall be heavy duty and of the size and depth as shown on the Standard Drawing 701, 703, 704 and 705. Boxes that are required for depths over 18-inches, stack boxes or use a riser to achieve the right depth. The boxes shall be installed with one course of brick as a base. The lid shall be a one-piece ductile iron cover with the word "Sewer" cast on the cover.

### PART 3 EXECUTION

### 3.1. SETTING VALVES AND FITTINGS

- A. General: Set valves, fittings, plugs, and caps and joint to pipe in the manner heretofore specified for cleaning, laying, and jointing pipe.
- B. Location of Valves: Valves in force mains shall, where possible, be located on the street right-of-way (R.O.W.) lines extended.
- C. Valve Boxes and Valve Pits
  - 1. Provide a valve box for every valve with the lettering on the valve box cover being placed 90 degrees to the line.
  - 2. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed by the District.

**END OF SECTION** 

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#### SECTION 02721

# LOW PRESSURE GRINDER PUMP SYSTEM

### **PART 1 GENERAL**

- 1.1 This section covers the service line connection, service pipe, grinder pump station, pump control panel and electrical disconnect.
- 1.2 Refer to other sections, Section 02222 Unclassified Excavation for Utilities for related work specified, furnished or installed under this heading.

### **PART 2 PRODUCTS**

- 2.1. PVC PIPE AND FITTINGS FOR LOW PRESSURE GRINDER SYSTEMS
  - A. Collector (main) lines and service lines pipe shall be schedule 40 PVC pipe, have NSF approval and shall be manufactured in accordance with ASTM D1785. Each production run of pipe manufactured in compliance to the standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785 and ASTM D2665 as applicable.
  - B. PVC schedule 40 fittings shall be manufactured from virgin rigid PVC with a cell class of 12454 as identified in ASTM D1784.
  - C. PVC schedule 40 fittings shall be injection molded and conform to ASTM D2466.
  - D. Furnish a certificate from the pipe manufacturer stating that he is fully competent to manufacture PVC pipe of uniform texture and strength and in full compliance with these specifications and further stating that he has manufactured such pipe and done so in sufficient quantities to be certain that it will meet all normal field conditions. In addition, the manufacturer's equipment and quality control facilities must be adequate to ensure that each extrusion of pipe is uniform in texture, dimensions, and strength. Also furnish a certificate from the manufacturer certifying that the pipe furnished for this project meets the requirements of these specifications.
  - E. Pipe may be furnished in the manufacturer's standard laying lengths of 20 feet when possible. The Contractor's methods of storing and handling the pipe shall be approved by the District. All pipe shall be supported within 5 feet of each end; in between the end supports, there shall be additional supports at least every 15 feet. The pipe shall be stored away from heat or direct sunlight. The practice of stringing pipes out along the proposed line routes will not be allowed.
  - F. Certain information shall be applied to each piece of pipe. At the least, this shall consist of:
    - 1. Nominal size
    - 2. Type of material

- 3. Pipe Schedule
- 4. Manufacturer
- 5. NSF Seal of Approval
- G. that fails to comply with the requirements set forth in these specifications shall be rejected.
- H. PVC pipe cleaner and solvent (glue) shall meet the requirements of the pipe manufacture.

### 2.2. SERVICE LINE CONNECTION

A. A 1-1/4 inch ball valve and check valve with a valve box shall be installed at the property/right-of-way line or next to the sewer main as applicable.

### B. Lateral Kit

1. The lateral kit on the service line at the connection to the main shall be an integrated stainless steel unit consisting of a check valve, ball valve and cleanout all in a compact module. The unit shall be E/One UNI-LATERAL model NB0184P01.

# C. Valve Box

1. The valve box shall be of plastic as manufactured by Carson, Part No. MSBCF-1730-18 or Sigma. The boxes shall be heavy duty and of the size and depth as shown on the Standard Drawing 702. Boxes that are required for depths over 18-inches, Contractor shall stack boxes or use a riser to achieve the correct depth. The boxes shall be installed with one course of brick as a base. The lid shall be a one-piece ductile iron cover with the word "Sewer" cast on the cover.

# 2.3. DETECTABLE TAPE AND WIRE

- A. Detection wire shall be #12 AWG high-strength copper clad steel conductor (HS-CCS), insulated with green 30 mil HDPE insulation.
- B. Detectable tape shall shall be no less than 2 inches in width and made of inert, bonded layer plastic with a metallized foil core and highly resistant to alkalis, acids, and other chemical components commonly encountered in soils. The tape shall be brightly colored green and shall bear the imprint "CAUTION SEWER LINE BURIED BELOW.

# 2.4. GRINDER PUMP CONTROL PANEL

A. The control panel shall be a corrosion-proof, NEMA 4X rated thermoplastic enclosure with an Audio/Visual Alarm as manufactured by Environment/One Corporation.

# **PART 3 EXECUTION**

3.1. INSTALLATION OF LOW PRESSURE FORCE MAINS

- A. Lay the force main to keep it at the lines and grades required by the drawings. All fittings shall be at the required locations.
- B. For low pressure sewer force mains, the force main shall generally follow the contours of the ground, sloping continuously between high and low points. All pipe shall have a minimum of 18 inches and maximum of 24 inches of cover unless otherwise shown on the drawings and approved by the District.
- C. Lower no pipes and fittings into the trench until they have been swabbed to remove any mud, debris, etc., that may have accumulated within them. After the pipe has been lowered, remove all unnecessary materials from it. Before any pipe is laid, brush and wipe clean the outside of its spigot end and the inside of its bell and ensure that the pipe is dry and oil-free.
- D. Take every precaution to keep foreign material from entering into the pipe while it is being placed in the line.
- E. Place no debris, tools, clothing, or other materials in the pipe during laying operations.
- F. Whenever pipe laying is not in progress, close the open ends of pipe in the trench with a watertight plug or by other means approved by the District. This shall be done not only at the end of each working day but also before work is stopped for lunch periods, bad weather, or any other reason. If there is water in a trench, this seal shall remain in place until the trench has been pumped completely dry.
- G. The cutting of pipe so that fittings or closure pieces can be inserted shall be done in a neat and workmanlike manner and without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.
- H. Unless otherwise directed by the District, lay pipe with the bell ends facing in the direction of laying.
- I. Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions, or wherever long radius curves are permitted, the amount of deflection shall not exceed that necessary for the joint to be satisfactorily made, nor that recommended by the pipe manufacturer, and shall be approved by the District.
- J. Lay no pipe in water or when it is the District's opinion that trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, this shall be considered incidental to the project, and no separate payment will be made for its use.
- K. Make all joints in conformance with the recommendations of the joint manufacturer as approved by the District.
- L. Install a sewage air release and/or air vacuum valve at all high points.
- M. Install a sewage air release and/or air vacuum valve at all high points.

- N. Detection wire shall be continuous and installed directly on the pipe, including services, in the 3 o'clock position. The wire shall be secured to the pipe with tape or other accepted methods at a spacing of no more than 36 inches apart and visibly exposed at service and valve boxes.
- O. Detectable tape shall be buried in the utility line trench, printed side up, directly above the pipe at a vertical distance of approximately 12 inches above the pipe.
- P. After completing each section of force main, remove all debris and all construction materials and equipment from the work site. Then grade and smooth over the surface on both sides of the main. The entire area shall be clean and left in a condition satisfactory to the District.
- Q. All lines shall be tested for a 30-minute period to a pressure of 100 psi separately from the sewage force main. There will be no leakage allowed on the service lines from inside the pump basin to the ball valve. PVC force mains shall be tested for a 30-minute period to a pressure of 100 psi, separately from the service lines.

#### 3.2. GRINDER PUMP STATION

- A. The station shall be no more than 25 feet from the control panel and installed in the ground to the fill marking on the side of the tank unless otherwise approved or directed by the District.
- B. The pump stations shall be mounted to a concrete foundation in accordance with the manufacture's recommendations to prevent the basin from flotation and to prevent the basin from shifting from its foundation.
- C. All products related to the grinder pump stations shall be installed in accordance with the manufacturer's written instruction and approved submittals.
- D. Low pressure grinder pump stations intended for commercial or industrial applications shall be installed, owned and maintained by the customer and not the responsibility of the District. The grinder pump station shall be duplex style and meet the applicable requirements of this section unless otherwise approved or directed by the District.

# 3.3. ELECTRICAL DISCONNECT

A. An electrical disconnect shall be installed within 3 feet of the pump control panel. The disconnect shall be 2 pole breaker type and shall be 30 amps, 240 volt minimum. The height of the disconnect shall be a minimum of four (4) feet from grade. The wiring to the disconnect shall be four (4) No. 10 gage wires with two (2) lines, and insulated neutral, and a ground. All wires exposed to weather shall be placed in rigid galvanized steel or Schedule 80 PVC conduit.

# **END OF SECTION**

### SECTION 02722

# **SANITARY SEWERS (GRAVITY)**

### **PART 1 GENERAL**

- 1.1. Furnish all material, equipment, tools, and labor in connection with the sewage lines, complete and in accordance with the drawings and these specifications.
- 1.2. REFERENCE STANDARDS
  - A. American Society of Testing Materials (ASTM)
    - 1. D1784 Rigid PVC Compounds
    - 2. D2152 Adequacy of Fusion of Extruded PVC Pipe and Molded Fittings by Acetone Immersion
    - 3. D2321 Underground Installation of Flexible Thermoplastic Sewer Pipe
    - 4. D2412 External Loading Properties of Plastic Pipe by Parallel-Plate Loading
    - 5. D2444 Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight)
    - 6. D3034 PVC Sewer Pipe and Fittings
    - 7. D3212 Joints for Sewer Plastic Pipe Using Elastomeric Seals
    - 8. A536 Ductile Iron Castings
    - 9. F477 Elastomeric Gaskets for Joining Plastic Pipe
  - B. Where materials and methods are indicated in these specifications as being in conformance with a standard specification, it shall refer in all cases to the latest edition of the specifications and shall include all interim revisions. Listing of a standard specification without further reference indicates that the particular material or method shall conform with such listed specification unless otherwise specified herein.
- 1.3. It shall be the Contractor's responsibility to ensure that all necessary materials are furnished to him and that those found to be defective in manufacture are replaced at no extra cost to the Owner. Materials damaged in handling after being delivered by the manufacturer shall be replaced at the Contractor's own expense. If installed material is found to be defective, the cost of both the material and labor needed to replace it shall not be passed on to the Owner.
- 1.4. The Contractor shall be responsible for safely storing materials needed for the work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.

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- 1.5. Refer to other sections for work related to that specified by this section. Coordinate this work with that required by other sections for timely execution.
- 1.6. Pipe material for sewer lines 12 inches and smaller shall be PVC unless otherwise shown on the drawings. Ductile iron pipe shall be used only when so indicated on the drawings.
- 1.7. Pipe material for sewer line tunnels or borings shall be C900 PVC or ductile iron pipe.
- 1.8. Sewer lines 18 inches and larger are considered to be interceptors and the pipe material shall be determined on an individual basis as recommended and approved by the District.
- 1.9. Sewers on 20 percent slope or greater and/or where velocities greater than 10 feet per second are expected, special provisions as required by the District shall be made to protect against internal erosion or displacement by shock.
- 1.10. For PVC and ductile iron pipe, furnish a certificate from the pipe manufacturer indicating that the pipe meets all applicable requirements of these specifications.

### **PART 2 PRODUCTS**

- 2.1. SDR-26 POLYVINYL CHLORIDE (PVC)
  - A. SDR-26 PVC pipe shall conform to the requirements of ASTM D3034; suitable for use as a gravity sewer conduit with provisions for contraction and expansion at each joint with flexible ring gaskets meeting the requirements of ASTM F477 and standard lengths of 12.5 feet plus or minus 1 inch; designed to pass all tests at 73 degrees F (plus or minus 3 degrees F); and with a minimum envelope of 6 inches of granular material around the pipe, but with all other bedding and backfilling requirements remaining the same as for other pipe material. SDR-26 PVC pipe shall be manufactured by Westlake Pipe & Fittings (NAPCO), Vulcan, Hawk, or J.M. Eagle.
  - B. A specimen of PVC pipe 6 inches long shall withstand, without failure, impact from a free-falling tup (20-lb Tup A and flat plate holder B) in accordance with ASTM D2444. There shall be no evidence of shattering or splitting when the energy is imposed.
  - C. The minimum pipe stiffness for PVC pipe at 5% deflection shall be 115 psi for all sizes when tested in accordance with ASTM D2412; external loading properties of plastic pipe shall be by parallel plate loading.
  - D. A specimen of PVC pipe 6 inches long shall be flattened between parallel plates in a suitable press until the distance between the plates is 40% of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is complete in 2 to 5 minutes.
  - E. After being immersed for 2 hours in a sealed container of anhydrous acetone (99.5% pure), a sample ring of PVC pipe shall show no visible spalling or cracking when tested in accordance with ASTM D2152 (swelling or softening is not considered a failure).
- 2.2. C900 POLYVINYL CHLORIDE (PVC)

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- A. C900 PVC pipe shall conform to the requirements of AWWA C900, latest edition, and shall be furnished in cast iron pipe equivalent outside diameters with integral wall thickened bell ends, DR 14; suitable for use as a gravity sewer conduit with provisions for contraction and expansion at each joint with factory installed flexible ring gaskets meeting the requirements of ASTM F477. Joints for pipe shall be manufactured in accordance with ASTM D3139. C900 PVC pipe shall be manufactured by Westlake Pipe & Fittings (NAPCO), Vulcan, or J.M. Eagle.
- B. Carrier pipe 4 inches through 16 inches in diameter inside steel casing shall be restrained joint pipe C900 Eagle Loc 900RL, Certa-Lok RJIB PVC pipe or approved equal.
- C. C900 PVC pipe shall be impregnated with green pigment and labeled with nominal size, type of material, dimension ratio, and manufacturer. Pipe shall be furnished in lengths of 20 feet unless otherwise approved by the District.
- D. A specimen of PVC pipe 6 inches long shall withstand, without failure using a Tup "B" and Flat Rate Holder "B", at 73 F, a tup impact energy of 100 ft-lbf. There shall be no evidence of shattering or splitting when the energy is imposed.
- E. A specimen of PVC pipe 6 inches long shall be flattened between parallel plates in a suitable press until the distance between the plates is 40% of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is complete in 2 to 5 minutes.
- F. After being immersed for 2 hours in a sealed container of anhydrous acetone (99.5% pure), a sample ring of PVC pipe shall show no visible spalling or cracking when tested in accordance with ASTM D2152 (swelling or softening is not considered a failure).
- G. Fittings shall be C900 and conform to the requirements in this specification section for fittings used with C900 PVC.

#### 2.3. **DUCTILE IRON PIPE AND FITTINGS**

- 1. Ductile iron pipe shall conform to the requirements of ANSI 21.51/AWWA C151 for ductile iron pipe centrifugally cast in metal or sand-lined molds. It shall be made and tested in accordance with ASTM A536 and be subjected to and able to withstand a hydrostatic pressure of 500 psi.
- 2. The pipe shall be plain end ductile iron pipe with push-on, single gasket joints. The design thickness shall be that specified by ANSI A21.50/AWWA C150 and a pressure class of 350 unless determined otherwise by the District. Pipe shall be manufactured by American Cast Iron Pipe Company, U.S. Pipe or McWane Ductile. All pipes shall be of the same manufacturer. The manufacturer must be a member in good standing of the Ductile Iron Pipe Research Association (DIPRA).
- 3. The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.
- 4. The push-on single gasket joints shall be either "Fastite" (by American Cast Iron Pipe Company) or "Tyton" (by U.S. Pipe and Foundry Company).

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- 5. The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and the compression of the gasket.
- 6. The gasket shall be of high quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquid tight for all pressures from a vacuum to a maximum rating of 350 psi of internal liquid pressure.
- 7. Enough lubricant shall be furnished with each order to provide for the proper installation of the pipe supplied with said order. This lubricant shall be nontoxic and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe.
- 8. The interior of all pipe and fittings shall receive 40 mils nominal dry film thickness of Protecto 401 Ceramic Epoxy. The outside coating shall be a petroleum asphaltic coating approximately 1 mil thick.
- 9. Fittings shall be ductile iron, compact body type and shall conform to the specifications of ANSI/AWWA C153/A21.53 (latest edition) in all respects. Fittings shall be manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Tyler/Union Foundry, Star, or Sigma.
- 10. The pipe manufacturer is to furnish the District a certificate of inspection, sworn to by the factory inspector in the presence of a notary public, stating that the pieces of pipe in the shipment were made and tested in accordance with AWWA/ANSI C151/A21.51 and that they were subjected to and withstood a hydrostatic pressure of 500 psi. Each statement is to give the number of pieces of pipe in the shipment, the length of each piece of pipe, and the weight of each piece of pipe making up the shipment.

### 2.4. SERVICE LATERALS AND INSPECTION TEES

- A. Service laterals shall be of the same material and manufacturer as the sewer main and have 6-inch nominal diameter unless otherwise specified or noted. The service laterals shall be able to withstand all test pressures involved without leakage.
- B. Service laterals shall be installed at a minimum slope of 1/4 inch per foot unless otherwise approved by the District.
- C. Inspection tee and bend as required for plumb inspection tee shall be of the same material as the service lateral.
- D. Install Jones Stephens S62304 sewer relief cleanout and valve at all sewer inspection tees as shown on Standard Drawing 127

# 2.5. JOINTS AND JOINTING MATERIALS

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- A. Polyvinyl Chloride (PVC) Pipe Joints: Bell and spigot type with a rubber ring suitable to meet all test requirements of these specifications.
- B. Ductile Iron Pipe Joints: Gasket type joints for bell and spigot ductile iron pipe designed to meet the infiltration requirements of these specifications; jointing to comply with the applicable provisions of ANSI A21.11.

# C. PVC Sewer Fittings

- 1. All PVC fittings, including inspection tee and bend as required, shall be manufactured in one piece of injection molded PVC meeting ASTM D1784.
- 2. Fittings shall be SDR 26 and conform to the requirements of ASTM D 3034 specification, latest edition. Gaskets for elastomeric joints shall be molded with a minimum cross-sectional area of 0.20 sq. in. and conform to ASTM F477 specification. Fittings shall be tee-wye as manufactured by Harco, Westlake Pipe & Fittings (NAPCO), or Multi Fittings. Service line caps are to be Fernco "Qwik" cap or Indiana Seal.
- 3. Fittings for C-900 PVC pipe shall be manufactured in one piece of injected molded PVC compound meeting ASTM D1784. Fittings shall be Class 150 and conform to requirements of DR 18. Bells shall be gasketed joints conforming to ASTM D3139 with gaskets conforming to ASTM F477.

# 2.6. INSPECTION TEE BOXES

- A. Boxes for inspection tee shall be of plastic as manufactured by Carson, Part No. BC 1118-12/18 or Sigma. The boxes shall be heavy duty and of the size and depth as shown on the standard drawing. The boxes shall be installed with one course of brick as a base. The lid shall be a one-piece ductile iron cover with the word "Sewer" cast on the cover.
- B. For boxes in paved areas the box shall be a John Bouchard No. 8006, EJ V-8455, or Sigma with a lid marked "Sewer".

# **PART 3 EXECUTION**

# 3.1. PIPE LAYING

- A. Lay no pipe except in the presence of a District Representative.
- B. Before placing sewer pipe in position in the trench, carefully prepare the bottom and sides of the trench.
- C. Wherever necessary to provide satisfactory bearing surface, place concrete cradles as shown on the Drawings or as directed by the District. Cradles shall be of concrete and conform to the dimensions shown on Standard Drawing 111. Concrete placed outside the dimensions shown shall be at the Contractor's expense.
- D. Lasers must be used after the type and procedures are approved by the District. When lasers are used, set reference points for both line and grade at each manhole. Where grades are

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- 0.6% or less, check the elevation of the beam each 100 feet with an offset point or engineer's level.
- E. Do not allow water to run or stand in the trench while pipe laying is in progress or before the trench has been backfilled. Do not at any time open up more trench than the available pumping facilities are able to dewater.
- F. Correct trench bottoms found to be unsuitable for foundations after pipe laying operations have started, bringing them to exact line and grade with compacted stone as necessary.
- G. Carefully inspect each piece of pipe and special fitting before it is placed, and lay no defective pipe in the trench. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. When pipe laying is not in progress, keep the ends of the pipe tightly closed with an approved temporary plug.
- H. Bell holes shall be large enough to allow ample room for the pipe joints to be properly made. Cut out bell holes no more than 2 joints ahead of the pipe laying. Carefully grade the bottom of the trench between bell holes so that each pipe barrel rests on a solid foundation for its entire length. Lay each pipe joint so as to form a close concentric joint with adjoining pipe and to avoid any offsets or inequalities in the flow line.
- I. Before constructing or placing any joints, demonstrate to the District, by completing at least one sample joint, that the methods to be used conform to the specifications and will provide a watertight joint and further that the workmen to be involved in this phase of work are thoroughly familiar and experienced with the type of joint proposed.
- J. No other type of joint may be used unless authorized in writing by the District.
- K. Install tee branches in sewer lines to serve promptly each lot facing or abutting on the street or alley in which sewer is being laid and at such other locations as may be designated by the District. In addition, for lines in easements, lay a minimum 10' section of service line, and for rights-of-way, lay the service line 10' inside the property line. If tee branches are not to be used immediately, close them with a cap that is held in place to prevent infiltration and withstand all test requirements.
- L. For all services that are laid in rock, blast a minimum of 6 LF of ditch beyond the end of the service tee, in the direction and to the approximate grade of the future lateral as directed by the District, but do not excavate the material. Furnish the District with a record of the exact location of each tee installed.
- M. If the work consists of constructing a new sewer to replace an existing one, connect existing service lines to the new line.
- N. New service laterals shall conform to the standard drawings. Refer to Standard Drawing 127.
- O. As the work progresses, thoroughly clean the interior of the pipe in place. After each line of pipe has been laid, carefully inspect it, and remove all earth, trash, rags, and other foreign matter from its interior.

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- P. After the joints have been completed, they shall be inspected before being covered. The pipe shall meet the test requirements for water tightness; immediately repair any leak or defect discovered at any time after completion of the work. Any pipe that has been disturbed after joints were formed shall be taken up, the joints cleaned and remade, and the pipe re-laid at the Contractor's expense. Carefully protect all pipe in place from damage until backfilling operations are completed.
- Q. Do not begin the backfilling of trenches until the pipe in place has been inspected by the District.
- R. Lay sewers at least 10 feet horizontally from any existing or proposed water main. If this is not practical, the sewer may be laid closer than 10 feet to a water main provided it is laid in a separate trench and the elevation of the top of the sewer is at least 18 inches below the bottom of the water main. Sewers shall always be installed under water mains unless otherwise approved by the District.
- S. Where a sewer crosses under water mains, the top of the sewer shall be at least 18 inches below the bottom of the water main. If the elevation of the sewer cannot be varied to meet the above requirements, relocate the water main to provide this separation, or else reconstruct it with mechanical joint ductile iron pipe for a distance of 10 feet on each side of the sewer with a full joint of the water main centered over the sewer.
- T. Approval must be granted where this separation cannot be obtained or where sewers cross over water mains. In this case the sewer shall be constructed of materials and with joints that are equivalent to water main (C900 PVC or ductile iron) standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.
- U. Perform boring by means of augering to the size, line, and grade shown on the drawings. Jack the steel casing pipe into place as the boring proceeds. Weld sections of casing pipe together to provide a watertight joint.
- V. Make connections to all existing sewer lines as shown on the drawings or as directed by the District. Make connections either by removing a section of the sewer from the existing line and inserting a branch of the proper size or by constructing a manhole as shown on the drawings.
- W. When connecting to an existing line where pipe material is not the same, use suitable compression couplings. If compression couplings are not available, make jointing with a special fabricated coupling approved by the District.
- X. Provide ductile iron pipe as shown on the drawings for pipe sewers that, when completed, have less than 2.5 feet of cover in non-traffic areas with a concrete cap.
- Y. Carefully protect from damage all existing sewers, water lines, gas lines, sidewalks, curbs, gutters, pavements, electrical lines, and other utilities or structures in the vicinity of the work at all times. If it is necessary to repair, remove, and/or replace any such utility or structure in order to complete the work properly, do so in compliance with the provisions set forth in other sections of these specifications. Any such work shall be considered incidental to the construction of pipe sewers.

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- Z. Service or house connections to existing sewers that are damaged or removed shall be repaired or replaced by the Contractor, in accordance with the District's Specifications.
  - 1. Water service connections that are damaged shall be repaired or replaced by the Contractor, in accordance with the District's Specifications.

### 3.2. TESTING OF GRAVITY SEWERS

# A. Visual Tests

- 1. Upon completion of the construction or earlier if the District deems advisable, the District will make a visual inspection of the sewer and construction site. Immediately repair all leaks and defects found by such inspection.
- 2. In addition to general cleanup and leakage, the following standards shall be used to determine failure or defects of this project.
- 3. Sewers shall be built so as to remain true to line and grade. The inclining grade of the bottom of the sewer after completion shall be such that, after flooding, the flood water drains off so that no remaining puddle of water is deeper than 1/2 inch on pipe 36 inches internal diameter or smaller and 3/4 inch on pipe larger than 36 inches internal diameter. Any section of pipe that does not comply with the specifications at any time previous to one year after final acceptance of the work shall be replaced or re-laid at the Contractor's expense.
- 4. The Contractor will be held strictly responsible that all parts of the work bear the load of the backfill. If defects develop in the pipe within one year from the date of final acceptance of the work, the Contractor will be required to replace, at his expense, all such defective pipe. To this end, the Contractor is advised to purchase pipe under a guarantee from the manufacturer, guaranteeing proper service of sewer pipe under conditions established by the drawings, specifications, and local conditioning at the site of the work.

# B. Air Testing for Sewers

- 1. Perform low pressure air testing as follows:
- 2. Furnish all equipment, facilities, and personnel necessary to conduct the test. The test shall be observed by a representative of the Owner.
- 3. Make the air test after all services have been installed and at least 7 days after backfilling has been completed and compacted.
- 4. Perform the first series of air tests after 1,000 LF but before 2,000 LF of sewer has been laid. The purpose of this first series of tests is to assure both the Contractor and the Owner that the materials and method of installation meet the intent of these specifications. If the total length of sewers for the project is less than 5,000 feet, this requirement may be waived by the Owner. Conduct the remainder of the tests after approximately each 10,000 LF has been laid.

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- Plug all tees and ends of sewer services with flexible joint caps securely fastened to
  withstand the internal test pressures. Such caps shall be readily removable, and their
  removal shall provide a socket suitable for making a flexible jointed lateral connection or
  extension.
- 6. Prior to testing, check the pipe to see that it is clean. If not, clean it by passing a full-gauge squeegee through the pipe. It shall be the Contractor's responsibility to have the pipe cleaned.
- 7. Immediately following this check or cleaning, test the pipe installation with low pressure air. Supply the air slowly to the plugged pipe installation until the internal air pressure reaches 4.0 psi. Allow at least 2 minutes for temperature stabilization.
- 8. The pipeline shall be considered acceptable when tested at an average pressure of 3.0 psi more than the average back pressure of any ground water that may submerge the pipe, if the section under test does not lose air at a rate greater than 0.0015 cfm per square foot of internal pipe surface area. The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 psi more than the average back pressure of any ground water that may submerge the pipe is not less than that shown in the following table:

### ALLOWABLE AIR LOSS VALUES PER 100 LF

Pipe Size (Inches)	Time in Seconds
6	42
8	72
12	108
18	144
24	216

- 9. If the pipe installation fails to meet these requirements, the Contractor shall determine at his own expense the source or sources of leakage and repair or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of this test before being considered acceptable.
- C. The recommended procedures for conducting acceptance tests are as follows:
  - 1. Clean pipe that is to be tested.
  - 2. Plug all pipe outlets with suitable test plugs, and brace each plug securely.
  - 3. Increase gauge pressure in the test by the amount of ground water pressure at the crown of the pipe.
  - 4. Add air slowly to the portion of the pipe installation being tested until the internal air pressure is raised to 4.0 psi.

- 5. After the above internal pressure is obtained, allow at least 2 minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
- 6. After 2 minutes, disconnect the air supply.
- 7. When pressure decreases to 3.5 psig either by leaking down or by bleeding down with a release valve, start the stopwatch, and determine the time in seconds that is required for the internal air pressure to reach 2.5 psig. Compare this time interval as calculated above. If the time is more than that calculated, the test shall be assumed to be acceptable.
- D. Plugs used to close the sewer pipe for the air test must be securely braced to prevent the unintentional release of the plug, which can become a high velocity projectile. Locate gauges, air piping manifolds, and valves at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Provide a safety release device set to release at 10 psi between the air supply and the sewer under test.
- E. Regardless of the outcome of the tests, repair any noticeable leak.

# 3.3. VISUAL INSPECTION OF MISCELLANEOUS MATERIALS

A. All material used on this project will be visually inspected by the District at the site for conformance to the required specifications. When reasonable doubt exists that said material meets the specifications, the District may require certified mill tests, samples, and/or tests by an independent laboratory or other suitable form of verification that the material meets the required specifications.

# 3.4. DEFLECTION TESTING FOR PVC PIPE

A. Deflection of the pipe shall be tested by passing 9-arm pin go/no-go mandrel sized to 95% of the inside pipe diameter of the actual pipe in place and covered. The District will furnish the mandrel. Make this acceptance test after backfill consolidation has occurred and upon the District's approval. A minimum of 7 days shall elapse from the final backfilling prior to this test.

# 3.5. INTERNAL TV INSPECTION

A. The District may conduct an internal inspection of the sewer with a Television instrument at no cost to the Contractor. The Contractor will be responsible for correcting all deficiencies discovered by this TV inspection. This internal inspection will be conducted following the inspection of the project by the District.

# 3.6. CLEANUP

A. After completing each section of the sewer line, remove all debris, construction materials, and equipment from the site of the work; grade and smooth over the surface on both sides of the line; and leave the entire right-of-way in a clean, neat, and serviceable condition.

# **END OF SECTION**

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#### SECTION 02722

# **SEWAGE FORCE MAINS**

#### **PART 1 GENERAL**

- 1.1. Furnish all material, equipment, tools, and labor in connection with the sewage force main, complete and in accordance with the drawings and these specifications.
- 1.2. It shall be the Contractor's responsibility to ensure that all necessary materials are furnished to him and that those found to be defective in manufacture are replaced at no extra cost to the Owner. Materials damaged in handling after being delivered by the manufacturer shall be replaced at the Contractor's own expense. If installed material is found to be defective before the final acceptance of the work, the cost of both the material and labor needed to replace it shall not be passed on to the Owner.
- 1.3. The Contractor shall be responsible for safely storing materials needed for the work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, and other accessories free from dirt and foreign matter at all times.
- 1.4. Refer to other sections for work related to that specified by this section. Coordinate this work with that required by other sections for timely execution.
- 1.5. All sewage force mains 4 inches through 12 inches in diameter shall be PVC C900 unless approved or directed by the District; 16-inch diameter and larger sewage force mains shall be ductile iron pipe.
- 1.6. Unless otherwise approved or directed by the District, only the following pipe diameters shall be acceptable for use as sewage force mains: 4, 6, 8, 12, 16, 20, and 24 inches.

# **PART 2 PRODUCTS**

- 2.1. C900 POLYVINYL CHLORIDE (PVC)
  - A. PVC pipe shall conform to the requirements of AWWA C900-07, latest edition, and shall be furnished in cast iron equivalent outside diameters with integral wall thickened bell ends and suitable for use as a pressure conduit. C900 PVC pipe shall be DR 18, pressure class 235, unless otherwise approved or directed the District.
  - B. Provision must be made for contraction and expansion of each joint with factory installed flexible ring gaskets; gasket materials shall meet the requirements established in ASTM F477. Joints for pipe shall be manufactured in accordance with ASTM D3139. C900 PVC pipe shall be manufactured by Westlake Pipe & Fittings (NAPCO), Vulcan, or J.M. Eagle.
  - C. C900 PVC pipe shall be impregnated with green pigment and labeled with nominal size, type of material, dimension ratio, and manufacturer. Pipe shall be furnished in lengths of 20 feet unless otherwise approved by the District.

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- D. A specimen of PVC pipe 6 inches long shall withstand, without failure using a Tup "B" and Flat Rate Holder "B", at 73 F, a tup impact energy of 100 ft-lbf. There shall be no evidence of shattering or splitting when the energy is imposed.
- E. A specimen of PVC pipe 6 inches long shall be flattened between parallel plates in a suitable press until the distance between the plates is 40% of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is complete in 2 to 5 minutes.
- F. After being immersed for 2 hours in a sealed container of anhydrous acetone (99.5% pure), a sample ring of PVC pipe shall show no visible spalling or cracking when tested in accordance with ASTM D2152 (swelling or softening is not considered a failure).
- G. Randomly selected C900 samples tested in accordance with AWWA C900-07 and ASTM D1599 shall withstand, without failure, the pressures listed below when applied for 60-70 seconds.

DR	AWWA C900-07 Pressure Class	Min. Burst Pressure at 73 F (psi)
18	235	755
14	305	985

- H. Fittings shall be ductile iron, compact body type, and shall conform to the specifications of ANSI/AWWA C153/A21.53 (latest edition) in all respects. Ductile fittings shall have interior lining and exterior coating as specified for ductile iron pipe. The use of "Mega Lugs" will not be permitted on C900 PVC pipe.
- I. Detectable tape shall be buried in the utility line trench, printed side up, directly above the pipe at a vertical distance of approximately 12 inches above the pipe. The detectable tape shall be no less than 2 inches in width and made of inert, bonded layer plastic with a metallized foil core and highly resistant to alkalis, acids, and other chemical components commonly encountered in soils. The tape shall be brightly colored green and shall bear the imprint "CAUTION SEWER LINE BURIED BELOW."
- J. Detection wire shall be #12 AWG high-strength copper clad steel conductor (HS-CCS), insulated with green 30 mil HDPE insulation.

### K. Joint Restraint

- 1. Restraint for C900 PVC pipe shall be noted on the drawings where applicable and shall be manufactured of ductile iron conforming to ASTM A536.
- 2. A split serrated ring shall be used to grip the plain end of the pipe and the barrel of the behind the bell and a sufficient number of bolts shall be used to connect the restraint rings. The combination shall be EBAA Iron Series 1900.
- 3. Carrier pipe 4 inches through 12 inches in diameter inside steel casing shall be restrained

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joint pipe C900 Eagle Loc 900RL, Certa-Lok RJIB PVC pipe or approved equal.

# 2.2. DUCTILE IRON PIPE AND FITTINGS

- A. Ductile iron pipe shall conform to the requirements of ANSI 21.51/AWWA C151 for ductile iron pipe centrifugally cast in metal or sand-lined molds. It shall be made and tested in accordance with ASTM A536 and be subjected to and able to withstand a hydrostatic pressure of 500 psi.
- B. The pipe shall be plain end ductile iron pipe with push-on, single gasket joints. The design thickness shall be that specified by ANSI A21.50/AWWA C150 and a pressure class of 350 unless determined otherwise by the District. Pipe shall be manufactured by American Cast Iron Pipe Company, U.S. Pipe or McWane Ductile. All pipes shall be of the same manufacturer. The manufacturer must be a member in good standing of the Ductile Iron Pipe Research Association (DIPRA).
- C. The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.
- D. The push-on single gasket joints shall be either "Fastite" (by American Cast Iron Pipe Company) or "Tyton" (by U.S. Pipe and Foundry Company).
- E. The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The plain spigot end of the pipe shall be beveled in order to simplify its entry into and centering within the bell and the compression of the gasket.
- F. The gasket shall be of high quality vulcanized rubber made in the form of a solid ring to exact dimensions. The design of the gasket groove in the bell of the pipe and the design, hardness, and other properties of the gasket itself shall be such that the joint is liquid tight for all pressures from a vacuum to a maximum rating of 350 psi of internal liquid pressure.
- G. Enough lubricant shall be furnished with each order to provide for the proper installation of the pipe supplied with said order. This lubricant shall be nontoxic and have no harmful effect on the rubber gasket. It shall have a consistency that will allow it to be easily applied to the pipe in either hot or cold weather and that will enable it to adhere to either wet or dry pipe.
- H. The interior of all pipe and fittings shall receive 40 mils nominal dry film thickness of Protecto 401 Ceramic Epoxy. The outside coating shall be a petroleum asphaltic coating approximately 1 mil thick.
- Fittings shall be ductile iron, compact body type and shall conform to the specifications of ANSI/AWWA C153/A21.53 (latest edition) in all respects. Fittings shall be manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Tyler/Union Foundry, Star, or Sigma.
- J. Restrained Joint Pipe and Fittings
  - 1. Restrained pipe and fittings are to be noted on Drawings where applicable. Restrained lengths shall be determined by the Engineer.

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- 2. For 16-inch and larger, restrained push-on pipe shall be either "Flex-Ring" or "Lok-Ring" (by American Cast Iron Pipe Company), or "TR Flex", "HDSS" or "HP Lok" (by U. S. Pipe), or "TR Flex" (by McWane Ductile). The lining and wall thickness shall be the same as that specified elsewhere in the section for sewage force mains.
- For fittings 12-inch and smaller and at connections to the existing system, restrained fittings shall be mechanical joint with restraining device Megalug Series 1100 as manufactured by EBAA Iron Sales Inc., Uni-Flange Series 1400 as manufactured by Ford, or One-Loc by Sigma.
- 4. For fittings 16-inch and larger, restrained fittings shall be "Flex-Ring" or "Lok-Ring" (by American Cast Iron Pipe Company), or "TR Flex" (by U.S. Pipe and McWane Ductile).
- 5. For restraining valves use Megalug Series 1100 as manufactured by EBAA Iron Sales Inc., Uni-Flange Series 1400 as manufactured by Ford, or One-Loc by Sigma.
- 6. Carrier pipe 16-inches in diameter and larger inside steel casing shall be restrained push-on pipe "Flex-Ring" or "Lok-Ring" (by American Cast Iron Pipe Company), or "TR Flex", "HDSS" or "HP Lok" (by U. S. Pipe), or "TR Flex" (by McWane Ductile).
- K. Detection wire shall be #12 AWG high-strength copper clad steel conductor (HS-CCS), insulated with green 30 mil HDPE insulation.
- L. The pipe manufacturer is to furnish the District a certificate of inspection, sworn to by the factory inspector in the presence of a notary public, stating that the pieces of pipe in the shipment were made and tested in accordance with AWWA/ANSI C151/A21.51 and that they were subjected to and withstood a hydrostatic pressure of 500 psi. Each statement is to give the number of pieces of pipe in the shipment, the length of each piece of pipe, and the weight of each piece of pipe making up the shipment.

# **PART 3 EXECUTION**

### 3.1. INSTALLATION OF FORCE MAINS

- A. Lay the force main to keep it at the lines and grades required by the drawings. All fittings shall be at the required locations, and spigots well centered in the bells. Where the grades are 0.2% or less, use a laser to maintain the required slopes.
- B. Force mains 4 inches and larger unless otherwise indicated by the drawings, shall have at least 30 inches of cover. The pipe shall slope continuously between high and low points and have a minimum of 60 inches cover at the high points. No departure from this policy shall be made except by order of the District.
- C. For low pressure sewer force mains, the force main shall generally follow the contours of the ground, sloping continuously between high and low points. All pipe shall have a minimum cover of 24 inches unless otherwise shown on the drawings. Any variation there from shall be made only at the order of the District.
- D. Detection wire shall be installed with all force mains regardless of material. Detection wire

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shall be continuous and installed directly on the pipe in the 3 o'clock position. The wire shall be secured to the pipe with tape or other accepted methods at a spacing of no more than 36 inches apart. For access purposes, detection wire shall be terminated at all valve boxes, combination air valve assemblies, etc.

- E. Provide and use tools and facilities that are satisfactory to the District and that will allow the work to be done in a safe and convenient manner. Use a derrick, ropes, or other suitable equipment to lower all pipe and fittings into the trench one piece at a time. Carefully lower each piece so that neither it nor any protective coating or lining it may have will be damaged. Under no circumstances, drop or dump force main materials into the trench.
- F. Lower no pipes and fittings into the trench until they have been swabbed to remove any mud, debris, etc., that may have accumulated within them. After the pipe has been lowered, remove all unnecessary materials from it. Before any pipe is laid, brush and wipe clean the outside of its spigot end and the inside of its bell and ensure that the pipe is dry and oil-free.
- G. Take every precaution to keep foreign material from getting into the pipe while it is being placed in the line. If the crew laying the pipe cannot put it into the trench and in place without allowing earth to get inside it, then place a heavy, tightly woven canvas bag of suitable size over each end of the pipe and leave it there until it is time to connect that pipe to the one adjacent to it.
- H. Place no debris, tools, clothing, or other materials in the pipe during laying operations.
- After a length of pipe has been placed in the trench, center the spigot end in the bell of the
  adjacent pipe, and then insert to the depth specified by the manufacturer and bring to the
  correct line and grade. Secure the pipe in place by tamping an approved backfill material
  around it.
- J. Whenever pipe laying is not in progress, close the open ends of pipe in the trench with a watertight plug or by other means approved by the District. This shall be done not only at the end of each working day but also before work is stopped for lunch periods, bad weather, or any other reason. If there is water in a trench, this seal shall remain in place until the trench has been pumped completely dry.
- K. The cutting of pipe so that fittings or closure pieces can be inserted shall be done in a neat and workmanlike manner and without any damage to the pipe. Follow the manufacturer's recommendations concerning how to cut and machine the ends of the pipe in order to leave a smooth end at right angles to the pipe's axis.
- L. The flame cutting of pipe by means of an oxyacetylene torch will not be allowed.
- M. Unless otherwise directed by the District, lay pipe with the bell ends facing in the direction of laying.
- N. Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions, or wherever long radius curves are permitted, the amount of deflection shall not exceed that necessary for the joint to be satisfactorily made, nor that recommended by the pipe manufacturer, and shall be approved by the District.

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- O. Lay no pipe in water or when it is the District's opinion that trench conditions are unsuitable. If crushed stone is used to improve trench conditions or as backfill for bedding the pipe, this shall be considered incidental to the project, and no separate payment will be made for its use.
- P. Install thrust blocks wherever the force main changes direction (e.g., at tees and bends), at dead ends, or at any other point where the manufacturer recommends and/or the District indicates that they are to be used.
- Q. Make all joints, whether standard mechanical, push-on, or solvent weld joints, in conformance with the recommendations of the joint manufacturer as approved by the District.
- R. Install a sewage air release and/or air vacuum valve at all high points.
- S. Test all force main in accordance with the provisions of Section 13 of AWWA C600. For the pressure test, subject the force main to a pressure of 200 psi; for the leakage test, to a pressure of 160 psi. If the testing reveals any cracked or defective pipes, fittings, or valves, replace them with sound material, and then repeat the testing until the results are satisfactory to the District.
- T. Perform all tests and provide all labor, equipment, etc., needed to do so at no extra cost to the Owner.
- U. After completing each section of force main, remove all debris and all construction materials and equipment from the work site. Then grade and smooth over the surface on both sides of the main. The entire area shall be clean and left in a condition satisfactory to the District.

# 3.2. HYDROSTATIC TESTS

### A. Pressure Test

- 1. After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 200 psi. All services are to be laid prior to testing the main and tested as part of the test of the main.
- 2. The duration of each pressure test shall be at least one hour.
- 3. Slowly fill each valved section of pipe with water, and apply the specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) with a pump connected to the pipe in a manner satisfactory to the District. This pipe shall be filled 24 hours prior to testing. Furnish the pump, pipe, connections, gauges, and all necessary apparatus.
- 4. Before applying the specified test pressure, expel all air from the pipe. If hydrants or blowoffs are not available at high places, make the necessary taps at the points of highest elevation before testing, and insert plugs after the test has been completed.
- 5. Carefully examine all exposed pipes, fittings, valves, and hydrants during the test. Remove

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any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test, and replace with sound material in the manner specified. Repeat the test until the results are satisfactory to the District.

# B. Leakage

- 1. Begin the leakage test immediately after the pressure test has been satisfactorily completed. Furnish the pump, pipe, connections, gauges, measuring devices, and all other necessary apparatus as well as all necessary assistance to conduct the test.
- 2. The duration of each leakage test shall be 2 hours; during the test, subject the main to a pressure of 160 psi.
- 3. Leakage is defined as the amount of water which must be supplied to the newly laid pipe or any valved section in order to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.
- 4. No pipe installation will be accepted until the leakage is less than the number of gallons per 2 hour period listed below:

Pipe Sizes (inches)	Gal per 1,000 ft of pipe
1-1/2 – 2-1/4	0.2
3	0.3
4	0.4
6	0.6
8	0.8
12	1.1
16	1.5
20	1.9
24	2.2
30	2.8

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

# C. Pressure Recording

1. The Contractor is to provide a connection on his test apparatus for the District to install a pressure recorder during the pressure and leakage tests.

# 3.3. CLEANUP

A. After completing each section of force main, remove all debris and all construction materials and equipment from the work site. Then grade and smooth over the surface on both sides of the main. The entire area shall be clean and left in a condition satisfactory to the District.

# **END OF SECTION**

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#### SECTION 02725

#### **BORING AND CASING FOR SEWER LINES**

#### **PART 1 GENERAL**

- 1.1. The work to be performed hereunder shall consist of the installation of a casing pipe for the purpose of installing a sanitary sewer as shown on the Drawings or as called for in these specifications. It shall include the excavation of a boring pit, auger boring between the points specified on the Drawings, furnishing and installing of the carrier pipe, and disposing of the excavated materials in the manner herein provided.
- 1.2. The District will provide the necessary control points required by the Contractor for this construction. The Contractor will provide the detailed layout required to keep the tunnel or bore on grade.

#### **PART 2 PRODUCTS**

#### 2.1. CASING PIPE

A. The casing pipe shall be of steel meeting the latest approved American Railway Engineering Association "Specifications for Pipelines for Carrying Flammable and Nonflammable Substances." The steel casing pipe shall have minimum yield strength of 35,000 psi and shall have the minimum wall thickness shown in the following table:

#### TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE

(For Highway H20 Loading)

Carrier Pipe (Inches)	Casing Pipe (Inches)	Nominal Thickness (Inches)	Casing Pipe (Inches)	Nominal Thickness (Inches)
2	6	0.250	8	0.250
4	8	0.250	10	0.250
6	12	0.250	14	0.250
8	16	0.250	18	0.281
12	20	0.281	24	0.375
16	24	0.375	30	0.500

(For Railroad E72 Loading)

20	30	0.500	30	0.500
24	36	0.500	36	0.625
30	42	0.500	42	0.625
36	48	0.625	48	0.750
42	54	0.625	54	0.875
48	60	0.750	60	0.875

#### 2.2. CARRIER PIPE

A. The carrier pipe shall be push-on restrained pipe and meet the standards specified in Section 02722 and 02724.

#### PART 3 EXECUTION

#### 3.1. BORING

A. The boring shall be accomplished by means of auguring to the size, line, and grade shown on the Drawings.

#### 3.2. INSTALLATION OF CASING PIPE

- A. Jack the steel casing pipe into place as the boring proceeds. Weld sections of casing pipe together to provide watertight joints.
- B. Do not remove unacceptable casing without prior approval from the District. If the removal of casing pipe is permitted, make proper provisions to prevent caving in of the earth surrounding the casing.

#### 3.3. INSTALLATION OF CARRIER PIPE

A. The carrier pipe(s) shall be furnished by the Contractor. Upon acceptance of the casing, install the carrier pipe in the casing by jacking it through the casing. Spacers shall be used within the casing pipe. Casing Spacers shall be bolt on style with a shell made in two sections of heavy T-304 Stainless Steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner 0.090 inch minimum thickness with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of heavy 304 Stainless Steel. The supports shall be mig welded to the shell and all welds shall be passivated. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least 0.75 inch from the

casing pipe wall at all times. A minimum of three spacers shall be placed on each joint of pipe.

B. Casing spacers shall be made by Cascade Waterworks Mgf. Co., CCI Piping Systems, Pipeline Seal and Insulator, Inc., BWM Company or approved equal. Each end of the casing pipe shall be sealed with a wrap-around neoprene end seal. (See Standard Drawing 1024).

#### 3.4. TUNNELING ALTERNATIVE

#### A. General

In the event boring and jacking is impossible because of pipe size, rock, or other factors
and the highway department or railroad will not permit open cutting, make crossings by
tunneling using liner plates. Conduct tunneling operations as approved by the railroad or
highway department. If voids are caused by the tunneling operations, fill by pressure
grouting or by other approved methods that will provide proper support.

#### B. Galvanized Plates

- 1. After the plates are formed to shape, the plates shall be galvanized on both sides by the hot dip process. A coating of prime western spelter, or equal, shall be applied at the rate of not less than 2 ounces per square foot of double exposed surface. If the average spelter coating as determined from the required samples is less than the amount specified above, or if any 1 specimen shows a deficiency of 0.2 ounce, the lot shall be rejected. Spelter coating shall be of first class commercial quality free from injurious defects such as blisters, flux, and uncoated spots.
- 2. The outside of the plates shall be given a bituminous coating meeting the AASHO M-190 specifications for bituminous protected corrugated metal pipe.

#### C. Design and Construction

- 1. Construct the tunnel by the tunnel method, and completely line on the inside with structural steel liner plates meeting all requirements specified hereinafter. The dimensions of the tunnel shall be as shown on the Drawings.
- 2. The tunneling operation is to commence from a pit that is a minimum of 12 feet long and 4 feet wider than the diameter of the tunnel, bottom to grade, and sheeted and shored, if necessary. Furnish line and grade stakes.
- 3. All excavation for the entire length of the tunnel shall be done by tunneling, and the work may be done from either or both ends of the conduit. Trim the periphery of the tunnel smooth to fit the outside of the steel liner plate as nearly as is practical, and fill all space outside of the steel liner plate with a sand cement grout mixture.
- 4. Install the steel liner plates immediately after the excavated material has been removed. Do not remove material more than 24 inches ahead of the installed liner plates.

Page 3 of 5	
	Boring and Casing for Sewer Lines

- 5. Provide all necessary bracing, bulkheads, and/or shields to ensure complete safety to all traffic at all times during the progress of the work, and perform the work in such a manner as to not interfere with normal traffic over the work.
- 6. The steel lining shall consist of plates 16 inches wide, and each circumferential ring shall be composed of the number and length plates necessary to complete the required diameter.
- 7. The inside diameter of the completed ring shall be a minimum size as called for as a casing pipe in Paragraph 2.1A, and no part of the plate or reinforcing ribs will be allowed to extend inside this net diameter.
- 8. The strength of the tunnel lining will be determined by its section modulus. In no case shall it be less than 0.0590 inch cubed per inch of plate width based on the average for 1 ring of plates. Thickness of the metal for these steel plates shall be not less than 10 gauge, allowing for standard mill tolerances. The tunnel strength shall be equal to AASHO railroad E80 loading at the depth of cover obtaining.
- 9. All plates shall be punched for bolting on both longitudinal and circumferential seams and shall be fabricated so as to permit complete erection from the inside of the tunnel. The longitudinal seam shall be of the lap type with offset equal to gauge of metal for the full width of the plate, including flanges, and shall have staggered bolt construction fabricated so as to allow the cross section of the plate to be continuous through the seam. All plates shall be of uniform fabrication, and those intended for 1 size tunnel shall be interchangeable.
- 10. The material used for the construction of these plates shall be new and unused and suitable for the purpose intended. Workmanship shall be first class in every respect.
- 11. Install the carrier pipe to the line and grade shown on the Drawings. The carrier pipe shall be adequately blocked inside the tunnel so that no part of the carrier pipe touches the tunnel liner. The blocking shall be such that the carrier pipe cannot move horizontally or vertically. The blocking shall be installed within one foot on each side of the bell of the carrier pipe and at the center of each joint. The main portion of the support shall be stainless steel with a PVC liner between the support and the carrier pipe. Detailed plans and specifications shall be submitted showing the proposed bracing and support of the carrier pipe inside the tunnel. Each end of the tunnel liner shall be plugged with brick and mortar.
- 12. All tunnel liners shall have one 2 inch grout coupling in every ring. Grout back of the rings as required.

#### **PART 4 GUARANTEE OF WORK**

4.1. Guarantee a usable completed casing or tunnel between the points specified and to the line and grade specified. The allowable tolerance at the downstream end point of the bore shall be such that the invert of the carrier pipe may be positioned within a vertical area limited on the top by an elevation no higher than the elevation shown on the Drawings and on the bottom by and elevation no lower than the existing inlet pipe invert.

4.2.	4.2. The allowable tolerance at the upstream end point of the bore shall be such that the inve the carrier pipe may be positioned at the elevation shown on the Drawings.							
		END OF SECTION						
		Page 5 of 5						
Sect	ion 02725		Boring and Casing for Sewer Lines					

#### SECTION 03303

#### **CONCRETE FOR UTILITY LINES**

#### **PART 1 GENERAL**

1.1. This item shall include furnishing and installing concrete blocking, cradles, anchors, caps, and/or pipe protection at the locations shown on the drawings and/or as directed by the District.

#### **PART 2 PRODUCTS**

#### 2.1. CONCRETE

- A. Concrete work shall conform to ACI 301-72 (as revised), as modified by the supplemental requirements below:
  - 1. The strength of concrete shall be 4,000 psi unless otherwise shown on the Drawings.
  - 2. All concrete exposed to weather shall be air entrained.
  - 3. Concrete shall be proportional and produced to have a slump of 3 inches with a 1-inch tolerance.

#### 2.2. ADMIXTURES

A. Air entrainment, mandatory for concrete exposed to weather, may be used. A water reducing admixture (retarding, normal, or accelerating, depending on placing temperature), may be used if approved by the District.

#### 2.3. REINFORCING STEEL

A. Yield strength of reinforcing steel shall be 60,000 psi.

#### **PART 3 EXECUTION**

Not Used

**END OF SECTION** 

Page 1 of 1	
	Concrete for Utility Lines

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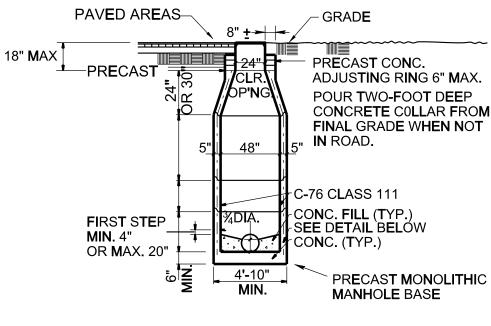
SHEET	DETAIL NAME
101	STANDARD PRECAST CONCRETE MANHOLES
102	STANDARD PRECAST CONCRETE GREASE INTERCEPTORS
103	FLOW METERING MANHOLES
106	DETAIL OF PLASTIC GASKET FOR PRECAST MANHOLE SECTIONS
108	DETAIL OF STANDARD LADDER BARS FOR MANHOLES AND WETWELLS
109	MANHOLE FRAME AND COVER
110	STANDARD DROP MANHOLE
111	CONCRETE CRADLE
112	CONCRETE PROTECTION
120	CONCRETE CAP
127	SANITARY SEWER LATERAL
129	AUTOMATIC AIR RELEASE VALVE MANHOLE
132	STANDARD MANHOLE VENT
135	STANDARD CONNECTION OF FORCE MAIN TO FIBERGLASS MANHOLE
207	TYPICAL VALVE BOX SETTING
208	STANDARD CONCRETE VALVE BOX
221A	CONCRETE THRUST BLOCKING
221B	CONCRETE THRUST BLOCKING DIMENSIONS
701	VALVE BOX AND CLEANOUT AT JUNCTION OF LOW PRESSURE MAIN
702	TYPICAL LOW PRESSURE SERVICE LINE CONNECTION
703	VALVE BOX AND CLEANOUT AT END OF LOW PRESSURE MAIN
704	AUTOMATIC AIR RELEASE ARRANGEMENT ON LOW PRESSURE MAIN
705	VALVE BOX AND CLEANOUT ALONG STRAIGHT RUNS AND AT CHANGES IN
	DIRECTION ON LOW PRESSURE MAIN
709	PRESSURE LINE CONNECTION TO PROPOSED GRAVITY SEWER
710	TYPICAL LOW PRESSURE SEWER CONNECTION TO MANHOLE
711	STANDARD CONTROL PANEL DETAIL
712A	TYPICAL GRINDER PUMP INSTALLATION
712B	TYPICAL GRINDER PUMP INSTALLATION
712C	TYPICAL GRINDER PUMP INSTALLATION
713	TYPICAL SIMPLEX GRINDER PUMP
805	ALUMINUM FENCE DETAIL
1024	CASING SPACER INSTALLATION DETAIL

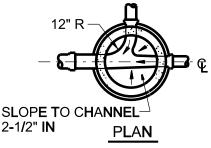
JOB NO. SEWER DETAIL INDEX
1 OF 1

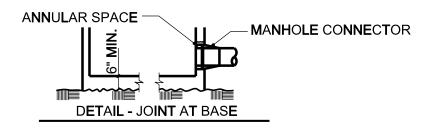
DETAIL NO.

#### **GENERAL NOTES:**

- 1. ALL MATERIALS, DESIGN, MANUFACTURE, PHYSICAL TEST REQUIREMENTS, FINISH, MARKING, INSPECTION, REJECTION AND REPAIRS TO MEET ASTM C478 FOR PRECAST REINFORCED CONCRETE MANHOLE RISERS AND TOPS EXCEPT AS MAY BE MODIFIED IN THESE SPECIFICATIONS.
- SEE STANDARD DRAWINGS FOR ADDITIONAL DETAILS.
- 3. SIZE AND LOCATE PIPE CUTOUTS AS REQUIRED.
- 4. GROUT ANNULAR SPACE AROUND PIPE INSIDE MANHOLE WITH NON-SHRINK GROUT.
- 5. INVERT OF CHANNEL TO SLOPE ACROSS MANHOLE FROM INVERT OF OUTLET TO INVERT OF EACH INLET.







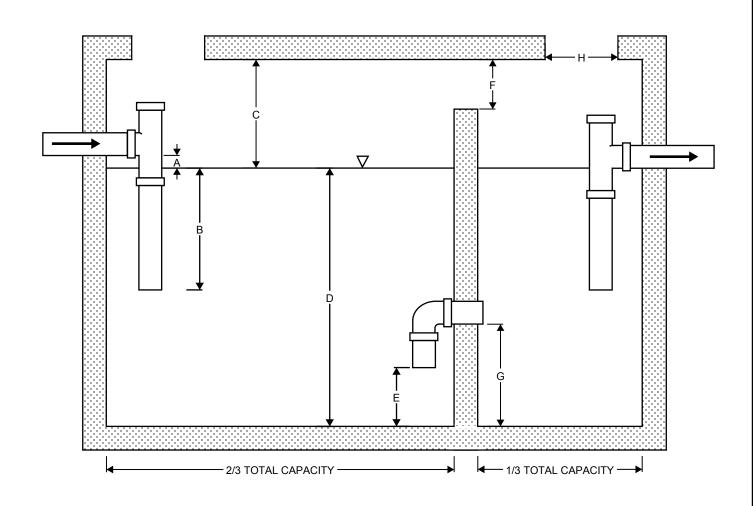
### HARPETH VALLEY UTILITIES DISTRICT

DA**TE**: FEB 2017

JOB **N**O.

STANDARD PRECAST CONCRETE MANHOLES
N.T.S.

D**ET**A**IL N**O.



#### **GENERAL NOTES & DIMENSIONS:**

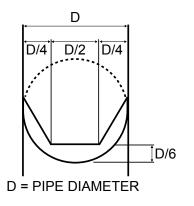
- A) 2-IN MINIMUM, 4-IN MAXIMUM FROM THE WATER LEVEL TO INLET INVERT
- B) 2/3 DEPTH OF WATER LEVEL
- C) 9-IN MINIMUM FROM CEILING TO WATER LEVEL
- D) 42-IN MINIMUM, 72-IN MAXIMUM FROM FLOOR TO WATER LEVEL
- E) 12-IN MINIMUM FROM FLOOR TO END OF 90 DEGREE BEND/BAFFLE WALL PIPING
- F) 1-IN MINIMUM, 6-IN MAXIMUM FROM CEILING
- G) 20-IN MINIMUM, 24-IN MAXIMUM FROM FLOOR TO BAFFLE WALL HOLE/PIPING INVERT
- H) 24-IN RAW OPENINGS

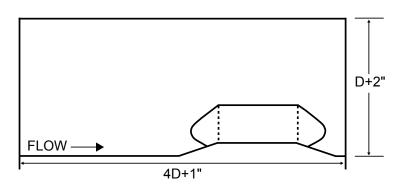
### HARPETH VALLEY UTILITIES DISTRICT

DA**TE**: MAY 2021

JOB **N**O.

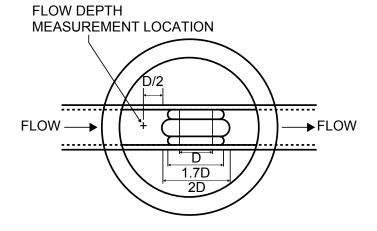
STANDARD PRECAST CONCRETE GREASE INTERCEPTORS
N.T.S.





### PALMER-BOWLUS FLUME

UPSTREAM PIPE	MAX ALLOWABLE
DIAMETER (IN)	UPSTREAM SLOPE
6	2.2 %
8	2.0 %
10	1.8 %
12	1.6 %
15	1.5 %



# UPSTREAM PIPE SLOPE NOTES:

### MANHOLE TOP VIEW

- 1. FLOW METERING MANHOLE SHALL BE FIBERGLASS MANUFACTURED BY LFM, TRACOM, OR APPROVED EQUAL AND SHALL CONFORM TO ALL APPLICABLE REQUIREMENTS OF SECTION 02600.
- 2. FLUME SHALL BE A FIBERGLASS REINFORCED PALMER-BOWLUS FLUME WITH INTEGRAL APPROACH SECTION AFFIXED TO MANHOLE BENCH AT THE FACTORY WITH RESIN-GLASS REINFORCED JOINT RESULTING IN A ONE PIECE UNIT. SEAMS SHALL BE FIBERGLASSED USING THE SAME GLASS-RESIN JOINTING PROCEDURE.
- 3. MAXIMUM UPSTREAM PIPE SLOPE SHALL BE PER TABLE ABOVE. DOWNSTREAM PIPE SLOPE SHALL BE EQUAL TO OR GREATER THAN THE UPSTREAM SLOPE.
- 4. UPSTREAM AND DOWNSTREAM PIPE SHALL CONNECT WITH METERING MANHOLE AT 180 DEGREE STRAIGHT ANGLE AS SHOWN ABOVE IN MH TOP VIEW.
- 5. THE FLUME SHALL BE LEVEL FROM FRONT-TO-BACK AND FROM SIDE-TO-SIDE AND CENTERED IN THE FLOW STREAM.

### HARPETH VALLEY UTILITIES DISTRICT

DATE: JULY 2025

JOB **N**O.

FLOW METERING MANHOLES

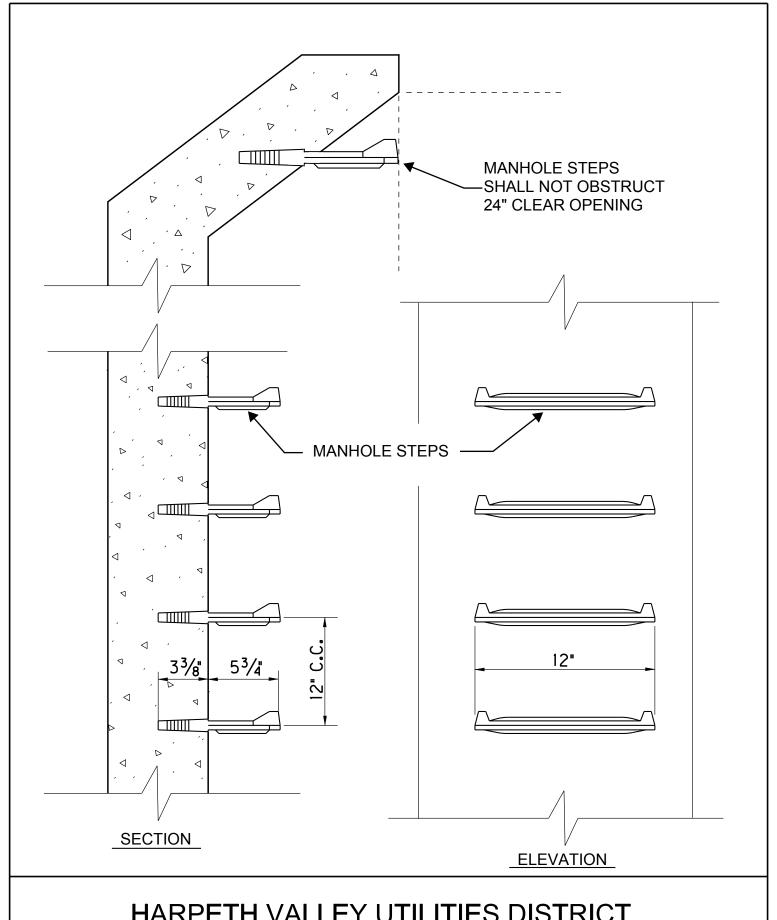
### NOTES: 1.) WHERE MASTIC DOES NOT PROTRUDE EITHER INSIDE OR OUTSIDE, POINT UP JOINT WITH GROUT. 2.) TRIM PROTRUDING MASTIC ON THE INSIDE OF THE MANHOLE AND COVER JOINT WITH MORTAR GROUT. PRECAST MANHOLE SECTIONS -TONGUE PRIMER PRIMER-◁ TONGUE **PROTECTIVE** PAPER WRAPPER **PRIMER** PREFORMED -PLASTIC GASKET PLACED BEFORE INSTALLATION **INSIDE** WALL OF PRIMER -MANHOLE "SQUEEZE-OUT"-GROOVE ▶ GROOVE PERMITTING VISUAL INSPECTION OF GASKET ◁ ◁ **OPEN JOINT CLOSED JOINT**

### HARPETH VALLEY UTILITIES DISTRICT

DATE: APRIL 2011

JOB **N**O.

DETAIL OF PLASTIC GASKET FOR PRECAST MANHOLE SECTIONS
N.T.S.

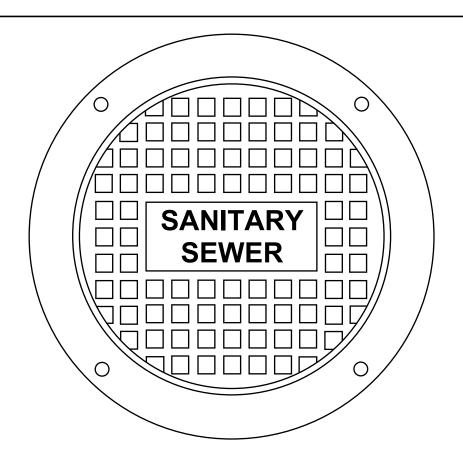


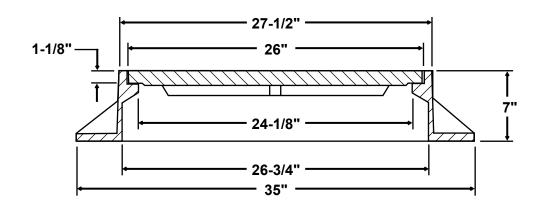
DATE: FEB 2017

JOB **N**O.

DETAIL OF STANDARD LADDER BARS MANHOLES AND WETWELLS N.T.S.

DETAIL NO. 108





### **NOTES FOR WATERTIGHT:**

- 1. WATERTIGHT FRAMES SHALL BE FURNISHED WITH GASKET IN FRAME.
- 2. COVER SHALL HAVE 4 BOLT HOLES FURNISHED WITH 4 1/2" X 2" BOLTS AND WASHERS

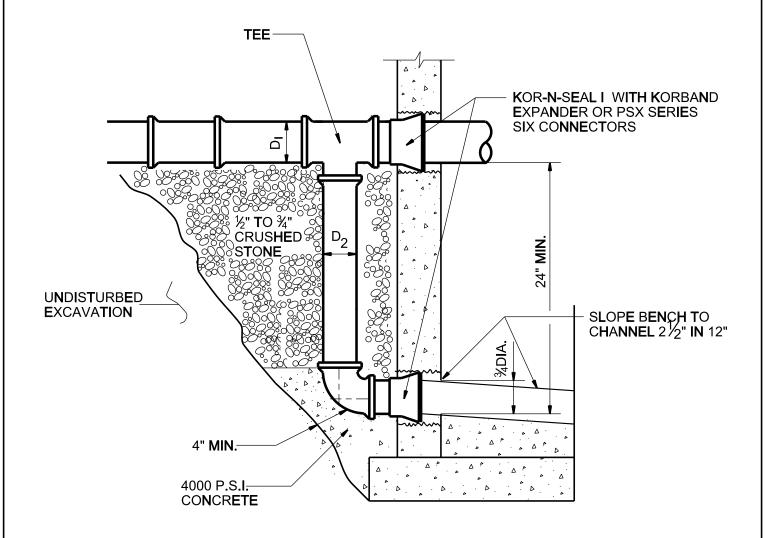
### HARPETH VALLEY UTILITIES DISTRICT

DATE: APRIL 2022

JOB **N**O.

MANHOLE FRAME AND COVER N.T.S.

- 1. SET INLET INVERT FROM DROP TO MATCH CROWNS WITH OUTLET EXCEPT THAT MINIMUM FALL ACROSS M.H. INVERT MUST BE 3".
- 2. FOR DETAILS NOT SHOWN SEE STANDARD MANHOLE DETAIL 101.



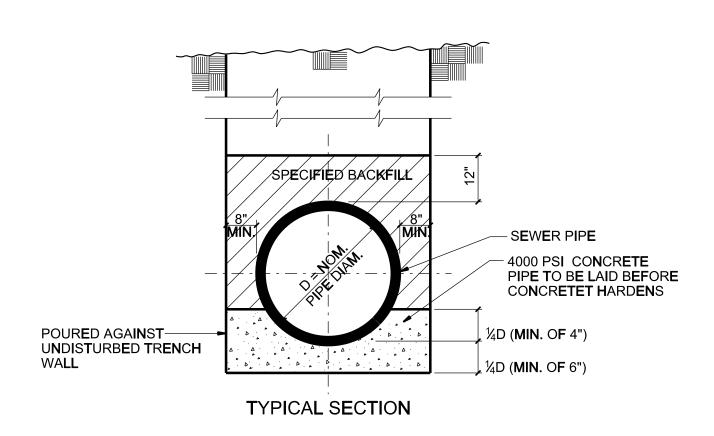
D <sub>I</sub>	$D_2$
8"	8"
10"	8"
12"	10"
15"	12"

DATE: APRIL 2011

ЈОВ **N**O.

STANDARD DROP MANHOLE

D**ET**A**IL N**O.



NOTE: CONCRETE TO BE POURED 16 HOURS BEFORE BACKFILL IS PLACED AND IN SUCH A MANNER AS TO PREVENT THE PIPE FROM FLOATING

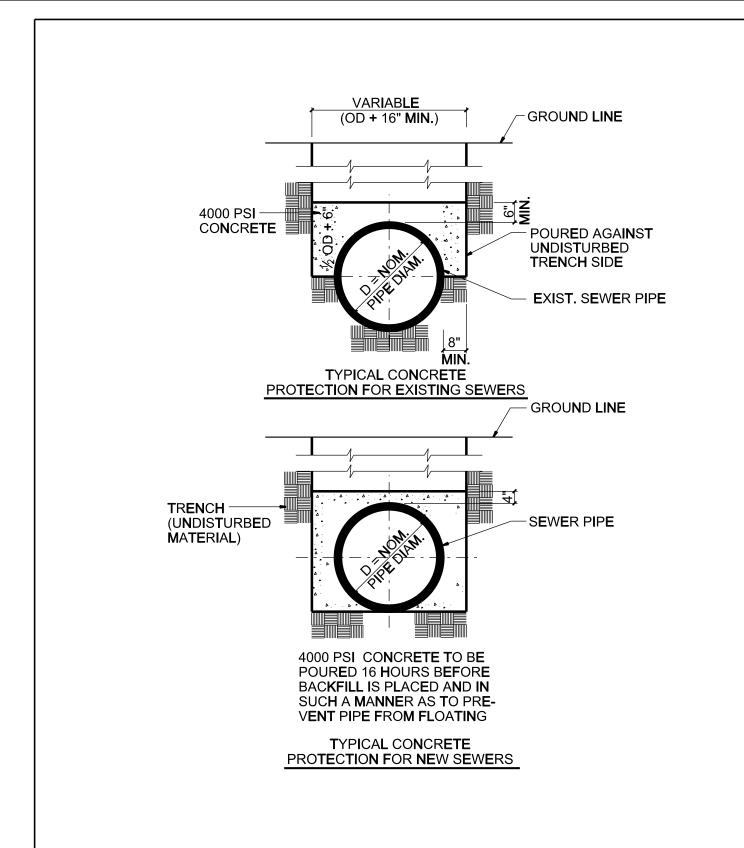
### HARPETH VALLEY UTILITIES DISTRICT

DATE: APRIL 2011

JOB **N**O.

CONCRETE CRADLE N.T.S.

DETAIL NO.

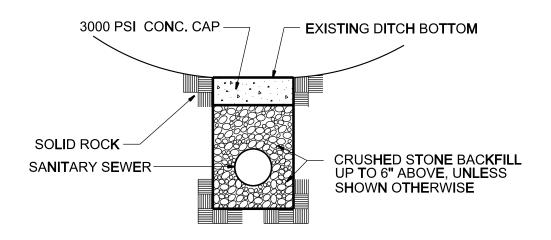


DATE: APRIL 2011

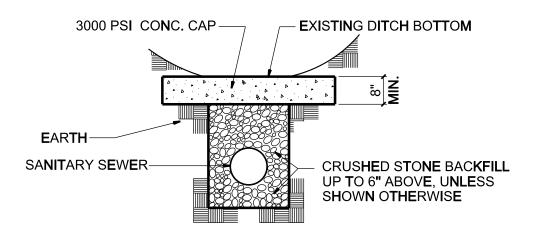
JOB **N**O.

CONCRETE PROTECTION N.T.S.

DETAIL NO.



### ROCK EXCAVATION



## EARTH EXCAVATION

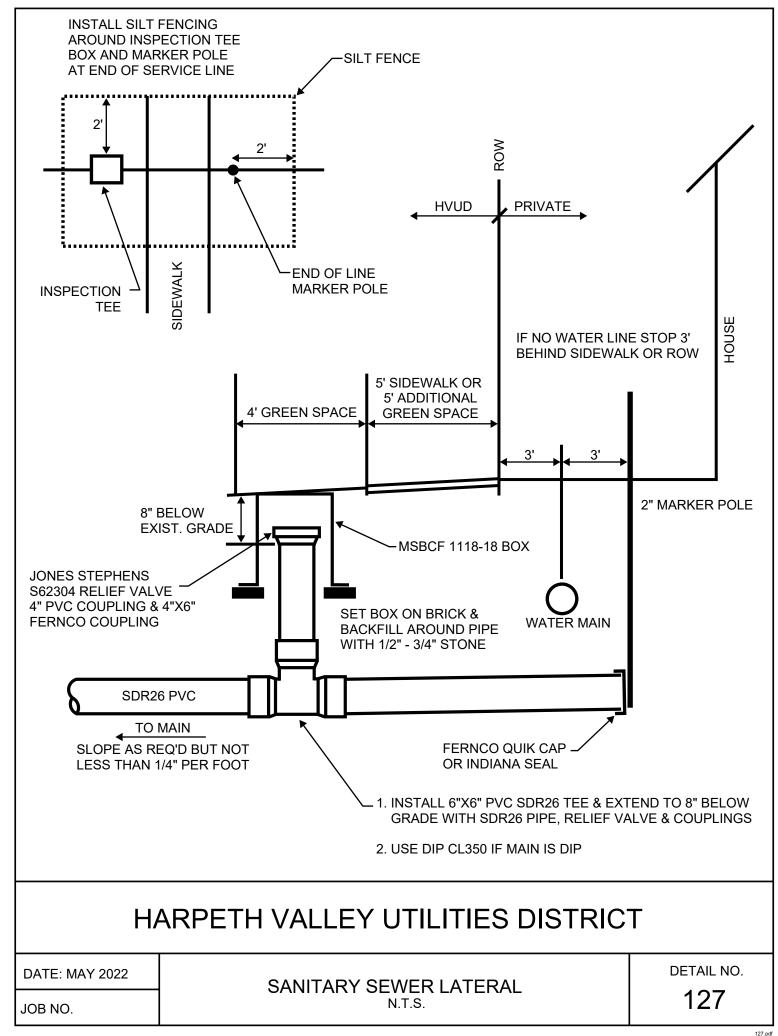
### HARPETH VALLEY UTILITIES DISTRICT

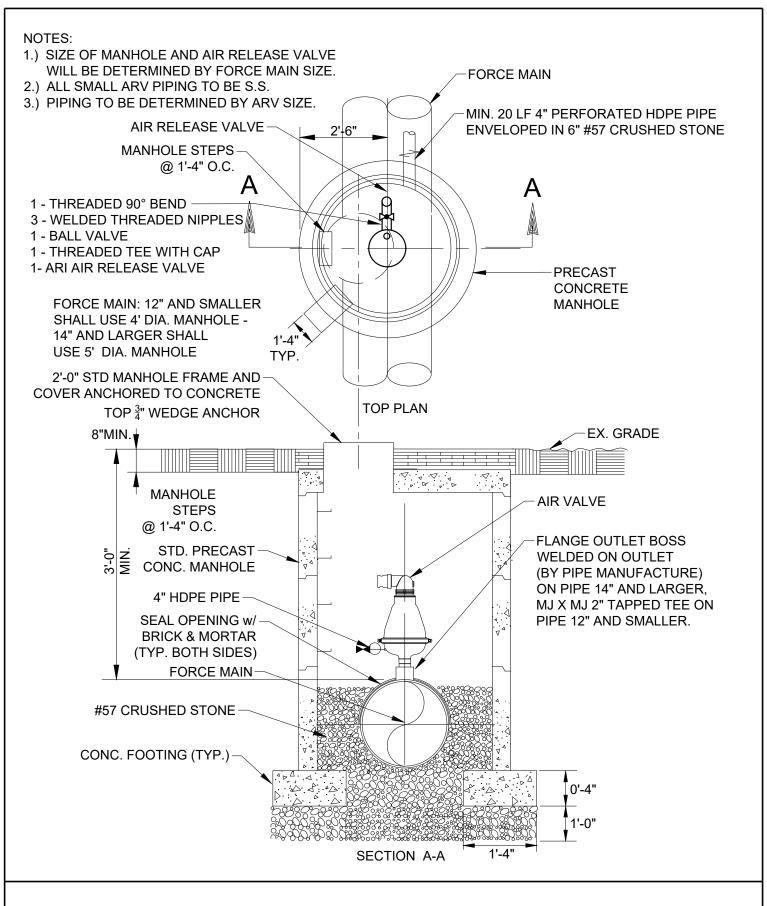
DA**TE**: APR**IL** 2011

JOB **N**O.

CONCRETE CAP

DETAIL NO.



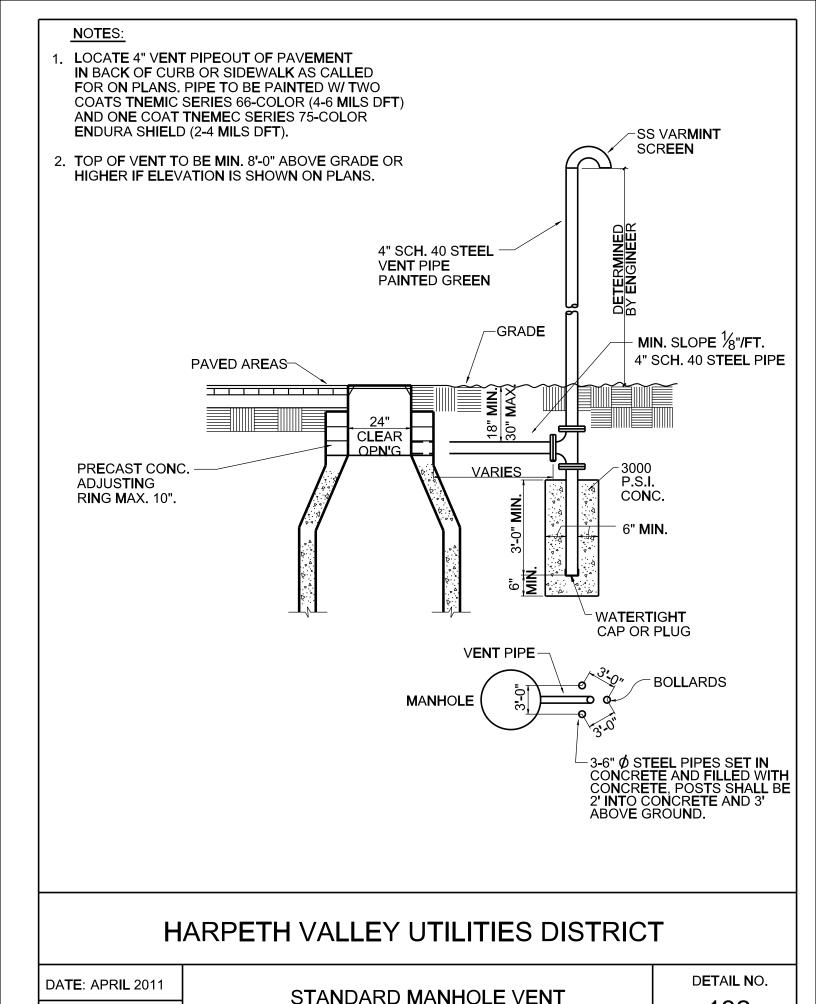


DA**TE**: APRIL 2022

JOB **N**O.

AUTOMATIC AIR RELEASE VALVE MANHOLE N.T.S.

DETAIL NO.



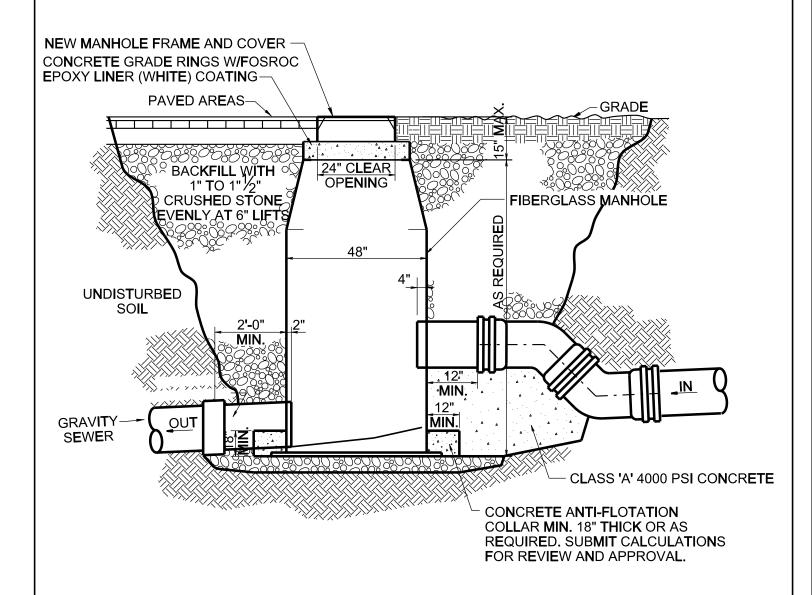
N.T.S.

JOB NO.

hwud\_stan\_mh\_went.dgn

#### NOTES

- 1.
- TRANSITION SECTIONS MAY BE USED TO DECREASE THE DIAMETER OF MANHOLES. NEW FIBERGLASS MANHOLES TO BE 1/2" WALL THICKNESS MINIMUM. 2" WALL THICKNESS MINIMUM. 2.
- STUB-OUTS FOR FRP AND PVC PIPES SHALL BE LIKE MATERIAL. 3. STUB-OUTS FOR D.I.P. SHALL BE C-900 PVC DR 14.
- STUB-OUTS TO BE FABRICATED INTERGRALLY TO THE MANHOLE BY MANUFACTURERS.
- INVERT OF CHANNEL TO SLOPE ACROSS MANHOLE FROM INVERT OF OUTLET TO INVERT OF EACH INLET. 5.
- CONTRACTOR TO SUBMIT DETAILED DRAWINGS FOR REVIEW AND APPROVAL OF ALL MANHOLES. 6.
- WHERE CAPS ARE CALLED FOR. THE CAP SHALL BE OF DUCTILE IRON.



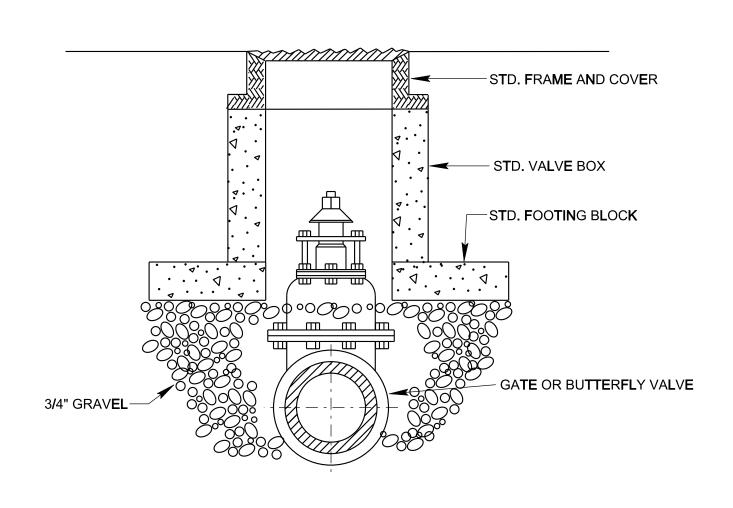
### HARPETH VALLEY UTILITIES DISTRICT

DATE: APRIL 2011

JOB NO.

STANDARD CONNECTION OF FORCE MAIN TO FIBERGLASS MANHOLE N.T.S.

DETAIL NO.

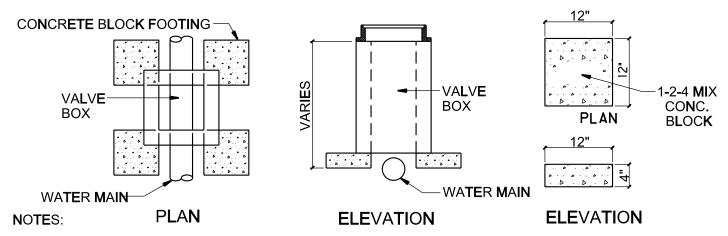


DATE: APRIL 2011

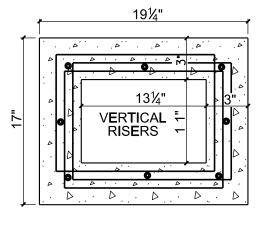
JOB **N**O.

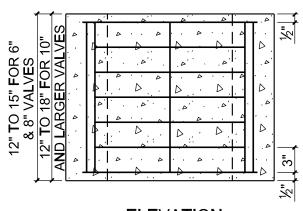
TYPICAL VALVE BOX SETTING N.T.S.

DETAIL NO.



- 1. FOUR (4) CONCRETE BLOCKS OF THE SIZE AND SHAPE SHOWN ARE TO BE PLACED UNDER EACH VALVE BOX, ONE UNDER EACH CORNER OF BOX.
- 2. NO REINFORCING IN FOOTING. CONCRETE MIX 1 PART CEMENT, 2 PARTS SAND AND 4 PARTS NO. 2 CRUSHED STONE OR GRAVEL. VOLUME FOR ONE BLOCK = 0.333 CU. FT. WEIGHT OF ONE BLOCK = APPROX. 50 LBS. FOR ALL FOUR BLOCK, WEIGHT = 200 LBS. BEARING AREA ON SOIL = 576 SQ. IN.





#### NOTES:

### **PLAN**

#### **ELEVATION**

- 1. REINFORCING TO BE 1/4" STEEL REINFORCING RODS PLACED HORIZONTALLY IN SQUARES 161/4" x 14" AND TO BE STAGGERED APPROX. AS SHOWN ON PLAN VIEW, ONE FOR EVERY 3" OF HEIGHT OF BOX. VERTICAL RISERS ARE TO BE 2" SHORTER THAN THE HEIGHT OF THE BOX AND SHALL BE PLACED IN EACH CORNER AND AT THE HALF WAY POINT OF EACH SIDE OF THE BOX USING 8 RISERS TO THE BOX. TOTAL LENGTH OF REINFORCING ROD FOR BOX APPROX. 47'.
- 2. CONCRETE MIXTURE TO BE 1 PART CEMENT, 2 PARTS SAND AND 4 PARTS NO. 2 CRUSHED STONE OR GRAVEL. TOTAL VOLUME OF MIXTURE FOR BOX APPROX. 2 CUBIC FT.

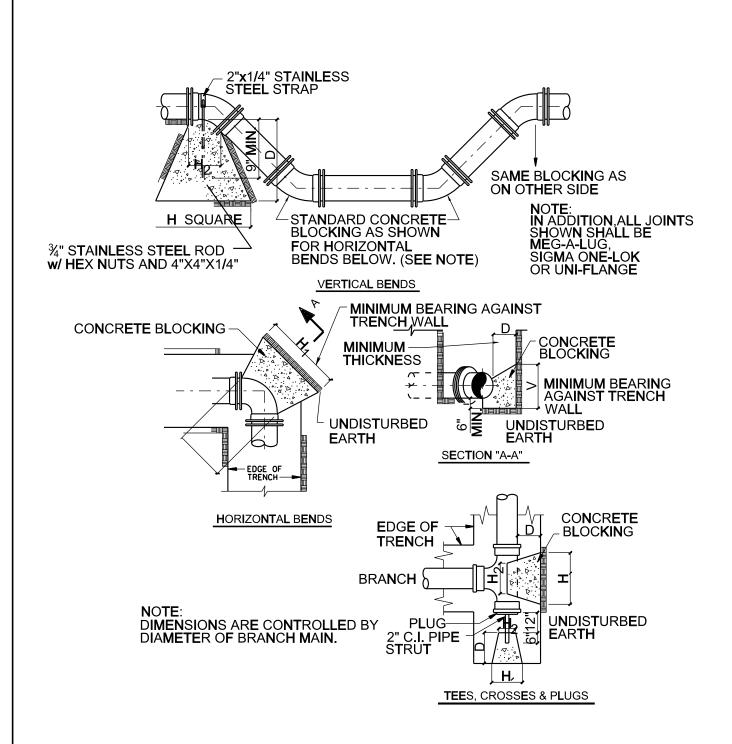
### HARPETH VALLEY UTILITIES DISTRICT

DATE: APRIL 2011

JOB **N**O.

STANDARD CONCRETE VALVE BOX

DETAIL NO.



DATE: APRIL 2011

JOB **N**O.

CONCRETE THRUST BLOCKING N.T.S.

DETAIL NO.

221A

	TABLE OF DIMENSIONS FOR CONCRETE BLOCKING																									
SIZE	TE &	ES CR	S,PI	UC SE	SS S	90° B <b>EN</b> DS				45° B <b>EN</b> DS				22½° B <b>EN</b> DS					1	SIZE						
PIPE	H <sub>1</sub>	$H_{2}$	>	ם	CU. FT.	H <sub>1</sub>	H <sub>2</sub>	>	О	öF	H₁	H <sub>2</sub>	٧	D	öF	H₁	$H_{2}$	>	О	ЗÉ	Η̈́	H <sub>2</sub>	٧	D	CU. FT.	P <b>I</b> P <b>E</b>
2"&2¼"	18"	10"	12"	18"	1.9	18"	10"	12"	18"	1.9	18"	6"	12"	18"	1.5	18"	6"	12"	18"	1.5	18"	6"	12"	18"	1.5	2"&2¼"
3"&4"	24"	12"	12"	18"	2.3	24"	12"	12"	18"	2.3	18"	8"	12"	18"	1.6	18"	8"	12"	18"	1 <b>.</b> 6	18"	8"	12"	18"	1.6	3"&4"
6"	24"	16"	18"	18"	3.5	30"	16"	18"	18"	4.1	24"	10"	16"	18"	3.2	24"	10"	16"	18"	3.2	24"	10"	16"	18"	3.2	6"
8"	36"	18"	18"	18"	5.1	39"	18"	24"	18"	7.3	30"	1 1"	18"	18"	4.0	24"	1 1"	18"	18"	3.5	24"	1 1"	16"	18"	3.4	8"
10"	48"	24"	18"	24"	7.2	54"	32"	24"	18"	10.3	24"	18"	21"	18"	4.6	24"	18"	21"	18"	4.6	24"	18"	21"	18"	4.6	10"
12"	54"	30"	24"	24"	13.4	54"	32"	36"	24"	18 <b>.</b> 2	42"	18"	24"	24"	9.6	24"	18"	24"	24"	6.6	24"	18"	21"	24"	6.1	12"
14"	60"	32"	30"	24"	17.9	60"	40"	42"	24"	25.0	44"	24"	30"	24"	13.2	30"	24"	24"	24"	9.2	27"	21"	24"	24"	7.9	14"
16"	66"	34"	36"	24"	22.5	69"	48"	48"	24"	29.0	48"	30"	36"	24"	17.0	36"	30"	27"	24"	1 1.8	27"	24"	27"	24"	9.1	16"
18"	72"	36"	40"	24"	30.0	72"	48"	60"	24"	38.0	54"	30"	42"	24"	21.0	42"	30"	30"	24"	15.0	30"	30"	36"	24"	13.0	18"
20"	84"	38"	42"	24"	36.0	84"	48"	66"	24"	48.0	60"	40"	46"	24"	27.0	48"	36"	36"	24"	19.0	42"	40"	36"	24"	18.0	20"
24"	108"	42"	48"	24"	45 <b>.</b> 0	108"	60"	72"	24"	68.0	72"	48"	56"	24"	41.0	54"	42"	42"	24"	25.0	48"	42"	42"	24"	23.0	24"
30"	132"	52"	60"	24"	70.0	132"	72"	92"	24"	104.0	84"	48"	76"	24"	58.0	60"	48"	48"	24"	32.0	52"	48"	54"	24"	32.0	30"
36"	162"	58"	72"	24"	100.0	162"	72"	108"	24"	150.0	108"	60"	84"	24"	85.0	66"	48"	60"	24"	50.0	36"	48"	60"	24"	40.0	36"
42"	166'	60"	84"	36"	168.4	190"	66"	108"	36"	190	122"	60"	84"	24"	90"	72"	48"	72"	24"	56.0	56"	48"	66"	24"	44.0	42"
48"	172"	66"	96"	36"	200.0	220'	72"	120"	36"	230	136"	60"	90"	24"	98"	78"	48"	84"	24"	66.0	60"	48"	72"	24"	50.0	48"

- 1. THIS TABLE IS BASED ON AN INTERNAL HYDROSTATIC PRESSURE OF 200 PSI AND AN ALLOWABLE SOIL BEARING CAPACITY OF 4000 LB/SF.
- 2. SHOULD THE INTERNAL HYDROSTATIC PRESSURE EXCEED 200 PSI AND/OR THE ALLOWABLE SOIL BEARING CAPACITY BE LESS THAN 4000 LB/SF, THE THRUST BLOCK SIZE MUST BE ENLARGED ACCORDINGLY. IF EITHER OR BOTH OF THESE CONDITIONS OCCUR, THE CONTRACTOR SHALL PROVIDE CALCULATIONS TO SUPPORT THE ENLARGED SIZE THRUST BLOCK PROPOSED.
- 3. DIMENSIONS FOR CONCRETE BLOCKING ARE FOR DUCTILE IRON FITTINGS ANSI 21.10/AWWA C110
- 4. ALL BENDS, TEES, CROSSES, AND PLUGS SHALL HAVE CONCRETE THRUST BLOCKING INSTALLED AS SHOWN ON THE STANDARD DRAWING 221-A OR AS DIRECTED BY THE A/E.

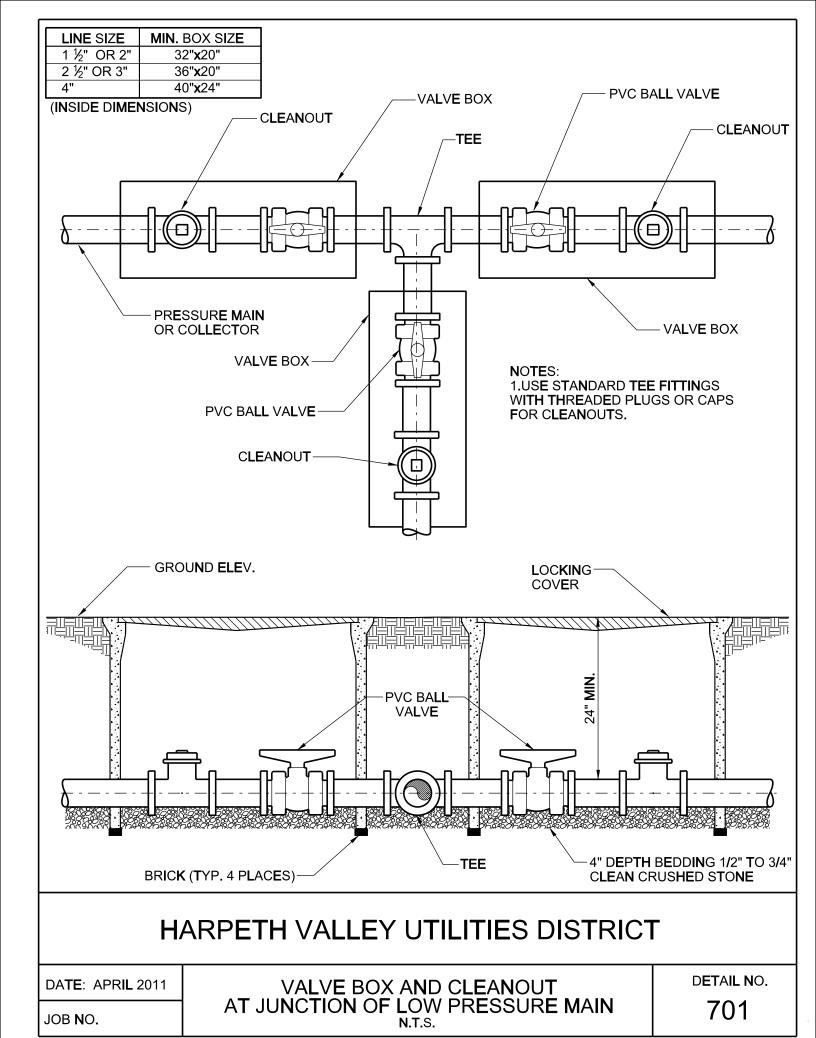
DA**TE**: APR**IL** 2011

JOB NO.

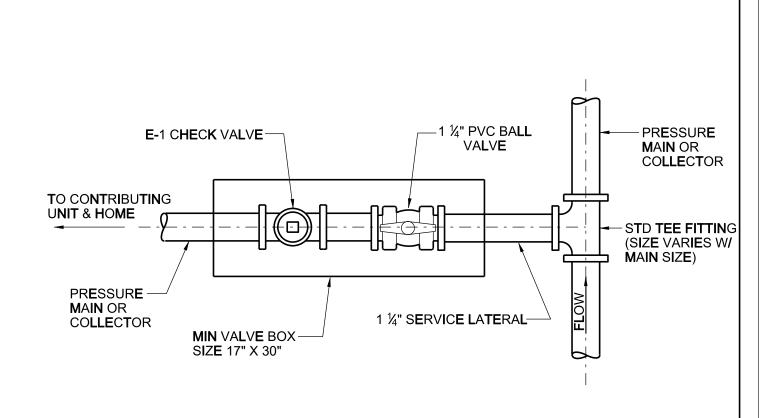
CONCRETE THRUST BLOCKING DIMENSIONS

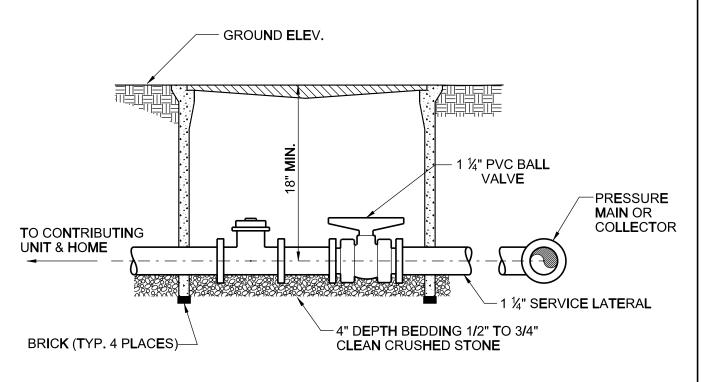
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221B



701,pdf

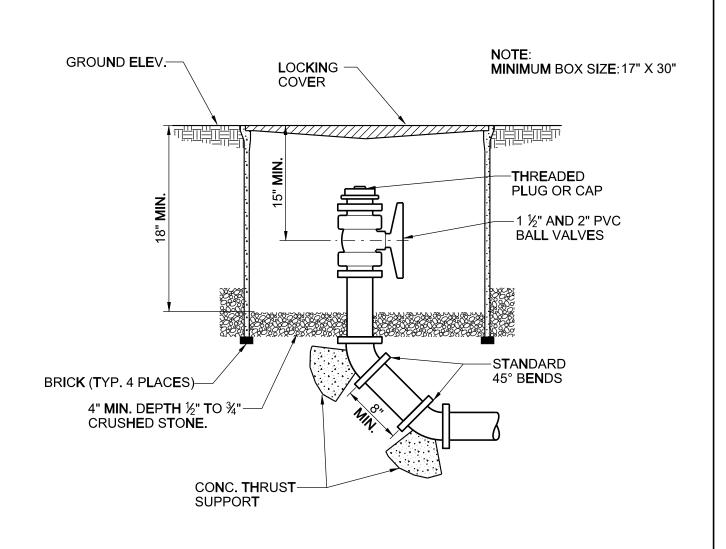




**DATE**: MAY 2022

JOB **N**O.

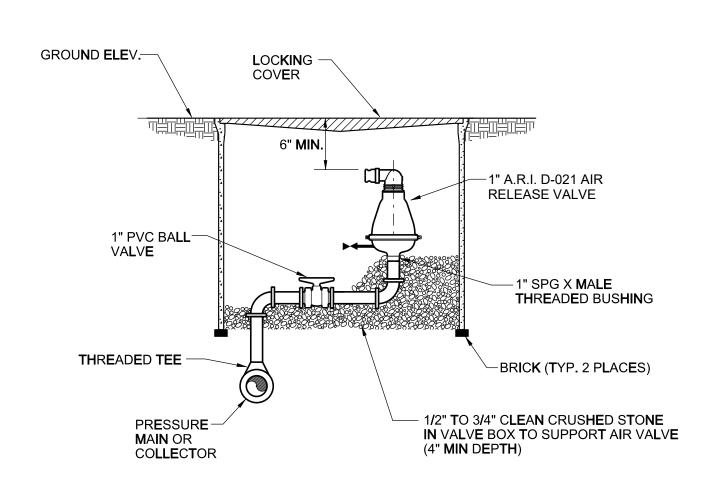
TYPICAL LOW PRESSURE SERVICE LINE CONNECTION N.T.S.



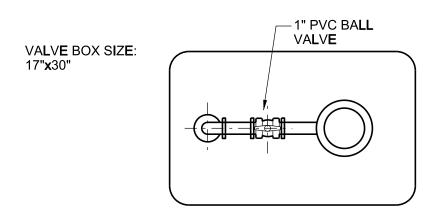
**DATE**: MAY 2022

JOB **N**O.

VALVE BOX AND CLEANOUT AT END OF LOW PRESSURE MAIN N.T.S.



### SIDE VIEW



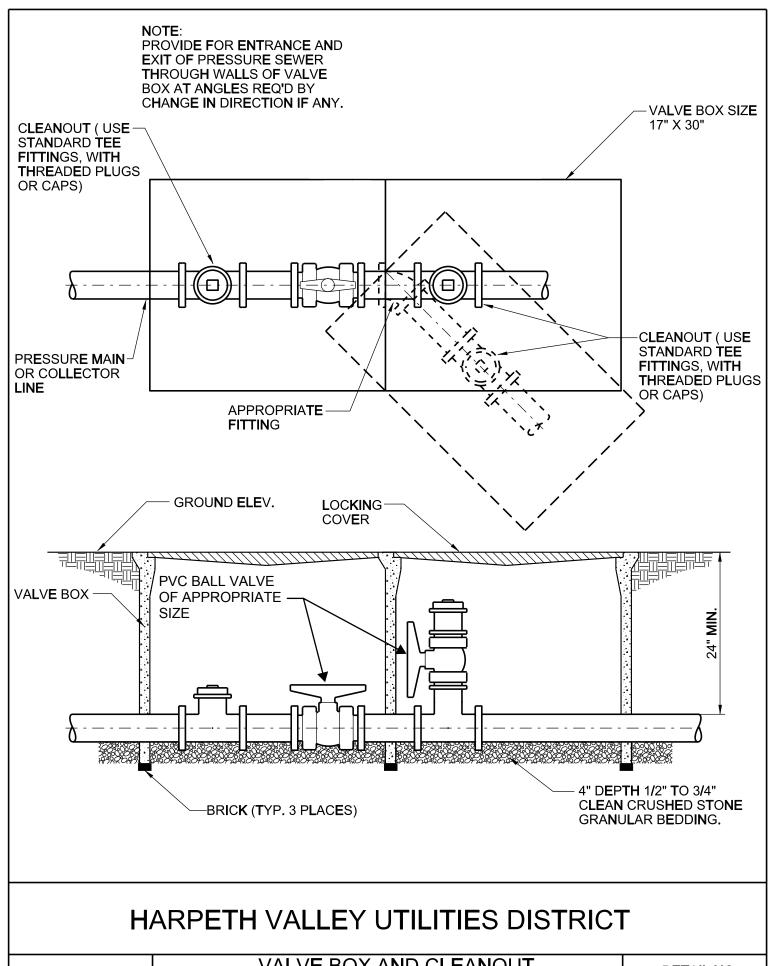
### **PLAN VIEW**

### HARPETH VALLEY UTILITIES DISTRICT

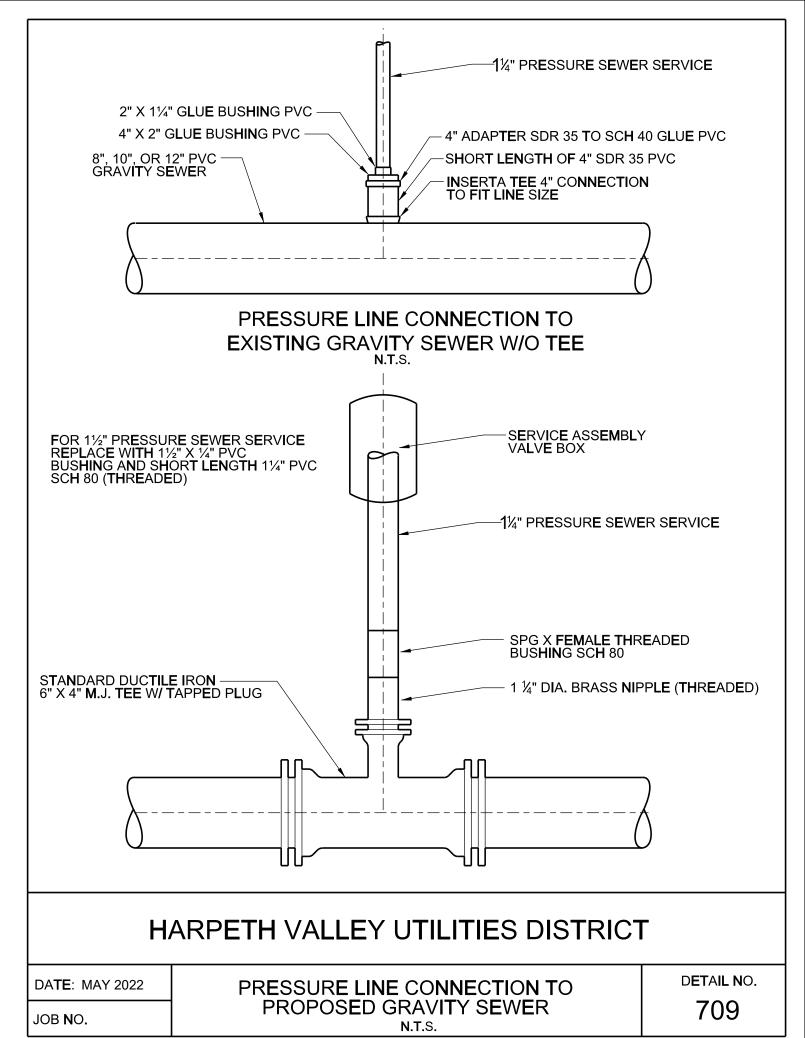
**DATE**: MAY 2022

JOB **N**O.

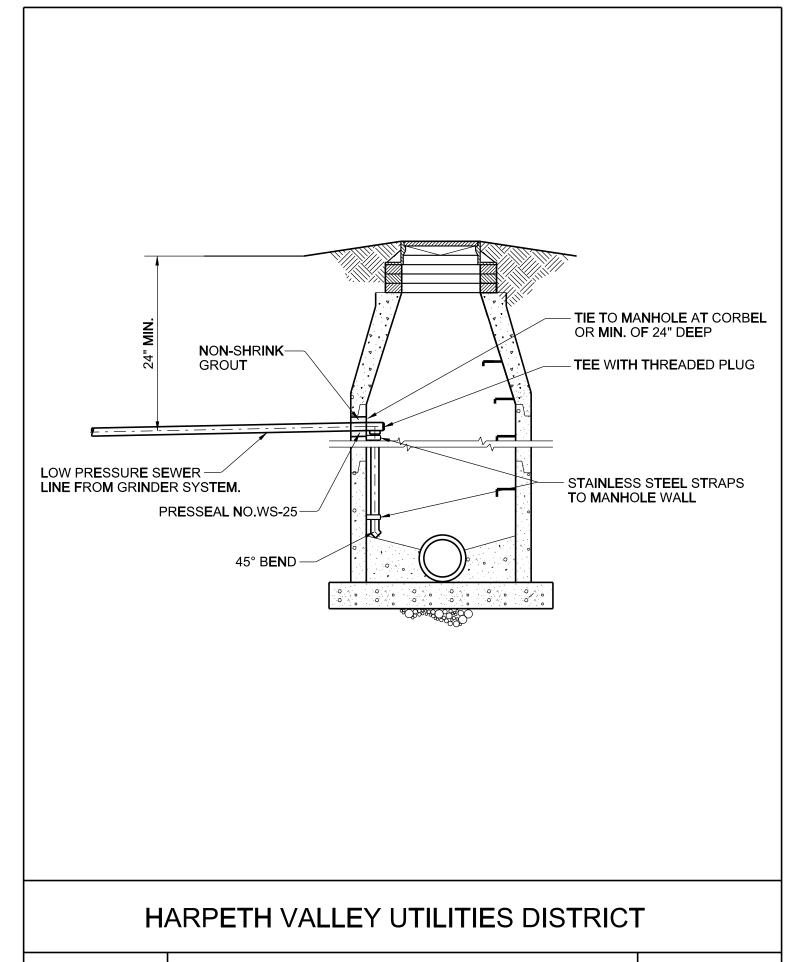
AUTOMATIC AIR RELEASE ARRANGEMENT ON LOW PRESSURE MAIN N.T.S.



DA**TE**: FEB 2017 JOB **N**O. VALVE BOX AND CLEANOUT ALONG STRAIGHT RUNS AND AT CHANGES IN DIRECTION ON LOW PRESSURE MAIN N.T.S.



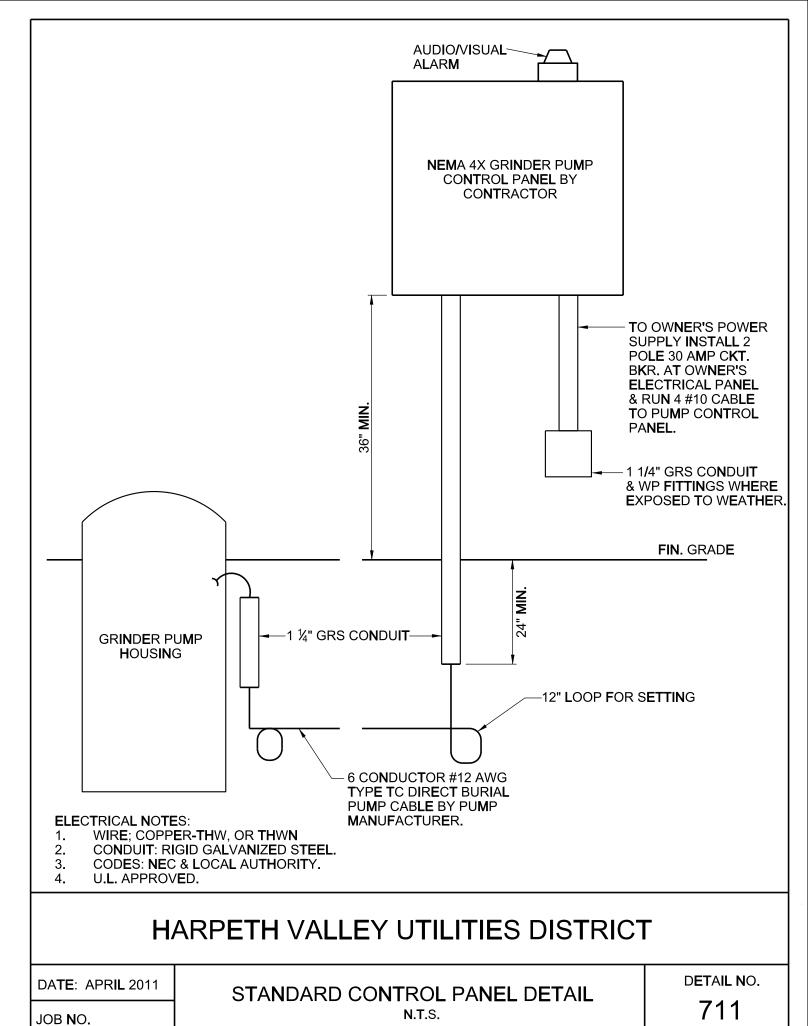
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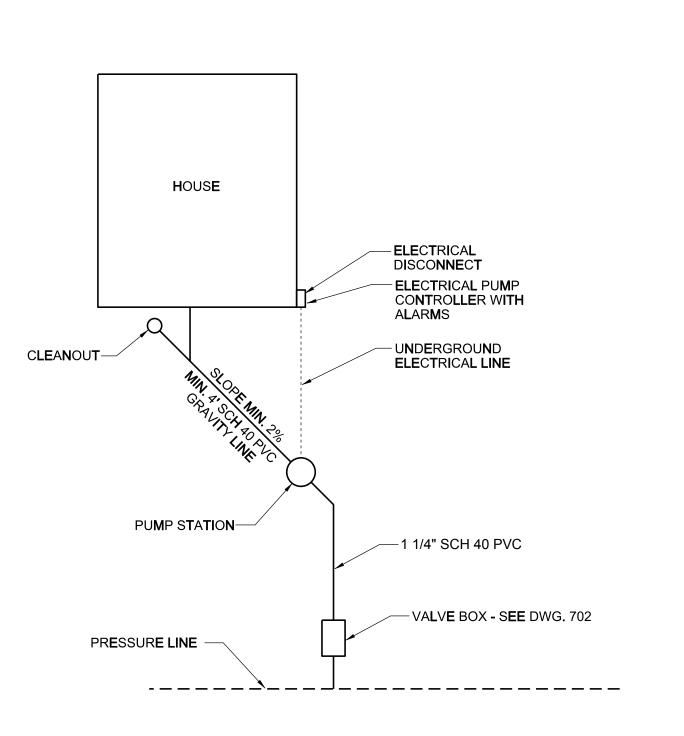


DA**TE**: FEB 2017

JOB **N**O.

TYPICAL LOW PRESSURE SEWER CONNECTION TO MANHOLE N.T.S.





#### NOTES:

- 1.) SEE DRAWING 711 FOR ELECTRICAL REQUIREMENTS
- 2.) BUILDING SEWER TO MEET REQUIREMENTS OF METRO CODES DEPARTMENT OR WILLIAMSON COUNTY CODES

### HARPETH VALLEY UTILITIES DISTRICT

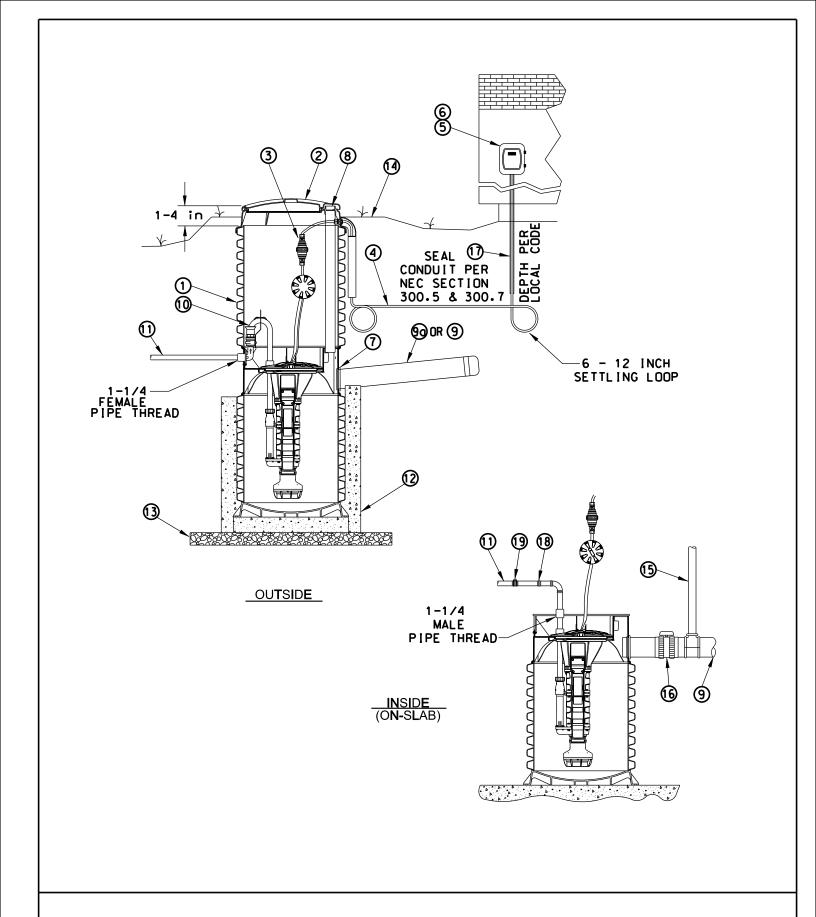
DATE: APRIL 2017

JOB **N**O.

TYPICAL GRINDER PUMP INSTALLATION N.T.S.

D**ET**A**IL N**O.

712A



DATE: APRIL 2011

JOB **N**O.

TYPICAL GRINDER PUMP INSTALLATION  $_{\rm N.T.S.}$ 

D**ET**A**IL N**O.

712B

#### GRINDER PUMP FEATURE IDENTIFICATION

- 1. GRINDER PUMP BASIN High density polyethylene (HDPE).
- 2. ACCESSWAY COVER FRP
- 3. ELECTRICAL QUICK DISCONNECT (EQD) Cable from pump core terminates here.
- 4. POWER AND ALARM CABLE Circuits to be installed in accordance with local codes.
- ALARM PANEL NEMA 4X enclosure. Equipped with circuit breakers. Locate according to local codes.
- 6. ALARM DEVICE Every installation is to have an alarm device to alert the homeowner of a potential malfunction. Visual devices should be placed in very conspicuous locations.
- 7. INLET- EPDM grommet (4.5" ID). For 4.5" OD DWV pipe.
- 8. WET WELL VENT 2.0" tank vent, supplied by factory in units with accessways.
- 9. GRAVITY SERVICE LINE 4" DWV, (4.5" OD). Supplied by others.
- 9a. STUB-OUT 4" x 5' long watertight stub-out, to be installed at time of burial unless the gravity service line is connected during installation. Supplied by others.
- 10. DISCHARGE VALVE 1-1/4" female pipe thread.
- 11. DISCHARGE LINE 1-1/4" nominal pipe size. Supplied by others.
- 12. CONCRETE ANCHOR See Ballast Calculations for specific weight for station height. supplied by others.
- 13. BEDDING MATERIAL 6" minimum depth, round aggregate, (gravel). Supplied by others.
- 14. FINISHED GRADE Grade line to be 1" to 4" below removable lid and slope away from the station.
- 15. **VENT I**ndoor installation. See section 6, **V**enting, on page 6.
- 16. VALVE Full ported ball valve. Recommended option; for use during service operations. supplied by others.
- 17. CONDUIT 1" or 1-1/4", material and burial depth as required per National and local codes. conduit must enter panel from bottom and be sealed per NEC Section 300.5 and 300.7. supplied by others.
- 18. UNION 1-1/4" or compression type coupling. Supplied by others. (Do not use rubber sleeve and hose clamp type coupling).
- 19. VALVE Ball valve must provide a full-ported 1-1/4" round passage when open. Supplied by others.
- 20. REBAR Required to lift tank after ballast (concrete anchor) has been attached, 4 places, evenly spaced around tank.

### HARPETH VALLEY UTILITIES DISTRICT

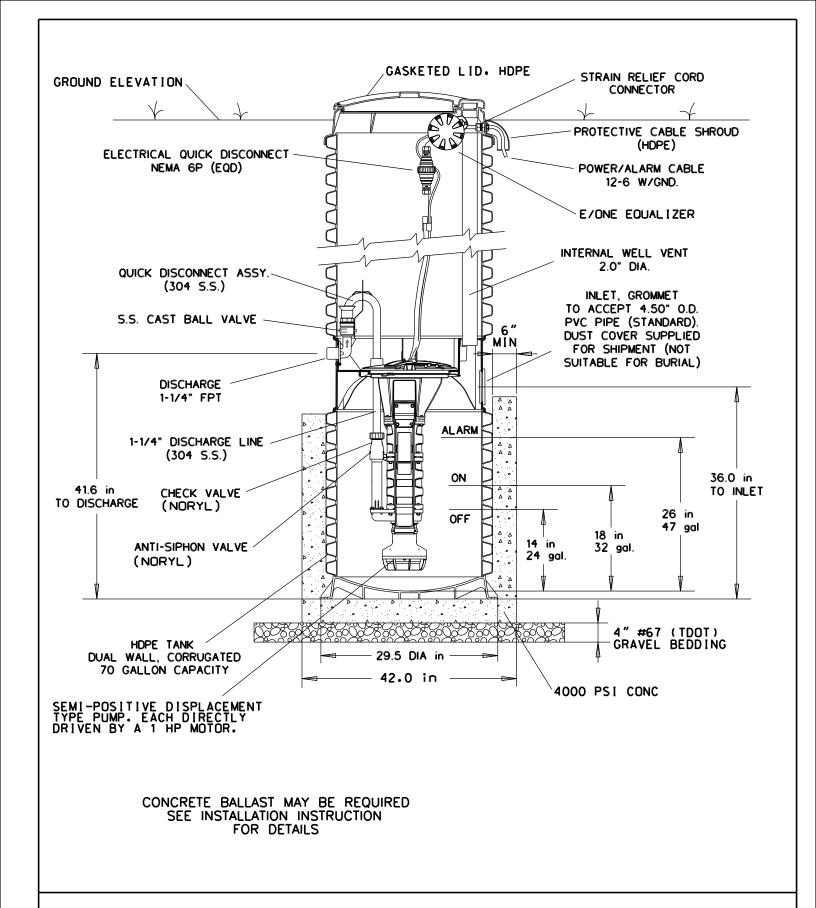
DATE: APRIL 2011

JOB **N**O.

TYPICAL GRINDER PUMP INSTALLATION

DETAIL NO.

712C

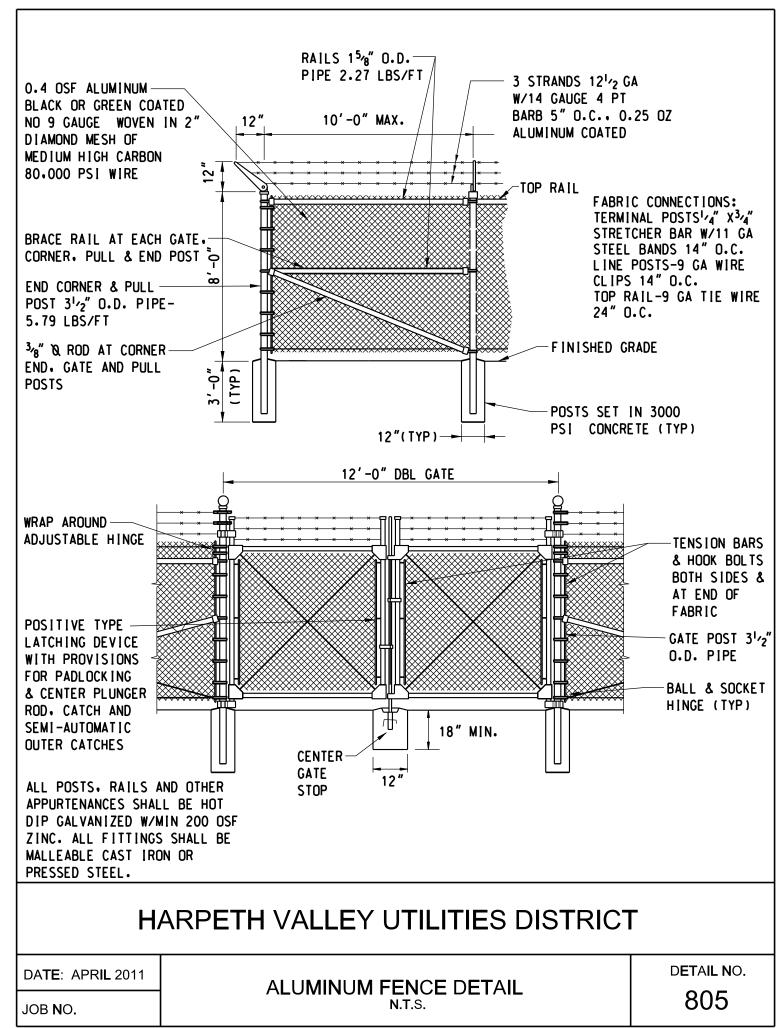


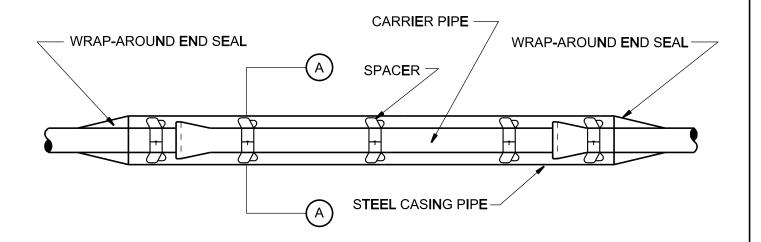
DATE: APRIL 2011

JOB **N**O.

TYPICAL SIMPLEX GRINDER PUMP

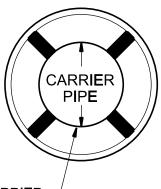
D**ET**A**IL N**O.





### NOTE:

SPACERS FOR CARRIER PIPES UP THROUGH 36-INCHES IN DIAMETER SHALL BE INSTALLED WITHIN 1-FOOT ON EACH SIDE OF THE BELL AND IN THE CENTER OF JOINTS. IF THE CASING OR CARRIER PIPE IS ANGLED, BENT, OR DENTED, SPACING SHALL BE AT 1/3 INTERVALS. IF SPACER IS MORE THAN 1-FEET FROM END OF CASING PIPE AN ADDITIONAL SPACER SHALL BE PLACED WITHIN 1-FOOT OF THE END OF THE CASING PIPE.



DUCTILE IRON CARRIER — PIPE TO BE CENTERED IN STEEL CASING PIPE.

**SECTION A-A** 

### HARPETH VALLEY UTILITIES DISTRICT

DATE: APRIL 2011

JOB **N**O.

CASING SPACER INSTALLATION DETAIL N.T.S.

DETAIL NO. 1024