TOWN OF THOMPSON'S STATION
WILLIAMSON COUNTY, TENNESSEE

SPECIFICATIONS COVERING THE DESIGN AND INSTALLATION OF SEWER COLLECTION SYSTEMS

INDEX

WPN 21.0367
Thompson's Station Standard Specification

APPROVED FOR CONSTRUCTION

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

TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION

DIVISION OF WATER RESOURCES

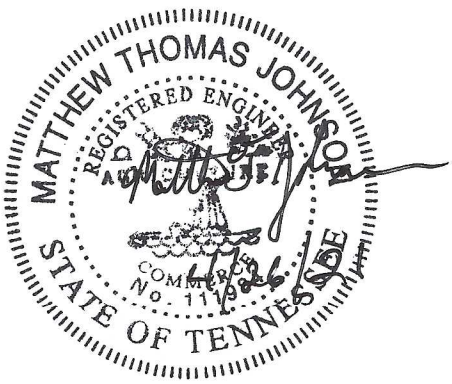
AND IS HEREBY APPROVED FOR CONSTRUCTION BY THE COMMISSIONER

Adnan Bahou

07/01/2021

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



SECTION 1
GENERAL GUIDELINES

PART 1. GENERAL

1.1 The purpose of these guidelines is to provide a guide to the Developers and their engineers and contractors in order to achieve an acceptable installation for furnishing of wastewater service to developments. The words "Town of Thompson's Station," "Town" and "Wastewater Operators" are to be used interchangeably. Approvals by the Town may be delegated to Town staff, Town engineering consultants, or other representatives of the Town. The Town will determine which of its staff and consultants are required to review submitted documents and perform inspections. Summarized below are requirements and conditions that apply to the granting of utility service by the Town of Thompson's Station.

1.1.1 Prior to the design of any utility line extension or expansion, the design engineer should first confer with the Town of Thompson's Station Staff in regard to growth potential and density that may be expected in the general area of the extension being planned. A conference with the Town Administrator and/or Wastewater Operator should follow to discuss system standards and requirements, as well as any problems related to the mains being extended.

1.1.1.1 Construction of utility lines, including individual service connections, may not begin prior to approval by the Town of Thompson's Station.

1.1.2 No connection to an existing utility shall be made until all lines have been completely tested and the tie-in is approved by the Town's Consulting Engineer.

1.1.3 The Town of Thompson's Station will not accept utility lines that were not approved in accordance with the Town Code and constructed in accordance with these specifications.

1.1.4 The Town of Thompson's Station requires performance and maintenance bonds for sewer infrastructure as specified in the Town's Subdivision Regulations.

1.1.5 All utility lines and services to property line or right-of-way only constructed utilizing these specifications become the property of the Town of Thompson's Station upon acceptance by the Town. Utility lines and services to property line or right-of-way only will not be accepted by the Town unless and until they are in strict conformance with these specifications.

1.1.6 Easements required across private property or in roads are to be acquired by the Developer in the name of the Town. Easements shall have a minimum width of 20 feet unless justification is submitted and approved for another width. Wider easements may be required for sewer lines over 12 feet deep. Each pipeline shall be the only utility located within a specific easement, unless approved by the Town.

1.1.7 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 construction throughout.

1.1.8 Sizes and locations of all water and sewer lines and appurtenances, and all construction shall be in accordance with the plans approved by the Town.

1.1.9 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 is required from the Developer to cover all costs of repair and maintenance for a period of one (1) year from the date of acceptance of the project by the Town for all work performed in existing rights-of-way of all roads.

1.1.10 If construction has not started within one (1) year from the date of approval, utility plans shall be resubmitted to renew approval. Renewal is not guaranteed.

1.1.11 The Developer's name, project cost, and estimated working time for each project shall be submitted to the Town.

1.1.12 Laboratory test reports shall be provided on all pipes to assure that it meets the requirements of the Town's specifications.

1.1.13 Shop drawings for utility materials shall be submitted to the Town of Thompson's Station for review after being thoroughly checked by the Developer and stamped with his approval.

1.1.14 The Town reserves the right to relocate water and sewer lines on the construction plans to facilitate maintenance.

1.1.15 All utility construction shall be in accordance with specifications of the Town of Thompson's Station.

1.1.16 Unless authorized by the Town, all grading work shall be completed, and all roads constructed to subgrade and lot corners are to be marked prior to the installation of utility lines.

1.1.17 The Developer shall be responsible for locating and verifying the elevations of existing utilities prior to construction.

1.1.18 The Developer shall provide a set of construction cut sheets prior to the preconstruction meeting and the cut sheets shall include the stations of all proposed service connections.

PART 2. EASEMENTS

2.1 Sewer installations require easements in accordance with the Town's Subdivision Regulations.

2.2 All easements shall be platted in accordance with the Town's Subdivision Regulations.

2.3 Multiple pipelines are not allowance in the same easement unless approved by the Town.

PART 3. PRE-CONSTRUCTION MEETING

3.1 Before beginning any construction, the Developer shall contact the Town and execute a contract with them paying all tapping privilege fees as required.

3.2 After this contract is executed and before beginning any construction, the Developer or his Engineer shall schedule a pre-construction conference to be held between the Contractor, Developer, Developer's Engineer, and the Town and their Consulting Engineer. At this meeting, the Developer will be informed of the Town's policies and any special requirements.

PART 4. DESIGN CRITERIA

4.1 DESIGN FACTORS: In determining the required capacities of sanitary sewers, the most recent edition of the Tennessee Department of Environment and Conservation's (TDEC) Design Criteria for Sewage Works, Chapter 2, Sewers and Wastewater Pumping Stations should be followed. If the Developer's engineer wishes to deviate from this Design Criteria or if specific items are not described in the Design Criteria, the Developer's engineer shall obtain Town approval.

4.2 DESIGN BASIS: Per capita flow: Sewer systems serving residential development should be designed on the basis of an average daily per capita flow of wastewater of not less than 350 gallons per day per Equivalent Dwelling Unit (EDU) when no water use information is available. The Developer may submit information and calculations that request use of other rates per EDU for the Town's review and approval. This amount of flow is assumed to cover nominal infiltration, but an additional allowance should be made where conditions are unfavorable.

Sewer systems serving commercial developments shall have wastewater flow rates and quality calculated based upon TDEC and established engineering design standards. Calculations shall be submitted to and reviewed and accepted by the Town.

4.3 MINIMUM SIZE: No sewer collection line shall be less than eight (8) inches in diameter.

4.4 ALIGNMENT: Sewers shall be designed with straight alignment between manholes.

4.5 INCREASED SIZE: When a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An acceptable approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

4.6 AIR PRESSURE TESTING: Low pressure air exfiltration testing of all pipes shall be as specified in Section 11 of the Town's specifications.

4.7 SURFACE WATER CROSSINGS: All surface water crossings shall be in accordance with the requirements of the General Permit for an Aquatic Resource Alteration Permit.

4.7.1 Above Water Crossings-The pipe shall be:

4.7.1.1 Adequately supported.

4.7.1.2 Protected from damage and freezing.

4.7.1.3 Accessible for repairs and replacement.

4.7.2 When Crossing Water Courses which are greater than 15 Feet in Width.

4.7.2.1 The pipe shall be push-on restrained joint ductile iron with locking gaskets. Pipe shall be American Fastite, US Pipe TR Flex, or equal.

4.8 INSTALLATION IN NEW FILL: Where sanitary sewers and force mains are installed in new fill, a compaction letter sealed by a Geotechnical Engineer registered in the State of Tennessee shall be submitted to the Town prior to accepting the installation. An acceptable compaction letter shall state that the field density testing indicates the fill has been compacted to at least 95% of the maximum dry density, according to the Standard Proctor. If a compaction letter is not available, special protection such as replacement with ductile iron pipe with joint restraint or encasement with flowable fill shall be utilized as approved by the Town.

END OF SECTION

SECTION 2
SPECIAL PROJECT PROCEDURES

PART 1. GENERAL

1.1 SMOKING AND FIRE PRECAUTIONS

1.1.1 No smoking, fire or use of any fire- or explosion-producing tools or equipment will be permitted on the properties of oil companies or other companies prohibiting same on their premises or at any locations where such may endanger said premises or the current operations thereon.

1.2 MANUFACTURERS' QUALIFICATIONS

1.2.1 The manufacturers of all materials and equipment used must be reputable and regularly engaged in the manufacture of the particular material or equipment for the use and service to which it will be subjected.

1.3 DEVELOPER SHALL PAY FOR ALL LABORATORY INSPECTION SERVICES

1.3.1 All materials and equipment used in the construction of the project shall be subject to adequate inspection and testing in accordance with accepted standards. The laboratory or inspection agency shall be selected by the Developer and approved by the Town. The Developer shall pay for all laboratory inspection services as a part of the Contract. Submit all material test reports to the Town or its engineer in triplicate.

1.4 COMPLIANCE WITH STATE AND LOCAL LAWS

1.4.1 Comply with all applicable requirements of state and local laws and ordinances to the extent that such requirements do not conflict with federal laws or regulations.

1.5 MARKERS

1.5.1 Preserve all Corps of Engineers, USGS, TVA, State of Tennessee, and private markers; do not remove or disturb any such markers without prior approval from the Town. Any removal and replacement of such markers shall be by the Developer.

1.6 PAVEMENT REPAIR AND/OR REPLACEMENT

1.6.1 Whenever pipe trenches are cut across or along existing pavement or shoulders, backfill same day and restore traffic over the cuts as quickly as possible by constructing a temporary twelve-inch (12") surface of Class A, Grade D crushed stone. Add material and otherwise maintain such surface until the permanent pavement is restored or until the entire project is accepted.

1.7 APPROVED CHEMICALS

1.7.1 All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification,

must show approval of either EPA or USDA. The use of all such chemicals and the disposal of residues shall be in strict conformance with all applicable instructions and regulations.

1.8 DEPARTMENT OF TRANSPORTATION PERMITS

1.8.1 The Town will assist in securing any permits and provide bond as required by the Tennessee Department of Transportation for the installation of permanent facilities on State highway rights-of-way. The costs for such bonds and/or permits, if applicable, shall be paid by the Developer. All such work shall be coordinated with and be subject to the approval of the Tennessee Department of Transportation, in addition to the approval of the Town.

1.8.2 The Developer will secure any permits as required by the local highway department for the installation of water lines within the rights-of-way of county roads. The Developer shall be responsible for complying with the requirements of the local highway department, and all such work shall be coordinated with and be subject to the approval of the local highway department, in addition to the approval of the Town.

1.9 INSTALLATION, TESTING, AND GUARANTEE

1.9.1 The completely installed system shall be guaranteed against any and all defects of manufacture, materials, workmanship, or installation for a period of one year from the date of acceptance.

1.10 DRAWINGS OF RECORD

1.10.1 The Developer shall provide and keep up-to-date a complete record set of blueline prints, which shall be corrected daily to show every change, and the approved shop drawings. The Developer shall keep this set of prints at the job site and use it only as a record set. This shall not be construed as authorization for the Developer to make changes to the approved layout without definite instructions in each case. The Developer shall turn the set over to the Town upon completion of the project.

1.11 UTILITIES

1.11.1 The Developer shall contact the owner of all underground utilities before beginning construction in the area. Carefully protect from damage all utilities in the vicinity of the work at all times. If it is necessary to repair, remove, and/or replace any such utility in order to complete the work properly, do so in compliance with the rules and regulations of the particular utility involved. Any such work shall be considered incidental to the construction of the project, and no additional payment will be allowed therefor.

1.12 INSURANCE

1.12.1 The Developer shall procure, maintain, and furnish an Owner's protective policy as hereinafter specified:

1.12.1.1 Owner's General Public Liability and Property Damage Insurance including vehicle coverage issued to the Town and protecting the Town from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with any operations under the Contract Documents, whether such operations be by the Developer or by any Subcontractor employed by the Developer or anyone directly or indirectly employed by the Developer or by a Subcontractor employed by the Developer. Insurance shall be written with a limit of liability of not less than $1,000,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident; and a limit of liability of not less than $1,000,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than $500,000 for all property damage sustained by any one person in any one accident; and a limit of liability of not less than $500,000 aggregate for any such damage sustained by two or more persons in any one accident. The Town of Thompson Station and their Engineer shall be named as additional insureds on the policy.

This requirement for an Owner's protective policy shall be in addition to any and all other insurance requirements as set forth in the Contract Documents, if applicable.

END OF SECTION

SECTION 3
REFERENCE STANDARDS

PART 1. GENERAL

1.1 REQUIREMENTS INCLUDED

1.1.1 Applicability of Reference Standards.

1.1.2 Provision of Reference Standards at site.

1.1.3 Acronyms used in Contract Documents for Reference Standards. Source of Reference Standards.

1.2 QUALITY ASSURANCE

1.2.1 For products or workmanship specified by association, trades, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

1.2.2 The date of the standard is that in effect as of the Bid date, or date of Owner-Contractor Agreement when there are bids, except when a specific date is specified.

1.2.3 When required by individual Specifications section, obtain copy of standard. Maintain copy at jobsite during submittals, planning, and progress of the specific work, until Substantial Completion.

1.3 SCHEDULE OF REFERENCES

AASHTO American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W.
Washington, DC 20001

ACI American Concrete Institute
P.O. Box 19150
Reford Station
Detroit, MI 48219

AGC Associated General Contractors of America
1957 E. Street, N.W.
Washington, DC 20006

AI Asphalt Institute
Asphalt Institute Building
College Park, MD 20740

AISC	American Institute of Steel Construction 400 North Michigan Avenue Eighth Floor Chicago, IL 60611
AISI	American Iron and Steel Institute 1000 16th Street, N.W. Washington, DC 20036
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
AWPA	American Wood-Preservers Association 7735 Old GeorgeTown Road Bethesda, MD 20014
AWS	American Welding Society 550 LeJeune Road Miami, FL 33135
CLFMI	Chain Link Fence Manufacturers Institute 1101 Connecticut Avenue, N.W. Washington, DC 20036
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Road Schaumburg, IL 60195

EJCDC	Engineers Joint Contract Documents Committee American Consulting Engineers Council 1050 15th Street, N.W. Washington, DC 20005
EJMA	Expansion Joint Manufacturers Association 707 Westchester Avenue White Plains, NY 10604
FM	Factory Mutual System 1151 Boston-Providence Turnpike Norwood, MA 02062
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Bldg. 197 Washington, DC 20407
GA	Gypsum Association 1603 Orrington Avenue Evanston, IL 60201
IEEE	Institute of Electrical and Electronics Engineers 345 East 47th Street New York, NY 10017
IMI	International Masonry Institute 815 15th Street, N.W. Washington, DC 20005
MIL	Military Specification Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
ML/SFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601

NEBB	National Environmental Balancing Bureau 8224 Old Courthouse Road Vienna, VA 22180
NEMA	National Electrical Manufacturers Association 2101 L Street, N.W. Washington, DC 20037
NFPA	National Forest Products Association 1619 Massachusetts Avenue, N.W. Washington, DC 20036
NSWMA	National Solid Waste Management Association 1120 Connecticut Avenue, N.W. Washington, DC 20036
NTMA	National Terrazzo and Mosiac Association 3166 Des Plaines Avenue Des Plaines, IL 60018
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 60077
PCI	Prestressed Concrete Institute 201 North Wacker Drive Chicago, IL 60606
PS	Product Standard U. S. Department of Commerce Washington, DC 20203
SDI	Steel Deck Institute P.O. Box 3812 St. Louis, MO 63122
SIGMA	Sealed Insulating Glass Manufacturers Association 111 East Wacker Drive Chicago, IL 60601
SJI	Steel Joist Institute 1703 Parham Road Suite 204 Richmond, VA 23229

SMACNA	Sheet Metal and Air Conditioning Contractors National Association 8224 Old Court House Road Vienna, VA 22180
SSPC	Steel Structures Painting Council 4400 Fifth Avenue Pittsburgh, PA 15213
TAS	Technical Aid Series Construction Specifications Institute 601 North Madison Street Alexandria, VA 22314
TCA	Tile Council of America, Inc. P.O. Box 326 Princeton, NJ 08540
UL	Underwriters Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062

PART 2. PRODUCTS

NOT USED.

PART 3. EXECUTION

NOT USED.

END OF SECTION

SECTION 4
QUALITY CONTROL

PART 1. GENERAL

1.1 REQUIREMENTS INCLUDED

1.1.1 General Quality Control.

1.1.1.1 Workmanship.

1.1.1.2 Manufacturers' Instructions.

1.1.1.3 Manufacturers' Certificates.

1.1.1.4 Mockups.

1.1.1.5 Manufacturers' Field Services.

1.1.1.6 Testing Laboratory Services.

1.2 RELATED REQUIREMENTS

1.2.1 General Conditions: Inspection and testing required by governing authorities.

1.2.2 Section 3 - Reference Standards: Applicability of specified reference standards.

1.3 QUALITY CONTROL, GENERAL

1.3.1 Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.4 WORKMANSHIP

1.4.1 Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

1.4.2 Perform work by utilizing only persons qualified to produce workmanship of specified quality.

1.4.3 When necessary, secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.5 MANUFACTURERS' INSTRUCTIONS

1.5.1 Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Town before proceeding.

1.6 MANUFACTURERS' CERTIFICATES

1.6.1 When required by individual Specification Sections, submit manufacturers' certificate, in duplicate, that products meet or exceed specified requirements.

1.7 MOCKUPS

1.7.1 When required by individual Specifications Section, erect complete, full-scale mockup of assembly at Project site.

1.8 MANUFACTURER'S FIELD SERVICES

1.8.1 When specified in respective Specification Sections, require supplier or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship; start-up of equipment; test, adjust, and balance of equipment, as applicable; and, to make appropriate recommendations.

1.8.2 Representative shall submit written report to Town listing observations and recommendations.

1.9 TESTING LABORATORY SERVICES

1.9.1 Developer shall employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services required by individual Specification Sections.

1.9.2 Services will be performed in accordance with requirements of governing authorities or agencies and with specified standards.

1.9.3 Reports will be submitted to Town in duplicate giving observations and results of tests, indicating compliance or non-compliance with specified standards and with Contract Documents.

1.9.4 Developer shall cooperate with Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.

1.9.4.1 Notify Town and Testing Laboratory at least 48 hours prior to expected time for operations requiring testing services.

1.9.4.2 Make arrangements with Testing Laboratory and pay for additional samples and tests for Developers' convenience.

PART 2. PRODUCTS

NOT USED.

PART 3. EXECUTION

NOT USED.

END OF SECTION

SECTION 5
EROSION CONTROL

PART 1. GENERAL

1.1 This work shall consist of erosion control on all cut and fill operations, excavation, backfill, or other construction activities within the limits of the construction site, within any temporary or permanent easements, and within any borrow site used during the period of construction. The protection of these sites shall continue throughout the construction period. During flood seasons, protect the sites by sandbagging, the pumping of water, and any other means appropriate to restrain flooding of plant and equipment. During dry weather, sprinkle the sites with water or use other means as necessary to provide dust control. In case of abnormally cold weather, any construction such as excavation work may be delayed until warmer weather or covered to prevent freezing.

1.2 All work shall be in accordance with the Town of Thompson's Station's stormwater policies and in accordance with the TDEC's Erosion and Sediment Control Handbook, latest edition. Prior to any excavation activities commencing, the developer, developer's engineer, and/or Developer shall apply for and receive an approved permit from the Town of Thompson's Station for such excavation activities. The application for permit will be reviewed by the Program Director and an approved permit shall be obtained prior to excavation activities. All erosion and sediment runoff control measures shall be installed in accordance with the approved permit and shall be maintained throughout the project cycle and until adequate and approved vegetative cover has been established.

PART 2. PRODUCTS

2.1 Temporarily stabilize areas from which topsoil has been removed and topsoil stockpiles by seeding fast growing annuals such as rye and annual ryegrass that provide quick protection. These annual grasses are to be seed certified by the State Department of Agriculture and can be worked into the soil when the site is prepared for final seeding of more permanent species. Use commercial lime and fertilizer on exposed areas subject to erosion.

PART 3. EXECUTION

3.1 Conduct construction so as to provide the site with maximum protection from erosion at all times.

3.2 Conduct excavation activities to provide erosion and sediment control as follows:

3.2.1 Do not start clearing and excavation until a firm construction schedule is submitted to and approved by the Town of Thompson's Station. Continuously coordinate the schedule with the clearing and excavation activity.

3.2.2 In streets and other paved areas, remove excavated material from the site as construction progresses to prevent any erosion of this material.

3.2.3 In other areas, place the excavated material so as not to block any drainage area. Replace this excavated material in the trench immediately after repairs have been completed and are approved by the Town of Thompson's Station.

3.2.4 Retain natural vegetation whenever feasible. Install sediment control measures where needed and maintain throughout the project.

3.2.5 Restore and cover exposed areas subject to erosion as quickly as possible by means of seeding and mulching. Use diversion ditches or other methods as appropriate to prevent storm water from running over the exposed area until seeding is established as specified.

3.2.6 Take particular care along streams and drainage ditches so that fallen trees, debris, and excavated material will not adversely affect the stream flow. Exercise care to minimize the destruction of stream banks. Wherever the stream banks are affected by construction, reduce the slope of the stream banks to provide a suitable condition for vegetation protection. Minimize land exposure in terms of area and time.

3.2.7 Cover exposed excavated areas with mulch or vegetation.

3.2.8 Mechanically retard the rate of runoff water.

3.2.9 Trap the sediment contained in the runoff water utilizing approved sediment control measures.

3.2.9.1 Divert water from erosive areas.

3.2.9.2 Take care during the pouring of concrete, hauling of materials, etc., to keep vehicles from creating a severe erosion problem. Proper scheduling of operations and prompt repair of ruts created during this operation is necessary from this source.

3.2.9.3 Control dust by sprinkling or other means as necessary to keep it to a minimum.

3.2.9.4 Pave or otherwise stabilize roadways and driveways as soon as feasible.

3.2.9.5 Regrade and reseed surfaces eroded or otherwise damaged during any and all construction operations as necessary.

END OF SECTION

SECTION 6
STORAGE AND PROTECTION

PART 1. GENERAL

NOT USED.

PART 2. PRODUCTS

NOT USED.

PART 3. EXECUTION

3.1 STORAGE, GENERAL

3.1.1 Store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.

3.1.2 Arrange storage in a manner to provide access for maintenance of stored items and for inspection.

3.2 EXTERIOR STORAGE

3.2.1 Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.

3.2.2 Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.

3.2.3 Provide surface drainage to prevent erosion and ponding of water.

3.3 MAINTENANCE OF STORAGE

3.3.1 Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.

END OF SECTION

SECTION 7
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 Town, 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

3.1.1 Before starting construction, remove from the work site all vegetation 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 Town specifically indicate are to be removed. Dispose of this refuse material in a manner acceptable to the Town.

3.1.2 In certain areas it may be desirable for existing trees, shrubs, or other vegetation on the site to be preserved for the permanent landscape. Such vegetation may be shown on the drawings, specifically listed in the specifications, marked on the site, or identified by the Town. In no case damage or remove such growth without written permission from the Town.

3.1.3 If the area to be excavated is occupied by trees, brush, or other vegetable growth, clear such growth, 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 Town. Fill all holes or cavities created during this work that extend below the subgrade elevation with suitable material, and compact to the same density as the surrounding material.

3.1.4 Trees, cultivated shrubs, etc., that are situated within public rights-of-way and/or construction easements through private property but not directly within the excavation area shall remain undisturbed unless it is necessary to remove them so that the work can be performed safely and unless their removal is specifically ordered by the Town.

Take special precautions to protect and preserve such growth throughout all stages of the construction.

3.1.5 Preparation of the site shall be considered an integral part of the excavation and one for which no separate payment shall be allowed.

3.2 UNSUITABLE MATERIALS

3.2.1 Wherever muck, quicksand, soft clay, swampy ground, or other material unsuitable for foundations, subgrade, 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 lifts of 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 No. 67 (TDOT) crushed stone for bedding.

3.3 ROCKS AND BOULDERS

3.3.1 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, and no separate payment will be made, therefore.

3.3.2 Should rock be encountered in the excavation, remove it by blasting or otherwise.

3.3.2.1 Blasting operations shall be conducted in accordance with all existing ordinances and regulations. All structures shall be protected from the effects of the blast. The blasting shall be done by licensed experienced workers. Dispose of excavated rock in accordance with applicable federal, state, county, and local regulations and in accordance with this Section.

3.3.2.2 If, in the sole opinion of the Town or Engineer, the Developer persistently uses excessive blasting charges or blasts in an unsafe or improper manner, the Town will direct the Developer to employ an independent, qualified blasting consultant, approved by the Engineer, to supervise the preparation for each blast and approve the quantity of each charge.

3.3.2.3 The Developer will notify the Engineer before any charge is set and prior to blasting. Following review by the Engineer regarding the proximity (normally within 300 linear feet) of permanent structures to the blasting site, the Engineer may direct the Developer to employ an independent qualified specialty subcontractor, approved by the Engineer, to monitor the blasting by use of seismograph, identify areas where light charges must be used, conduct pre event and post event inspections of all structures, including photographs or videos, and maintain a detailed written log.

3.3.2.4 Any damage caused as a result of blasting operations shall be promptly repaired by the Developer.

3.3.3 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 in 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 No. 67 (TDOT) crushed stone or other approved material, tamp to the proper grade, and make ready for construction. For monolithic concrete sewers and for structures, excavate rock to the outside bottom of the structure or sewer.

3.4 DISPOSAL OF MATERIALS

3.4.1 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 Town shall be used for these purposes. Any materials not to be used for these purposes shall be considered waste materials and disposed of by the Developer as specified below.

3.4.2 Waste materials may be deposited in spoil areas at locations approved by the Town. Do not leave in unsightly piles but instead spread in uniform layers, neatly level, and shape to drain. Seed as specified in Section 8, Seeding.

3.4.3 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 workman like condition, as described below.

3.4.4 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

3.5.1 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.

3.5.2 The Developer may, if he chooses, use a motor powered trenching machine. If he does, however, he shall be fully responsible for the preservation or repair of existing utility service connections.

3.5.3 Unless the construction of lines by tunneling, jacking, or boring is called for by the drawings or specifically authorized by the Town, make excavation for pipelines in open cut and true to the lines and grades shown on the drawings or established by the

Town on the ground. Cut the banks 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 not be more than the distance determined by the following formula: 4/3d + 15 inches, where "d" represents the internal diameter of the pipe in inches. When approved in writing by the Town, the banks of trenches from the ground surface down to a depth not closer than 1 foot above the top of the pipe may be excavated to non-vertical and nonparallel planes, provided the excavation below that depth is made with vertical and parallel sides equidistant from the pipe centerline in accordance with the formula given above. Any cut made in excess of the formula 4/3d + 15 inches may be cause for the Town to require that stronger pipe and/or a higher class of bedding.

3.5.4 Pipe bedding shall be as specified in Section 1, 1.9.

3.5.5 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.

3.5.6 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 Developer excavate below the elevations shown or specified, he shall fill the void with either concrete or granular material approved by the Town.

3.5.7 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 Town deems necessary to maintain vehicular or pedestrian traffic.

3.5.8 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.

3.5.9 Excavation for 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.

3.6 SHEETING, SHORING, AND BRACING

3.6.1 Take special care to avoid damage wherever excavation is being done. Sufficiently sheet, shore, and brace the sides of all excavations to prevent slides, cave-ins,

settlement, or movement of the banks and to maintain the specified trench widths. Use solid sheets in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have enough strength and rigidity to withstand the pressures exerted, to keep the walls of the excavation properly in place, and to protect all persons and property from injury or damage. Separate payment will not be made for sheeting, shoring, and bracing, which are considered an incidental part of the excavation work.

3.6.2 Wherever employees may be exposed to moving ground or cave-ins, shore and lay back exposed earth excavation surfaces more than 5 feet high to a stable slope, or else provide some equivalent means of protection. Effectively protect trenches less than 5 feet deep when examination of the ground indicates hazardous ground movement may be expected. Guard the walls and faces of all excavations in which employees are exposed to danger from moving ground by a shoring system, sloping of the ground, or some equivalent protection.

3.6.3 Comply with all OSHA standards in determining where and in what manner sheeting, shoring, and bracing are to be done. The sheeting, shoring, and bracing system shall be designed by a professional engineer licensed in the State of Tennessee and shall be subject to approval by the Town. However, such approval does not relieve the Developer of the sole responsibility for the safety of all employees, the effectiveness of the system, and any damages or injuries resulting from the lack or inadequacy of sheeting, shoring, and bracing.

3.6.4 Where excavations are made adjacent to existing buildings or structures or in paved streets or alleys, take particular care to sheet, shore, and brace the sides of the excavation so as to prevent any undermining of or settlement beneath such structures or pavement. Underpin adjacent structures wherever necessary, with the approval of the Town.

3.6.5 Do not leave sheeting, shoring, or bracing materials in place unless this is called for by the drawings, ordered by the Town, or deemed necessary or advisable for the safety or protection of the new or existing work or features. Remove these materials in such a manner that the new structure or any existing structures or property, whether public or private, will not be endangered or damaged and that cave-ins and slides are avoided.

3.6.6 Fill and compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing as specified herein.

3.6.7 The Developer may use a trench box, which is a prefabricated movable trench shield composed of steel plates welded to a heavy steel frame. The trench box shall be designed to provide protection equal to or greater than that of an appropriate shoring system.

3.7 THE DEWATERING OF EXCAVATION

3.7.1 Provide and keep in operation enough suitable pumping equipment whenever necessary or whenever directed to do so by the Town. Give special attention to

excavations for those structures that, prior to proper backfilling, are subject to flotation from hydrostatic uplift.

3.8 BORROW EXCAVATION

3.8.1 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, then 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 Town. All state and local regulations concerning borrow pits, drainage and erosion control shall be strictly followed.

3.8.2 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 Town.

3.8.3 Properly clear and grub borrow pits and remove all objectionable matter from the borrow pit material before placing it in the backfill.

3.8.4 The taking of materials from borrow pits for use in the construction of backfill, fills, or embankments shall be considered an incidental part of the work; no separate payment shall be made for this.

3.9 BACKFILLING

3.9.1 Begin backfilling after the line construction is completed and then inspected and approved by the Town. Backfill materials shall be in accordance with these specifications.

3.9.2 Backfill material above the pipe envelopes shall consist either of fine, loose earth like sandy soil or loam or of granular material that is free from clods, vegetable matter, debris, stone, and/or objectionable materials. Place this backfill simultaneously on either side of the trench in even layers that before compaction are no more than 6 inches deep. Thoroughly and completely tamp each layer into place before placing additional layers. Compaction of backfill material layers shall be at 90% by standard proctor test. Where adjacent to and within paved areas the top 12-inches of the trench at subgrade shall consist of crusher-run stone compacted at 95% by standard proctor test. Compaction testing shall be at intervals directed by the site inspector.

3.9.3 From 1 foot above the pipe upward, the backfill material may contain broken stones that make up approximately 3/4 of the backfill's 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 4 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 pavement or at locations of improvements subject to damage by displacement, tamp and thoroughly compact the backfill in layers that, before compaction, are 6 inches deep. In other areas, 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.

3.9.4 If earth material for backfill is, in the opinion of the Town, too dry to allow thorough compaction, then add enough water so that the backfill can be properly compacted. Do not place earth material that the Town considers too wet or otherwise unsuitable.

3.9.5 Wherever excavation has been made within easements across private property, the top 1 foot of backfill material shall consist of fine loose earth free from large clods, vegetable matter, debris, stone, and/or other objectionable materials.

3.9.6 Wherever trenches have been cut across or along existing pavement, temporarily pave the backfill of such trenches by placing Class A, Grade D, crushed stone as the top 12 inches of the backfill. Maintain this temporary pavement either until the permanent pavement is restored or until the project is accepted by the Town. On heavily traveled roadways, cold mix or leveling course binder 2 inches thick shall be installed and maintained until permanent pavement is installed.

3.9.7 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.

3.9.8 Wherever pipes have diameters of 15 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.

3.9.9 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 whatever repairs are necessary, whenever directed to do so by the Town.

3.9.10 Backfilling and clean-up operations shall closely follow pipe laying; failure to comply with this provision will result in the Town's requiring that the Developer's other activities be suspended until backfilling and clean-up operations catch up with pipe laying.

3.9.11 Compaction Requirements: Unless specified otherwise elsewhere, under buildings and 2 times the depth of pipe beyond, and under roads and 2 times the depth beyond the shoulder, compact to 95% maximum density in accordance with ASTM D698. In all other locations, compact to 90% maximum density.

3.10 MAINTENANCE

3.10.1 Seed and maintain in good condition all excavated areas, trenches, fills, embankments, and channels until final acceptance by the Town.

3.10.2 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 Town. Continue such maintenance until final acceptance of the project, or until the Town issues a written release.

3.11 SLOPES

3.11.1 Neatly trim all open cut slopes, and finish conforming either to the slope lines shown on the drawings or the directions of the Town. Leave the finished surfaces of bottom and sides in reasonably smooth and uniform planes like those normally obtainable with hand tools, though the Developer 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

SECTION 8
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 Town; and maintenance.

1.2 Unless otherwise approved in writing by the Town, seeding operations shall be limited to the following planting periods:

1.2.1 Spring - March 1 through May 30

1.2.2 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: Kentucky 31 Fescue (Festuca elatior) and/or 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 will be accepted.

2.2 FERTILIZER: 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: containing a minimum of 85% calcium carbonate and magnesium carbonate combined, 85% of which passes a No. 10 mesh sieve.

2.4 MULCH: stalks of rye, oats, wheat, or other approved grain crops properly cured prior to bailing, air dried, and reasonably free of noxious weeds and weed seeds or other material detrimental to plant growth.

2.5 MULCH BINDER: Mulch on slopes exceeding 3 (horizontal) to 1 (vertical) shall be held in place by the use of a mulch binder, as approved by the Town/Engineer. The mulch binder shall be non-toxic to plant and animal life.

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 Town.

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 seed bed, and lightly harrow, rake, or otherwise incorporate them into the soil for a depth of approximately 1 inch at the following rates:

3.4.1 Fertilizer: 15 pounds per 1,000 square feet

3.4.2 Agricultural Limestone: 40 pounds per 1,000 square feet

3.5 Sow seed uniformly with a rotary seeder, wheelbarrow seeder, 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 untillable.

3.9 Spread mulch material evenly over the seeded areas immediately following the seeding operation.

3.9.1 Mulch Rate: 2 bales (100 pound minimum) per 1,000 square feet

3.10 The mulch rate may be varied by the Town, 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 Developer shall be responsible for watering seeded areas until a sufficient stand of grass has been developed, as determined by the Town.

3.13 Dispose of all surplus materials as directed by the Town.

PART 4. INSPECTIONS

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

PART 5. GUARANTEE

5.1 Secure an acceptable growth of grass in all areas designated for seeding.

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 9
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 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 Both these specifications and the drawings 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 WARRANTY: The Developer shall provide Town with a two-year unconditional maintenance free warranty on the asphaltic concrete pavement. The warranty time shall begin on the date of final acceptance of the pavement by the Town. The warranty shall be executed by the paving contractor and co-signed by the Developer.

PART 2. PRODUCTS

2.1 MINERAL AGGREGATE BASE: Class A, Grading D crushed stone (TDOT specifications, Section 303, subsection 903.05)

2.2 BITUMINOUS PRIME COATS: cutback asphalt, Grade RC-250, or emulsified asphalt, Grade AE-P (Section 402, Subsections 904.02 and 904.03)

2.3 CRUSHED STONE CHIPS: Size 7 or Size 8 (Subsection 903.14)

2.4 DOUBLE BITUMINOUS SURFACE: for both courses, either cutback asphalt, Grade RC-800 or RC-3000, or emulsified asphalt, Grade RS-2 (Subsections 904.01 and 904.03)

2.5 ASPHALTIC CONCRETE BINDER: Grading B or C, as directed by the Town (Section 307)

2.6 BITUMINOUS TACK COAT: Grade AE-3 (Section 403, Subsection 904.03)

2.7 ASPHALTIC CONCRETE SURFACE: Grading E (Section 411)

2.8 QUICK DRY TRAFFIC MARKING PAINT (WHITE AND YELLOW): Section 716

PART 3. EXECUTION

3.1 SUBGRADE

3.1.1 Before any base material is installed, compact the subgrade of the area to be paved to 95% of optimum density as determined by ASTM D698 (Standard Proctor).

3.1.2 The backfill material shall contain no topsoil or organic matter. For all areas where subgrade 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 subgrade shall be hard, smooth, stable, and constructed in reasonably close conformance with the lines and grades that existed prior to beginning construction.

3.1.3 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

3.2.1 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

3.3.1 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.

3.4 DOUBLE SURFACE

3.4.1 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.

3.4.2 After the application of the cove aggregate, lightly broom or otherwise maintain the surface for a period of 4 days, or as directed by the Town. 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 Town.

3.5 ASPHALTIC CONCRETE BINDER

3.5.1 Apply a bituminous prime coat of emulsified asphalt, Grade AE-P, or cutback asphalt, Grade RC-250, at a rate of 0.38 to 0.42 gallon per square yard. Take care to prevent the bituminous material's splashing on exposed faces of curbs and gutters, walls, walks, trees, etc; if such splashing does occur, remove it immediately. After the prime coat has been properly cured, apply an asphaltic concrete binder to the thickness shown on the standard drawings or the plans.

3.5.2 Carefully place the material to avoid segregation of the mix. Broadcasting of the material will not be permitted. Remove any lumps that do not readily break down.

3.6 ASPHALTIC CONCRETE SURFACE

3.6.1 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 of the drawings or standard drawings.

3.6.2 Apply the surface course as described above for the binder course.

3.7 SMOOTHNESS

3.7.1 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.

3.8 SAMPLING AND TESTING

3.8.1 Submit to the Town 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.

3.8.2 Tests shall be made of 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.

3.8.3 When making surface tests, furnish one man to mark all surface defects for corrections.

END OF SECTION

SECTION 10
MANHOLES

PART 1. GENERAL

1.1 Manholes shall be precast or monolithic concrete with eccentric cones unless otherwise approved by the Town. All manholes shall contain Xypex add mixture to be batch mixed with the concrete prior to casting of the manhole. In special instances, upon requesting and obtaining prior approval of the Town of Thompson's Station, Xypex may be applied to the manhole after it has been cast but prior to leaving the manufacturer's site.

1.2 Refer to other sections for items affecting manholes. Coordinate this work with that specified by other sections for timely execution.

1.3 Location: Manholes shall be installed at the upper end of each collection sewer line, at all changes in grade, at points of changes in size, and at all pipe intersections

1.4 Drop Manholes: A drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert should be u-shaped to prevent deposition of solids.

1.5 Diameter: The minimum diameter of manholes shall be 48 inches. The entrance tube shall be at least 24 inches in diameter.

1.6 Shop drawings are required for castings, plastic gaskets, and precast manholes specified in this section.

PART 2. PRODUCTS

2.1 CONCRETE MASONRY: reinforced or plain, meeting the applicable requirements of Section 14, Concrete for Utility Lines.

2.2 CASTING ADJUSTMENT: Adjustment of casting to match finish grade may be made by concrete grade rings or Expanded Polypropylene rings. Expanded Polypropylene rings shall be Cretex Pro-Ring or equal.

2.3 MORTAR: composed of one (1) part Portland cement and two (2) 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, retempered, or previously set will not be allowed.

2.4 GRAY IRON CASTINGS: cast iron conforming to the requirements of Class 30, ASTM A48; 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, painted with a bituminous coating so as to present a smooth finish;

tough and tenacious when cold, but not tacky and with no tendency to scale; and with the actual weight in pounds stenciled or printed by the manufacturer on each casting in white paint.

2.5 PLASTIC GASKET FOR PRECAST MANHOLES: Preformed plastic gasket shall meet or exceed all requirements of FS SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints," Type I, rope form. 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 pipes are laid. Use two (2) complete ropes at each joint. The sealing compound shall be protected by a suitable removable two (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. The flexible plastic gasket shall also meet the requirements of the following table:

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

Property	Test Method	Minimum	Maximum
Specific Gravity at 77 degrees F	ASTM D71	1.20	1.30
Ductility at 77 degrees F (cm)	ASTM D113	5.0	---
Softening Point	ASTM D36	320° F	---
Penetration at 77 degrees F (150 gms) 5 sec.	ASTM D217	50	120

2.6 LADDER BARS: an aluminum alloy weighing 2.2 pounds or 1/2 inch steel reinforced rod encapsulated in polypropylene plastic.

2.7 MATERIAL TESTING: All precast reinforced concrete manhole risers and tops specified herein shall be tested and inspected by a commercial testing laboratory approved by the Town 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 Town before using the materials. The commercial testing laboratory shall be engaged and paid for by the Developer. Submit a certificate from the manufacturer of the castings indicating that they meet all applicable requirements of these specifications.

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. All manhole installations require the subgrade soil to be compacted to a minimum of 95% standard proctor density and a minimum of 12" of TDOT #67 compacted base stone.

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 Town. Wherever water is encountered at the site, place all cast-in-place bases or monolithic structures on a one-piece waterproof membrane to prevent any movement of water into the fresh concrete.

3.3 When the foundation subgrade has been prepared and is approved by the Town, carefully construct the concrete foundation for monolithic manholes to the line and grade required by the drawings. Construct the manholes after the concrete foundation has been allowed to set for a period of not less than 24 hours.

3.4 For precast manholes, carefully block the base section above the prepared surface so that it is fully and uniformly supported in true alignment; make sure that all entering pipe can be inserted at proper grade. Then place the concrete foundation and invert under and upon this base section as shown in the standard drawings. A base section with monolithic foundation (bottom) may be used when approved by the Town.

3.5 Thoroughly wet and then completely fill all lift holes and joints, inside and outside, with non-shrink grout to ensure water tightness.

3.6 Construct monolithic concrete manholes and bases of 4,000 psi concrete in accordance with the provisions of this section and applicable provisions of Section 16, Concrete for Utility Lines. The ladder bars shall be cast in place.

3.7 Carefully set the cast iron frame for the cover at the required elevation, and properly bond it to the masonry with cement grout and mastic seal. The required elevation is defined as the top of casting elevation on the approved construction plans. Whenever 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.

3.8 Manhole inverts shall be constructed of concrete or Portland cement mortared masonry fill and may, at the Developer's option, be covered with cement mortar 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.

3.9 All rigid unreinforced pipe entering or leaving the manhole shall be provided with flexible joints within 12 inches of the manhole structure; or encase the full joint in concrete. Place such pipe on firmly compacted bedding, particularly in the area of the manhole excavation, which is normally deeper than excavation for sewer trenches. Take special care to see that the

openings through which pipes enter the structures are completely and firmly rammed full of shrink proof mortar or otherwise constructed to ensure watertightness.

3.10 A flexible pipe to manhole connector shall be used to provide a watertight joint between the gravity sewer line and manhole. This connector shall be Kor-N-Seal I Connector or an approved equal.

3.11 Where the difference in the invert elevation of two or more lines 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 3,000 psi concrete as indicated by the standard drawings.

3.12 Place backfill by hand around the manhole and to a distance of at least one (1) pipe length into each trench; and tamp with selected material up to an elevation of 12 inches above the crown of all entering pipes. Continue backfilling in accordance with the requirements for trench backfilling.

3.13 Each manhole shall be vacuum tested. No standing water shall be allowed in the manhole excavation which may affect the accuracy of the test. All lifting holes and exterior joints shall be filled and pointed with an approved non-shrink mortar. 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 drawn. Installation and operation of the vacuum equipment and indicating devices shall be in accordance with equipment specification and instructions provided by the manufacturer. A vacuum of 10 inches shall be drawn. The time for the vacuum to drop to 9.0 inches for one minute shall be recorded. Acceptance for four (4) feet diameter manholes shall be defined as when the time to drop one (1) inch meets 60 minutes.

For manholes five (5) feet in diameter, add an additional 15 seconds. For manholes six (6) feet in diameter, add an additional 30 seconds. If the manhole fails the test, necessary repairs shall be made and the vacuum test repeated until the manhole passes the test. If the manhole joint mastic on gasket is displaced during the vacuum test, the manhole shall be disassembled, the seal replaced, and the manhole re-tested.

END OF SECTION

SECTION 11
SANITARY SEWERS (GRAVITY)

PART 1. GENERAL

1.1 Pipe material shall be PVC unless otherwise shown on the drawings. Ductile iron pipe shall be used only when approved by the Town or as allowed by this Specification.

1.2 Shop drawings are required for all products specified in this section.

1.3 Refer to other sections for items affecting gravity sewers. Coordinate this work with that specified by other sections for timely execution.

PART 2. PRODUCTS

2.1 PIPE

2.1.1 Polyvinyl Chloride (PVC): to meet and/or exceed the requirements of ASTM D3034, SDR 35; suitable for use as a gravity sewer conduit with provisions for contraction and expansion at each joint; with a rubber ring and standard length 12.5 feet plus or minus one (1) inch; designed to pass all tests at 73 degrees F (plus or minus 3 degrees F); six (6) inches long sections of pipe to be subjected to impact from a free falling type (20 pounds, Type A) in accordance with ASTM D2444 with no evident splitting or shattering (denting not considered a failure); and with a minimum envelope of four (4) inches of granular material around the pipe, but with all other bedding and backfilling requirements remaining the same as for other pipe material.

2.1.2 For mains 15 inches or smaller with greater than 12 feet of cover, SDR26 PVC. Regardless of depth, pipe material for mains larger than 24 inches shall be approved by the Town. No lines shall be deeper than 15 feet without Town approval.

2.1.3 Ductile Iron: with push-on joints conforming to ASTM A746, minimum Class 250 thickness unless otherwise shown on the drawings. Mains 16 inches through 24 inches in diameter shall be Ductile Iron.

2.1.4 Lateral Branches: to be tees of the same material as the main sewer and have a four (4) inch inside diameter for residential and six (6) inch diameter for commercial unless otherwise specified or noted; able to withstand all test pressures involved without leakage.

2.1.5 For PVC and ductile iron pipe, furnish a certificate from the pipe manufacturer indicating that the pipe meets all applicable requirements of these specifications.

2.2 JOINTS AND JOINTING MATERIALS

2.2.1 All rubber end rings shall be extruded or molded and cured such that any cross section will be dense, homogenous and free of parasites, blisters, pitting, and other imperfections. The basic rubber material, EPDM, shall meet ASTM C443 with the

exception of 40-60 duro hardness. The resilient interlocked end seals shall be duro A-40-70, plus or minus 2.

2.2.2 Polyvinyl Chloride (PVC) Pipe Joints: Joints for sewer plastic pipe shall meet all requirements of ASTM D3212 standard specifications. Joint design shall be tested and certified to result in no leakage under prescribed laboratory test conditions of joint alignment, load conditions, pressure and vacuum, and deflection. Pipe and fittings shall have integral bell with elastomeric seal joint.

2.2.3 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.

2.3 COMPRESSION COUPLINGS

2.3.1 When dissimilar pipe materials are joined, use compression couplings that are resistant to the corrosive action of soils and sewage and that will provide a permanent watertight joint. The compression couplings shall be of natural or synthetic rubber or rubber-like material and shall comply with the requirements and test methods specified in Table 2 of ASTM C425. The coupling shall meet the leak requirements specified in ASTM C425, and the bands for attaching the couplings to the dissimilar pipes shall be of stainless steel meeting ASTM A167 or A240. Each coupling shall bear the manufacturer's identifying mark and an indication of its size.

PART 3. EXECUTION

3.1 PIPE LAYING

3.1.1 Lay no pipe except in the presence of an inspector representing the Town unless authorized.

3.1.2 Depth: In general, sewers should be deep enough to drain basements and to prevent freezing. Where practical, a minimum depth of five (5) feet should be maintained unless approved otherwise by Thompson’s Station

3.1.3 Before placing sewer pipe in position in the trench, carefully prepare the bottom and sides of the trench, and install any necessary bracing and sheeting as provided in Section 7, Unclassified Excavation for Utilities.

3.1.4 Wherever necessary to provide satisfactory bearing surface, place concrete cradles as shown on the drawings or as directed by the Town. Cradles shall be of concrete and conform to the dimensions shown on the drawings.

3.1.5 Slope: Slope determination to achieve minimum velocity shall be calculated according to the most recent addition of the TDEC’s Design Criteria for Sewage Works Chapter 2 – Collection Systems. No pipes shall be installed with a slope greater than 20%.

3.1.6 High Velocity Protection: Ductile iron pipe shall be used when slopes are greater than:

SEWER SIZE INCHES	SLOPE (FT/100 FT)
8	18
10	13
12	9

3.1.7 Lasers must be used after the type and procedures are approved by the Town. When lasers are used, set reference points for both line and grade at each manhole. Where grades are 0.6% or less, check the elevation of the beam each 100 feet with an offset point or engineer's level.

3.1.8 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.

3.1.9 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 and as approved by the Town.

3.1.10 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.

3.1.11 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 two (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 sudden offsets or inequalities in the flow line.

3.1.12 Pipe Bedding: All sewers shall be designed to prevent damage from superimposed loads. Proper allowance for loads on the sewer shall be made because of the width and depth of trench. Backfill material from one (1) foot above the pipe should not exceed four (4) inches in diameter at its greatest dimension. Ductile iron pipe shall be required when: 1) sewer installation occurs in areas of non-virgin soil (i.e. areas of "fill"), 2) the final grading cover is less than 2 1/2 feet, and 3) in roadways where cover is less than four (4) feet . Piers shall be provided for when necessary for support. An impermeable barrier of compacted clay or concrete encasement shall be used at the transition from fill to virgin soil to prevent piping of water through the crushed stone bedding.

For structural reasons, ductile iron pipe, concrete encasement, or relocation shall be required when culverts or other conduits are laid such that the top of the sewer is less than 18 inches below the bottom of the culvert or conduit. Special care shall be used in placing bedding in the haunching region.

3.1.12.1 Unpaved areas: Each sewer pipe section shall be laid on six (6) inch bed of size no. 57 or size no. 67 crushed stone and shall be backfilled to 12" above the pipe top using size no. 57 or size no. 67 compacted crushed stone.

3.1.12.2 Paved Areas: Each sewer pipe section shall be completely encapsulated with six (6) inches of bedding material on the bottom and both sides. The entire depth of the trench shall also be backfilled with bedding materials compacted in 6" lifts. Bedding materials shall be size no. 57 or size no. 67 crushed stone.

3.1.13 Before constructing or placing any joints, demonstrate to the Town 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.

3.1.14 No other type of joint may be used unless authorized in writing by the Town.

3.1.15 Install tee branches in sewer lines to serve properly 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 Town. If tee branches are not to be used immediately, close them with approved stoppers that are held in place to prevent infiltration and withstand all test requirements. All service line end caps shall be marked by a green metal fence post as to allow the builder to determine the exact location of the service lateral.

3.1.16 For all tees that are plugged and laid in rock, blast a minimum of six (6) linear feet of ditch line in the direction and to the approximate grade of the future lateral as directed by the Town, but do not excavate the material. Furnish the Town with a record of the exact location of each tee installed.

3.1.17 If the work consists of constructing a new sewer to replace an existing one, connect existing service lines to the new line.

3.1.18 New service laterals shall conform to the standard drawings.

3.1.19 The Developer shall provide an above-ground green metal fence post marker or 2" PVC pipe painted green, at the property line to indicate the termination of new service laterals.

3.1.20 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.

3.1.21 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 relaid. Carefully protect all pipe in place from damage until backfilling operations are completed.

3.1.22 Do not begin the backfilling of trenches until the pipe in place has been inspected and approved by the Town.

3.1.23 Water Supply Interconnections: There shall be no physical connection between a potable water supply line and a sewer or appurtenance thereto which would permit the passage of any wastewater or polluted water into the potable supply.

3.1.24 Water Main Horizontal Separation: Whenever possible, sewers should be laid at least ten (10) feet horizontally edge to edge from any existing or proposed water pipe. Should local conditions prevent a lateral separation of ten (10) feet to the water main, a separation of less than ten (10) feet may be approved if the sewer is laid in a separate trench and if the elevation of the top of the sewer pipe is at least 18 inches below the bottom of the water pipe.

3.1.25 Utility Vertical Separation: Whenever a sewer must cross under a water main or storm drain, the sewer shall be laid at such elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be varied to meet the above requirement, the water main shall be relocated to provide the separation or reconstructed with ductile iron pipe for a minimum distance of ten (10) feet on each side of the sewer. At least one (1) full length of water main should be centered over the sewer so that both joints shall be as far from the sewer as possible.

3.1.26 When it is impossible to obtain proper horizontal and vertical separation as stipulated above, both the water main and the sewer shall be installed inside a steel casing pipe extending ten (10) feet beyond the crossing in both directions.

3.1.27 Perform boring by means of auguring 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.

3.1.28 Make connections to all existing sewer lines as shown on the drawings or as directed by the Town. Make connections either by removing a section of the sewer from the existing line and inserting a wye or tee branch of the proper size or by constructing a manhole, junction box, regulator chamber, or other structure as shown on the drawings.

3.1.29 Make connections to existing manholes or inlets by methods of machine coring and installation of a Kor-N-Seal boot connector. After the boot connector has been properly installed in the existing structure, insert a length of sewer pipe into the boot connector and tighten the band strap of the boot connector. Fill around the void area between the pipe and existing structure located on the inside of the existing structure with non-shrink grout to a neat finish. Shape or reshape the existing inverts or bottom of the manhole/structure as necessary to fit the invert of the sewer pipe and allow unobstructed flow through the existing structure.

3.1.30 Joint dissimilar pipe by using suitable compression couplings. If compression couplings are not available, make jointing with a special fabricated coupling approved by the Town.

3.1.31 Provide concrete protection or concrete cap as shown on the drawings for pipe sewers that, when completed, have less than 2.5 feet of covering in non-traffic areas and four (4) feet of cover in traffic areas. If such protection is not shown on the drawings, place it in accordance with the typical section shown.

3.1.32 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 section of these specifications. Any such work shall be considered incidental to the construction of pipe sewers, and no additional payment will be allowed, therefore.

3.1.33 Water service connections will be repaired or replaced by the Developer.

3.1.34 Service or house connections to existing sewers that are damaged or removed shall be repaired or replaced by the Developer.

3.1.35 Where required, the Developer shall provide a concrete check dam in the trench for the gravity sewer lines. The check dam shall be constructed in accordance with the detail included in the Standard Drawings. Check dams shall be provided on each creek bank, swale etc. as to prevent ground water from traveling along the trench and to prevent surface water from entering the trench at creek crossings. The Town may request addition of check dams anywhere on gravity lines or force mains where groundwater conditions require.

3.2 TESTING OF GRAVITY SEWERS

3.2.1. Visual Tests

3.2.1.1 Upon completion of the construction or earlier if the Town deems advisable, the Town will make a visual inspection of the sewer and construction site. Immediately repair all leaks and defects found by such inspection.

3.2.1.2 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 final acceptance of the work shall be replaced or relaid by the Developer.

3.2.1.3 The Developer will be held strictly responsible that all parts of the work bear the load of the backfill. If cracks 1/100 inch in width develop in the pipe within one (1) year from the date of final acceptance of the work, the Developer will be required to replace all such cracked pipe. To this end, the Developer 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.

3.2.2 Leakage Tests: Test lines for leakage by either infiltration tests or exfiltration tests, or by low-pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

3.2.2.1 Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with ASTM C969. Make calculations in accordance with the Appendix to ASTM C969.

3.2.2.1 Low pressure air tests: Perform low pressure air testing as follows:

i) Furnish all equipment, facilities, and personnel necessary to conduct the test. The test shall be observed by a representative of the Owner.

ii) Perform the first series of air tests after 2,000 LF but before 4,000 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. Conduct the remainder of the tests after approximately each 10,000 LF has been laid.

iii) Plug all tees and ends of sewer services with flexible joint plugs or caps securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

iv) 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.

v) Ductile Iron pipelines: Test in accordance with ASTM C924. Allowable pressure drop shall be as given in ASTM C924. Make calculations in accordance with the Appendix to ASTM C924.

vi) PVC plastic pipelines. Test in accordance with UBPPA Uni-B-6. Allowable pressure drop shall be as given in UBPPA Uni-B-6. Make calculations in accordance with the Appendix to UBPPA Uni-B-6.

3.2.3.4 Repairs: Regardless of the outcome of any tests, repair any noticeable leak.

3.3 VISUAL INSPECTION OF MISCELLANEOUS MATERIALS

3.3.1 All material used on this project will be visually inspected by the Town at the site for conformance to the required specifications. When reasonable doubt exists that said material meets the specifications, the Town 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: Perform a deflection test on entire length of installed plastic pipeline on completion of work adjacent to and over the pipeline, including leakage tests, backfilling, placement of fill, grading, paving, concreting, and any other superimposed loads determined in accordance with ASTM D2412. Deflection of pipe in the installed pipeline under external loads shall not exceed 4.5 percent of the average inside diameter of the pipe. Determine whether the allowable deflection has been exceeded by the use of a pull-through device or a deflection measuring device.

3.4.1 Pull-through device: This device shall be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections shall conform to the following:

3.4.1.1 A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.

3.4.1.2 Homogeneous material throughout, shall have a density greater than 1.0 as related to water at 40 degrees F, and shall have a surface Brinell hardness of not less than 150.

3.4.1.3 Center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 psi, with eyes or loops at each end for attaching pulling cables.

3.4.1.4 Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.

3.4.2. Deflection measuring device: Sensitive to 1.0 percent of the diameter of the pipe being tested and shall be accurate to 1.0 percent of the indicated dimension. Deflection measuring device shall be approved prior to use.

3.4.3. Pull-through device procedure: Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.

3.4.4. Deflection measuring device procedure: Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.

3.5 CLEANUP

3.5.1 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 area in a clean, neat, and serviceable condition.

3.6 VIDEO INSPECTION

3.6.1 New gravity sewer lines shall be required to be inspected using CATV video inspection equipment should the sewer line not pass the standard air testing, mandrel test or visual inspections. The Town of Thompson's Station will require the Developer to perform this type of inspection to determine if debris or defects exist within the sewer line. This video inspection shall be performed after all utilities have been installed, roadways paved and all other infrastructure installed and completed. This inspection shall serve to verify that sewer lines, manholes and service laterals are clean and free of debris and defects. Any defects discovered during the video inspection shall be corrected in accordance with these standard specifications by the developer and/or his contractor.

END OF SECTION

SECTION 12
SEWAGE FORCE MAIN

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 Developer's responsibility to ensure that all necessary materials are not found to be defective in manufacture. Materials damaged in handling after being delivered by the manufacturer shall be replaced by the Developer. If installed material is found to be defective before the final acceptance of the work or during the warranty period, the material shall be fully replaced.

1.3 The Developer 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 Minimum force main size shall be four (4) inches in diameter.

1.6 Air Release Valve: An automatic air release valve shall be placed at high points in the force main to prevent air-locking.

1.7 Termination: Force mains shall terminate in the invert of a manhole.

1.8 Pipe Diameter: Force mains are to be designed to achieve scouring velocity as demonstrated in the Developer's or engineer's submittals to the Town. Minimum velocity shall be at least 2 feet per second, with velocities of 3.5 feet per second preferred for small diameter forcemains.

1.9 A maximum Hazen and Williams "C" factor used should not be greater than 130 regardless of that actually determined for the pipe.

PART 2. PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS (TOWN APPROVAL REQUIRED)

2.1.1 Ductile iron pipe shall be made of good quality ductile cast iron that meets the requirements of ASTM E8-61T. The pipe shall be 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.

2.1.2 The pipe shall be plain end ductile iron pipe with a push-on single gasket joint and shall conform to ANSI A21.51/AWWA C151. The design thickness shall be Class 50 for pipe as defined by ASTM A21.50/AWWA C150.

2.1.3 The length of each individual piece of ductile iron pipe shipped must be plainly marked on that piece of pipe.

2.1.4 The push-on single gasket joints shall be UL approved and able to withstand an operating pressure of 200 psi.

2.1.5 The bell of each pipe shall have a tapered annular opening and a cast or machined retaining groove for the gasket. The gasket groove shall have a flared design so that maximum deflection will be provided. 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.

2.1.6 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 the maximum internal liquid pressure of 350 psi.

2.1.7 Enough lubricant shall be furnished with each order to provide a thin coat on the spigot end of each pipe. This lubricant shall be nontoxic, impart no taste or smell, 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.

2.1.8 Standard and special fittings shall be ductile iron. Use standard mechanical joint fittings unless otherwise shown on the drawings. All fittings shall conform to ANSI A21. 10/AWWA C110. Restrained joint fittings and pipe shall be subject to Town approval.

2.1.9 Pipe and fittings shall be lined with Protecto 401, Permox CTF, or Engineer-approved equal. The outside coating shall be manufacturer's standard asphaltic coating.

2.2 PVC PIPE

2.2.1 All forcemains shall be constructed of PVC, unless approved by Town. All plastic pipe shall be made from Class 12454-B polyvinyl chloride plastic (PVC 1120) as defined by ASTM D1784.

2.2.2 Pipe shall have gasket belled ends for push on type jointing and shall conform to AWWA C900, ductile iron pipe equivalent outside diameters. The pipe shall have a minimum Dimension Ratio (DR) of 18 and shall be capable of withstanding a working pressure of 235 psi. Pipe shall be supplied in minimum lengths of 20 feet. Each length of pipe furnished shall bear identification markings in conformance with AWWA Standard C900.

2.2.3 The Developer's methods of storing and handling the pipe shall be approved by the Town. All pipe shall be supported within five (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 force main routes will not be allowed.

2.2.4 Certain information shall be applied to each piece of pipe. At the least, this shall consist of:

2.2.4.1 Nominal size

2.2.4.2 Type of material

2.2.4.3 DR

2.2.4.4 Manufacturer

2.2.4.5 Pressure Rating

2.2.5 Pipe that fails to comply with the requirements set forth in these specifications shall be rejected.

2.2.6 The pipe shall have push-on joints designed with grooves in which continuous molded rubber ring gaskets can be placed. Gaskets shall be made of vulcanized natural or synthetic rubber; no reclaimed rubber will be allowed. The gaskets shall be of the manufacturer's standard design dimensions and of such size and shape as to provide a positive seal under all combinations of joint and gasket tolerance. The gasket and annular groove shall be designed and shaped so that when the joint is assembled, the gasket will be radially compressed to the pipe and locked in place against displacement, thus forming a positive seal.

2.2.7 The spigot end of each pipe shall be beveled so that it can be easily inserted into the gasket joint, which in turn shall be designed so that the spigot end may move in the socket as the pipe expands or contracts. The spigot end shall be striped to indicate the distance into which it is to be inserted into the socket. Each joint shall be able to accommodate the thermal expansions and contractions experienced with a temperature shift of at least 75 degrees F.

2.2.8 Enough lubricant shall be furnished with each order to provide a coat on the spigot end of each pipe. This lubricant shall be nontoxic, impart no taste or smell, have no harmful effect on the gasket or pipe material, and support no bacterial growth. The lubricant containers shall be labeled with the manufacturer's name.

2.2.9 Joints shall be manufactured in accordance with ASTM D3139 except that the thickness of the bell shall be, as a minimum, equal to that of the barrel. Joints shall be either integral bell and ring joints with rubber compression gaskets as manufactured by the Clow Corporation, Johns-Manville, or Vulcan Plastic Corporation; twin gasket couplings as manufactured by the Certain-Teed Products Corporation; or equal. However, the pipe and bell must be made by the same manufacturer.

2.2.10 Standard and special fittings shall be ductile iron. Use standard mechanical joint fittings. All fittings shall conform to the specifications of ANSI A21. 10/AWWA C110. Restrained joint fittings and pipe shall be subject to Town approval.

2.2.11 Fittings Pipe and fittings shall be lined with Protecto 401, Permox CTF, or Engineer-approved equal. The outside coating shall be manufacturer's standard asphaltic coating.

2.2.12 Fitting laying lengths shall conform to ANSI A21. 10/AWWA C110.

2.2.13 Fittings shall be in accordance with the standard mechanical joint fittings manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Clow Corporation, or equal.

2.3 VALVES

2.3.1 Plug Valves:

2.3.1.1 Non-lubricated type eccentric valves shall be rated for 175 psig service at 140 degrees F. Valves shall have drip-tight shutoff with pressure from either direction and cast iron bodies. Exposed service valves shall have flanged ends in accordance with ASME B16.1 flanged or AWWA C606 grooved end connections.

2.3.1.2 Plug shall be all metal, matching body with round or rectangular port with no less than 80% of connecting pipe area and coated with Buna-N, welded nickel seats, self-lubricating stainless steel stem bearings, and stem seal multiple V-rings or U-cups with O-rings of nitrile rubber, with grit seals on both upper and lower bearings. For buried service, provide completely sealed operator filled with heavy lubricant and 2-inch nut. Size operator for 1.5 times the maximum shutoff pressure differential for direct and reverse pressure, whichever is higher.

2.3.1.3 Manufacturers and Products:

i) DeZurik, Style PEC

ii) Valmatic, Style 5800R

iii) Pratt, Ballcentric

2.3.2 Air Release Valves: shall be mounted on common header and all high points along force mains. Air/Vacuum release valves shall be rated for raw sewage, have a minimum 2" inlet, and be provided with flush ports. Valves shall be sized for intended system hydraulics. Air release valves shall be mounted on isolation valves. The air release valve drain pipe shall be a minimum of 1-inch PVC Sch. 40 Drain pipe shall be solidly fastened and shall discharge into gravel bottom of the valve vault. Liquid shall not accumulate within the drain pipe. Air/Vacuum release valves shall have a

PVC or stainless steel 316 body. Approved manufacturer is DeZurik/APCO 401 or Vent-O-Mat Series RGX.

PART 3. EXECUTION

3.1 INSTALLATION OF FORCE MAIN

3.1.1 Lay the force main to and 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, either use batterboards or a laser to maintain the required slopes.

3.1.2 Unless otherwise indicated by the drawings, all force mains shall have at least 36 inches of cover. The pipe shall slope continuously between high and low points and have a minimum of 60" cover at the high points. No departure from this policy shall be made except at the order of the Town, or unless shown otherwise on the drawings.

3.1.3 Provide and use tools and facilities that are satisfactory to the Town 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.

3.1.4 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.

3.1.5 Take every precaution to keep foreign material from getting into the pipe while it is being placed in the trench. 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.

3.1.6 Place no debris, tools, clothing, or other materials in the pipe during laying operations.

3.1.7 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.

3.1.8 Bell holes shall be big enough so that there is ample room for the pipe joints to be properly made. Between bell holes, carefully grade the bottom of the trench so that each pipe barrel will rest on a solid foundation for its entire length.

3.1.9 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 Town. Caulk the joints of any

pipe in the trench that cannot be completed until a later time with packing in order to make them as watertight as possible; 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.

3.1.10 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.

3.1.11 The flame cutting of pipe by means of an oxyacetylene torch will not be allowed.

3.1.12 Unless otherwise directed by the Town, lay pipe with the bell ends facing in the direction of laying.

3.1.13 Wherever pipe must be deflected from a straight line (in either the vertical or horizontal plane) in order to avoid obstructions or plumb stems, 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 Town.

3.1.14 Lay no pipe in water or when it is the Town'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.

3.1.15 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 Town indicates that they are to be used.

3.1.16 Make all joints, whether standard mechanical or push-on joints, in conformance with the recommendations of the joint manufacturer as approved by the Town.

3.1.17 When PVC pipe is installed, a minimum size 14-gauge copper wire shall be installed along the pipe. The ends of the wire shall terminate in a valve box or other acceptable location whereby detection equipment may be attached.

3.1.18 All pipe shall have detection tape installed. Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Sewer, Green, “Caution Sewer Line Buried Below”. Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 2 inches when buried less than 10 inches below the surface. Tape width shall be a minimum of 3 inches when buried greater than 10 inches and less than 20 inches.

3.2 HYDROSTATIC TESTS

3.2.1 Pressure Test

3.2.1.1 After pipe has been laid and backfilled as specified above, subject all newly laid pipe or any valved section thereof to a pressure of 150 psi, or 1.5x the working pressure, whichever is greater. All connections (if applicable) are to be laid prior to testing the main and tested as part of the test of the main. No more than 2,500 linear feet of pipe shall be tested at one time.

3.2.1.2 The duration of each pressure test shall be at least one (1) hour.

3.2.1.3 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 Town. Furnish the water, pump, pipe, connections, gauges, and all necessary apparatus.

3.2.1.4 Before applying the specified test pressure, expel all air from the pipe. If air/vacuum assemblies 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.

3.2.1.5 Carefully examine all exposed pipes, fittings, and valves, during the test. Remove any cracked or defective pipes, fittings, and/or valves, 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 Town.

3.2.2 Leakage Test

3.2.2.1 Conduct the leakage test after the pressure test has been satisfactorily completed. Furnish the water, pump, pipe, connections, gauges, measuring devices, and all other necessary apparatus as well as all necessary assistance to conduct the test.

3.2.2.2 The duration of each leakage test shall be two (2) hours; during the test, subject the main to a pressure of 150 psi.

3.2.2.3 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.

3.2.2.4 No pipe installation will be accepted until the leakage is less than the number of gallons per two (2) hour period listed below:

Pipe Sizes	Gallons per 1,000 Feet of Pipe
2" - 2-1'4"	0.2
3"	0.5
4"	0.6
6"	0.9
8"	1.2
10"	1.5
12"	1.9
14"	2.2
16"	2.6
18"	2.9
20"	3.2
24"	3.8

3.2.2.5 Should any test of pipe laid disclose leakage greater than that specified, the Developer shall locate and repair the defective joints until the leakage is within the specified allowance.

3.3 CLEANUP

3.3.1 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 Town. Seed and mulch as required elsewhere in these specifications.

END OF SECTION

SECTION 13
BORING AND CASING FOR SANITARY SEWERS

PART 1. GENERAL

1.1 The work to be performed hereunder shall consist of the installation of casing pipe and carrier pipe for water lines as shown on the drawings or as called for in these specifications. For the open cut casing pipes, it shall include the excavation of the trench, placing proper bedding material, furnishing and installing the casing pipe, furnishing and installing the carrier pipe, backfilling, and disposing of the excess excavated materials. For the boring and jacking of casing pipes, it shall include the excavation of a boring pit, auger boring between the point as specified on the drawings, furnishing and installing of the carrier pipe, and disposing of the excavated materials in the manner herein provided.

PART 2. PRODUCTS

2.1 CASING PIPE

2.1.1 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 E72 LOADING

Carrier Pipe Diameter	Casing Pipe Diameter (min.)	Nominal Thickness
4 inches	10 inches	0.250 inches
6 inches	12 inches	0.250 inches
8 inches	16 inches	0.312 inches
10 inches	20 inches	0.312 inches
12 inches	22 inches	0.312 inches
14 inches	24 inches	0.344 inches
16 inches	26 inches	0.375 inches
18 inches	28 inches	0.406 inches

2.1.2 When the casing pipe is installed without benefit of a protective coating, the wall thickness shown above shall be increased to the nearest standard size, which is a minimum of 0.063 inches greater than the thickness shown.

2.2 CARRIER PIPE: The carrier pipe shall be PVC, SDR 21, unless otherwise noted on the drawings.

2.3 CASING SPACERS:

2.3.1 The casing spacers shall be constructed of circular stainless steel bands, which bolt together forming a shell around the carrier pipe. The casing spacer shall be lined with a ribbed EPDM extrusion with a retaining section that overlaps the edges of the shell and prevents slippage. The spacer shall be designed with risers and runners to support the carrier pipe within the casing and maintain a minimum clearance of 1.0 in. between the casing ID and the carrier pipe OD.

2.3.2 The runners shall be Glass Filled Polymer with ends of the runners beveled to facilitate installation over rough weld beads or the weld ends of misaligned or deformed casing pipe. The runners shall be attached to support structures (risers) at appropriate positions to properly support the carrier pipe within the casing and to ease installation. They shall have a minimum length of 8.0 in. and a minimum width of 2.0 in.

2.3.3 The shell shall be manufactured of 14-gauge T-304 stainless steel. The riser shall be constructed of 10-gauge T-304 stainless steel, with a height to be determined based on the annular space between the carrier pipe OD and the casing ID.

2.3.4 Unless otherwise shown, spacers shall be placed 1-2 feet on either side of the bell joint and one every 6-8 feet apart thereafter for a total of three casing spacers per joint of pipe.

2.4 CASING END SEALS

2.4.1 End seals shall be pull-on or wrap-around seals.

2.4.2 The Wrap-Around or Pull-On end seal shall be manufactured of 1/8" thick neoprene rubber. Provide minimum 2" wide T-304 stainless steel banding with 100% non-magnetic worm gear mechanism.

PART 3. EXECUTION

3.1 BORING

3.1.1 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

3.2.1 For open cut of casing pipes, install the steel casing pipe into the open cut as the trench excavation proceeds. Weld sections of casing pipe together to provide watertight joints, and replace the coatings in areas where damaged by welding.

3.2.2 For boring casing pipes, jack the steel casing pipe into place as the boring proceeds. Weld sections of casing pipe together to provide watertight joints.

3.2.3 Do not remove unacceptable casing without prior approval from the Town. 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

3.3.1 The carrier pipe shall be furnished by the Developer. Upon acceptance of the casing, install the carrier pipe in the casing by jacking it through the casing. If necessary to achieve proper line and grade on the carrier pipe, strap wood or other suitable blocking to the carrier pipe to offset any minor variations in the alignment of the casing.

3.4 LAYOUT OF WORK

3.4.1 The Developer will provide the detailed layout required to keep the excavation and pipe installation on grade.

PART 4. GUARANTEE OF WORK

4.1 Guarantee a usable completed casing between the points specified and to the line and grade specified. The allowable tolerance at the downstream end point of the casing 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 an elevation no lower than the existing inlet pipe invert.

4.2 The allowable tolerance at the upstream end point of the casing shall be such that the invert of the carrier pipe may be positioned at the elevation shown on the drawings.

END OF SECTION

SECTION 14
CONCRETE FOR UTILITY LINES

PART 1. GENERAL

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

PART 2. PRODUCTS

NOT USED.

PART 3. EXECUTION

3.1 Concrete work shall conform to ACI 301-72 (as revised), as modified by the supplemental requirements below:

3.1.1 Strength: The strength of concrete shall be 3,000 psi unless otherwise shown on the drawings.

3.1.2 Durability: All concrete exposed to weather shall be air entrained.

3.1.3 Slump: Concrete shall be proportional and produced to have a slump of 3 inches with a 1 inch tolerance.

3.1.4 Admixtures: 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 Thompson's Station.

3.1.5 Reinforcing Steel: Yield strength of reinforcing steel shall be 60,000 psi.

END OF SECTION

SECTION 15
SEWER LIFT STATION

PART 1. GENERAL

1.1 SUMMARY

1.1.1 This Specification details the requirements for small residential and commercial wastewater pump stations and valve vaults. Small stations are defined as having a peak hour flow (PHF) capacity of less than 1,000 gpm.

1.1.2 This is not intended to be an all-inclusive specification for the construction of a submersible type station and associated valve vault. Project specific conditions may make it necessary to modify the requirements of this section.

1.1.3 All pump stations shall include a minimum of two pumps (duplex arrangement) sized to convey the peak hourly flow (PHF) with one pump out of service.

1.1.4 All sanitary sewer lift stations shall be submersible type.

1.1.5 All lift stations shall operate automatically based on the water level in the wet well. Level control device and float switch shall be fully accessible without the need for personnel entering the wet well.

1.1.6 Pump station shall be provided with a generator as specified below.

1.2 GENERAL

1.2.1 All pumps, regardless of station design, shall be electric, centrifugal non-clogging units capable of passing incompressible 3-inch spheres, and shall have no less than 4-inch diameter suction and discharge openings. Semi chopper or vortex pumps may be accepted on case-by-case basis.

1.2.2 The lift station shall consist of submersible centrifugal sewage pumps, stainless steel 316 guide rail system, wet well access, discharge seal and elbow, control panel, starters, liquid level control system, SCADA monitoring system, and all hardware necessary to provide a complete working system. Every integral component of the guide system shall be stainless steel 316, which includes the following but not limited to: guide rails, brackets, fittings, bolts, nuts, fasteners, adapters, attachments, etc. Flanged discharges are not allowed.

1.2.3 Pumps shall be capable of meeting all system hydraulic conditions without overloading the motors. In addition, a minimum of 5-hp motor is required, unless prior arrangements have been made and approved by the Town. Submit pump head capacity and system curves to the Town, along with the lift station plans. Base the curves on the total of static head, friction losses through force mains, headers and pump risers. Pump duty point for nominal design flow shall be within 75% and 115% range of pump's flow at Best Efficiency Point (B.E.P).

1.2.4 The proposed elevation of all critical components shall be shown in the Drawings including, but not limited to, pump intake line inverts, control and alarm levels, top of the wet well, influent line invert(s).

1.2.5 All electrical equipment/panels and controls shall be above ground.

1.2.6 Scaled engineering drawings and calculations shall be submitted to the Town for review and approval. After completion of project, as-built drawings shall be provided to the Town prior to final acceptance of station.

1.2.6.1 Calculations shall include flow projections for area served initially and future build-out, if applicable.

1.2.6.2 Calculations should use a peak multiplier of at least 2.5.

1.2.6.3 Include hydraulic calculations that show pump and system curve, pump cycle times, and pipe headloss.

1.2.6.4 Calculation package and/or Engineering Report submitted to TDEC for approval shall also be submitted to the Town.

1.2.7 Lift station design shall comply with Town's standard drawings and include all features and appurtenances shown.

1.3 PUMPS

1.3.1 Impellers shall consist of cast stainless steel or hard iron. Mechanical Seals shall consist of Tungsten Carbide. Silicon Carbide seals will be evaluated and approved on case-by-case basis.

1.3.2 The motor shall be submersible and conform to the requirements of NEMA MG 1. The motors shall be 3-phase, 60-Hz, 277/480 V, squirrel cage, induction type, NEMA Design B Type, Class H motor insulation, high efficiency design, housed in a completely watertight and air-filled chamber, with a minimum 1.15 service factor. The motor shall be sized to avoid overload when operating at any point along the characteristic curve of the pump.

1.3.3 Pump duty point shall be within 75% to 115% range of pump's flow at Best Efficiency Point (BEP) for one and two pumps in operation as to achieve the maximum efficiency possible, and no substitutions will be accepted after approval of the Lift Station construction plans. Designer shall consider different combinations of pumps, impellers and pipe sizes including discharge and force main piping in order to achieve the pump operating criteria and maximum efficiency.

1.3.4 Approved pump manufacturer is Flygt.

1.3.5 Sealing of the pump unit to the discharge connection shall be a machined metal to metal watertight, hydraulically sealed contact.

1.3.6 Pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well.

1.3.7 All cables shall be continuous (no splices allowed) and intended for wastewater service applications.

1.4 STATION PIPING

1.4.1 Pipe reducers, if required installed at discharge base of submersible pumps shall be eccentric type. Reducers installed at discharge header shall be concentric reducer.

1.4.2 The piping design shall consider surge effects and provide protection where necessary. Surge relief shall be contained in the system.

1.4.3 Floor drains from valve vaults to wet wells shall be designed to prevent gas from entering the valve vault, using a check valve and "P" trap.

1.4.4 Provide 316 stainless steel pipe supports for pipes in wet well. Pipe supports in the valve vault shall be stainless steel or concrete.

1.4.5 Lift station piping shall be ductile iron or stainless steel and shall have flanged connections to allow for removal of pumps and valves without interruption of the lift station operations. Wall penetrations shall be Link Seal or approved equal.

1.4.6 If elevation change is required outside of the valve vault, use forty-five (45) degree ductile iron elbows to achieve the correct elevation.

1.5 WET WELL

1.5.1 Pump station wet well shall be precast reinforced concrete and shall conform to ASTM C478.

1.5.2 Dimensions: Minimum 72” in diameter; larger as necessary to accommodate submersible pumping equipment, piping, supports, emergency storage volume (1 hour of average flow) and to support pump cycle times. Depth of wet wells shall consider, but not be limited to all the following: emergency storage volume and adequate submergence of submersible pumps.

1.5.3 Sufficient depth shall be provided to accommodate cycle time and motor submergence.

1.5.4 In determining the cycle time, only the volume below the pipe invert and above the top of pump or manufacturer’s minimum submergence (whichever is greater) shall be considered.

1.5.5 Pumping levels shall be set to provide a minimum capacity between operational water levels sufficient to allow a minimum of ten minutes in one pumping cycle. The minimum time between successive starts of the same pump shall be ten minutes.

1.5.6 The effective volume (from pump off elevation to the invert of the gravity pipe) shall be based on a fill time of 30 minutes at Average Daily Flow (ADF). The high liquid level in the wet well (storage capacity) shall not exceed the invert elevation of the lowest inflow pipe.

1.5.7 Pump-off water levels shall provide adequate submergence to preclude pump inlet cavitation. Design maximum water levels shall not exceed the invert elevation of the influent pipe.

1.5.8 The wet well floor shall have a minimum slope of 1:1 to the hopper bottom. The horizontal area of the hopper bottom shall be no greater than necessary for proper installation and function of the pump inlet.

1.5.9 Interior ladders shall not be permitted.

1.5.10 Only one inlet connection shall be permitted to a wet well. A kingpin manhole shall be installed within 20 feet of the wet well.

1.5.11 For buoyancy calculations, the soil ring weight (from the outer face of the bottom slab to the outer edge of the wet well) shall be 100 percent of the total weight of the soil ring. The net density of the soil shall be used for calculating weight, i.e., soil density less the water density (62.4 pounds per cubic foot). A minimum safety factor of 1.1 shall be achieved.

1.5.12 Wet well shall be coated with bitumastic coal tar epoxy. Commercial Product's epoxy will not be allowed.

1.5.13 Preformed butyl rubber gaskets shall be used at all joints between manhole sections.

1.5.14 The wet well shall have at least one double-leaf hatch as specified in this Section.

1.5.15 A davit crane shall be mounted at the wet well for the purpose of retrieving the pumps from the wet well. Davit crane shall be provided with an electric winch with stainless steel cable. Provide hook and saddle grab for lifting pumps via chain. All components must be rated for the pump weight with a factor of safety of 1.2. Davit crane shall be manufactured by Thern.

1.6 VALVE VAULT

1.6.1 Valve vaults shall be precast reinforced concrete and shall conform to ASTM C478.

1.6.2 A separate valve vault shall be installed downstream of the wet well vault. It shall be sized to accommodate valves and routine maintenance without removing the valve from vault.

1.6.3 Plug Valves: Install a plug valve on the downstream side of each check valve. Valves shall meet the following requirements:

1.6.3.1 Non-lubricated type eccentric valves shall be rated for 175 psig service at 140 degrees F. Valves shall have drip-tight shutoff with pressure from either direction and cast iron bodies. Exposed service valves shall have flanged ends in accordance with ASME B16.1 flanged or AWWA C606 grooved end connections.

1.6.3.2 Plug shall be all metal, matching body with round or rectangular port with no less than 80% of connecting pipe area and coated with Buna-N, welded nickel seats, self-lubricating stainless steel stem bearings, and stem seal multiple V-rings or U-cups with O-rings of nitrile rubber, with grit seals on both upper and lower bearings. Valves to 6" shall be provided with lever operator. Larger valves shall be equipped with totally enclosed, geared, manual operator with handwheel. Size operator for 1.5 times the maximum shutoff pressure differential for direct and reverse pressure, whichever is higher. For buried service, provide completely sealed operator filled with heavy lubricant and 2-inch nut.

1.6.3.3 Manufacturers and Products:

i) DeZurik, Style PEC

ii) Valmatic, Style 5800R

iii) Pratt, Ballcentric

1.6.4 Check Valves: A flanged, non-slamming check valve shall be installed on the discharge side of each pump. Check valves shall be swing type with an external lever and minimum pressure rating of 250 psi. Approved check valve manufacturers and models are APCO CVS-6000/6000A and Valmatic 7800/7900.

1.6.5 Butterfly valves, tilting disc check valves, or other valves utilizing a tilting disc in the flow line are not allowed.

1.6.6 Air/Vacuum Release Valves: shall be mounted on common header and all high points along force mains. Air/Vacuum release valves shall be rated for raw sewage, have a minimum 2" inlet, and be provided with flush ports. Valves shall be sized for intended system hydraulics. Air release valves shall be mounted on isolation valves. The air release valve drain pipe shall be a minimum of 1-inch PVC Sch. 40 Drain pipe shall be installed in a manner that doesn't represent a tripping hazard and shall be solidly fastened; unless embedded in concrete slab, and shall discharge into wet well. Liquid shall not accumulate within the drain pipe. Air/Vacuum release valves shall have a PVC or stainless steel 316 body. Approved manufacturer is DeZurik/APCO 401 or Vent-O-Mat Series RGX.

1.6.7 Surge Relief Valves: When required, surge relief valve size shall be selected based on Firm Pumping Capacity flow. It shall be rated for raw sewage service, and it shall have isolation valve on the inlet side. Opening setting shall not exceed 5 psi above normal operating pressure of the system at header when firm pumping capacity flow

is being discharged. Surge relief pipe shall be routed back to either wet well or manhole next to wet well. When the analysis shows dangerous surge pressure at firm pumping capacity, a surge relief valve will be included in the design in addition to the soft starters.

1.6.8 Install a discharge pressure gauge rated for corrosive service that meets the following specifications: 4.5" Dial, Grade 1A, ASME B40.100, ±1% full scale accuracy, liquid filled, type 316 stainless steel bourdon tube, glass safety lens, full blowout protection, weatherproof, hermetic seal and with a standard ¼ inch NPT. Pressure gauge shall be provided with a glycerin filled diaphragm seal and isolation ball valve. Vacuum gauges shall meet the same specifications of the pressure gauges.

1.6.9 Bypass Connection: Each valve vault shall include a bypass connection with a male cam-lock fitting and cap. The bypass connection shall be isolated by a plug valve, as specified above.

1.7 ACCESS FRAMES AND DOORS

1.7.1 Access frames shall be manufactured by USF Fabricators, Halliday Products, Bilco or Approved Equal.

1.7.2 The wet well shall be furnished with access frame and doors along with an integrated fall protection system. Equipment furnished shall include the necessary aluminum access frames with spring loaded double doors, stainless steel upper guide holder, and level sensor cable holder. Doors shall be aluminum diamond plate.

1.7.3 Wet well access doors shall be sized according to the pump manufacturer's recommendations. As a minimum, doors shall be sized to allow pumps to pass through the hatch opening with a one-inch clearance between the back of the pump volute and the door. The front hatch frame shall have a minimum eight-inch clearance from the front of the pump volute. Double doors shall be used wherever possible.

1.7.4 The valve vault shall be furnished with spring loaded double access doors which covers entire vault opening. The difference between the interior vault dimensions (length and width) and hatch dimensions shall not be greater than 12-inches. Equipment furnished shall include the necessary aluminum access frames, and spring loaded double doors. Doors shall be aluminum diamond plate.

1.7.5 Wet well hatch hinges shall not be mounted on the same side as the guide rails and float/control ball rack.

1.76 The access frame and door(s) shall have stainless steel hardware.

1.7.7 Access doors that are not exposed to vehicular traffic shall have a load rating of 300 pounds per square foot (psf). Access doors exposed to vehicular traffic shall have a H-20 traffic load rating. The support beam for load rating shall be mounted on the door.

1.7.7.1 Angle Frame Covers (300 psf rating)

i) The single leaf and double leaf access frames and covers shall have a 1/4 inch (7mm) thick one-piece, mill finish, extruded aluminum frame, incorporating a continuous concrete anchor. Door panels shall be 1/4 inch (7mm) aluminum diamond plate, reinforced to withstand a live load of 300 lbs. psf (1464 kg. psm), uniform load. Doors shall open to 90 degrees and automatically lock with T-316 stainless steel hold open arms with aluminum release handles. Doors shall close flush with the frame. Hinges and all fastening hardware shall be T-316 stainless steel. Unit shall lock with a non-corrosive locking bar and have a non-corrosive handle. Unit shall carry a lifetime guarantee against defects in material and/or workmanship.

1.7.7.2 H-20 Rated Angle Frame Covers

i) The single leaf and double leaf access frames and covers shall have a ¼ inch (7mm) thick, one-piece, mill finish, extruded aluminum frame, incorporating a continuous concrete anchor. The inside of the frame shall have a door-support ledge on two (2) sides. Both frame and ledge must be supported by a full bed of Class A concrete. The door panels shall be ¼ inch (7 mm) aluminum diamond plate, reinforced to withstand a live load of the H-20, uniform live load. Doors shall open to 90 degrees and automatically lock with a T-316 stainless steel hold open arm with release handles. For ease of operation, doors shall incorporate enclosed stainless steel compression spring assists. Doors shall close flush with the frame. Hinges and all fastening hardware shall be T-316 stainless steel. Unit shall lock with a T-316 stainless steel slam lock with removable keys and have a non-corrosive handle. Unit shall carry a lifetime guarantee against defects in material and/or workmanship.

1.7.8 The protective fall protection panel shall be installed with a 3-inch (76 mm) aluminum "I" bar grating with Safety Orange powder-coated finish. Grating shall be hinged with tamper proof stainless steel bolts and shall be supplied with a positive latch to maintain unit in an upright position. Grating shall have a 6 inch (152 mm) viewing area on each lateral unhinged side for visual observation and limited maintenance. A padlock hasp for owner-supplied padlock shall be provided.

1.8 ELECTRICAL EQUIPMENT

1.8.1 Electrical service shall be 277/480-volt, 3-phase, and 4-wire, unless otherwise approved or the power company indicates this is unacceptable. Minimum service size shall be 200 amps. Request for smaller electrical service shall be reviewed and considered for approval on a case by case basis. All enclosures shall be stainless steel 304, rated NEMA 4X with lever type door closures. Pump control enclosure shall be double door type as to locate all 480V/230V equipment on the right side and all 120V equipment on the left side. Single-phase systems are not allowed.

1.8.7.1 If 3-phase power is unavailable, then a phase converter (PC) shall be provided for each pump station that will convert single phase incoming power into three phase power to operate the pump station. The phase converter shall be sized and provided by the pump manufacturer, and the pump manufacturer shall take full responsibility for coordinating sizing and installation of the PC. The PC shall be a static three phase converter, designed to operate multiple motors to their full load rating, plus normal overload. Unit shall be Ronk Type K-Duo Add-A-Phase Power Converter, sized for the selected pumps.

1.8.2 Conductors for power shall be stranded copper, rated for 75 ºC, with insulation suitable for dry and wet locations. Sizing shall be done according to NEC requirements. Power conductors shall be continuous. Field splices are not allowed.

1.8.3 Wire size for controls shall be minimum #14 AWG copper stranded rated for 90 ºC. Wire size for SCADA controls shall be minimum #16 AWG copper stranded rated for 90 ºC.

1.8.4 Install a din rail mounted transient voltage surge protector and lightning arrestor inside the control panel.

1.8.5 Due to the potential presence of hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in sewage, all mounting hardware shall be Type 304 Stainless Steel. Seal-offs shall be installed in conduit leading into the pump control panel and junction boxes. All enclosures shall be Type 304 Stainless Steel and disconnects shall be FRP-NEMA 4X. All enclosures and disconnects shall be lockable with a padlock.

1.8.6 Main electrical disconnect shall be housed in a separate NEMA 4X, stainless steel enclosure and shall be equal to Square D, Class 3110, 600-volt class, heavy duty, service rated safety switch, with all copper current carrying parts, Model H36_DS. Provide with fusing class size based on the characteristics of the motor loads served and the available fault current. Main electrical disconnect shall be time delay fuse or time delay circuit breaker. Provide a surge arrestor in a separate NEMA 4X, SS304 enclosure mounted in the service pole mounting rack. Approved Manufacturers: Square D, Siemens, General Electric, and Cutler-Hammer.

1.8.7 Electrical equipment shall comply with the latest version of the NFPA National Electrical Code (NEC) requirements for Class 1, Group C and D, Division 1 locations. Additionally, equipment located in wet wells shall be suitable for use under corrosive environments. Each flexible cable shall be provided with a watertight seal and separate strain relief. High water float switch shall be normally open and nonmercury type.

1.8.8 Free-standing electrical service and transfer switch shall be housed in heavy-duty electrical weatherproof, NEMA 4X, stainless steel 304 enclosures securely mounted onto the rack a minimum of 24” above the ground. Provide 120-volt,

20-amp duplex, GFI, receptacle in an "in-use" weatherproof box with clear cover. Light switches shall also be installed in a weatherproof box with an "in-use" clear weatherproof cover.

1.8.9 All electrical equipment shall be protected from the 100-year flood event and be protected from potential flooding from the wet well. If the electrical equipment is raised four-feet or more to be above the 100-year flood event, then a platform shall be constructed with rails and adequate working clearance in front of the electrical equipment, with permanent ladder or steps for access. As a minimum, control panels shall be mounted on a 4-inch tall concrete housekeeping pad. All electrical equipment and connections in wet wells and valve vault shall be rated for Class 1 Division 1 explosion proof.

1.8.10 Transfer switches, motor controls, dry type transformers, load centers, SCADA monitoring system and connectors for portable generators, and wiring gutters shall be mounted on a single rack. Mounting rack shall be constructed of type 304 stainless steel strut, 1-1/2" minimum, mounted on a minimum 4-inch diameter and ½-inch thick hot dip galvanized structural steel tube. Approved manufacturers: UNISTRUT, Kindorf, and B-Line. Touch up with cold galvanizing compound any scratches where coatings are applied. Close all exposed tube ends with proper size PVC plug caps. Do not use the electrical service pole for supports.

1.8.11 Provide terminal blocks and panel wiring for future remote start and stop contacts.

1.8.12 All underground electrical conduits shall be grey, rigid nonmetallic conduit (RNC). Field manufactured bends are not permitted. Only factory fabricated conduit bends are allowed. Buried conduit shall have a cover depth of 18 to 24 inches beneath the finished surface. Conduit shall comply with minimum NEC bend radius and not burned or kinked.

1.8.13 All exposed conduit shall be rigid aluminum. To avoid tripping hazards, conduits must be buried and/or embedded in concrete slabs.

1.8.14 Provide general illumination of 1.0 foot-candle (average) on the lift station equipment areas. Use LED fixtures for general illumination.

1.8.15 Install all conduit runs in initial construction sized to meet ultimate electrical and instrumentation needs.

1.8.16 Design electrical supply, control and alarm circuits to allow for disconnection outside the wet well. Terminals and connectors shall be protected from corrosion by location outside the wet well in a NEMA 4X stainless steel enclosure.

1.8.17 Locate the motor control center outside the wet well, readily accessible and protected by conduit seals, to meet the requirements of the NFPA National Electrical Code to prevent the atmosphere of the wet well to enter the control center. The seal shall be so located that the motor may be electrically disconnected without disturbing the seal.

1.8.18 Pump motor cables shall meet the requirements of the National Electrical Code for flexible cords in wastewater pumping stations. Power cord terminal fittings shall be corrosion-resistant and constructed in a manner to prevent entry of moisture into the cable and shall be provided with strain relief appurtenances.

1.8.19 Ground in accordance with NEC Code.

1.8.20 All electric conduits shall be sized in a manner that electric conductors shall not overfill the conduits. The conductor filling percentage for all conduits shall not exceed 40%. For motors with insulated jacketed power cables provided by pump manufacturer as an integral part of the pumping unit, the diameter of the electric conduit for such power cable shall have a diameter 1.58 times greater than the outer diameter of the power cable. When the calculated diameter for the conduit lies between two standard conduit sizes select the next larger size.

1.8.21 Laminated wiring schematics of Pump Control Panel and SCADA Panel shall be provided. Also, each schematic shall be placed in each respective panel.

1.9 STATION CONTROLS, INSTRUMENTATION AND MONITORING

1.9.1 Primary level monitoring and pump control must be of the submersible level transmitter type. Accepted manufacturers are Siemens (Milltronics HydroRanger 200), Greyline Instruments, and Drexelbrook for controller. Submersible level transmitter approved manufacturer is Mercoid model PBLT2 or equivalent. An equivalent unit must be of equivalent design and weight of at least 4 pounds. A stainless steel 316 stranded cable must be solidly fastened to the instrument for removal ease. A 24Vdc power supply shall be included in the pump control panel to feed the submersible level transmitter.

1.9.2 Place the wet well level transmitter in a stilling well. Stilling well shall be 6-inch perforated PVC, terminating 1″ above the bottom of the wet well.

1.9.3 Place the backup float switches in an area of the wet well which is removed from the effects of the influent flow being received.

1.9.4 A common junction box that houses the motor power cable splice, motor sensor cable, low-low-level and high-level float, and wet well level transmitter shall be located on side of the wet well.

1.9.5 Lift station shall be capable of discharging all anticipated peak wet weather flows. The “lead” pump is turned on at the first “on control elevation” and the “lag” pump will start with a rising liquid level at the “second on” control elevation. The “lead” and “lag” pumps will continue to operate until the “pump off control elevation” is reached. The “lead” and “lag” shall automatically alternate between the two pumps at the completion of each pumping cycle.

1.9.6 Install elapsed time meters and overload reset with metal extension and plastic cap on the inner panel of the pump control enclosure. Meters shall be five digits, indicates

tenths of hours and be non-resetting. Operating power shall be 120-volt. Approved manufacturers are Cramer, Hobbs, Honeywell, and Redington

1.9.7 Provide structural support of the mounting rack that houses electrical, communication, control, and instrumentation components.

1.10 SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

1.10.1 All lift stations shall include a High Tide Technologies SCADA remote terminal unit.

1.10.2 SCADA system shall monitor for each pump all the following, but not limited to: Pump Hand/Off/Auto Status, Pump Run, Pump Stator Leak, Motor High Temp, Motor Overload. In addition, the SCADA system shall monitor all the following, but not limited to: Low Level Alarm, High Level Alarm, Utility Power On, Generator Power On, Transfer Fail, and Wet Well Continuous Level.

1.10.3 SCADA panel must include isolation relays for all digital inputs. Isolation relays must be located within the SCADA panel to separate 120Vac circuits or others from SCADA 24Vdc.

1.10.4 SCADA Panel will be provided with an uninterruptible power supply of 24Vdc. The power supply will provide reliable power for a minimum of 2 hours. Power supply will be used exclusively for the 24Vdc loads within the SCADA panel and pressure transmitter located in the header. The wet well level controller and any other 24Vdc load located within the Pump Control Panel and automatic transfer switch (if any) shall not be powered by the SCADA power supply.

1.10.5 Install a din rail mounted transient voltage surge protector and lightning arrestor inside the SCADA panel. Approved manufacturer is Phoenix Contact, model Combotrab 2856702, or approved equal.

1.11 STANDBY GENERATOR

1.11.1 Permanent stationary standby generator set shall be provided for all lift stations.

1.11.2 The generator transfer switch shall be of the automatic type. The generator shall be fueled by diesel. Diesel fuel tanks shall be base tanks integrated into generator unit by OEM, shall include double wall containment, and shall be sized to run the generator for at least 10 hours continuously at 100% load. The concrete base to install the generator shall be provided with a spill containment structure to capture any spillage. The generator shall have a 4-foot clearance all around, and it shall be provided with noise control package. Sound attenuation system performance shall result in measured sound levels not to exceed 78 dB @ 7 meters (23 feet), 60 Hz.

1.11.3 The generator shall have a motor starting kVA capacity to limit the voltage dip to no more than 15% for any motor starting conditions. Such generator load analysis must be included in the engineering report. Approved manufacturers are Kohler, Onan, Caterpillar and Generac, or approved equal.

1.12 ODOR CONTROL

1.12.1 The lift station design shall minimize odor potential. Locate incoming wet well gravity pipe to reduce turbulence. Minimize detention times in wet well during all phases of development. If detention times are greater than 180 minutes, the Town may require odor control measures based on evaluation of, but not limited to, construction phasing, prevailing wind direction, and proximity to neighborhoods. If odor control measures are needed, it shall consist of a chemical drum scrubber with top mounted blower to absorb odorous compounds for oxidizing. The drum scrubber shall be designed to operate at 99.5% gas removal. The design specification shall be prepared by the drum scrubber and media supplier. Approved manufacturers are HiBocs, Purafil, or approved equal.

1.13 SITE DEVELOPMENT

1.13.1 Lift Station site layouts shall consider clearances for unimpeded maintenance operations. The area surrounding the lift station components including, but not limited to, the wet well, valve slabs, generator, electric service rack shall be large enough to permit heavy equipment and vehicles ample room to maneuver. The lift station site shall be designed to allow maintenance vehicles to have direct access to the wet well, electric controls, and generator.

1.13.2 The lift station shall have an access road, located in a dedicated right-of-way or permanent easement. The access road surface shall have a minimum width of 16 feet and the pavement shall meet AASHTO HS 20-44 standard. Crushed stone, flexible base or similar materials are not considered all weather materials and will not be accepted. The access road surface shall be designed to be above the water level caused by a 25-year storm event. The design of the access road shall include plan, section and profile sheets of the access road, drainpipes and details. The design shall limit the slope to no more than 8 percent (8%) and grade break to 3 percent (3%) and provide soil erosion protection to prevent collection of sedimentation along the access road. Inside the boundary of a proposed residential development, design of the access road, either temporary or permanent, shall minimize turns and achieve the straightest possible alignment.

1.13.3 Provide two 8-foot gates for a 16-foot clearance to allow access by large maintenance equipment. Lift stations with relatively long driveways must include pole gates at the entrance of the driveway. Turnarounds shall be required for at all station, unless otherwise approved by the Town. Allow sufficient space for large maintenance vehicles to have unhindered access to the wet well, generator, by-pass and on-site manhole. Entries located parallel to the roadway should also be considered. Lift stations are not allowed within the street right-of-way. All parking and driving areas within the fence shall be paved with asphalt.

1.13.4 The lift station, including all electrical and mechanical equipment, shall be protected from a 100-year flood event and remain fully operational during such event.

1.13.5 Provide protection of the lift station, including mechanical and electrical equipment, from access by any unauthorized person. The lift station shall be enclosed within an intruder resistant fence consisting of a black vinyl coated chain link fence 6-feet minimum in height, with a 1-foot section above consisting of 3 strands of barbed wire "up-riggers." HDPE, UV resistant fence slats shall be included in the fence. Color shall be selected by the Town. Privacy fences shall complement the character of the lift station location and will be evaluated on a case-by-case basis.

1.13.6 Design shall provide for ¾-inch minimum freeze proof water service with hose bib vacuum breaker attached to the hose connection. It shall be located within 10-foot radius of wet well.

1.13.7 Lift station site shall be located or designed in a manner that will be protected from storm runoff entering the lift station site and that will allow storm water to drain away from lift station site.

1.14 FORCE MAIN

1.14.1 Forcemain shall be as specified in Section 12.

END OF SECTION

SECTION 16
CHECKLIST

PART 1. GENERAL

1.1 SANITARY SEWER GENERAL SPECIFICATIONS

1.2 SEWER EXTENSION AND/OR SERVICE CONNECTION: The following are guidelines for the preparation of sanitary sewer plans and should not be construed as being the total requirements. The City may at its option require additions to be made in the plans where circumstances warrant.

1.2.1 Five (5) hard copy sets and one electronic copy of drawings including vicinity map shall be submitted for approval.

1.2.2 Submittals shall be at least fourteen (14) days prior to a scheduled meeting in order to be considered at that meeting.

1.2.3 After approval, drawings shall be submitted to the Tennessee Department of Environment and Conservation for their approval. Approval of the plans and specifications 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.

1.2.4 One (1) state approved set of drawings and one (1) copy of the State approval letter shall be provided to the Wastewater Operator prior to beginning construction.

1.2.5 Prior to acceptance of lines by the Town, a set of reproducible "Record Drawings" showing all work, changes, service locations, and other data not shown on the original set shall be given to the Wastewater Operator after each project or phase of a project is completed. Developer shall provide one hard copy and one electronic copy of the Record Drawings. Record Drawings shall include GPS coordinates of manholes, air release valves, fittings, wet wells, and valve vaults.

1.2.6 Detail drawings and specifications shall be submitted to the Town by an Engineer employed by the Developer for any special condition or structures such as pump stations, creek crossings, etc., and approved by the Town before beginning any construction.

1.2.7 Plans shall be drawn on a standard 24" x 36" sheet and stamped by a licensed Tennessee Engineer.

1.2.8 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" = 1,000', the name of the project, and the names, addresses and telephone numbers of the Developer and the Engineer.

1.2.9 Include a key map indicating sheet numbers for each sewer line.

1.2.10 Sewer plans must be on plan and profile sheets, with 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.

1.2.11 All plans shall show conduits for all utilities including, but not limited to, gas lines, underground telephone conduits, power and telephone poles, water mains, sanitary sewer lines, storm sewers, etc.

1.2.12 The scale of the plan/profile sheet will be: Plan 1" = 50' horizontal; Profile 1" =50' horizontal, 1" = 5' or 1" = 10' vertical.

1.2.13 All sewer plans shall include at least one (1) benchmark based on U.S.G.S. Datum. Additional benchmarks shall be shown at approximately 1,500 feet intervals. The use of a manhole invert elevation or an assumed elevation will not be approved.

1.2.14 Show all topographic features, such as driveways, pavement, rights-of-way, property lines, storm drainage structures, etc.

1.2.15 The direction of North should be clearly shown on all plans.

1.2.16 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.

1.2.17 A connection must be provided for each parcel or proposed lot. The connection will be shown as a SDR 35 PVC tee wye (machine made only) and a six (6) inch SDR 35 PVC service line extension. Handmade tees and wye connections are not acceptable. When sewers are constructed by private Developers to serve proposed developments and are to be constructed in public right-of-way in areas currently without sewer service, the Developer shall provide a service line extension and tee wye in accordance with the requirements mentioned above. All parcels currently unserved along the route shall receive a service line extension. When laying the mains in private property a wye and ten (10) feet of service line shall be provided for each existing parcel.

1.2.18 A maximum of two (2) six-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. The maximum length of a service line from the sewer main to property line shall be seventy-five (75) feet.

1.2.19 Special pipe considerations are as follows:

1.2.19.1 The same type of pipe material must be used from manhole to manhole; jointing of two different type pipes between manholes will not be permitted.

1.2.19.2 Due to maintenance considerations, it will be Town's policy to require that all lateral sewers proposed at depths greater than 14 feet be constructed of ductile iron pipe and any service line risers from this depth also be ductile iron pipe. This condition should be avoided whenever possible and first consideration given to other routes.

1.2.19.3 All sanitary sewers shall have a minimum of 30 inches cover in private property and 48 inches in paved areas subject to vehicular traffic.

1.2.20 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 300 feet. Manhole spacing greater than 300 feet shall require Town approval.

1.2.21 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 City will require approved watertight frames and covers (with brass bolts) to be installed on the manholes.

1.2.22 A vent stack assembly will be required on watertight manholes at 1,000 feet intervals.

1.2.23 When sewers are proposed to serve new subdivisions, at least one (1) copy of the subdivision plans, including grading, drainage, and roadway plans must be submitted with the sewer plan for review. The roadway plans must contain a typical section of the proposed roadway. A statement should be incorporated into the letter for transmittal for plans designating which roads are to be public and which are to be private, as well as designating which sewer lines are to be public.

1.2.24 Smaller lines shall not be connected to larger lines by utilizing a concrete collar. Only an approved compression or rubber O-ring style coupling will be acceptable. The practice of "hammer tapping" a sewer line is not in conformance with the Standard Plumbing Code and is not an acceptable method of connecting a service line to a new or existing sewer line. In all cases, a tee, wye, or tapping saddle shall be used.

1.2.25 Any time 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.

1.2.26 The profiles of all drains adjacent to and crossing proposed sewers must be shown on the sewer plan profile. Concrete protection must be provided on sanitary sewers across drains where there will be less than 2.5 feet of cover.

1.2.27 Whenever wastewater lift stations are proposed, the following information must be submitted along with the design drawings:

1.2.27.1 Complete design criteria for the proposed pumping station including pump curves and hydraulic calculations.

1.2.27.2 Topographic map with the drainage area clearly defined and the acreage shown.

1.2.27.3 Complete information concerning the proposed area of service, including the number and type of proposed units.

1.2.27.4 Complete anticipated average, maximum, and peak flow data based on Tennessee Department of Environment and Conservation design criteria and utilizing a peak factor not less than 2.5.

1.2.27.5 Complete details of possible alternate gravity sewers to serve the same area, including cost estimates of both type systems.

1.2.28 In general, wastewater collection extensions shall be designed for the estimated ultimate tributary population.

1.3 DRAWING LIST

1.3.1 Manhole

1.3.2 Frame and Cover

1.3.3 Manhole Connection

1.3.4 Pipe Trench/Bedding

1.3.5 Lateral Connection

1.3.6 Cleanout

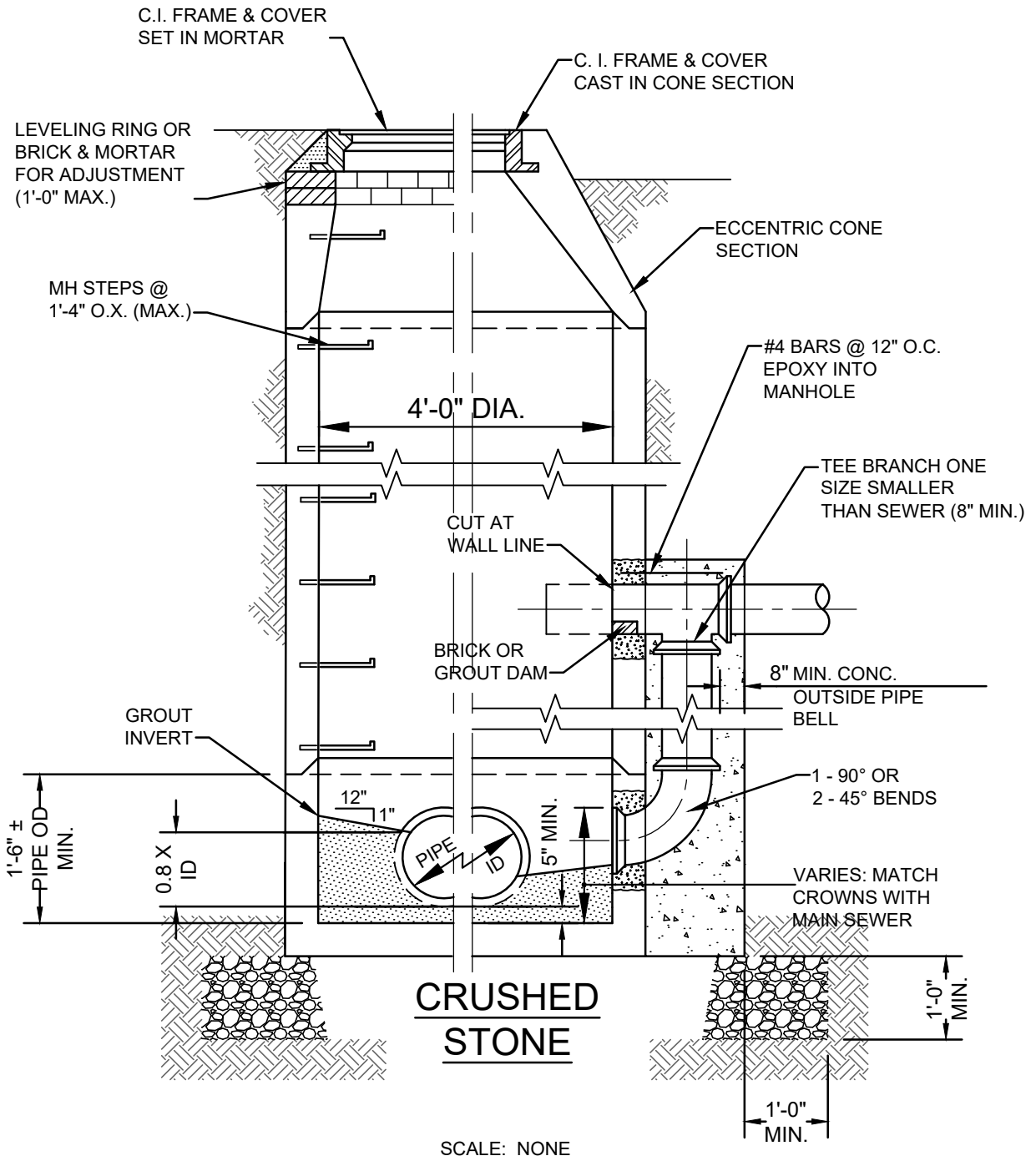
1.3.7 Concrete Cap/Encasement

1.3.8 Casing Spacer/End Seals

END OF SECTION

TOP AT GRADE

TOP ABOVE GRADE



SCALE: NONE

HALF SECTION STANDARD MANHOLE

HALF SECTION DROP MANHOLE

BARGE DESIGN SOLUTIONS

615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

PRECAST CONCRETE MANHOLE

TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

DRAWN BY:	CHECKED BY:
DB	LB

DRAWING NO.: DETAIL 1

PROJECT NO.:	DATE:
36724-07	4-13-2021

BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

SANITARY MANHOLE JOINT

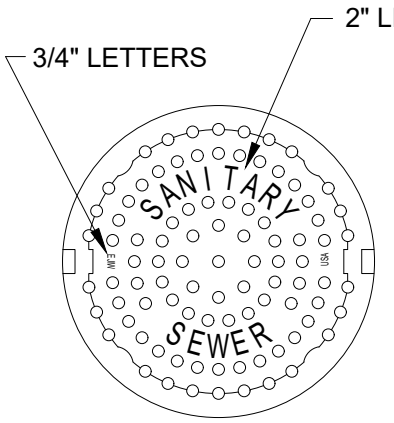
TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

DRAWN BY:	CHECKED BY:
DB	LB

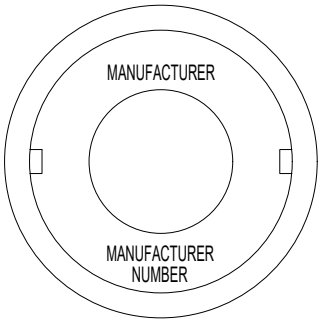
DRAWING NO.: DETAIL 2

PROJECT NO.:	DATE:
36724-07	4-13-2021

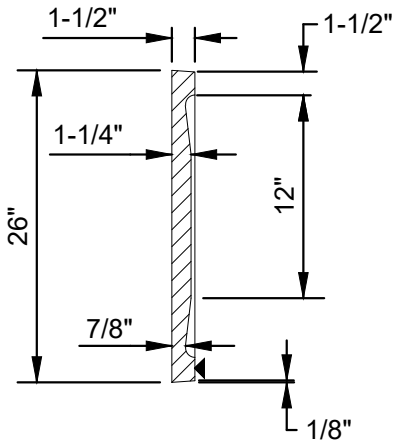
SCALE: NONE



COVER FACE



COVER BACK



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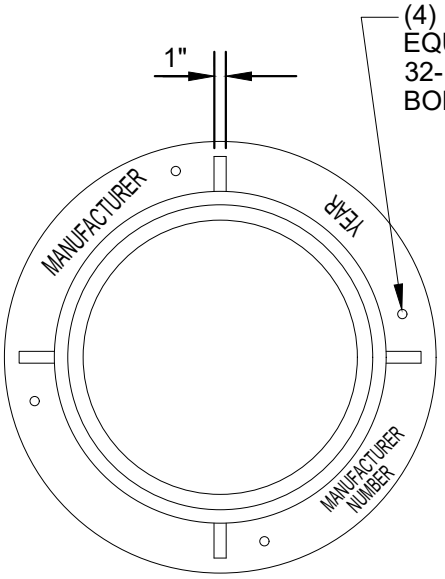
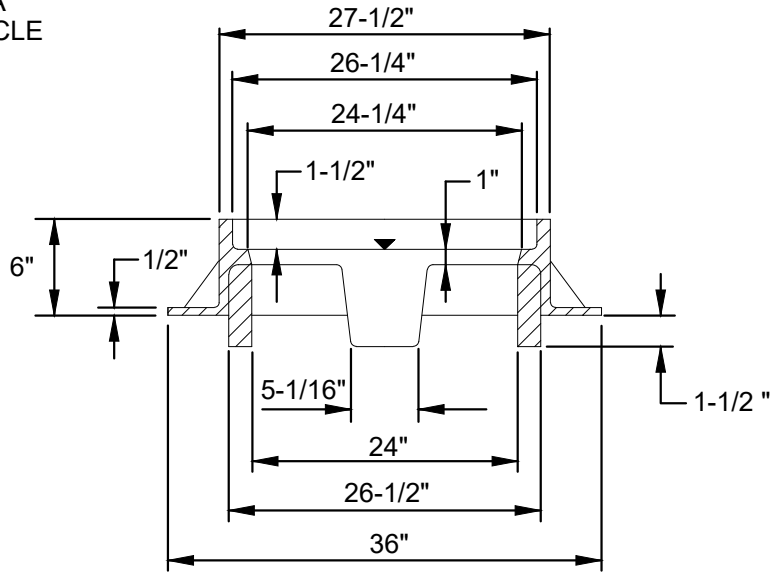


FRAME TOP VIEW



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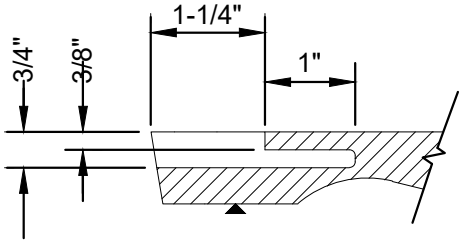


(2) TYPE TWO NON-PENETRATING PICKHOLES

PICKHOLE

ESTIMATE WEIGHT

COVER 165 LBS
FRAME 250 LBS
TOTAL 415 LBS

MACHINED BEARING SURFACE ▼

BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

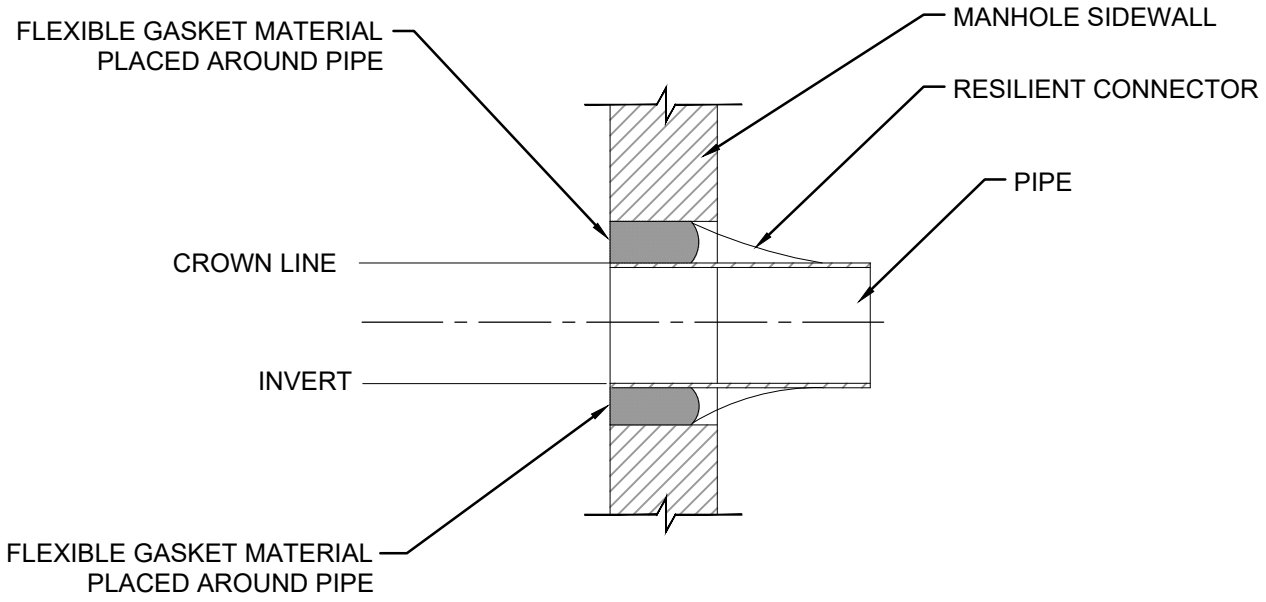
SANITARY MANHOLE FRAME & COVER

TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

DRAWN BY:	CHECKED BY:
DB	LB

DRAWING NO.: DETAIL 3

PROJECT NO.:	DATE:
36724-07	4-13-2021



BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

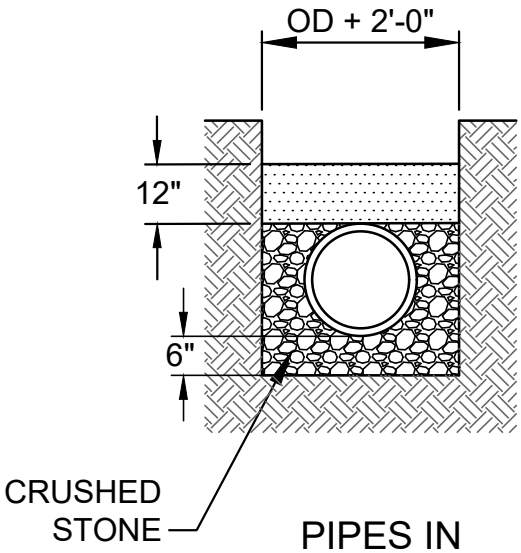
RESILIENT PIPE CONNECTOR TO MANHOLE

TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

DRAWN BY:	CHECKED BY:
DB	LB

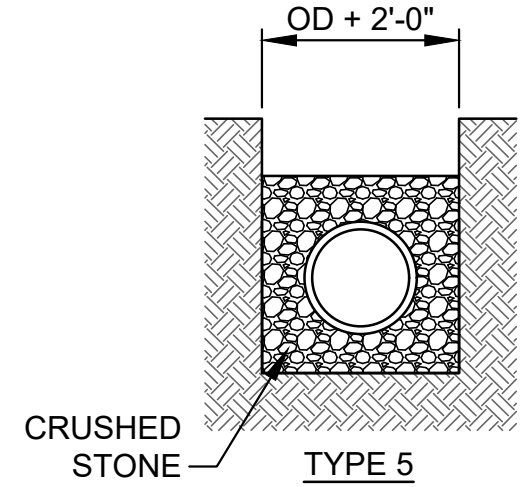
DRAWING NO.: DETAIL 4

PROJECT NO.:	DATE:
36724-07	4-13-2021



PIPES IN
UNPAVED AREAS

PIPE BEDDED TO ITS CENTERLINE IN COMPACTED GRANULAR MATERIAL, 6" MINIMUM UNDER PIPE. COMPACTED GRANULAR MATERIAL TO 12" ABOVE TOP OF PIPE. (APPROXIMATELY 90% STANDARD PROCTOR, AASHTO T-99.)



PIPES IN
PAVED AREAS

PIPE BEDDED TO ITS CENTERLINE IN COMPACTED GRANULAR MATERIAL, 6" MINIMUM UNDER PIPE. COMPACTED GRANULAR MATERIAL TO TOP OF PIPE. (APPROXIMATELY 90% STANDARD PROCTOR, AASHTO T-99, COMPACTED IN 6" LIFTS.)

SCALE: NONE

BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

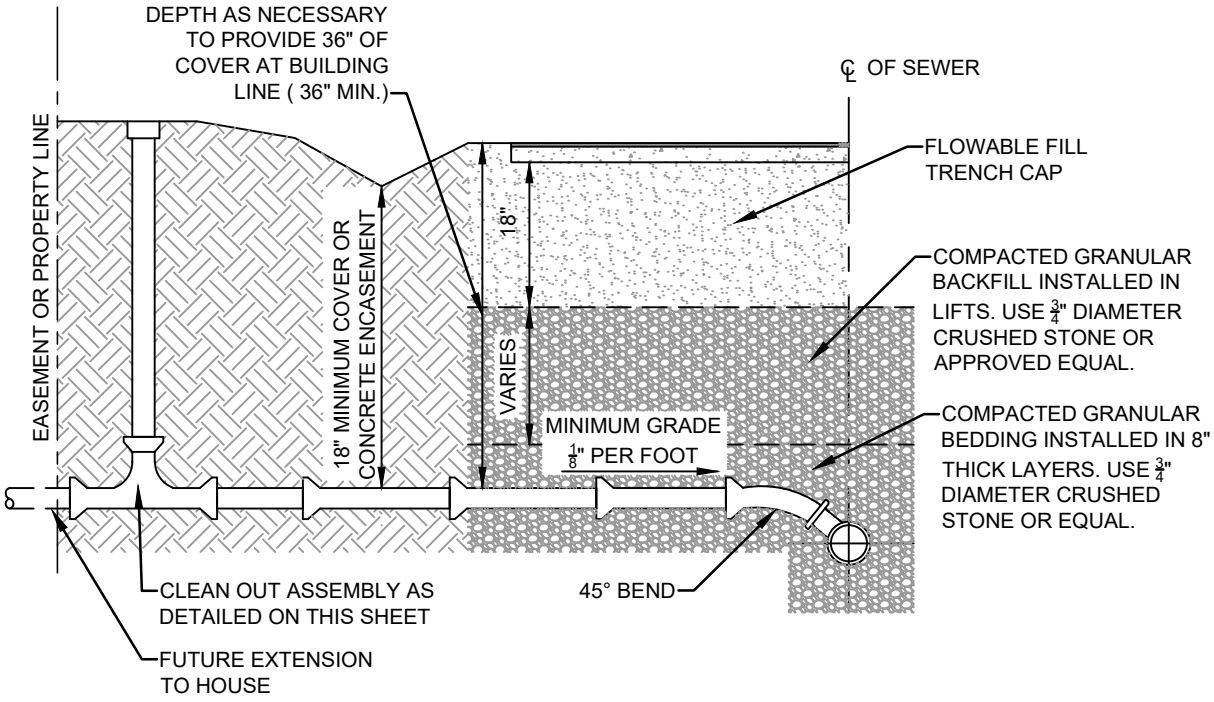
SEWER PIPE BEDDING & HAUNCHING

TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

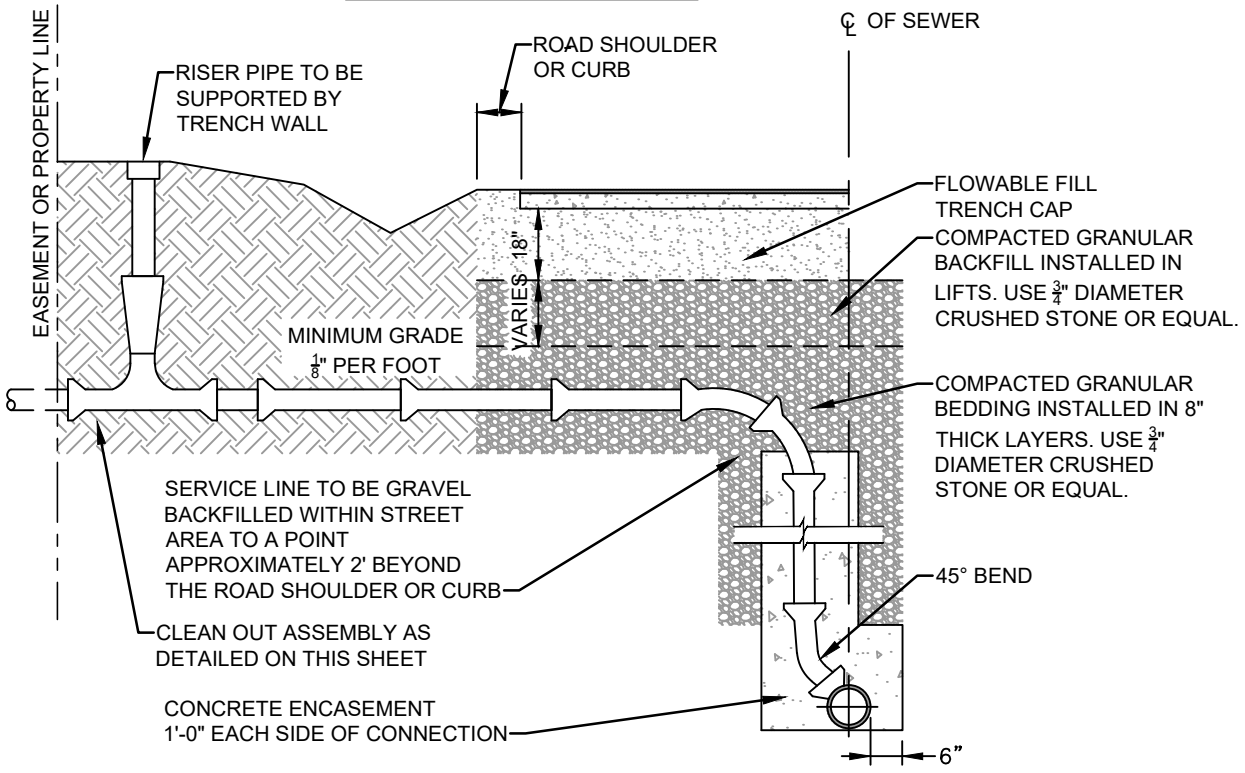
DRAWN BY:	CHECKED BY:
DB	LB

DRAWING NO.: DETAIL 5

PROJECT NO.:	DATE:
36724-07	4-13-2021



SEWER SERVICE



RISER PIPE FOR SEWER SERVICE

SCALE: NONE

BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

SERVICE REPAIR

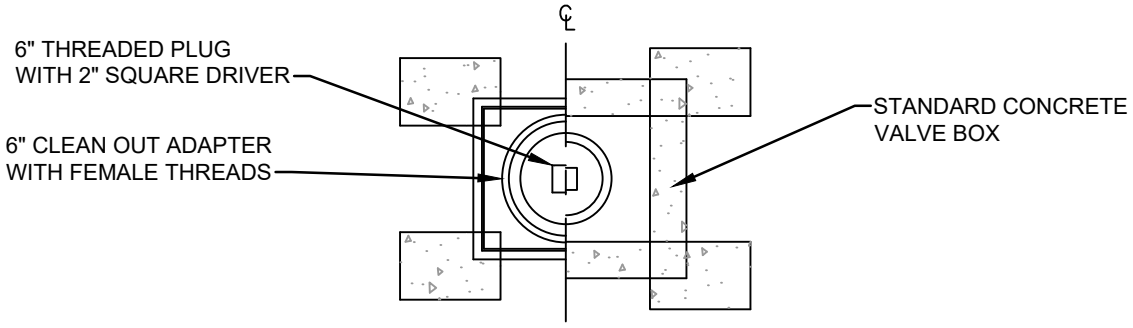
TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

DRAWN BY:	CHECKED BY:
DB	LB

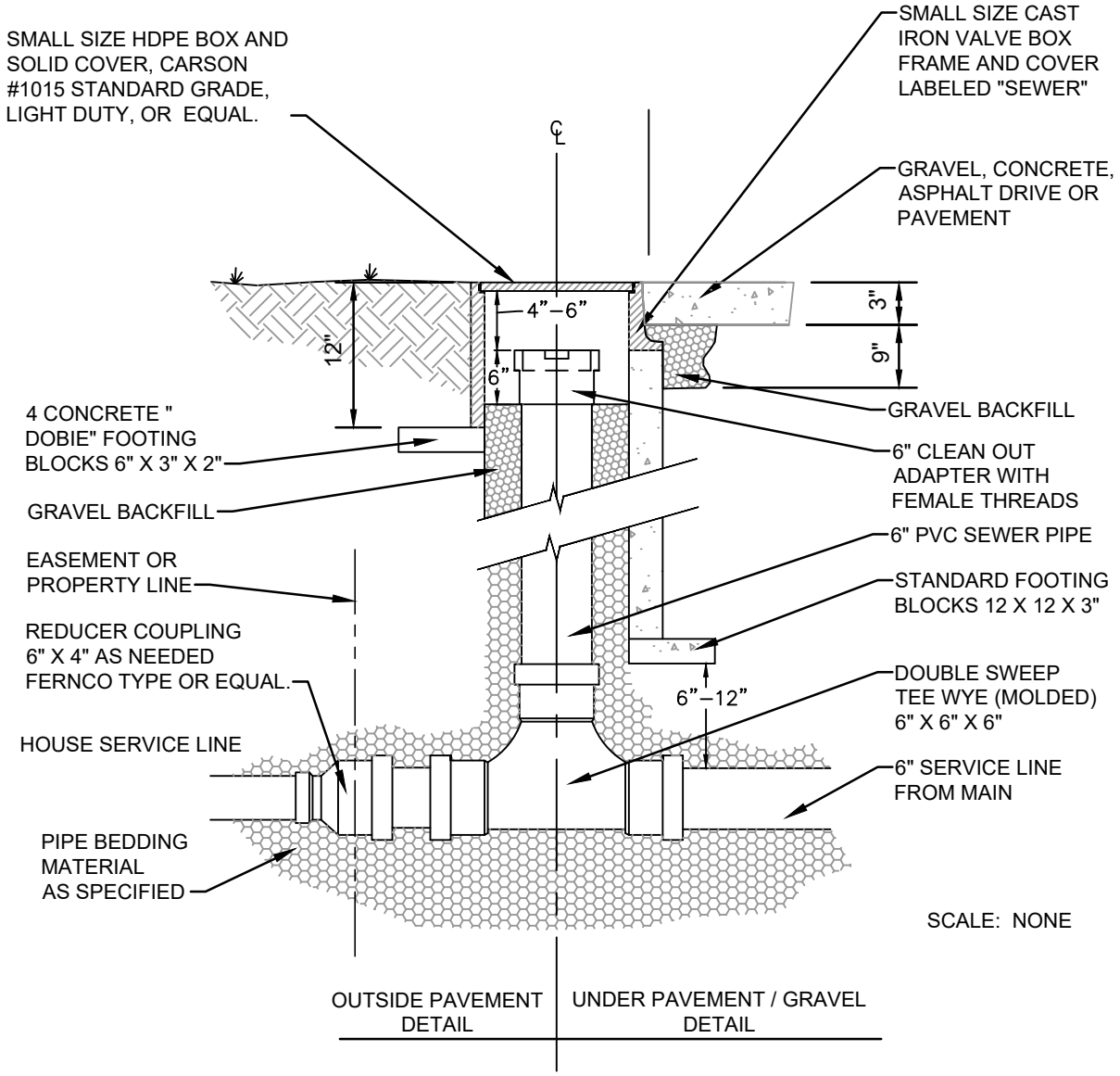
DRAWING NO.: DETAIL 6

PROJECT NO.:	DATE:
36724-07	4-13-2021

OUTSIDE PAVEMENT DETAIL | UNDER PAVEMENT / GRAVEL DETAIL



TOP VIEW



SCALE: NONE

OUTSIDE PAVEMENT DETAIL | UNDER PAVEMENT / GRAVEL DETAIL

BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

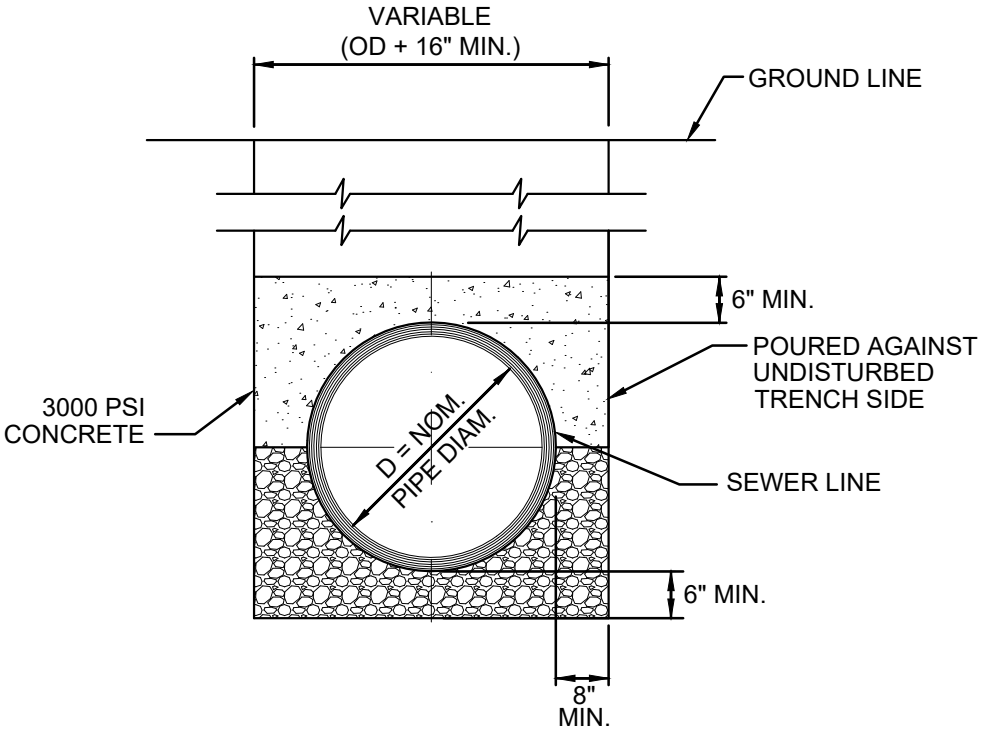
CLEANOUT

TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

DRAWN BY:	CHECKED BY:
DB	LB

DRAWING NO.: DETAIL 7

PROJECT NO.:	DATE:
36724-07	4-13-2021



SCALE: NONE

BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

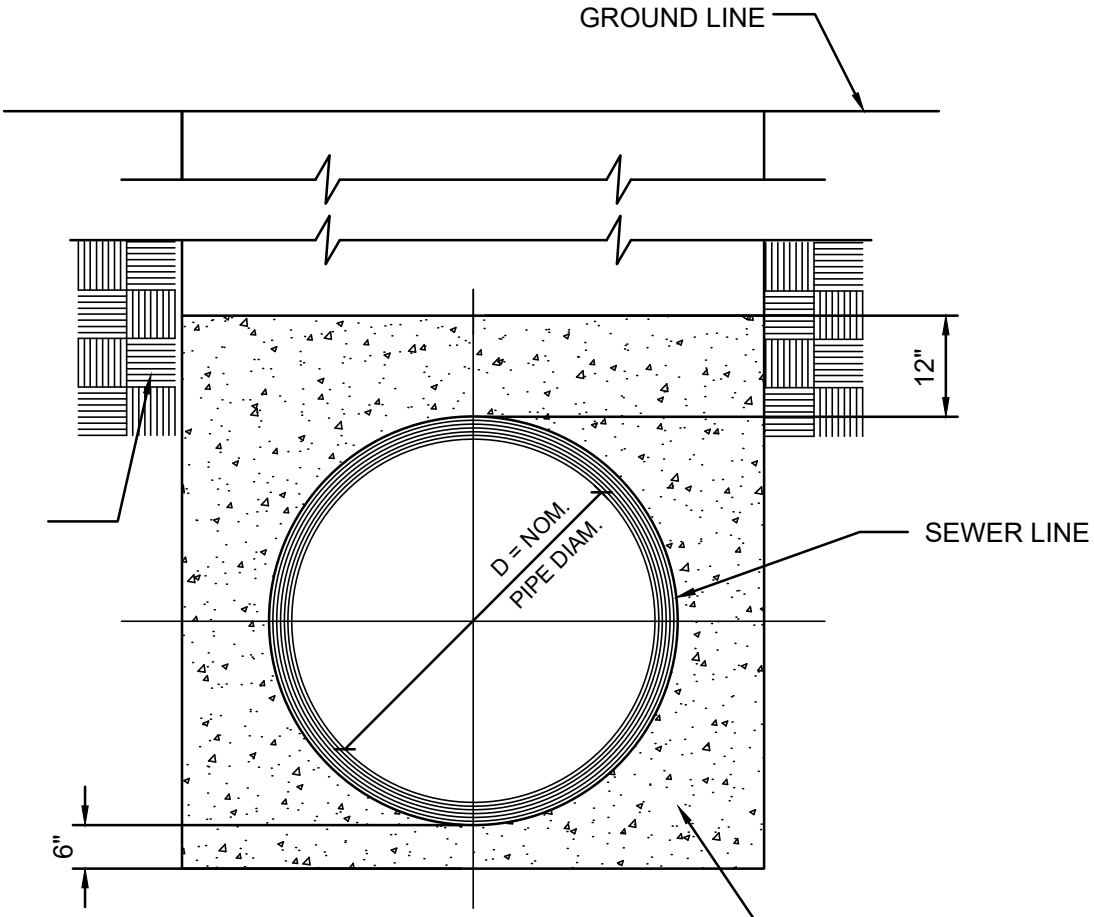
CONCRETE CAP

TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

DRAWN BY:	CHECKED BY:
DB	LB

DRAWING NO.: DETAIL 8

PROJECT NO.:	DATE:
36724-07	4-13-2021



SCALE: NONE

BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

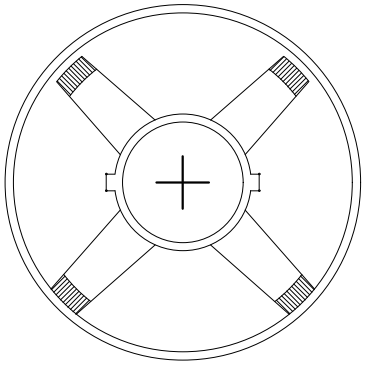
CONCRETE ENCASEMENT

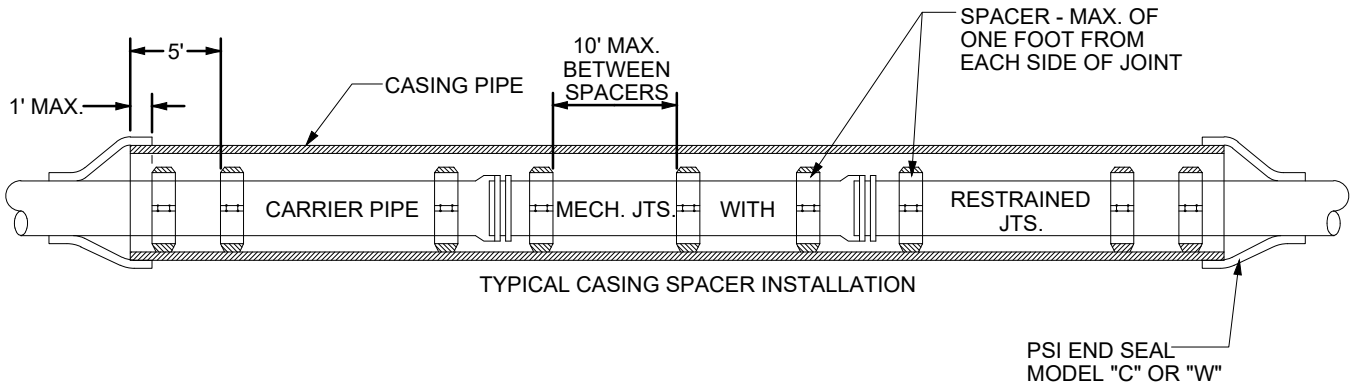
TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

DRAWN BY:	CHECKED BY:
DB	LB

DRAWING NO.: DETAIL 9

PROJECT NO.:	DATE:
36724-07	4-13-2021





TYPICAL CASING SPACER INSTALLATION

NOTES:

1. CASING PIPE SHALL BE CARBON STEEL WITH A MINIMUM SPECIFIED YIELD STRENGTH OF 35,000 PSI.
2. CASING PIPE, CARRIER PIPE, SPACERS, AND END SEALS SHALL BE AS SPECIFIED IN SECTION 13.

SCALE: NONE

BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

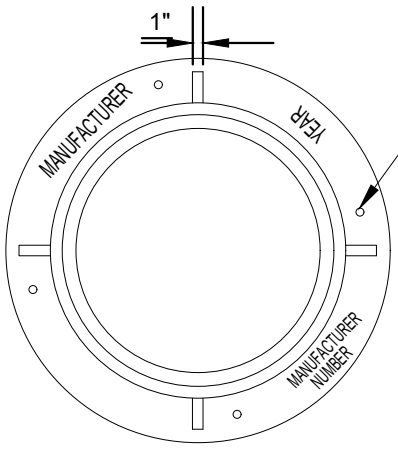
UTILITY CASING PIPE

TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

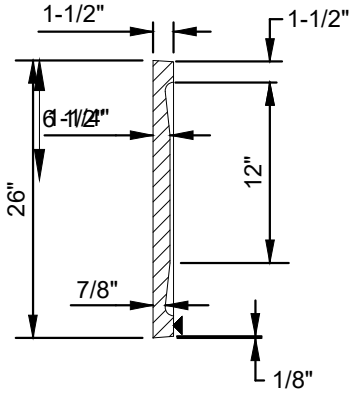
DRAWN BY:	CHECKED BY:
DB	LB

DRAWING NO.: DETAIL 10

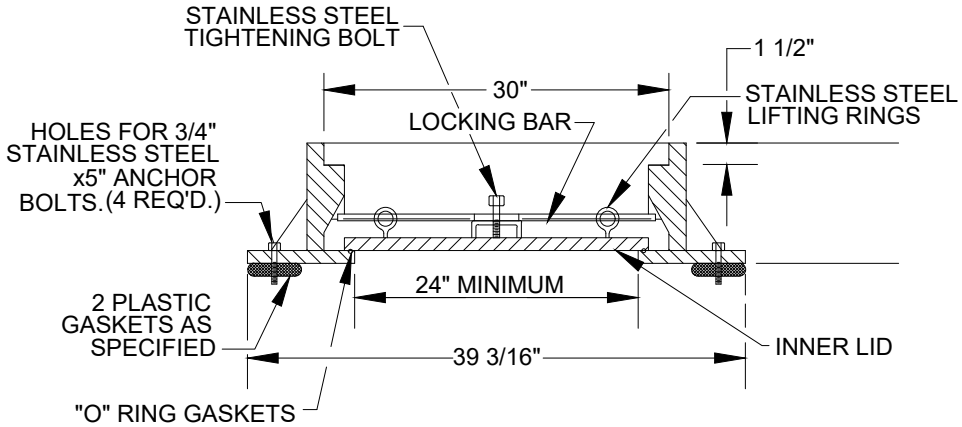
PROJECT NO.:	DATE:
36724-07	4-13-2021



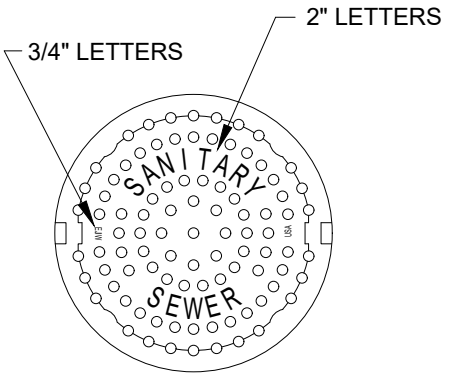
FRAME TOP VIEW



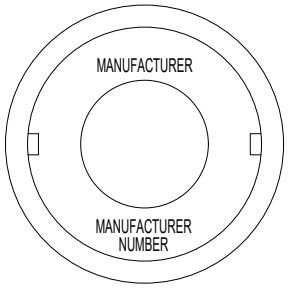
COVER SECTION



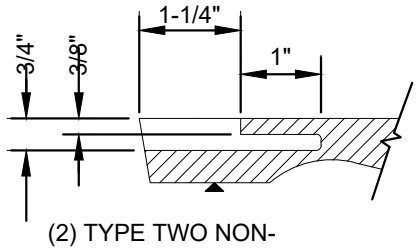
SECTION



COVER FACE



COVER BACK



(2) TYPE TWO NON-PENETRATING PICKHOLES

PICKHOLE

SCALE: NONE

BARGE DESIGN SOLUTIONS
615 3rd Avenue South // Suite 700 // Nashville, Tennessee 37210
PHONE (615) 254-1500 // FAX (615) 255-6572

WATER-TIGHT MANHOLE COVER

TOWN OF THOMPSON'S STATION
STANDARD SEWER SPECIFICATIONS
THOMPSON'S STATION, TENNESSEE

DRAWN BY:	CHECKED BY:
DB	LB

DRAWING NO.: DETAIL 11

PROJECT NO.:	DATE:
36724-07	4-13-2021