CKS Engineers, Inc.

STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER MAINS, SANITARY SEWERS AND APPURTENANCES

For

Bedminster Municipal Authority
Bucks County, Pennsylvania

November 30, 2018

Ref: #7800-78

BEDMINSTER MUNICIPAL AUTHORITY

TABLE OF CONTENTS

PART 1 - GENERAL INFORMATION GI

PART 2 - MATERIALS, INSTALLATION AND TESTING MIT

Section I – Trench Excavation, Protection, Backfill and Maintenance

Section II – Trench Repaving and Restoration

Section III – Materials, Installation and Testing – Water Systems

Section IV – Materials, Installation and Testing – Sanitary Sewer Systems

Section V – Special Construction

PART 3 - STANDARD DETAILS SD

BEDMINSTER MUNICIPAL AUTHORITY

PART 1 – GENERAL INFORMATION

A. Definitions

Wherever the following words or terms are used in these Specifications, the intent and meaning shall be interpreted as follows:

1. Authority – The Bedminster Municipal Authority (AUTHORITY) Bucks County, Pennsylvania. The term also includes any agent, employee or representative of the AUTHORITY. The term OWNER shall be synonymous with the word AUTHORITY.

2. Building Service – The extension from any structure to the public water service.

   Building Sewer – The extension from any structure to the public sewer lateral.

3. Contract – The written agreement executed by and between the DEVELOPER or AUTHORITY and the CONTRACTOR, covering the performance of the WORK and the furnishing of labor, materials and service in the construction of the sanitary sewer and/or water additions and extensions (including appurtenant facilities) to the AUTHORITY'S sanitary sewer and/or water system(s).

4. Contractor – The Individual, group, partnership or corporation undertaking to do the WORK herein specified (including his or their heirs, legal representatives, successors or assigns) and is the party of second part of the CONTRACT contained herein. The term DEVELOPER, except as otherwise noted, shall be synonymous with the term CONTRACTOR.

5. Developer – Any landowner, agency of such landowner, or tenant with the permission of such landowner, who makes or who causes to make a subdivision of land or land development, or who constructs, or causes to be constructed a water main extension/water facilities or a sanitary sewer extension/sewerage facilities.

6. Drawings – Collectively, all plans, details and construction notes which show the character and scope of the WORK to be performed, and which have been reviewed by the ENGINEER and approved by the AUTHORITY. These shall include the Standard Details contained herein,

and may also include drawings of the ENGINEER, the DEVELOPER, the CONTRACTOR, the AUTHORITY, or others.

7. Engineer – The appointed Registered Professional Engineering consultant whose services are retained by the AUTHORITY for the performance of engineering services, including the construction observation of the WORK.

8. Inspector - An authorized representative of the ENGINEER and/or AUTHORITY assigned to inspect the WORK performed and the materials supplied by the CONTRACTOR as to compliance with the Contract Documents.

9. Lateral – That part of the sewer system extending from a sewer main, located in the street right-of-way or easement to the structure side of the building sewer serving an improved property. If there shall be no improvement on the property, the "lateral" shall mean that part of the sewer system extending from said sewer main to the right-of-way or easement boundary to a point of future connection to the building sewer, if and when said property is improved.

10. Municipality – Any Borough or Township, including the Township of Bedminster, in which Work may be performed by the DEVELOPER and/or CONTRACTOR.

11. PennDOT – The Commonwealth of Pennsylvania, Department of Transportation.

12. Project – The entire construction to be performed as provided in the DRAWINGS and SPECIFICATIONS.

13. Specifications – The Standard Materials, Installation and Testing Specification(s) and Standard Detail(s) adopted by the AUTHORITY, and as may be amended from time to time.

14. Solicitor – The appointed chief legal council whose services are retained by the AUTHORITY, for legal advice pertaining to AUTHORITY matters.

15. Standard Specification Abbreviations – All standard specifications referred to herein, such as ACI, ASTM, AWWA, and the like, shall have the meaning set forth opposite each below and shall be the latest revision thereof at the time of bidding.

AASHTO American Association of State Highway and Transportation Officials

ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
IPC	International Plumbing Code
NCSA	National Crushed Stone Association

16. Work – Any and all obligations, duties, and responsibilities necessary for the successful completion of the PROJECT assigned to or undertaken by the DEVELOPER and/or the CONTRACTOR under the DRAWINGS and SPECIFICATIONS, including the furnishing of all labor, materials, equipment and other incidentals.

B. Scope

These SPECIFICATIONS cover the requirements for additions and extensions to the Bedminster Municipal Authority's sanitary sewer and water systems. All additions and extensions shall be completed in accordance with the requirements of the *Bedminster Municipal Authority's Sewer and Water Service – Rates, Rules and Regulations* and these SPECIFICATIONS. The WORK shall include the furnishing of all plans, labor, new materials, equipment, supplies, transportation, fuel and power and performing all WORK as required by the SPECIFICATIONS and including such detail drawings as may be required to prosecute the WORK. The WORK shall be executed in the best and most workmanlike manner by qualified, careful and experienced workman.

Should any incidental WORK or materials be required, but are not specifically described in the DRAWINGS/SPECIFICATIONS, which are necessary for the proper implementation and good workmanlike execution of the scope of work, the CONTRACTOR shall understand same to be implied and required, and shall furnish, install and perform such work as necessary.

Bedminster Municipal Authority reserves the right to establish special supplemental requirements for any given addition or extension based upon unique features of the specific PROJECT, recent changes in standard sewer and water systems operating and construction practices which may not be reflected within the SPECIFICATIONS as herein contained, or for other legal or

administrative reasons which the AUTHORITY may identify, including, but not limited to, quality of wastewater discharged to the AUTHORITY'S sewer system.

C. Submittals

Prior to the start of construction, the DEVELOPER shall submit DRAWINGS for the PROJECT to the AUTHORITY for review. The AUTHORITY will approve requests for sewer and water service additions and/or extensions only after approval of these DRAWINGS.

The DRAWINGS may be part of subdivision or land development plans prepared to meet regulatory requirements pertaining to land development activities, or the DRAWINGS may be specifically prepared to meet the requirements of Bedminster Township and / or Bedminster Municipal Authority. Four (4) copies of each set of DRAWINGS, including any supporting submission documents, will be submitted to the AUTHORITY. The DRAWINGS, and any supporting documentation, will be reviewed by the ENGINEER, SOLICITOR, and AUTHORITY staff, as required. When the DRAWINGS describing the proposed Work are found to be acceptable for construction, six (6) copies of the DRAWINGS, stamped "Approved for Construction", shall be submitted to the AUTHORITY for its use during observation of construction. As necessary, additional sets of DRAWINGS may be required for attachments to legal agreements which address the provisions throughout which the extension or addition to the system may be constructed. The DEVELOPER shall also furnish additional copies of the "Approved for Construction" DRAWINGS as needed for the construction of the PROJECT.

All DRAWINGS shall show the location of the sanitary sewer mains, sanitary sewer manholes, sanitary sewer laterals, water mains, water valves, fire hydrants and other necessary sewer and water appurtenances required for the completion of the WORK. All DRAWINGS shall incorporate both a plan view and a profile drawing which shall contain the proposed location of the proposed sanitary sewer and water mains, along with the location of the existing sanitary sewer and water mains, and existing and proposed sewer, water and storm sewer mains, and other underground utilities within the PROJECT site.

All DRAWINGS shall contain details for the proposed sanitary sewer and water facilities. Details should be sufficient for construction of the facilities and should include, but not necessarily be limited to, restoration details, utility crossing details, standard installation details for sanitary sewer manholes, sanitary sewer laterals, pumping stations, valves, fire hydrants and other appurtenances, standard casing and concrete encasement details, and details of connections to the existing system(s).

In the case of submissions which are clearly incomplete or which are significantly non-responsive to the AUTHORITY'S standards for the system additions and extensions, the AUTHORITY will reject the proposed submission without extensive review, pending the receipt of DRAWINGS which reasonably address the AUTHORITY'S requirements. It shall not be the AUTHORITY'S responsibility to design such extensions or additions.

In addition to DRAWINGS, the DEVELOPER shall also submit such product data, product samples, manufacturer's operating and maintenance instructions, etc., as may be required by the Authority.

Shop Drawings. All materials to be incorporated in the WORK shall be subject to approval by the ENGINEER. The CONTRACTOR shall obtain manufacturer's certified shop drawings and other pertinent data and shall submit them to the ENGINEER for review. All shop drawings must be reviewed and approved by the CONTRACTOR prior to submittal to the ENGINEER. All shop drawings not stamped with the CONTRACTOR'S approval will be returned to the CONTRACTOR. A minimum of six (6) copies of each shop drawing must be submitted. The ENGINEER will retain four copies for his dispersal and return all remaining copies to the CONTRACTOR after review. Shop drawings shall be submitted for all materials. Detailed shop drawings shall be submitted to the ENGINEER for approval prior to installation of any equipment/material. The CONTRACTOR shall not install any material until the shop drawings have been approved and the CONTRACTOR has received written notification from the ENGINEER. The CONTRACTOR shall schedule his work so as to allow sufficient time for review of all shop drawing submittals by the ENGINEER.

D. Authority Review Costs

The DEVELOPER shall agree to pay all engineering, legal and administrative costs incurred by the AUTHORITY in the review of the DRAWINGS, including shop drawings. These costs shall be in addition to and separate from any costs which may be required by Bedminster Township, Bedminster Municipal Authority, or the County Planning Agency.

E. Developer's Agreement

In all cases involving additions or extensions to sanitary sewers or water mains, the DEVELOPER shall enter into an agreement with the Authority before commencing any WORK on the PROJECT. This agreement will be prepared by the AUTHORITY, and will address the specific circumstances of each specific project.

F. Construction Completion Security

The DEVELOPER shall provide the AUTHORITY with security to insure completion of the sanitary sewer and/or water additions and extensions. This security shall be in the amount of one hundred ten percent (110%) of the estimated construction cost of the sanitary sewer and/or water additions and extensions. Said security shall be in the form of a letter of credit drawn on a lending institution acceptable to the AUTHORITY, in the form and manner approved by the AUTHORITY SOLICITOR; or a cash payment to be maintained by the AUTHORITY in a non-interest bearing escrow account. A completion bond will not be acceptable.

G. Construction Observation of the Work

The DEVELOPER shall establish with the Bedminster Municipal Authority, an escrow account in the amount sufficient to cover the established cost of construction observation, engineering expenses, administrative expenses, legal expenses, and other charges related to the proposed construction. The amount of the escrow fund for construction-related activities shall be established by the AUTHORITY. The DEVELOPER, acting through its CONTRACTOR, shall notify the Bedminster Municipal Authority three (3) days in advance of the commencement of construction WORK, so that appropriate construction observation time may be scheduled. Where WORK is to be performed in a state highway or county road, advance notice shall be given as required by the respective regulatory agency. No WORK may be prosecuted in the absence of construction observation, and any WORK performed without construction observation shall be re-excavated, exposed and observed by the Bedminster Municipal Authority's representatives as ordered by the AUTHORITY. Any defective WORK, or WORK not conforming to the SPECIFICATIONS, is to be replaced to the satisfaction of the AUTHORITY at no expense to the AUTHORITY. No WORK shall be performed on Saturdays, Sundays, Holidays or at night, except with the written permission of the AUTHORITY. Should the escrow account be depleted prior to the completion of the construction, additional escrow funds shall be deposited by the DEVELOPER with the AUTHORITY prior to continuing with any additional WORK. Any unused escrow funds shall be returned to the DEVELOPER upon completion and acceptance of the construction.

H. Record Plans

Before acceptance of the sanitary sewer and/or water system extensions and additions, the DEVELOPER shall prepare and deliver to the AUTHORITY, record as-built plans, including one (1) set of reproducible mylars, three (3) sets of paper prints and two (2) digital copies in both pdf and AutoCAD formats, which

delineate the sanitary sewer and/or water facilities actually installed. The record plans shall clearly show the location of all sanitary sewer and water facilities and shall be free of extraneous markings which may obscure the sewer and water facilities. The material, size and location of all facilities shall be shown. The adequacy of the record plans will be determined by the AUTHORITY, in its sole discretion. In addition, digital recordings of sanitary sewer closed circuit television inspections shall be prepared and delivered to the AUTHORITY.

I. Acceptance of System Additions and Extensions

After any sanitary sewer or water facilities have been added to or extended from the existing system(s), and have been satisfactorily tested and approved by the AUTHORITY'S representatives, and have been placed in operation, the AUTHORITY will notify the DEVELOPER of its intention to accept dedication of the facilities. No sanitary sewer or water facility shall become the responsibility of Bedminster Municipal Authority until a deed of dedication shall have been fully executed by the DEVELOPER and accepted by the AUTHORITY. For a period of eighteen (18) months after the date of dedication, the DEVELOPER shall guarantee the stability of all materials and equipment and the workmanship of all labor, and shall correct and/or replace all defective materials, equipment and WORK at its own expense and to the satisfaction of the AUTHORITY when notified in writing by the AUTHORITY to do so. The DEVELOPER shall provide the AUTHORITY with security for the aforesaid guarantee in the amount of fifteen percent (15%) of the AUTHORITY ENGINEER'S opinion of construction cost. The security shall be not less than $5,000.00. Said security shall be in the form of a letter of credit from a commercial banking institution acceptable to the AUTHORITY and approved by the AUTHORITY'S SOLICITOR as to form and manner of execution; or a cash payment to be maintained by the AUTHORITY in a non-interest bearing escrow account. Should the DEVELOPER not promptly address any defects in the WORK, the AUTHORITY will invoke its security guarantee to provide funds for the repairs.

J. Government Regulations and Agencies

The DEVELOPER will be responsible for meeting all requirements of the various governmental agencies, including applying for and obtaining all necessary permits, licenses, approvals, and paying all applicable fees, taxes, etc. Agencies include, but are not limited to, the Department of Environmental Protection, the Bucks County Conservation District, the Township of Bedminster, and the Pennsylvania Department of Transportation.

All sanitary sewer system appurtenances shall comply with the requirements and guidelines of the Department of Environmental Protection's Domestic Wastewater Facilities Manual, latest edition. All water system appurtenances

shall comply with the requirements of the Department of Environmental Protection's Public Water Supply Manual, latest edition.

All construction shall comply with the requirements of Title 25, Chapter 102, Erosion and Sediment Control Rules and Regulations, as set forth by the Pennsylvania Department of Environmental Protection.

All construction within State Highways and Shoulders shall meet the requirements of the Pennsylvania Department of Transportation. State and local highway and shoulder restoration details provided in Part 3 – Standard Details of these SPECIFICATIONS are provided as a reference only. Actual restoration requirements shall be confirmed with the Department of Transportation, the Township of Bedminster, or other applicable local municipal government prior to submission to the AUTHORITY for review.

K. Design Standards

All water mains, sanitary sewers and appurtenances shall conform to the following applicable design standards:

1. Wherever possible and/or reasonable, water mains and sanitary sewer mains shall be installed within existing or proposed public rights-of-way or AUTHORITY easements. The use of private easements is to be avoided.

2. Individual water services and curb stops and individual sanitary sewer laterals and cleanouts are to be installed in unpaved areas except where otherwise specifically approved by the AUTHORITY.

3. No water transmission main shall extend in excess of 1,000 feet without the installation of a gate valve and no water distribution piping within existing and/or proposed developments shall extend in excess of 500 feet without the installation of a gate valve.

4. A gate valve and one length of capped water pipe shall be provided at the end of any water main that could potentially be extended in the future. Water mains shall extend to the boundary of any existing and/or proposed development and a hydrant shall be located prior to the terminal gate valve.

5. The final location of all fire hydrants shall be subject to the approval of the Fire Marshal. Fire hydrants not located at street corners shall be located at property lines or a minimum of 10 feet from a driveway or access drive.

6. New sanitary sewer manholes shall be numbered in accordance with the current manhole numbering system and as approved by the AUTHORITY.

7. All sanitary sewer manholes located in unimproved areas, along or adjacent to drainage channels, within roadway gutter areas or any other areas subject to surface infiltration, shall be provided with watertight manhole frames and covers conforming to these SPECIFICATIONS.

L. Septic Tank Closure

New connections to the sanitary sewer system which require abandonment of existing septic tanks, in place, shall meet the following minimum requirements:

1. The existing sewer lateral shall be cut off at the building wall foundation and permanently sealed.

2. The CONTRACTOR shall connect new piping in accordance with these SPECIFICATIONS and the Standard Details.

3. All existing liquid and solid content in the existing septic tank shall be removed and disposed of off-site in accordance with all state, county or local requirements.

4. The existing septic tank shall be backfilled with PennDOT 2A aggregate material and compacted.

5. Closure of the septic tank shall be inspected by the AUTHORITY, the local municipality and Bucks County, as applicable.

6. All such WORK shall also comply with any requirements of Bucks County.

M. Low Pressure Sewer Systems and Package Grinder Pump Stations

The DEVELOPER shall follow the minimum design requirements regarding a low pressure sewer system and package grinder pump station as provided in the Department of Environmental Protection's Domestic Wastewater Facilities Manual, latest edition. Low pressure sewer system materials and construction shall be in accordance with Section 4.06.c of these Specifications.

N. Steel Products

For any CONTRACT involving the construction, reconstruction, alteration, repair, improvement or maintenance of "public works" as defined by the Pennsylvania Municipalities Planning Code, CONTRACTOR agrees to comply with the "Steel

Products Procurement Act of March 3, 1978" (P.L. 6, No. 3, 73 P.S. § 1881 et seq.).

CONTRACTOR shall provide to the AUTHORITY, certification of the source of steel products used before payments are made under the CONTRACT.

END OF SECTION

BEDMINSTER MUNICIPAL AUTHORITY

INDEX

PART 2 - MATERIALS, INSTALLATION AND TESTING

SECTION I	TRENCH EXCAVATION, PROTECTION, BACKFILL AND MAINTENANCE
SECTION II	TRENCH REPAVING AND RESTORATION
SECTION III	MATERIALS, INSTALLATION AND TESTING – WATER SYSTEMS
SECTION IV	MATERIALS, INSTALLATION AND TESTING – SANITARY SEWER SYSTEMS
SECTION V	SPECIAL CONSTRUCTION

BEDMINSTER MUNICIPAL AUTHORITY

PART 2 – MATERIALS, INSTALLATION AND TESTING

SECTION I

TRENCH EXCAVATION, PROTECTION, BACKFILL AND MAINTENANCE

INDEX

Item	Title
1.01	General
1.02	Removal of Pavement and Storage of Materials
1.03	Sheeting, Bracing, and Shoring
1.04	Protection of Property and Structures
1.05	Removal of Obstructions
1.06	Width and Depth of Trenches
1.07	Length of Open Trench
1.08	Accommodation of Traffic
1.09	Accommodation of Drainage
1.10	Excavation of Unyielding Materials
1.11	Explosives and Blasting
1.12	Tunneling and Jacking
1.13	Pipe Laid in Embankments
1.14	Backfilling
1.15	Topsoil, Seeding, and Landscaping
1.16	Temporary Paving and Maintenance of Trench Surfaces

SECTION I

TRENCH EXCAVATION, PROTECTION, BACKFILL AND MAINTENANCE

1.01 GENERAL

a. The CONTRACTOR shall excavate, protect, backfill, and maintain all trenches that may be necessary for completion of the WORK. All excavation shall be in open trenches except where, and to such extent, as otherwise shown on the DRAWINGS, or as the AUTHORITY may authorize or direct. The use of excavation machinery will be permitted, except in places where operation of same will cause damage to trees, buildings, or existing utilities and structures above or below ground; in which case, hand methods shall be employed. No tunneling, boring, or forcing will be allowed without approval from the AUTHORITY. Excavated material must be piled so as not to encroach on private property, endanger the WORK, obstruct sidewalks or roadways, nor interfere with proper drainage. The CONTRACTOR shall have no claim for compensation due to the fact that hand excavation instead of machine excavation may be necessary for whatever cause.

b. The CONTRACTOR shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the DRAWINGS, as specified herein, or as directed by the AUTHORITY. All excavated materials not required or suitable for backfill shall be removed and wasted or otherwise disposed of by the CONTRACTOR as directed or specified.

c. The CONTRACTOR'S attention is directed to the regulations of the PA Department of Labor and Industry relating to trenches and excavations, tunnel construction, equipment, materials, labor, safety, sanitation, and other regulations on which the CONTRACTOR shall be fully informed and with which he shall fully comply. Attention is also directed to the U.S. Department of Labor, Occupational Safety and Health Administration, Occupational Safety and Health Standards/Safety and Health Regulations for Construction (29CFR Part 1910/1926), latest revision.

d. It is the CONTRACTOR'S responsibility and obligation to contact all utility companies, through the PA One Call System, Inc., (1-800-242-1776), for utility location verification and mark-out three (3) working days prior to any and all excavation.

e. The CONTRACTOR shall solely be responsible for the condition of all excavations made by him. All slide and cave-ins shall be removed by the CONTRACTOR at whatever time and under whatever circumstances they may occur.

f. The term "subgrade" as used herein shall mean the bed of the trench, and the term "grade" shall mean the surface on which the pipe is laid.

1.02 REMOVAL OF PAVEMENT AND STORAGE OF MATERIALS

a. The CONTRACTOR shall remove all pavement, materials, road surfaces, curbing, driveways, and sidewalks within the lines of excavation. Concrete and asphalt pavements shall be saw cut to neat straight lines using equipment suitable to furnish a clean cut in the pavement and base without undue shattering. The edges of all paved surfaces shall be protected and maintained by the CONTRACTOR until repaving is completed. All concrete curbing, driveways, or sidewalks within the lines of excavation shall be broken up and removed by the CONTRACTOR. All such WORK shall be done in accordance with the rules and regulations of the governmental agencies having jurisdiction. The use of weights dropped on pavement for breaking will not be allowed except by written permission of the AUTHORITY.

b. The CONTRACTOR shall clear and grub through wooded areas and shall remove all surface materials, of whatever nature, over the line of the trench; and shall properly separate and classify the materials removed, and shall store, guard, and preserve such quantities of said materials as may be required for use in backfilling, resurfacing, repaving, seeding, landscaping, or for other purposes. All excavated materials suitable for fill or backfill shall be stored in such parts of the street or roadway, or such other suitable places, and in such manner, as shall be approved or directed by the AUTHORITY. All excavated materials unsuitable or not required for backfill and all perishable and objectionable material including, but not limited to boards, fences, trees, brush, vines, shrubs, bushes, logs, stumps, roots, weeds, rubbish, and other organic matter shall be removed from the construction site and properly disposed of by the CONTRACTOR. Burning or burying of refuse or other debris will NOT be permitted. The CONTRACTOR shall be responsible for any loss of, or any damage to materials through careless removal or neglectful or wasteful storage, disposal, or use.

c. The CONTRACTOR shall remove paving to the widths as shown on the Standard Details. In case the paving is removed for a greater width, or in case any paving is removed or disturbed on account of settlement, slides,

or cave-ins, or in making excavation outside the lines of the WORK without the written order of the AUTHORITY, the CONTRACTOR shall pay all cost of permanently replacing the paving so removed or damaged.

d. When it is necessary to haul soft or wet material over roadways or driveways, the CONTRACTOR shall use lined or otherwise sealed vehicles for this purpose. The CONTRACTOR is responsible for any deposition of excavated materials onto area roadways and driveways.

1.03 SHEETING, BRACING, AND SHORING

a. Wherever it is necessary, to prevent injuries or to avoid damage to existing structures, pavement or foundations, or to prevent excessive trench loads on the pipe, due to caving or sliding of banks of excavations, the CONTRACTOR shall sheet, brace, or shore such excavations.

b. In all cases, trenches shall be protected in accordance with the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration, the State Department of Labor and Industry, and any other regulatory agencies having jurisdiction.

c. All sheeting, sheet piling, bracing, and shoring, including trench boxes, shall be installed by personnel skilled in such WORK. Timber or steel members used shall be sound, straight, and free from defects.

d. Sheeting and sheet piling shall remain in place within the pipe zone, which is the area of trench from the top of the pipe to the subgrade. Sheeting, sheet piling, bracing, and shoring above the pipe zone shall be withdrawn and removed as the trench is being backfilled; except where and to such extent as the AUTHORITY shall order, in writing, that the same be left in place; or where the AUTHORITY shall permit the CONTRACTOR to leave the same in place, at the request and expense of the CONTRACTOR.

e. In withdrawing sheeting and sheet piling, special care shall be taken to ensure that all voids or holes are filled with satisfactory material and thoroughly compacted, so as to prevent injury to the pipe and its appurtenances and injury or settlement of adjacent structures and pavement.

f. The neglect, failure, or refusal of the AUTHORITY to order the use of sheeting or sheet piling, to order better quality or larger sizes of timber or steel members, or to order sheeting, sheet piling, bracing, or shoring to be left in place, or the failure to give any orders or directions as to the manner of methods of driving or placing sheeting, sheet piling, bracing, or shoring

shall not in any way or to any extent relieve the CONTRACTOR of any or all obligations under this CONTRACT.

1.04 PROTECTION OF PROPERTY AND STRUCTURES

a. The CONTRACTOR shall protect from direct or indirect damage, all pipes, conduits, poles, tracks, walls, buildings, and other structures or property in the vicinity of the WORK, whether above or below the surface of the ground. At all times the CONTRACTOR shall have a sufficient quantity of timber, plank, steel members, trench boxes, chains, ropes, and other necessary equipment and materials available and shall use them as required for sheeting the excavation and for sustaining or supporting any structures that are uncovered, undermined, endangered, threatened, or weakened.

b. The CONTRACTOR shall assume all risks resulting from the presence or proximity of pipes, conduits, poles, tracks, walls, buildings, and other structures and property of every kind and description, in, under, or over trenches, or in the vicinity of the WORK, whether above or below the surface of the ground. The CONTRACTOR shall be responsible and assume all expenses for all damages to the above-described items or injury to any person, caused directly or indirectly by performance of the WORK, whether the above are or are not shown on the DEVELOPER'S drawings.

c. Where necessary, or when ordered by the AUTHORITY, in order to keep one side of the street or roadway free from any obstruction, or to keep material piles alongside of the trench from falling on private property outside the right-of-way, a safe and suitable fence shall be placed alongside the trench.

d. If groundwater or other potentially dangerous conditions are encountered or where passing especially heavy structures which, by their construction or position may bring significant pressure upon the trenches, the AUTHORITY may direct that such buildings or structures shall be underpinned, or supported and protected, or that special sheeting shall be driven in such a manner and to such depth, as may be directed, or that only a short length of trench shall be opened at one time. Any WORK done as above directed shall be at the cost and expense of the CONTRACTOR.

e. All trees which are indicated on the DRAWINGS to be saved, shall be protected by tree protection fencing. Where tree branches hang over the trench or construction area, such branches shall be neatly sawed off at the

tree trunk or otherwise protected to prevent breaking of the limb at the tree trunk. All cuts or scars on trees shall be painted with an approved material.

1.05 REMOVAL OF OBSTRUCTIONS

a. Should the position of any obstruction (pipe, conduit, pole, or other structures) above or below the ground, whether or not shown on the DRAWINGS, be such as, in the opinion of the AUTHORITY, to require its removal, realignment, or change due to the WORK to be done under the CONTRACT, the removal, realignment, or change will be done by, or in a manner approved by the owner of the obstruction. The CONTRACTOR shall uncover and sustain the obstruction before such removal and before and after such realignment or changes.

b. The CONTRACTOR shall not interfere with any persons, firms, or corporations, or with the AUTHORITY in protecting, removing, changing, or replacing the obstruction, but shall allow them to take all such measures as deemed necessary or advisable for the above purpose. At railroad or highway crossings, any expense incurred in shoring or in maintaining traffic shall be borne by the CONTRACTOR or DEVELOPER.

1.06 WIDTH AND DEPTH OF TRENCHES

a. Trench Widths

1. The trench subgrade shall be excavated true to line so that a clear space of eight inches (8") in width is provided on each side of the barrel of the pipe to a height not less than one foot (1') above the top of the pipe. If sheeting is required at the level of the pipe, the dimensions in the foregoing sentence shall be applicable to the inside faces of the sheeting. In the case of flexible pipe material, which can be joined outside the trench, a trench of less width may be permitted by the AUTHORITY.

2. From a point twelve inches (12") above the top of the pipe to the surface, the trench walls shall be kept as vertical as possible. In all streets, roads, highways, driveways, sidewalks, parking lots or other improved areas, the trench width at the surface grade shall be of sufficient width to provide adequate room for the construction and installation of the pipe, including any sheeting, bracing and shoring which may be required.

3. Where trench widths exceed the above requirements, pipe of greater crushing strength and/or other bedding may be required by the AUTHORITY.

b. Trench Depths

1. The depth of the excavation for the pipe and appurtenances shall be such that they can be constructed to proper grade. All crushed stone used for pipe bedding shall be 2B coarse aggregate (AASHTO No. 57). In earth excavation, the trench shall be excavated as follows:

(a) The depth to the trench subgrade shall be a minimum of six inches (6") or ¼ outside diameter of pipe, whichever is greater, below the bottom of the pipe. The bedding shall be constructed in accordance with Standard Detail No. SD-G-03. The bedding material shall be PennDOT No. 2B coarse aggregate (AASHTO No. 57). The bedding shall be placed to a minimum depth of one foot (1') above the pipe and compacted by hand or mechanically to at least 90% of the Standard Proctor Density, as determined in accordance with AASHTO T99. Care shall be taken to assure that sufficient bedding material is worked under the haunching of the pipe to provide adequate side support.

(b) Where concrete easement of the pipe is required, either on the DRAWINGS, or by order of the AUTHORITY, trench subgrade and encasement shall be as shown on Standard Detail No. SD-G-04.

c. Unstable Subgrade

1. When the material encountered at trench subgrade is determined by the AUTHORITY to be unstable, it shall be removed to a minimum depth of one foot (1') below the invert of the pipe and one foot (1') on either side of the pipe, or as otherwise directed by the AUTHORITY. The trench shall then be backfilled with PennDOT 2A aggregate material to within four inches (4") of the bottom of all pipe. The remaining four inches (4") shall be backfilled to the bottom of all pipe with the appropriate bedding material, as specified herein. If earth trenches are excavated beyond the specified depths, without the approval of the AUTHORITY, the CONTRACTOR shall backfill the excavation below subgrade with 2A aggregate material.

d. Unyielding Subgrade

1. When any unyielding material, such as rock, is encountered at subgrade, it shall be removed to the depth of the trench subgrade and the trench shall be backfilled with bedding material, or concrete if encasement is required, so that the pipe is supported along its entire length.

2. If trenches are shattered by blasting below or beyond the lines of excavation specified herein, the trench shall be refilled to specified lines of excavation with concrete, as directed by the AUTHORITY.

1.07 LENGTH OF OPEN TRENCH

a. The AUTHORITY shall have the right to limit the amount of trench opened in advance of pipe laying and the amount of pipe laid in advance of backfilling. Unless otherwise approved by the AUTHORITY, no more than 100 hundred feet (100') of trench shall be opened at any one place in advance of the completed pipe. The trench shall not be opened for a distance of more than four hundred feet (400') at any one time.

b. Trench excavation shall be fully completed, except for the forming of the trench subgrade, at least twenty five feet (25') in advance of the pipe placement, and shall be kept free from obstruction; except that at the close of the workday, or at the discontinuance of WORK, the pipe-laying may be completed to within five feet (5') of the end of the opened trench. The amount of pipe laid in advance of backfilling shall not exceed one hundred feet (100'). In state highways, all trenches in roadway areas must be closed and not more than forty feet (40') of trench may remain open in shoulder areas at the close of the workday or discontinuance of WORK.

c. The AUTHORITY may, at any time, require the backfilling of open trenches over completed pipelines. No trench shall be left open at the end of each work day.

d. If WORK is discontinued on any trench, and the excavation remains open for an extended length of time, in the opinion of the AUTHORITY, the CONTRACTOR shall backfill such trench, if so directed by the AUTHORITY.

1.08 ACCOMMODATION OF TRAFFIC

a. The WORK in all streets and highways shall be governed by the regulations of the governmental agency having jurisdiction. Traffic control on all State Highways, county roads and municipal streets shall be maintained and protected in accordance with PennDOT Publication 213 (latest edition) and Section 901 of PennDOT Specifications, Publication 408 (latest edition).

b. Streets shall not be unnecessarily obstructed. Unless the AUTHORITY has, in writing, authorized or ordered the complete or partial closing of a street, the CONTRACTOR shall take such measures as may be necessary to keep the street or road open and safe for traffic and at least one travel lane, alongside of the trench, shall be kept open at all times.

c. The CONTRACTOR shall construct and maintain bridges over excavations as may be necessary or required for the safe accommodation of pedestrians or vehicles. The bridge shall be extended a minimum of eighteen inches (18") of either side of the excavation and shall be tied into the existing cartway. The CONTRACTOR shall furnish and erect illuminated barricades at crossings of trenches, or along the trench, to protect the traveling public. Access to driveways shall be bridged across trenches. The CONTRACTOR shall not obstruct fire hydrants.

d. Where WORK is to be performed at sidewalks or other walkways, a straight and continuous passageway, at least three feet (3') in width and clear from all obstructions, shall be provided. Additional passageway, as may be directed by the AUTHORITY, shall be maintained free from obstruction.

e. In narrow or congested streets or alleys, when so directed by the AUTHORITY, the CONTRACTOR shall complete the WORK to a location designated by the AUTHORITY before starting additional WORK, in order to give access to driveways, garages and other places.

f. The CONTRACTOR shall, in all cases, so arrange the WORK to cause the least inconvenience to property owners and the general public consistent with the proper execution of the WORK, as determined by the AUTHORITY.

1.09 ACCOMMODATION OF DRAINAGE

a. The CONTRACTOR shall keep all trenches and other excavations free from surface or subsurface water while the WORK is in progress. The

CONTRACTOR shall remove by pumping, bailing or other means, any water which may accumulate or be found in the trenches or other excavations and shall form all dams, flumes, or other works necessary to keep them entirely clear of water while the sanitary sewers, water mains and other structures are being constructed. The CONTRACTOR shall have sufficient pumping machinery available at all times on the site ready for immediate use. At no time is water to run through the pipes or its bedding material.

b. The CONTRACTOR shall provide for the disposal of the water removed from excavations in such manner as will not cause injury or a public health nuisance or injure public or private property, to the work of other contractors, to any portion of the WORK completed or in progress, or produce any impediment to the use of highways, streets, and sidewalks by the public.

c. Gutters, storm sewers, drains, ditches and watercourses shall be kept open at all times to accommodate surface drainage. The CONTRACTOR shall not direct any flow of water across pavements or sidewalks, except through pipes or other drainage facilities as approved by the AUTHORITY.

d. All pipes shall be tightly closed at the open ends at the completion of each workday. The CONTRACTOR shall, when ordered by the AUTHORITY, remove any water which may be encountered or which may accumulate in trenches.

e. In open watercourses, ditches, or pipes, encountered during the progress of the WORK, the CONTRACTOR shall provide for and accommodate the continuous flow in such courses or pipes and shall repair any damage that may be done to them, in the course of the WORK.

f. All WORK shall be conducted in accordance with the recommendations and regulations of the Pennsylvania Department of Environmental Protection with respect to soil erosion and sedimentation control. Discharge from dewatering operations which is sediment laden, shall not be allowed to leave the construction site without first passing through filter media or a sediment trap/basin to remove all suspended sediment.

1.10 EXCAVATION OF UNYIELDING MATERIALS

a. Unless otherwise directed by the AUTHORITY, unyielding material, such as rock, shall be removed at least twenty-five feet (25') in advance of pipe laying, to the depths and widths as specified in Section 1.06, herein.

b. Unyielding material appearing in miscellaneous excavations, or where future pipes are to connect with those installed under this CONTRACT, shall be excavated in accordance with the directions of, and to the lines prescribed by the AUTHORITY.

c. Where manholes or other structures are excavated in unyielding material, they shall be excavated twelve inches (12") outside the exterior lines of the structure and to depths as shown on the Standard Details and the DRAWINGS.

1.11 EXPLOSIVES AND BLASTING

a. Blasting will be permitted only upon the written approval of the AUTHORITY, which approval will fix the time during which blasting may be done. In the event that any blasting is required for any reason, during the course of WORK, the CONTRACTOR shall obtain any and all required permits from the appropriate State, Township and/or Municipal officials prior to the commencement of any blasting. All adjacent property and utility owners shall be notified, in writing, by the CONTRACTOR, of the CONTRACTOR'S intentions to blast at the time of filing for the necessary permits. The CONTRACTOR shall once again notify the adjacent property and utility owners, in person, at least three days prior to the date of the commencement of blasting activities. Adjacent property owners shall be those persons living within 500 feet of the blasting site.

b. The use of explosives shall be governed by the "Regulations for the Storage, Handling, and Use of Explosives" of the Pennsylvania Department of Labor and Industry.

c. All blasting shall be field monitored using seismographic type equipment and shall be performed under the supervision of a Professional Engineer or Geologist, licensed to practice in the Commonwealth of Pennsylvania.

d. No blasting shall be permitted adjacent to existing utility lines or structures which may be damaged through blasting operations, and under no circumstances shall blasting be done on the site during, or for, a period of at least 48 hours after the placement of concrete.

e. The excavation of unyielding materials, including rock, within ten feet (10') of water or gas mains shall be done by hand and with light charges of explosives, and the utmost care shall be exercised to avoid disturbance of the main. All exposed sewers and special structures shall be carefully protected from the effects of blast, and any damage to them by blasting shall be promptly repaired by the CONTRACTOR. In no case shall the

blasting be done within forty feet (40') of newly laid sanitary sewer or water mains.

f. All shots shall be covered with cable or rope mats placed in accordance with governing regulations, and special care shall be exercised in areas where high tension power lines are located. Prior to blasting, sufficient warning shall be given all persons in the vicinity and traffic shall be stopped at the proper distance from the site and controlled by watchmen.

g. The CONTRACTOR shall use the utmost care in the use of explosives necessary for the completion of the WORK and not to endanger life or property. All blasting operations shall be done by experienced men who have proper certificates or licenses issued by the Commonwealth of Pennsylvania. The handling and use of explosives shall be done strictly in accordance with the specifications issued by the United States Bureau of Mines and with any Federal or State regulations now in affect or that might become effective in the future; and in compliance with the Local and State laws. All explosives shall be transported and stored in a secure manner in accordance with the Local and State laws. All vehicles and such storage places shall be marked clearly "Dangerous-Explosives", and shall be in care of a competent watchmen at all times. No larger quantity of explosives shall be kept in any one place than will be required for the next ensuing twelve (12) hours of work. In no case shall caps or other detonators be stored or transported with dynamite or other explosives. The location of magazines or the storage of explosives and the separate storage of detonators shall be subject to the approval of the AUTHORITY and applicable State agencies.

h. All blasts shall be properly matted and securely covered. The CONTRACTOR shall bear and hereby assumes sole responsibility for any injury to persons and/or property arising from his use of explosives.

i. Prior to any blasting, the CONTRACTOR shall obtain any necessary permits or approvals from the AUTHORITY and/or the MUNICIPALITY and shall deposit with the AUTHORITY, a certificate of insurance, naming Bedminster Municipal Authority as its additional insured with a specific reference to blasting activities and in amount of $1,000,000.00. In addition to the CONTRACTOR shall indemnify and hold the AUTHORITY and the ENGINEER harmless from any liability arising from the use of explosives.

1.12 TUNNELING AND JACKING

a. Tunnels for the installation of pipelines shall be of sufficient size to allow, at all points, the proper joining of pipes, and the proper compacting of the backfill around them. Tunnels shall be braced where and to such extent as may be necessary. Where unyielding material is encountered in a tunnel, it shall be removed from the pipe zone, as described in Section 1.06, herein. All methods of tunneling proposed for use shall be subject to the approval of the AUTHORITY and/or the ENGINEER.

b. Where tunneling or jacking is performed under state highways or railroads, the WORK shall be performed in accordance with the regulations of the applicable agency.

c. Where casing pipe is to be installed for the PROJECT, the construction shall be as specified in Section V, SPECIAL CONSTRUCTION, of these SPECIFICATIONS.

1.13 PIPE LAID IN EMBANKMENTS

a. When pipe is to be installed in fill, the embankment shall be initially constructed at least one foot (1') above the proposed top of the pipe. The embankment shall then be excavated to the proper width and subgrade, in accordance with Section 1.06, herein, and the pipe and bedding material installed. The embankment shall then be constructed to provide a minimum cover of four feet (4') above the top of the pipe.

1.14 BACKFILLING

a. Extent of Backfill

1. Backfilling shall include all filling, compacting or rolling, the regrading of adjacent disturbed areas, the replacing of drains and other surface and subsurface structures, the placing and maintaining of temporary roadway, sidewalks and driveways, the furnishing of additional suitable backfill materials, if necessary, the reseeding or resodding of lawns and other unimproved areas, and the replacing of trees and shrubbery damaged by the CONTRACTOR, together with all appurtenant work.

2. In all unpaved areas where such areas are not used as a traffic way, the CONTRACTOR shall crown to such a height as determined by the AUTHORITY, the top of all backfilled excavation. This crown is to be constructed after the trench backfill material has

been compacted. As the trenches are filled in, and the WORK completed, the CONTRACTOR shall cart away, remove or otherwise dispose of all surplus material, or shall make use of such surplus material at such points as the AUTHORITY may designate.

3. When the trenches in unimproved areas do not furnish sufficient material of suitable quality for refilling, the CONTRACTOR shall procure and supply acceptable materials. Frozen material shall not be used for backfilling.

4. All trenches must be backfilled at the end of the day. If the CONTRACTOR does not backfill the trenches at the end of the day, with approval of the AUTHORITY, all open trenches must be enclosed with snow fences, securely staked. Blinking barricades must also be placed around the area to the satisfaction of the AUTHORITY.

b. Backfill Material

1. Only bedding material approved by the AUTHORITY shall be used for backfilling under and along the sides of the pipe and to a height of one foot (1') over the top of the pipe or for backfilling around structures and appurtenances. The bedding material shall be thoroughly tamped with a light tamper in layers not to exceed four (4") in thickness. For sanitary sewer pipe, water mains and force mains, the bedding material shall consist of 2B stone in accordance with Section 1.06.b., herein, and as shown on Standard Detail No. SD-G-03.

2. For trenches located within Township or Municipal streets, street rights-of-way, sidewalk areas or potential future street rights-of-way (as determined by the MUNICIPALITY), the remainder of the trench shall be backfilled with PennDOT 2A aggregate material as shown in Standard Detail No. SD-G-05 and No. SD-G-06. Also, stone other than 2A aggregate material may be used if a responsible municipal official representing the MUNICIPALITY in which the WORK will take place or the respective MUNICIPALITY'S consulting engineer provides written confirmation permitting an alternative material.

3. For trenches located in State highways, shoulders or highway rights-of-way, the remainder of the trench shall be backfilled with PennDOT Select Granular Material (2 RC).

4. For trenches located in unimproved areas such as yards and lawns, the remainder of the trench shall be backfilled with clean select material consisting of good earth, sand and gravel, free of stones larger than six inches (6") in size and free of wet, frozen, or organic materials, as shown on Standard Detail No. SD-G-07. Excavated material meeting the same requirements may be used.

c. Method of Backfilling

1. Unpaved Municipal Streets or Private Rights-Of-Way

(a) For rigid pipe, after the pipe and bedding have been installed, the trench shall be backfilled to the ground surface with material, as specified in Section 1.14.b., herein, compacted in eight inch (8") layers and in such a manner as not to disturb the pipe. The bedding material shall be solidly compacted around the pipe and carefully placed by hand with shovels to a level at least one foot (1') above the top of the pipe.

(b) For flexible pipe, after the pipe, including the bedding material under the pipe, has been installed, bedding material shall be carefully placed by hand with shovels and solidly compacted in the haunching area (the area around the lower half of the pipe and horizontally in both directions to the undisturbed trench walls) until the trench has been backfilled to the spring line of the pipe. Additional bedding material shall then be carefully placed by hand with shovels to a level at least one foot (1') above the top of the pipe. The trench shall then be backfilled to the ground surface and compacted in eight inch (8") layers and in such a manner as not to disturb the pipe.

(c) Trenches in unpaved municipal streets, street rights-of-way, sidewalk areas, or potential future street rights-of-way (as identified by the municipality) shall be backfilled to the existing surface with PennDOT 2A aggregate material as shown on Standard Detail No. SD-G-05.

2. Paved Municipal Streets

(a) After the pipe and bedding have been installed to a height of one foot (1') above the top of the pipe, the trench shall then be backfilled with 2A aggregate material, compacted in

layers not to exceed eight inches (8"), to a level two inches (2") below finished grade as shown on Standard Detail No. SD-G-05.

3. State Highways and Shoulders of State Highways

(a) The CONTRACTOR shall determine the specific backfilling requirements of PENNDOT. In the absence of any specific requirements from PENNDOT, the CONTRACTOR shall comply with Section 1.14.c.3(b), herein.

(b) After the pipe and bedding have been installed to a height of one foot (1') above the top of the pipe, the trench shall then be backfilled with PennDOT select granular material (2 RC) compacted in layers not to exceed four inches (4") to a level two inches (2") below finished grade, as shown on Standard Detail No. SD-G-05.

4. General Backfill Requirements

(a) As the trenches are backfilled and the WORK completed, the CONTRACTOR shall remove and dispose of all surplus material from the PROJECT. The CONTRACTOR shall leave all roads, driveways, sidewalks, and other places free, clear, clean, and in good order.

(b) No backfilling shall be performed until the WORK has been inspected and approved by the AUTHORITY. All backfill shall be placed in compacted layers (lifts) as specified herein and in such manner as not to disturb or damage the WORK. Each layer of backfill shall be compacted, and, if requested by the AUTHORITY or ENGINEER, the CONTRACTOR shall demonstrate by actual tests that the method of compacting proposed will produce an in-place density of at least ninety-five percent (95%) of the materials maximum dry density as determined by ASTM D 698 ("standard proctor test").

(c) All in-place density tests on compacted fill shall be performed in accordance with "Standard Test Methods for Density of Soil and Soil-Aggregate in Place by the Nuclear Methods", ASTM D 2922.

d. Compaction Requirements

1. If tests indicate WORK does not meet the specified requirements, it shall be removed, replaced, and retested until compliance is achieved.

2. Maintain moisture content of backfill materials, within the range of two percentage points (plus or minus) of optimum as determined by laboratory analysis in accordance with ASTM D1557 ("modified proctor test").

3. Compact materials to the following percentages of maximum lab density as determined by ASTM D1557.

(a) Bituminous or concrete roadways (other than PennDOT highways); driveways, and parking areas (except within public highway rights-of-way): 95% of laboratory determined maximum dry density.

(b) Bituminous or concrete walkways: 95% of laboratory determined maximum dry density.

(c) Within public highway rights-of-way: per PennDOT Specifications, Pub 408 (latest edition).

(d) Unimproved Areas: 90%.

1.15 TOPSOIL, SEEDING, AND LANDSCAPING

a. Methods and materials for placing topsoil, seeding, and landscaping shall be as specified in SECTION II – TRENCH REPAVING AND RESTORATION, of these SPECIFICATIONS.

1.16 TEMPORARY PAVING AND MAINTENANCE OF TRENCH SURFACES

a. In paved portions of highways, streets, alleys, driveways, sidewalks, or shoulders, after the trench has been properly backfilled and compacted to the proper depths below the street grade, the trench shall be temporarily paved in accordance with Section II – TRENCH REPAVING AND RESTORATION. After the trench has been temporarily paved, no dirt or loose material shall be allowed on the trench. Any sinking of the trench shall be repaired by constructing to grade as described in Section II.

b. The CONTRACTOR shall maintain the surfaces of all trenches, which have been temporarily paved, a minimum of forty-five (45) calendar days for Municipal streets and a minimum of ninety (90) calendar days for State highways, or longer, as directed by PENNDOT or the AUTHORITY, until permanent pavement is placed.

c. Along unimproved private rights-of-way, the trench shall be properly backfilled and compacted to the original ground surface. After the trench has been backfilled, no course material or debris shall be allowed in the trench. Any settlement of the trench shall be repaired with clean select material constructed to finished grade.

END OF SECTION

BEDMINSTER MUNICIPAL AUTHORITY

PART 2 – MATERIALS, INSTALLATION AND TESTING

SECTION II

TRENCH REPAVING AND RESTORATION

INDEX

Item	Title
2.01	General
2.02	Temporary Paving
2.03	Permanent Paving
2.04	Topsoil, Seeding and Soil Stabilization
2.05	Maintenance and Restoration

SECTION II

TRENCH REPAVING AND RESTORATION

2.01 GENERAL

a. The CONTRACTOR shall maintain the surface of all trenches and shall repair all depressions, settlements, washouts or other potential hazards, as determined by the AUTHORITY, until such time as the CONTRACTOR is notified by the AUTHORITY, in writing, that the trench surfaces are satisfactory for permanent repaving or restoration.

b. The CONTRACTOR shall replace all guiderails, fences, sidewalks, curbs and gutters, driveways, signs, mailboxes, retaining walls, or other items as directed by the AUTHORITY, which have been damaged or removed in the course of the WORK. All replacements shall conform in size and shape, and be of equal quality of material and workmanship to the original structures prior to being disturbed.

c. All materials specified in this Section shall be in accordance with PennDOT Specifications, Pub.408 (latest edition).

d. Maintenance, temporary and permanent paving and restoration of trenches in State Highways and Municipal Streets shall be in accordance with PennDOT Specifications, Pub.408 and 67 PA Code, Chapter 459, "Occupancy of Highways by Utilities" (latest edition).

e. Where permanent repaving of sidewalks, paved municipal streets or driveways occurs in a MUNICIPALITY other than the Township of Bedminster, the DEVELOPER shall provide written confirmation from that MUNICIPALITY that Section 2.03.a. Sidewalks, Section 2.03.b. Paved Municipal Streets– Bituminous and/or Concrete Paving, and Section 2.03.d. Paved Driveways–Municipal Streets and State Highways, are acceptable. If these SPECIFICATIONS are not acceptable to the MUNICIPALITY, the DEVELOPER shall provide written documentation as to what is acceptable to the applicable MUNICIPALITY.

f. The CONTRACTOR shall be responsible for the adjustment of all manhole and valve box covers and any other such facility in advance of any paving operations. All adjustments shall be in accordance with the requirements of the respect owners of such facilities.

g. The CONTRACTOR shall be responsible for the restoration of all lawns, grassed areas, shrubs, bushes and other plantings. All shrubs, bushes

and other plantings that were disturbed during construction or die during construction or before the end of the guarantee period shall be replaced in kind by the CONTRACTOR.

2.02 TEMPORARY PAVING

a. The CONTRACTOR shall immediately, upon completion of trench backfilling and compacting, place and roll a 2 inch layer of Superpave binder course temporary paving in all paved roads, streets, State highways, driveways, parking lots (all paved areas), etc., as shown on Standard Detail No. SD-G-05. When weather conditions do not permit the use of Superpave binder, a 2 inch layer of Type 2P bituminous paving (cold patch) shall be placed. The CONTRACTOR shall not proceed to excavate additional trench, until this WORK is completed and approved, unless specifically directed otherwise by the AUTHORITY.

2.03 PERMANENT PAVING

a. Sidewalks and Curbs

Unless otherwise ordered by the AUTHORITY, or required by local regulations, the CONTRACTOR shall install and compact four inches (4") of aggregate material and a concrete sidewalk four inches (4") thick shall be constructed to replace sidewalk removed as a result of the WORK. Sidewalk width shall match the width of the sidewalk replaced. In addition, the CONTRACTOR shall replace all curbing, removed as a result of the WORK. All materials and construction for sidewalk and curb replacements shall conform to the specifications of the applicable MUNICIPALITY.

b. Paved Municipal Streets – Bituminous Paving and/or Concrete Paving

The temporary pavement restoration shall be removed to the depths required and the existing paving shall be cut, sawed, or removed in such a manner as to provide a clean cut in the roadway surface and base without undue disturbance to subgrade or fragmentation of surrounding areas for a distance of twelve inches (12") on each side of the trench area. Prior to the placement of permanent materials, the area shall be thoroughly rolled and compacted. The permanent pavement replacement for both bituminous and concrete pavement shall be as shown on Standard Detail No. SD-G-06.

c. State Highways

The CONTRACTOR shall determine the specific temporary and permanent surface restoration requirements of the Pennsylvania Department of Transportation for WORK occurring in State Highways. In the absence of any specific requirements from PENNDOT, the CONTRACTOR shall comply with Standard Detail No. SD-G-08 and No. SD-G-09, as applicable.

d. Paved Driveways – Municipal Streets and State Highways

For paved driveways along municipal streets or State highways, the temporary pavement restoration shall be removed to the depths required and the existing driveway paving shall be saw cut for a distance of twelve inches (12") on each side of the trench area. Prior to the placement of permanent materials, the area shall be thoroughly rolled and compacted. The permanent pavement replacement for driveways along municipal streets shall be as shown on Standard Detail No. SD-G-06 and the permanent pavement replacement for driveways along State highways shall be as shown on Standard Detail No. SD-G-08 or No. SD-G-09, as applicable.

e. Bituminous Sealer

Where the new wearing course joins existing bituminous pavement or is placed adjacent to curbs, or upon existing bituminous material, or adjacent to structures, utilities, etc., it shall be sealed with a bituminous sealer for a distance of twelve inches (12") from curbs, structures, utilities, etc., or six inches (6") on both sides of a bituminous joint in order to prevent accelerated deterioration caused by natural elements. The bituminous sealer shall be Performance Grade Asphalt PG 64-22, conforming to PennDOT Bulletin 25, Specifications for Bituminous Materials.

2.04 TOPSOIL, SEEDING AND SOIL STABILIZATION

a. Temporary Seeding

1. All areas shown on the DRAWINGS, all disturbed areas where construction activity has or will cease for more than four (4) days, and where otherwise directed by the AUTHORITY, shall be seeded as follows:

(a) Fertilizer – 10-20-10 at a rate of 25 pounds per 1,000 square feet.

(b) Limestone – Pulverized Dolomitic at a rate of 90 pounds per 1,000 square feet.
(c) Seed – Annual Ryegrass at a rate of one pound per 1,000 square feet.
(d) Mulch – Hay or small grain straw at a rate of 60 pounds per 1,000 square feet.

b. Permanent Seeding and Soil Stabilization

1. Whenever the surface of the ground has been disturbed in the course of the WORK, the final grade surface shall be stabilized by seeding, sodding, planting or other methods approved by the AUTHORITY to prevent erosion and control sedimentation.

2. A minimum of six inches (6") of topsoil shall be spread over areas to be seeded. Topsoil shall be free of stones, sticks, plants, roots, waste material and similar debris. Frozen ground shall not be spread as topsoil, and topsoil shall not be spread on frozen ground. All topsoil that was removed and stockpiled shall be used provided that it is suitable. Topsoil furnished from off-site areas may also be used provided that it is typical of topsoil of the locality and is suitable. Topsoil shall be spread only when the CONTRACTOR is prepared to follow up with fertilizing and seeding. Fine grading to finished lines, grades and contours, fertilizing and seeding shall be done at such times as approved by the AUTHORITY.

3. The topsoil shall be spread and brought to finished grade, then leveled through the use of straight edges and finally rolled, but not compacted, the topsoil to have a depth of not less than 6 inches after final rolling. The surface shall be rolled with a 200 pound roller. The surfaces, when finished and settled, shall conform to the finished grade and shall be free of hollows or other inequalities and from stones, sticks and other debris.

4. After spreading, raking and rolling the topsoil, the CONTRACTOR shall apply limestone and commercial fertilizer, worked in to depths of three inches (3") to four inches (4"), as follows:

(a) Dolomitic Limestone at a rate of 135 pounds per 1,000 square feet.
(b) 10-20-10 Fertilizer at a rate of 25 pounds per 1,000 square feet.

5. Seeding shall be done during periods from April 15th to June 1st and/or from September 1st to October 15th, unless otherwise directed by the AUTHORITY.

6. Grass seed shall not be planted after a heavy rain nor when the velocity of the wind exceeds a gentle breeze of about 5 miles per hour and not sooner than two (2) days after applying lime and fertilizer, as specified herein.

7. All seed used shall be labeled in accordance with the U.S. Department of Agriculture General Provisions under the Federal Seed Act in effect at the time of purchase, which shall be later than the date of the CONTRACT. Seed, which has become wet, moldy, or otherwise damaged in transit or in storage, will not be acceptable. Seed shall not be more than two (2) years old and shall be retested for germination rate no more than ninety (90) days prior to planting.

8. Seeding and planting shall be as follows:

   (a) Sloped Areas less than 25% (4 horizontal to 1 vertical)

Seed Mix	% Mix	Germination
Kentucky Bluegrass	50	80%
Red Fescue	30	80%
Perennial Ryegrass	20	90%

   Seed Spreading Rate – 8.0 lbs per 1,000 square feet (4.0 lbs in one direction and 4.0 lbs in direction at right angle to first direction.)

   (b) Sloped Areas 25% (4 horizontal to 1 vertical) and greater

Seed Mix	% Mix	Germination
Creeping Red Fescue	29.11	92
Timothy	19.99	93
Tetrapoloid Annual Ryegrass	19.95	91
Red Top	17.10	91
Alsike Clover	11.97	80
Other Crop	0.12	--
Inert Matter	1.74	--
Weed Seed	0.02	--

Spreading rate – 7.0 lbs. per 1,000 square feet

Seed mix shall be "Right-of-Way Woods Mixture" by Ernst Conservation Seeds or AUTHORITY approved equal.

9. The CONTRACTOR shall maintain the seeded and planted areas until all of the WORK under the CONTRACT has been completed and accepted by the AUTHORITY.

10. The maintenance shall consist of refilling erosion gullies, reseeding, replanting, mowing and watering during periods of drought and removal of large and obnoxious weeds, all as directed by the AUTHORITY.

c. Mulching – Sloped Areas less than 25% (4 horizontal to 1 vertical)

After the permanent seeding of sloped areas less than 25%, the CONTRACTOR shall furnish, place, anchor and maintain mulch at the locations shown on the DRAWINGS and as directed by the AUTHORITY. Mulching material shall be either hay, unrotted salt hay or weed-free straw, or a combination of each, free from any seed-bearing stalks and roots of noxious weeds. Mulch shall be placed within forty-eight (48) hours after seeding and shall be applied at a rate of one hundred forty (140) pounds per one thousand (1,000) square feet.

d. Erosion Control Blankets – Sloped Areas 25% (4 horizontal to 1 vertical) and Greater

1. Erosion control blankets shall be placed as shown on the DRAWINGS or as otherwise directed by the AUTHORITY. In addition to the permanent limestone, fertilizer and seeding specifications noted herein, the CONTRACTOR shall furnish, place, anchor and maintain erosion control blankets in all disturbed areas with slopes 25% and greater, as follows:

   (a) The erosion control blanket for areas with slopes of 25% to 50% shall be "North American Green – S150 BN" biodegradable blanket or AUTHORITY approved equal.

   (b) The erosion control blanket for areas with slopes of 50% and greater shall be "Maccaferri, Mac-Mat R8" blanket or AUTHORITY approved equal.

2. The erosion control blankets shall be secured in place with pegs or staples in accordance with manufacturer's recommendations. All permanent seed, fertilizer and limestone applications performed in conjunction with the erosion control blanket installation shall be performed as per manufacturer's recommendations.

3. The CONTRACTOR shall maintain all erosion control blankets until all WORK has been completed and accepted by the AUTHORITY.

e. Sodding

1. Where designated on the DRAWINGS, or where otherwise directed by the AUTHORITY, the CONTRACTOR shall furnish, place and maintain cultivated sod in accordance with these SPECIFICATIONS.

2. Sod.

(a) Sod shall be predominantly K-31 Fescue and shall not contain more than ten (10%) percent of other acceptable fine turf species. It shall be entirely free of weeds, harmful insects and disease and be of mineral soil origin. All sod shall meet the certification requirements of the Pennsylvania Department of Agriculture.

(b) A sample of the sod to be installed shall be supplied to the AUTHORITY for approval prior to delivery.

3. Installation.

(a) Sod shall be cut in rectangular sections measuring 12 inches to 24 inches in width by 2 feet to 6 feet in length to permit handling without tearing or breaking. The section of sod shall be approximately ¾ inch in thickness and the height of the grass shall be approximately 1½ inches.

(b) All sod shall be placed within 48 hours after being cut and shall be in a well-moistened condition when delivered to the site. Should temporary storage be required, the sod shall be protected from direct sunlight and drying. Dried-out sod will not be accepted.

(c) All grading and soil preparation shall be completed prior to the placement of the sod. The soil shall be moist prior to

placing sod and when moisture and temperature conditions are suitable. Sod shall not be cut or placed when the temperature is lower than 35°F.

(d) Sod shall be carefully placed by hand with tight joints and no overlap. Care shall be taken to not damage the sod during installation. Transverse joints shall be broken or staggered. All sod shall be thoroughly watered to the point of saturation immediately after placement.

(e) After watering, the sod shall be sufficiently tamped with an approved tamper to close all joints and ensure a close contact between the sod and sod bed. After tamping, the sod shall be free from bumps and depressions and shall present a smooth even surface.

(f) On all slopes, the sod shall be placed with the long axis parallel to the contour starting at the bottom of the slope. On slopes and in ditches, each strip of sod shall be securely staked with at least one for each two square feet of sod. Stakes shall be driven flush with the top of the sod and with the long face parallel to the slope contour.

2.05 MAINTENANCE AND RESTORATION

a. In paved highways, streets, alleys, sidewalks, driveways and shoulders, temporary paving shall be maintained in accordance with Section 1.16.b., herein, or as otherwise directed by the AUTHORITY, before permanent paving is installed. During this period, any settlement or other deterioration of the trench shall be repaired in accordance with the requirements of Section 1.16, herein. No dirt or loose material will be allowed on the trench.

b. Along private rights-of-way, trenches shall be maintained for a minimum of ninety (90) calendar days after backfilling, or as otherwise directed by the AUTHORITY before permanent restoration is made. During this period, any settlement of the trench shall be repaired by constructing to grade with clean, approved fill material.

c. Trench areas shall be restored as specified herein or, with the approval of the AUTHORITY, to the condition existing prior to the start of WORK; and shall include, but not be limited to, reseeding or resodding lawns, replacing trees and shrubbery damaged by the CONTRACTOR, and

replacement of pavement, curbing, driveways, walkways, guiderails or fences.

d. The CONTRACTOR shall repair any settled or defective trench, in a manner approved by the AUTHORITY, occurring during the maintenance period as required by the Agreement between the CONTRACTOR and the AUTHORITY.

END OF SECTION

BEDMINSTER MUNICIPAL AUTHORITY

PART 2 – MATERIALS, INSTALLATION AND TESTING

SECTION III

MATERIALS, INSTALLATION AND TESTING – WATER SYSTEMS

INDEX

Item	Title
A.	MATERIALS
3.01	General
3.02	Concrete and Concrete Work
3.03	Masonry Units
3.04	Mortar
3.05	Grout
3.06	Precast Concrete Chambers
3.07	Ductile Iron Pipe
3.08	Gate Valves and Valve Boxes
3.09	Butterfly Valves
3.10	Tapping Sleeves and Valves
3.11	Combination Air Valves
3.12	Copper Service Tubing
3.13	Service Connection Appurtenances
3.14	Fire Hydrants

INDEX (CONT'D)

Item	Title
B.	INSTALLATION AND TESTING
3.15	General
3.16	Materials
3.17	Laying Water Mains
3.18	Installation of Valves
3.19	Installation of Fire Hydrants
3.20	Thrust Blocking and Joint Restraint
3.21	Installation of Blow-off Valves
3.22	Laying Service Connections
3.23	Field Testing
3.24	Disinfection
3.25	Failure of Tests
3.26	Interruption of Water Service

SECTION III

MATERIALS, INSTALLATION AND TESTING – WATER SYSTEMS

A. MATERIALS

3.01 GENERAL

a. Unless otherwise specified, all materials used in the WORK shall conform to the requirements of ASTM International (formerly the American Society for Testing and Materials) (ASTM), the American Water Works Association (AWWA), the American National Standards Institute (ANSI), and the International Plumbing Code (IPC), which are current as of the date of these SPECIFICATIONS, unless otherwise noted herein.

b. No material shall be used until it has been inspected and approved by the AUTHORITY at the job site of the WORK. When required by the AUTHORITY, any or all materials entering into the construction of any WORK shall be tested by a testing laboratory acceptable to the AUTHORITY. Such inspection shall not relieve the CONTRACTOR from any obligation in this respect and any defective material or workmanship which may have been passed by the AUTHORITY shall be at all times liable to rejection when discovered, until completion of the maintenance period as required by the Agreement between the CONTRACTOR or DEVELOPER and the AUTHORITY.

c. Only materials called for on the DRAWINGS or specified herein will be permitted. The methods of installation of these materials are detailed in Section III.B. of these SPECIFICATIONS.

3.02 CONCRETE AND CONCRETE WORK

a. General

(1) All concrete shall conform to the Commonwealth of Pennsylvania Department of Transportation Specifications, Section 704 of Publication 408 (latest edition) for Class AAA, Class A and Class C concrete. All concrete shall be Class AAA, unless otherwise indicated on the DRAWINGS. Concrete shall be both watertight and chemical resistant. Class AAA concrete shall have a minimum compressive strength of 4,500 psi at 28 days, Class A concrete should have a minimum compressive strength of 3,300 psi at 28

days, and Class C concrete shall have a minimum compressive strength of 2,000 psi at 28 days.

(2) The maximum allowable slump for all concrete shall be 4 (± 0.5) inches. Slump determination shall be in accordance with ASTM Specification C143.

(3) All concrete shall be plant mixed and air entrained (5% ± 1% by volume). The air entraining admixture shall conform to ASTM C 260. A water reducing admixture, conforming to ASTM C 494, shall be used and shall be either "WRDA with Hycol", by W.R. Grace & Co., or "Pozzolith" by BASF, or AUTHORITY approved equal. The quantity to be added, the controlling temperatures, and the method of mixing shall conform to the written recommendations of the manufacturer. A copy of the proposed concrete mix shall be submitted to the AUTHORITY before proceeding with the concrete work.

b. All reinforcing mesh and bars shall conform to the requirements of "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement", ASTM A 615 for Grade 60 carbon-steel. Welded wire fabric shall conform to the requirements of "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete", ASTM A 185.

c. Loose material or backfill used to support fresh concrete shall be compacted sufficiently to maintain settlement within the dimensional requirements of ACI 347-04. If forms are used by the CONTRACTOR, they must be adequately constructed and supported to avoid bulging of, and/or deforming, the concrete. Forms are to be coated with cup grease, or an approved equal, in order to facilitate removal. All forms must be removed by the CONTRACTOR after the concrete has sufficiently hardened.

d. All exposed vertical surfaces shall receive a smooth rubbed finish. All exposed flat surfaces and exterior slabs shall receive a floated finish.

e. Thrust blocks and vertical anchor blocks shall be provided, as shown on Standard Detail No. SD-W-07 and SD-W-08, and as required to restrain either flanged, mechanical joint, or push-on joint pipe.

f. The AUTHORITY reserves the right to have tests performed to ensure that the concrete, as furnished, meets the requirements of these Specifications. The CONTRACTOR shall furnish the services of an

independent professional materials testing laboratory, as approved by the AUTHORITY, to certify, as specified or required, all work and materials incorporated in the furnishing and installing of quality concrete work for the PROJECT. If the strength tests fail to meet the concrete requirements, the AUTHORITY may then require in-place and/or core tests. All tests shall be at the expense of the CONTRACTOR or DEVELOPER.

g. Concrete work which fails to meet the Specification requirements, or which is not brought into compliance, may be rejected, in which case it shall be removed and replaced at the expense of the CONTRACTOR.

3.03 MASONRY UNITS

a. Brick intended for uses in manholes and appurtenances shall conform to the requirements of ASTM C 32, Grades MS and MM. Lugged paving brick, cored brick, or brick having recesses or openings extending through the body of the brick shall not be used.

3.04 MORTAR

a. The mortar for masonry work shall be either a prepared mortar conforming with the requirements of ASTM C 91, with Type II cement, or shall be made of one (1) part Portland cement, one (1) part lime, and five (5) parts sand in a damp loose condition. The cement shall conform to the requirements of ASTM C150 with Type I cement. The lime shall conform to the requirements of ASTM C207 with Type S special hydrated lime. The sand shall conform to the requirements of ASTM C144.

3.05 GROUT

a. The grout mix shall be one (1) part Portland cement to two (2) parts sand, plus the minimum amount of water necessary for proper placement, which shall not exceed a water to cement ratio of 0.49 by weight. When permitted to stand until setting takes place, the ground should neither bleed nor segregate. Cement shall conform to the requirements of ASTM C150 with Type I cement, and the sand shall conform with the requirements of ASTM C144. Immediately before placing the grout, the area to be grouted shall be thoroughly cleaned and moisture applied. The grout shall be carefully placed to completely fill all voids. Exposed edges of the grout should be kept moist and at temperatures above 40°F for at least three (3) days after placement.

3.06 PRECAST CONCRETE CHAMBERS

a. Precast concrete chambers or vaults, including steps, frames, covers, etc., shall be as specified under Section 4.05 of these SPECIFICATIONS, except the word "**WATER**" shall be cast in the cover.

3.07 DUCTILE IRON PIPE

a. All buried water mains shall be ductile iron pipe, of the required size(s) as indicated on the DRAWINGS. The pipe barrel shall conform to ANSI A21.51/AWWA C-151-09. All pipe shall be gasketed push-on type and/or mechanical joints and all fittings must be mechanical joint. Mechanical joint/push-on joint pipe shall be minimum thickness Class 52 for sizes up to and including 12-inch pipe and minimum thickness Class 53 for sizes greater than 12-inch pipe, all with a 350 psi maximum working pressure as per ANSI A21.51/AWWA C151-09.

b. All buried pipe and fittings shall be cement-mortar lined (double thickness per ANSI A21.4/AWWA C104-088) and shall have manufacturer's standard bituminous coating applied to exterior surfaces.

c. Mechanical joint/push-on joint ductile iron pipe and mechanical joint ductile iron fittings shall conform to the following standards:

ANSI A21.51/AWWA C151-09 – Ductile Iron Pipe (Class 52)
ANSI A21.11/AWWA C111-07 – Rubber Gasket Type Joints
ANSI A21.10/AWWA C110-08 – Ductile Iron Mechanical Joint Fittings

3.08 GATE VALVES AND VALVE BOXES

a. Gate valves shall be manufactured in full compliance with the content of these SPECIFICATIONS and with AWWA C509-09 for Resilient-Seated Gate Valves. The valves shall have iron body construction, bronze mounted, and resilient seated. The valve interior shall be free of ledges, pockets, or other areas which can collect debris or sediment. The valve body and bonnet shall be fusion bonded epoxy coated on all interior and exterior surfaces. The interior epoxy coating shall be AWWA approved for potable water applications. The waterway area shall be unobstructed and valve shall be capable of passing a full size shell cutter. The valve shall be provided with "O" ring stem seals and a lubricant reservoir for the purpose of lubricating the "O" rings and stem thrust collar when valve is operated. Stem seal design shall allow replacement of "O" ring seals while valve is in any position of service. The valve shall be the non-rising stem type, standard 2-inch square nut-wrench operated, and shall open

when operated in the counter clockwise direction. The gate valve shall have a 250 psig working pressure and shall be certified to pass a 500cycle test at 250 psig unbalanced pressure without wearing away the interior epoxy coating to bare metal. Valve shall also seal after cycle test without leakage at the gate or the "O" ring stem seals.

b. Gate valves shall be mounted vertically and shall be furnished with mechanical joint end connections.

c. Gate valves shall be as manufactured by Waterous Company, U.S. Pipe Valve and Hydrant Division of Mueller Water Products, LLC, or AUTHORITY approved equal.

d. Valve boxes shall be cast iron and shall be installed at each buried gate valve. The minimum thickness of the metal of the box, at any point, shall be not less than 3/16 of an inch. The cover shall have cast thereon the word "WATER". The cast iron valve box and cover shall be given a heavy coat of bituminous paint. Valve boxes shall be adjustable two (2) piece sliding type for 12-inch diameter and smaller, and adjustable three (3) piece sliding type for pipe sizes greater than 12-inch diameter and all shall have an internal shaft diameter of 5¼ inches. The bell diameter of bottom section shall properly fit over the valve bonnet and be compatible with the various gate valve sizes specified for the WORK. Valve boxes shall be as manufactured by Tyler Pipe/Utilities Division or AUTHORITY approved equal.

3.09 BUTTERFLY VALVES

a. Butterfly valves may be approved by AUTHORITY on lines sixteen inches (16") in diameter or larger. All butterfly valves shall be manufactured in accordance with AWWA C504 for Class 150B service, with mechanical joint ends for buried service.

b. Cast iron body shall conform to ASTM A126 for Class B gray iron.

c. Cast iron valve disc shall conform to ASTM A48 with Grade 316 stainless steel seating edge and Buna-N rubber valve seat.

d. Valve actuators shall be fully grease packed and have stops in the open/close position.

e. Butterfly valves shall be as manufactured by Henry Pratt Company for Groundhog Butterfly Valves or AUTHORITY approved equal.

f. Valve boxes for butterfly valves shall be as specified in Section 3.08.d, herein.

3.10 TAPPING SLEEVES AND VALVES

a. Tapping valves shall be mounted vertically and shall be of the same construction and type as specified in Section 3.08, herein.

b. Inlet ends of tapping valves shall have an ANSI, B16.1, Class 125 inlet flange for attaching to the sleeve; the outlet of the valve shall have a mechanical joint end.

c. The tapping sleeves shall have an ANSI, B16.1, Class 125 outlet flange. The tapping sleeves shall be made in two halves and shall be designed for 250 psi working pressure. The sleeves shall be the mechanical joint type. The O.D. on the pipe upon which the tapping sleeves are to be placed shall be verified in the field by inspection by the CONTRACTOR prior to their installation.

d. Tapping sleeves and valves shall be as manufactured by Mueller Company for mechanical joint tapping sleeve or AUTHORITY approved equal.

3.11 COMBINATION AIR VALVES

a. Combination air valves shall be provided for air release and vacuum relief, as shown on Standard Detail No. SD-W-02. The combination air valve shall be either single body or dual body as required by the AUTHORITY for the WORK and shall be as manufactured by GA Industries, LLC, or AUTHORITY approved equal.

3.12 COPPER SERVICE TUBING

a. Copper service tubing shall conform with the requirements of ASTM B88-09 for Type K, heavy wall, soft temper seamless copper alloy water tubes. All water services shall be installed using the specified copper service tubing. The tubing diameter shall be either ¾" diameter or 1" diameter as required by the AUTHORITY for the specified WORK. The tubing diameter for combination residential fire and domestic services shall be 1½" diameter. All joints shall be of the compression type. Couplings, with nonmetallic O-ring seals, may be used, if permitted by the AUTHORITY.

b. Any alternate water service materials must be approved by the AUTHORITY.

3.13 SERVICE CONNECTION APPURTENANCES

a. Each water service connection of one inch (1") diameter and smaller shall be made by use of a corporation stop of the size and type indicated on Standard Detail No. SD-W-03 for the pipe material and size being tapped. Each service connection will terminate at a curb stop with curb stop box as shown on Standard Detail No. SD-W-03. All service connection fittings shall be NO LEAD in compliance with the latest requirements of the Federal Safe Drinking Water Act. Service tubing shall be continuous from corporation stop to curb stop and of the material noted.

1. Corporation Stops. Brass corporation stops shall be provided for service connections to the water mains at the locations as indicated on the DRAWINGS, or as directed by the AUTHORITY. Corporation stops shall be designed and manufactured to conform with AWWA Standard C800-2012. The corporation stops shall have a 300 psi working pressure, and shall be individually inspected and tested for leaks by air pressure under water. Corporation stops shall be installed using tapping machines of current design. Buried corporation stops for ¾-inch and 1-inch diameter services shall be only Mueller Company, Model H-15008N or Ford Meter Box Company, Model FB1000-3-Q-NL for ¾-inch services and Model FB1000-4-Q-NL for 1-inch services.

2. Curb Stop Valves. Curb stops for ¾-inch and 1-inch diameter water services shall be only Mueller Company, Model H-15209N or Ford Meter Box Company, Model B44-333-Q-NL for ¾-inch services and Model B44-444-Q-NL for 1-inch services.

3. Curb Stop Boxes. Curb stop boxes shall be cast iron, arch pattern, 1-inch upper sections with 3-1/2 foot long stainless steel stationary shut-off rods and shall be only Mueller Company, Model H-10314 or A.Y. McDonald Mfg. Co., Model 5601 with Model 5660SS rod. The lids shall be cast iron with 2-hole "Erie" pattern on lid in non-paved areas and with brass pentagon plug in paved areas. Both styles shall be marked "WATER" in raised letters. The boxes and lids shall be coated with black dip and shall be furnished with a combination lid and brass pentagonal plug.

b. Service connections for combination 1" residential fire and domestic service lines shall be as shown on Standard Detail No. SD-W-13 and, unless otherwise specified, shall conform to the requirements of Section 3.13.a, herein.

1. Corporation Stops. Brass corporation stops for 1" diameter services shall be only Mueller Company, Model H-15008N or Ford Meter Box Company, Model FB 1000-4-Q-NL. Corporation stops for ¾-inch domestic lines shall be as specified in Section 3.13.a.1, herein.

2. Curb Stop Valves. Curb stops for 1" diameter fire lines shall be only Mueller Company, Model H-15209N or Ford Meter Box Company, Model B44-444-Q-NL. Curb stops for ¾-inch domestic liens shall be as specified in Section 3.13.a.2, herein.

3. Curb Stop Boxes. Curb stop boxes for 1-inch curb stop valves shall have 1-inch upper sections and shall be only Mueller Company, Model H-10314 or A.Y. McDonald Mfg. Co., Model 5601 with Model 5660SS rod. Curb stop boxes for ¾-inch domestic lines shall be as specified in Section 3.13.a.3, herein.

3.14 FIRE HYDRANTS

a. All fire hydrants shall be manufactured in accordance with AWWA C-502-05 for post-type, dry-barrel, compression type hydrant with valve opening against the pressure and closing with the pressure. All fire hydrants shall have a 250 psig rated working pressure.

b. Inlet size and type shall be 6" mechanical joint with mechanical joint retainer gland accessories. Valve opening shall be five and one-quarter inches (5-1/4").

c. All hydrants shall be equipped with two (2) 2-1/2" hose nozzles, and one (1) 4-1/2" pumper nozzle. The threads on the hose and pumper nozzles shall be National Standard unless otherwise required by the local Fire Company. All nozzles shall have a nozzle cap individually attached to the standpipe with rustproof/kinkproof keeper chain. Operating nozzle cap nuts shall be AWWA standard unless otherwise specified.

d. All hydrants shall open counterclockwise (left). All internal operating parts shall be removable through the standpipe without digging or removing the barrel.

e. Hydrants shall be provided with an O-ring type seal plate. The O-ring seal plate shall be so constructed that a moistureproof grease chamber integral with the seal plate shall be provided which shall enclose the operating threads, thereby automatically lubricating the operating threads and friction surfaces each time the hydrant is operated. The seal plate shall be

fitted with at least two (2) O-rings, the lower O-ring shall serve as a pressure seal and the upper O-ring as a combined dirt and moisture seal to prevent foreign matter and moisture from entering the grease chamber. An oil bath chamber is acceptable for Waterous hydrants.

f. The standpipe sections shall be connected two inches (2") above the ground line by a two-part traffic safety flange. Depth of bury shall be four and one-half (4-1/2') feet. The nozzles shall be a minimum of eighteen inches (18") above the ground line.

g. A six inch (6") mechanical joint gate valve with valve box as specified in Section 3.08 shall be furnished and installed at each hydrant in accordance with Standard Detail No. SD-W-06.

h. All external surfaces of the hydrant standpipe above grade (upper barrel) shall have a factory applied epoxy primer and polyurethane top coat. The hydrant standpipe below grade (lower barrel), together with all internal ferrous surfaces above grade, shall be given two (2) coats of black asphaltum varnish. The exposed surfaces above grade, including nozzle caps and bonnet, shall be primed and given two (2) finished coats of oil base paint. The body of the hydrant shall be painted with Rustoleum "Safety Red" #5264 and the bonnet and nozzles finish painted with Rustoleum "Gloss White" #5292.

i. Fire hydrants shall be Metropolitan/M-94, as manufactured by U.S. Pipe. No substitutions will be permitted.

B. INSTALLATION AND TESTING

3.15 GENERAL

The CONTRACTOR shall install all water mains, service connections and appurtenances of the size and type shown on the DRAWINGS in accordance with these SPECIFICATIONS and shall perform all testing in accordance with the requirements of ASTM International.

3.16 MATERIALS

All materials used in the installation of water systems shall be as specified in Section III.A., herein.

3.17 LAYING WATER MAINS

Water mains and service connections shall be laid in accordance with AWWA C600-10 (Installation of Ductile Iron Water Mains and their Appurtenances), recommendations of the manufacturer for storage, handling and installation and these SPECIFICATIONS.

a. Handling

Pipe and accessories shall be distributed at the PROJECT site and shall, at all times, be carefully handled to avoid damage. All pipes shall be rolled or lifted, with care being taken not to bump or drop pipe or fittings. In order to avoid damage to the interior of the pipe, lifting hooks or bars shall not be inserted therein. Before installing any pipe, care shall be taken that the interior and machined ends of all pipes shall be thoroughly cleaned and kept free from dirt, cuttings and foreign matter. Tool marks and unnecessary pipe threads shall be avoided. Burrs formed when cutting pipe shall be removed by reaming. Valves and hydrants shall be protected from damage and dirt and kept drained of water, which could cause damage during freezing weather.

b. Trench Preparation

The trench shall be excavated to the proper subgrade and the bedding material shall be placed in the trench at a minimum thickness of 6 inches below the pipe. The bedding material shall conform to Section 1.06.b. of these SPECIFICATIONS. The pipe shall then be placed so that the entire length of the pipe is resting on the bedding, not on the bells. Each length of pipe shall be carefully handled, and accurately laid, by skilled workmen to line and grade with a minimum cover over the top of the pipe of 4'-0" or as otherwise shown on the DRAWINGS, without the use of any form of blocking. Each length shall be cleaned, the joint prepared in accordance with the manufacturer's recommendations, and be pushed home against previously installed pipe.

c. Alignment and Grade

The alignment and grade for proposed water piping shall follow the procedures of Section 4.11.c of these SPECIFICATIONS.

d. Installation of Pipe

1. Any conflicts arising during the erection of piping shall be brought to the attention of the AUTHORITY. No improvising or field changes will be permitted without the approval of the AUTHORITY.

2. All piping shall be erected in such a manner as to obtain sufficient flexibility and to prevent excessive stresses in materials and excessive bending moments at joints or connections to equipment.

3. Full lengths of pipe shall be used whenever possible. Short lengths of pipe with couplings will not be permitted, except as may be approved by the AUTHORITY to eliminate overstressing or misalignment. All pipe shall be cut to exact measurement and shall be installed without forcing or springing.

4. Where piping is pitched for drainage, an accurate grade shall be maintained. Piping shall be supported in such a manner as to prohibit deflection due to gravity that would be sufficient to pocket the lines when full of liquid. All changes in direction shall be made by using pipe fittings, unless otherwise shown on the DRAWINGS, or as approved by the AUTHORITY.

5. Unions shall be installed in all piping connections to equipment, regulating valves, and wherever necessary to facilitate the dismantling of piping and removal of valves and other items requiring maintenance. Flanges on equipment may be considered as unions. At least one union shall be provided in every straight run of pipe, when directed by the AUTHORITY.

6. All buried bolts, nuts, lugs, rods, brackets, etc., except stainless steel, shall be given one heavy coat of coal tar epoxy coating prior to backfilling.

7. When pipe is cut in the field, the cut end shall be tapered back approximately 1/8 inch, at an angle of 30° with the centerline of the pipe, with a coarse file or grinder to remove any rough edges which might injure a gasket, where applicable.

8. Where it is necessary to join pipes of different types and/or sizes, the CONTRACTOR shall furnish and install the necessary transition sleeves, couplings, and/or reducers/increasers, approved by the AUTHORITY. Transition sleeves, couplings, and/or reducers/

increasers shall have ends conforming to specifications for the appropriate type of joint to receive the adjoining pipe.

Where approved by the AUTHORITY, pipe transitions shall be made with solid cast ductile iron sleeve couplings as manufactured by Smith-Blair, Inc. or AUTHORITY approved equal. Where transitions are made between pipes of same or different sizes and same or different materials, the connections shall be made with the use of OMNI Couplings, No. 441/442, as manufactured by Smith-Blair, Inc. or Engineer-Approved equal.

9. Pipe shall be carefully lowered into the prepared trench and bedding. The AUTHORITY will inspect each length of pipe and all fittings prior to installation. Rejected pipe or fittings shall be promptly removed from the PROJECT site. For bell and spigot pipe, the WORK shall proceed with bells facing the direction of lying. On slopes greater than ten percent (10%), the pipe lying will proceed upgrade. The ends of pipe to be joined shall be carefully cleaned and gasket lubricant placed in accordance with the recommendations of the pipe manufacturer.

10. The spigot end shall be set into the bell for coupling in place, centered and pushed into place with a jack or other device approved by AUTHORITY.

11. Field fabrication of make-up pieces shall be completed in accordance with recommendations of the pipe manufacturer and full use shall be made of the manufacturer's specialty pieces for this purpose.

12. Every precaution should be used to prevent foreign material from entering the pipe. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or other means approved by AUTHORITY.

13. After laying of pipe and installation of all appurtenances, the trench shall be completely backfilled in accordance with Section I of these SPECIFICATIONS.

3.18 INSTALLATION OF VALVES

Valves of the sizes and at the locations shown on the DRAWINGS shall be set in accordance with Standard Detail No. SD-W-01. All valves shall have mechanical joint ends with either retainer glands or mega-lugs. The connecting pipe shall be

adapted, if necessary, to suit the mechanical joint fitting with at least one short make-up piece. The valve shall be uniformly bedded and supported in 2B stone bedding installed for support of the valve box base. The valve stem and valve box shall be set plumb and the box shall be centered over the opening nut.

3.19 INSTALLATION OF FIRE HYDRANTS

Fire hydrants shall be installed at the locations shown on the DRAWINGS and shall be installed in accordance with Standard Detail, SD-W-06. Unless otherwise noted, hydrant installation will be through a hydrant tee with six-inch (6") branch, six-inch (6") gate valve and six-inch (6") piping. Joints shall be mechanical joints with either retainer glands or mega-lugs. Hydrant and shut-off valve shall be set plumb, and thrust blocking and drainage bed shall be constructed as shown on the Standard Details. Drainage bed and drain holes shall not be encased by concrete.

3.20 THRUST BLOCKING AND JOINT RESTRAINT

a. Cast-in-place concrete thrust blocking or anchors shall be provided on all lines at bends, tees, capped or valved end fittings and at all points of potential thrust or where otherwise directed by the AUTHORITY. Blocking or anchors shall be poured against undisturbed earth and shall be in accordance with Standard Details No. SD-W-07 and No. SD-W-08. Soil bearing values used shall be as designated by the AUTHORITY.

b. CONTRACTOR shall use restrained joint ductile iron pipe and restraining elbows, tees, hydrants and plugs where indicated. Restrained joint pipe shall be used when one or more of the following conditions exist:

1. Where indicated on DRAWINGS.
2. Unsuitable trench conditions as directed by the ENGINEER.
3. Unsuitable soil conditions as directed by the ENGINEER.
4. Interference with, or close proximity to buried structures, pipelines or utility lines.

Restrained joint fittings, valves and piping shall be constructed in place, not preassembled, and then installed. This is to eliminate movement/damage to the restraint when installing.

c. Restrained Joint Pipe: When thrust blocks cannot be used, restrained joints shall be placed at all points of potential thrust. The number of joints to be restrained on each side of a fitting shall be determined by the pipe manufacturer and submitted to the ENGINEER for review and approval. The length of restrained pipe shall be sufficient to resist the specified

hydrostatic test pressures and shall also take into account such factors as the burial depth, soil types and backfill material used. Restrained joint ductile iron pipe shall be of the restrained mechanical or push-on joint type. Mechanical joint retainer glands are not acceptable. Restrained joint piping shall sustain the indicated test pressures, as a minimum.

3.21 INSTALLATION OF BLOW-OFF VALVES

Blow-off valves shall only be permitted when a fire hydrant cannot be utilized and must be approved by the AUTHORITY. The discharge from the blow-off shall be to a drainage structure, a natural drainage course, or to a surface as directed by the AUTHORITY. Blow-off valves shall conform in all respects to the requirements for gate valves as specified in Section 3.08 herein, and the installation shall conform to Section 3.18 and Standard Details No. SD-W-10, No. SD-W-11 and No. SD-W-12, as applicable.

3.22 LAYING SERVICE CONNECTIONS

a. Service connections shall extend from the public water main to the structure or facility to be served and should be installed at the locations and of the sizes shown on the DRAWINGS or as directed by the AUTHORITY. Service connections shall consist of a corporation stop, curb stop and box with interconnecting service tubing. The connecting ends of corporation stops and curb stops shall be consistent with the size and material of service tubing in accordance with Section 3.13 of these SPECIFICATIONS and with Standard Detail No. SD-W-03.

b. Service connections at the main shall be made with a drilling and tapping machine by the approved manufacturer (Mueller). The corporation stop shall be installed with a minimum engagement of three (3) full threads. Under no circumstances shall the CONTRACTOR connect to the main without approval of the AUTHORITY. When installing the corporation stop, the tap shall be made on the pipe crown at the 10:00 or 2:00 position.

c. Service tubing shall be loosely laid without kinking from the corporation stop to the curb stop in a single length without the use of intermediate couplings.

d. The curb box shall be set plumb over the curb stop. The consumer side or the curb stop shall be suitable for receiving copper tubing unless instructed otherwise by the AUTHORITY. All excavation and backfill for service connections shall be in accordance with Section I of these SPECIFICATIONS.

3.23 FIELD TESTING

a. General

1. During construction and at the completion of the WORK, the CONTRACTOR shall make tests, as directed by the AUTHORITY, to ascertain if the pipe is properly aligned and the joints are tight. The AUTHORITY will direct and witness all tests. The CONTRACTOR is responsible for providing a pressure gauge and a metering device if required for the test. The CONTRACTOR shall also furnish a suitable pump and all other apparatus required. Defective work shall be repaired or replaced immediately, at the CONTRACTOR'S expense.

2. All pipe lines shall be thoroughly flushed with water to obtain free flow through all lines. All obstructions and debris in lines shall be removed and any apparent defects corrected prior to testing.

3. Where any section of water main is provided with concrete thrust blocks, the hydrostatic pressure test shall not be made until at least five calendar days after the installation of the thrust blocks, unless otherwise approved by the AUTHORITY.

b. Testing of Buried Water Mains

Testing shall be in accordance with AWWA C600-10, Section 4, Hydrostatic Testing. Before the pipe is tested, concrete thrust blocks shall be in place and backfilling shall be completed. When the entire pipe line, or designated portion thereof, is completed, it shall be tested hydraulically as follows:

1. The pipe line or designated portion thereof shall be slowly filled by the CONTRACTOR with water from a source of supply made available by the AUTHORITY, and shall be vented free from air or air pockets.

2. After the system has been full of water for 24 hours, the hydrostatic pressure shall be brought to 150 lbs./sq. in minimum and maintained for a period of 2 hours, or as directed by the AUTHORITY. Test pressure shall not vary by more than ± 5 psi for the duration of the test.

3. During the 2-hour period when the system is under the test pressure, no section of pipe of uniform diameter shall show a

leakage in excess of 11.65 gallons per day per mile per inch of diameter. Allowable leakage is based on the following formula:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where:
- L = allowable leakage, in gallons per hour
- S = length of pipe tested, in feet
- D = nominal diameter of pipe, in inches
- P = average test pressure during the leakage test, in pounds per square inch (gauge)

Any leaks shall be repaired in a satisfactory manner by the CONTRACTOR, at his own expense. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

4. Water service connections shall be tested and checked for visual leakage under normal system operating pressure, after installation and prior to backfilling, as specified herein.

5. All connections to existing piping shall be tested and checked for visual leakage under normal system operating pressure, after connections are completed and prior to backfilling, as specified herein.

6. A 1-inch diameter corporation stop shall be supplied and installed by the CONTRACTOR for the purpose of pressurizing the new main. The corporation stop for testing shall be installed at the point of highest elevation in the section of new main to be hydrostatically tested. Upon completion of the test, the corporation stop shall be removed and a threaded brass plug shall be installed by the CONTRACTOR.

7. Water mains not dedicated shortly after testing may be required to have a leak detection survey performed prior to dedication. The need for a leak detection survey shall be determined by the AUTHORITY or ENGINEER.

3.24 DISINFECTION

a. Potable Water Piping

1. Each unit of completed water supply lines and distribution system shall be thoroughly disinfected with chlorine before it is placed in operation. The disinfection shall conform to the requirements and standards set forth in AWWA C651-05, "Disinfecting Water Mains." All procedures for disinfection shall be approved by the AUTHORITY prior to initiation of work. The form of chlorine to be used in the disinfection operation shall be only calcium hypochlorite granules. Liquid chlorine, sodium hypochlorite solution or calcium hypochlorite tablet forms of chlorine shall NOT be permitted. The standards for the calcium hypochlorite granular form of chlorine are defined in Section 4.1.3 of AWWA C651-05.

2. The continuous feed method for disinfection, utilizing calcium hypochlorite granules, shall be used. All procedures shall conform to Sections 4.2, 4.3, 4.4.3 and 4.5 of AWWA C651-05. The amount of chlorine applied shall be in accordance with Section 4.4.3 of AWWA C651-05. The methods and procedures for filling the water line for disinfection shall be approved by the AUTHORITY. Following a contact period of not less than 24 hours, the heavily chlorinated water shall be flushed from the system as soon as possible with clean water until the residual chlorine content is no higher than that generally prevailing in the distribution system, as determined by the AUTHORITY. Dechlorination of the heavily chlorinated water shall be performed prior to discharge.

3. The flushing procedures employed by the CONTRACTOR, and subsequent discharge location of the wasted water, shall be approved by the AUTHORITY prior to implementation. All valves in water lines being sterilized shall be opened and closed several times during the test period. Only AUTHORITY representatives shall operate valves.

b. Materials

1. The form of chlorine to be used for disinfecting the new water supply lines and distribution system shall be only calcium hypochlorite in granular form, containing 65% available chlorine by weight.

2. After sterilization, the AUTHORITY will determine the bacteriological quality of the lines by laboratory testing. The test results must be certified by the laboratory that the water main/supply lines are free from coliform bacteria contamination. Failure of testing will require re-sterilization and testing.

3.25 FAILURE OF TESTS

If any of the above-referenced testing or sterilization procedures produces unsatisfactory results, as determined by the AUTHORITY, the CONTRACTOR will be responsible to perform any required corrective work and to retest the subject line(s) until satisfactory results are obtained.

3.26 INTERRUPTION OF WATER SERVICE

During the course of the WORK, it may be necessary or advantageous to temporarily interrupt service to a customer or group of customers. If the CONTRACTOR wishes to interrupt service, written approval of the AUTHORITY shall be obtained at least forty-eight (48) hours prior to such interruption of service; and it shall be the responsibility of the CONTRACTOR to notify all customers, whose service will be interrupted, at least twenty four (24) hours prior to such interruption of service. In all instances, the duration of interruption of service shall be kept to a minimum.

END OF SECTION

BEDMINSTER MUNICIPAL AUTHORITY

PART 2
MATERIALS, INSTALLATION AND TESTING

SECTION IV

MATERIALS, INSTALLATION AND TESTING – SANITARY SEWER SYSTEMS

INDEX

Item	Title
A.	MATERIALS
4.01	General
4.02	Concrete and Concrete Work
4.03	Mortar
4.04	Grout
4.05	Concrete Chambers
4.06	Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
4.07	Ductile Iron Pipe
4.08	Shop Tests on Pipe
B.	INSTALLATION AND TESTING
4.09	General
4.10	Materials
4.11	Laying Gravity and Low Pressure Sewer Pipe
4.12	Laying Service Connections
4.13	Construction of Manholes

INDEX (CONT'D)

Item	Title
4.14	Field Testing
4.15	Television Inspection of Sanitary Sewers
4.16	Sewage Flow Bypass Pumping

C. PUMP STATIONS

4.17	General
4.18	Municipal Sewage Pumping Stations
4.19	Low Pressure Sewage Pumping Stations

SECTION IV

MATERIALS, INSTALLATION AND TESTING – SANITARY SEWER SYSTEMS

A. MATERIALS

4.01 GENERAL

a. Unless otherwise specified, all materials used in the WORK shall conform to the requirements of ASTM International (formerly the American Society for Testing and Materials) (ASTM), and the American National Standards Institute (ANSI), which are current on the date of these SPECIFICATIONS, unless otherwise noted herein.

b. No material shall be used until it has been inspected and approved at the job site of the WORK. When required by the AUTHORITY, any or all materials entering into the construction of any WORK shall be tested by a testing laboratory acceptable to the AUTHORITY. Such inspection shall not relieve the CONTRACTOR from any obligation in this respect and any defective material or workmanship which may have been passed by the AUTHORITY shall be at all times liable to rejection when discovered, until completion of the maintenance period as required by the Agreement between the CONTRACTOR or DEVELOPER and the AUTHORITY.

c. Only materials called for on the DRAWINGS or specified herein will be permitted. The methods of installation of these materials are detailed in Section IV.B. of these SPECIFICATIONS.

4.02 CONCRETE AND CONCRETE WORK

a. All concrete and concrete work shall conform to Section 3.02 of these SPECIFICATIONS.

4.03 MORTAR

a. The mortar for masonry work shall conform to Section 3.04 of these SPECIFICATIONS.

4.04 GROUT

a. The grout mix shall conform to Section 3.05 of these SPECIFICATIONS.

4.05 CONCRETE CHAMBERS

a. Precast concrete chambers or monolithically cast-in-place concrete chambers, as specified below, shall be used in the WORK.

1. Precast Manholes/Chambers

(a) General

(1) All manholes shall be precast, reinforced concrete. Manholes shall be manufactured in accordance with ASTM Specification C478, "Standard Specification for Precast Reinforced Concrete Manhole Sections." Manholes shall have an internal diameter of 48 inches, unless noted otherwise on the DRAWINGS or as required by the AUTHORITY. The top section shall be an eccentric type cone with a 24 inch diameter opening.

(2) The precast manhole bases, risers and top sections shall be reinforced with steel, as required in ASTM Specification C478, Section 6.

(3) Precast bases shall include an integral wall of sufficient height so that there is a minimum of two (2") inches of inside wall height below all wall openings, and a minimum of eight (8") of inside wall height above all wall openings.

(4) The entire exterior surface of precast concrete manholes/chambers shall be factory coated with two coats of bitumastic coating.

(b) Manhole/chamber inverts or channels shall be precast and shall generally conform with Standard Detail No. SD-S-01.

(c) Joints of manhole/chamber sections shall be lap joint and sealed with a double bead flexible butyl rubber sealant, or AUTHORITY approved equivalent.

(d) Manhole/chamber steps shall be copolymer polypropylene plastic (CCP) with an embedded ½ inch diameter Grade 60 steel reinforcing bar. The steel reinforced CCP steps shall be Type PS2-PFSL-DF, as manufactured by M.A. Industries,

Inc., or AUTHORITY approved equal. Manhole steps shall be cast integrally into the concrete walls of bases, risers and top sections to secure steps in uniform alignment and spacing, as shown on Detail Drawings No. SD-W-02, No. SD-W-09, No. SD-S-02, No. SD-S-03, and No. SD-S-11.

(e) Piping Connections to New Manholes/Chambers

Connections between sewer pipe and new precast manholes/chambers shall be made by means of a rubber gasket-type piping seal such as "A-LOK Full Compression Seal," as manufactured by A-LOK Products, Inc., or AUTHORITY approved equal. The piping connections shall conform to the requirements of ASTM C923. Boot-type pipe-to-manhole connection fittings will not be allowed.

The rubber gasket-type seals must be manufactured so as to be properly mated to the type and size of the sewer pipe being used.

(f) The interior of the joint shall not be filled. Openings for lifting precast concrete bases, walls and sections shall be filled with non-shrink waterproof grout, if determined necessary by the AUTHORITY.

2. Manhole Encapsulation System

(a) New and rehabilitated manholes shall be installed with WrapidSeal™ as manufactured by Canusa CPS prior to completion of construction and shall conform with the requirements of ANSI/AWWA C216-07.

(b) Installation of the manhole encapsulation system shall be in accordance with the manufacturer's recommended practices and shall be a wraparound heat shrinkable system applied to the outside of the manholes.

(c) The manhole encapsulating system shall be applied to seal all joints between manhole base, riser(s) and cone sections and shall completely encapsulate the entire upper portion of the manhole, including the top of the cone section, the grade ring(s), the rubber riser rings and the manhole frame. The encapsulating material shall extend a minimum of four (4") inches above and below each joint.

(d) Installation of the manhole encapsulation system shall be performed to create a barrier from water infiltration to protect the manhole from future damage.

3. Manhole Liner System

(a) A manhole liner system shall be applied to all manholes, whether existing or proposed, to which a sanitary sewer force main or low pressure sewer system connects and also to the next three (3) manholes downstream of the connection manhole. The manhole liner system shall produce "A Total System for Manholes" to provide a corrosion resistant liner that restores walls to original surface levels and eliminates water infiltration and exfiltration. The manhole liner system shall be OBIC Armor 100F Aromatic Polyurea Coating System by OBIC LLC, or Raven 405 Epoxy Coating System by Raven Lining Systems.

(b) References.

(1) ASTM 7234 - Adhesion
(2) ASTM D412 or D638 - Tensile Strength (PSI)
(3) ASTM D412 or D638 - Elongation (%)
(4) ASTM D624 - Tear Strength (PLI)
(5) ASTM D2240 – Hardness
(6) ASTM D790 – Flexural Strength
(7) ASTM 4060 – Taber Abrasion (mg loss)

(c) Submittals. All materials and procedures required to establish compliance with the SPECIFICATIONS shall be submitted to the AUTHORITY for review/approval. Submittals shall include at least the following:

(1) Technical Data Sheet on each product used.
(2) Material Safety Data Sheet (MSDS) for each product used.
(3) ASTM References.
(4) CIGMAT Evaluation.
(5) Descriptive literature, bulletins and/or catalogs of materials.

(6) Work procedures including flow diversion plan, method of repair, etc.
(7) Material and method for repair of leaks or cracks in manholes.
(8) Final installation report on completed manholes.

(d) 10-Year Limited Warranty. The Manufacturer and CONTRACTOR shall warrant the manhole liner system against failure for a period of 10 years. "Failure" will be deemed to have occurred if the protective lining fails to (a) prevent the internal damage or corrosion of the structure and (b) protect the substrate and environment from contamination by effluent. If any such failure occurs within 10 years of initial completion of work on a structure, the damage will be repaired to restore the lining at no cost to the AUTHORITY within 60 days after written notification of the failure. "Failure" does not include damage resulting from mechanical or chemical abuse or act of God. Mechanical or chemical abuse means exposing the lined surfaces of the structure to any mechanical force or chemical substance not customarily present or used in connection with structures of the type involved herein.

(e) Quality Assurance

(1) The manufacturer and/or applicator of the total liner system of manholes shall be a company that specializes in the design, manufacture or installation of corrosion protection systems for manholes. Applicator shall be completely trained in leak repair, surface preparation and corrosion materials application on manholes. Corrosion materials/products shall be suitable for installation in a severe hydrogen sulfide environment without any deterioration to the liner.

(2) The applicator shall be trained and certified by the manufacturer for the handling, mixing, application and inspection of the liner system as described herein.

(3) To ensure total unit responsibility, all materials and installation thereof shall be furnished and coordinated with/by one supplier/applicator who turnkeys the work

and assumes full responsibility for the entire operation.

(f) Materials and Equipment

(1) The materials to be utilized in the lining of manholes shall be designed and manufactured to withstand the severe effects of hydrogen sulfide in a wastewater environment. Manufacturer of corrosion protection products shall have long proven experience in the production of the lining products utilized and shall have satisfactory installation record.

(2) Equipment for installation of lining materials shall be high quality grade and be as recommended by the manufacturer.

(3) The lining system to be utilized for manhole structures shall be a two-component, sprayable, solvent free, 100% solids polyurea or epoxy moisture/chemical barrier system, specifically developed for the corrosive wastewater environment.

(g) Inspection

(1) Applicator shall take appropriate action to comply with all local, state and federal regulations including those set forth by OSHA, EPA, the AUTHORITY and any other applicable authorities.

(2) Prior to conducting any work, perform inspection of structure to determine need for protection against hazardous gases or oxygen depleted atmosphere and the need for flow control or flow diversion.

(3) Submit plan for flow control or bypass to AUTHORITY for approval prior to conducting the WORK.

(4) New Portland cement structures shall have endured a minimum of 28 days since manufacture prior to commencing installation of the liner system.

(h) Surface Preparation

(1) Conduct surface preparation program to include monitoring of atmosphere for hydrogen sulfide, methane, low oxygen or other gases, approved flow control equipment, and surface preparation equipment.

(2) Surface preparation methods may include high pressure water cleaning, hydro blasting, abrasive blasting, grinding, detergent water cleaning and shall be suited to provide a surface compatible for installation of the liner system.

(3) Surface preparation method shall produce a cleaned, abraded and sound surface with no evidence of laitance, loose concrete, brick or mortar, contaminants or debris, and shall display a surface profile suitable for application of liner system.

(4) After completion of surface preparation, perform the seven point check list, which is the inspection for:

(aa) Leaks
(bb) Cracks
(cc) Holes
(dd) Exposed Rebar
(ee) Ring and Cover Condition
(ff) Invert Condition
(gg) Inlet and Outlet Pipe Condition

(5) After the defects in the structure are identified, repair all leaks with a chemical or hydraulic sealant designed for use in field sealing of groundwater. Severe cracks shall be "repaired with a urethane based chemical" sealant. Product to be utilized shall be as approved by AUTHORITY prior to installation. Repairs to exposed rebar, defective pipe penetrations or inverts, etc. shall be repaired utilizing non-shrink grout or approved alternative method.

(i) Material Installation

(1) Application procedures shall conform to recommendations of the manufacturer, including materials, handling, mixing, environmental controls during application, safety and spray equipment.

(2) Spray equipment shall be specifically designed to accurately ratio and apply the liner system.

(3) Application of multi-component liner system shall be in strict accordance with manufacturer's recommendation. Final installation shall be a minimum of 500 mils. A permanent identification and date of work performed shall be affixed to the structure in a readily visible location.

(4) Provide final written report to AUTHORITY detailing the location, date of report, and description of repair.

(j) Completion

(1) Final liner system shall be completely free of pinholes or voids. Liner thickness shall be the minimum value as described herein.

(2) Visual inspection shall be made by the AUTHORITY. Any deficiencies in the finished liner system shall be marked and repaired according to the procedures set forth by the Manufacturer.

(3) The sewer system may be returned to full operational service as soon as the final inspection has taken place.

4. Manhole/Chamber Frames and Covers

(a) Castings for manhole/chamber frames and covers shall be of uniform quality, free from blow holes, porosity, hard spots, shrinkage, defects, cracks or other injurious defects. They shall be smooth and well cleaned. Castings shall be heavy duty and designed for AASHTO Highway Loading Class HS-20.

(b) Material used in the manufacture of the castings shall conform to ASTM Specification A48/A48M-03 (2012), CL.35B.

(c) All castings shall be of the dimensions shown on Detail Drawing No. SD-S-04 and manufactured true to pattern and with a close fit of component parts. Round frames and covers shall be of non-rocking design and with machined metal bearing surfaces, so that fitting parts will not rock.

(d) All manhole/chamber frames shall be cast with four 1-inch diameter holes equally spaced.

(e) All covers shall have lettering cast thereon which conforms to the requirements of Detail Drawing No. SD-S-04.

(f) Runners, risers and other cast-on pieces shall be removed. All castings shall be tough and of even grain. All parts of castings shall be thoroughly coated at the factory with one coat of black asphaltum paint or other impervious preparation approved by the AUTHORITY.

(g) Manhole frames and covers shall have self-sealing lids. Covers shall include a flexible gasket installed in a machined groove in the lid of the casting. Pick holes shall not extend completely through the cover. The lids are to be bolted to the frame with four (4) ½-inch diameter stainless steel bolts. Standard frames and covers shall be Neenah Foundary, Catalog No. R-1772. The watertight frames and covers shall be Neenah Foundary, Catalog No. R-1916-F, or AUTHORITY approved equal.

4.06 POLYVINYL CHLORIDE (PVC) SEWER PIPE AND FITTINGS

a. The following materials shall be acceptable for sanitary sewer piping to the limits as described under each type. Any couplings required to effect interconnections between two dissimilar types of pipe shall require the prior approval of the AUTHORITY before being used in the field.

b. Gravity Sewer Pipe and Fittings

1. PVC pipe, diameters of 15" and smaller: ASTM D3033 and ASTM D3034, Type PSM, SDR-26.

2. PVC pipe, diameters of 18" to 27": ASTM F679.

3. Push-on type pipe joints, integral bell with elastomeric gasket: ASTM D3212 and ASTM F477.

4. PVC pipe (SDR 26) may be used for Building Sewers on private property, except that Schedule 40 plastic pipe will be required under any concrete building slabs.

c. Pressure Sewer Pipe and Fittings

1. Pressure-Rated Pipe (Except for Low Pressure Sewer System)

(a) PVC pressure rated pipe, SDR-21 (200 psi) with ductile iron equivalent O.D. and integral bell and gaskets: ASTM D3034. ASTM D2441, ASTM F477 and AWWA C900-07.

(b) All pressure rated force main pipe of diameters of 4" and greater shall be ductile iron pipe conforming to Section 3.07 of these Specification.

2. Push-on type pipe joints, flexible elastomeric seal ASTM D3139 and ASTM F477. Use thrust blocking or approved equivalent restraint for all changes in alignment, valves, tees, caps, and plugs.

3. Appurtenances

(a) PVC solvent weld pipe (Solvent 80) cleanouts, fittings, couplings, and transition gaskets: ASTM D1785. Installed as shown on the DRAWINGS. Threaded brass pipe plug with raised operating unit.

(b) Penetrations through manholes for pressure sewer pipe applications shall be Link Seal® by Thunderline Modular Seals in accordance with Section 4.11.h.3, herein.

d. Low Pressure Sewer System

1. The low pressure sewer main located in street rights-of-way and/or sanitary sewer easements shall be PVC pipe conforming to ASTM D1785 and ASTM D2466. For pipe diameters of 1½ inches, the low pressure pipe shall be Schedule 40 PVC pipe. For pipe diameters of 2 inches and greater, the low pressure pipe shall be SDR 21 PVC pipe.

2. The individual discharge line from each home shall be 1¼ inch diameter Schedule 40 PVC pipe, which shall connect to the low pressure sewer main with a 45 degree fitting in the direction of flow.

3. For each individual home or property, a lateral assembly shall be installed between the curb and sidewalk unless otherwise directed by the AUTHORITY. The lateral assembly shall include a stainless steel ball valve curb stop with integral check valve, a valve box with lid and all required adapters, couplings, etc.

4. Installation of the low pressure sewer system shall be in accordance with the manufacturer's suggested practices, these standard SPECIFICATIONS and Standard Detail No. SD-S-13.

5. Low Pressure Service Connections

   (a) Service Saddles

      (1) Galvanized iron or bronze body
      (2) Neoprene, O-ring gasket
      (3) Double straps with matching hardware
      (4) Outlet end suitable for service pipe specified

6. Low Pressure Sewer Lateral Connection Box

   (a) Curb Stop and Check Valve:

      (1) 1¼" PVC True Union Curb Stop
      (2) 1¼" PVC True Union Ball Type Check Valve

   (b) Box and Cover:

      (1) 36" diameter by 48" deep HDPE Mid-States Meter Box with inside top and bottom flanges or approved equal
      (2) 36" diameter Cast Iron Recessed Frame and Cover with 30" diameter lid opening. Cover shall be marked "Sewer" and shall bolt down.

   (c) Low Pressure Sewer Lateral Connection Box Assembly

      (1) Install service fittings and appurtenances on suitable brick or concrete supports. Do not use earth, rocks, wood or other organic materials as supports.

(2) Clean and inspect all pipes, valves and fittings before installing and assemble as shown on the DRAWINGS and in accordance with the manufacturer's recommended practices. Use joints recommended by the manufacturer and as approved by the AUTHORITY.

(3) Provide fittings and spool pieces as needed to provide a complete assembly and to allow connection of the service lateral on both sides of the completed assembly.

(4) Operate each curb stop before and after installation.

7. All gate valves and valve boxes shall conform to Section 3.08 of these SPECIFICATIONS.

8. Low pressure sewer junctions and low pressure cleanouts and flushing connections shall be installed in the low pressure sewer system where shown on the DRAWINGS and in accordance to Standard Details No. SD-S-14, No. SD-S-15 and SD-S-20.

4.07 DUCTILE IRON PIPE

a. All ductile iron pipe and fittings used for gravity or pressure sewer applications shall conform to Section 3.07 of these SPECIFICATIONS.

4.08 SHOP TESTS ON PIPE

a. If requested by the AUTHORITY, the materials listed below shall be tested at the shop or plant of, and by, the manufacturer. Each manufacturer of such materials shall be fully equipped to carry out the tests herein designated. Upon demand of the AUTHORITY, the manufacturer shall perform such additional tests as the AUTHORITY may deem necessary to establish the quality of the material offered for use. The AUTHORITY shall be furnished with certified reports of records of the results of all tests. Such records or reports to contain a sworn statement that the tests have been made as specified. The number of tests performed shall be as specified in the appropriate ASTM or AWWA Test Method. Payment for all tests shall be made by the CONTRACTOR or the DEVELOPER.

PIPE MATERIAL	TEST METHOD
Ductile Iron Pipe	AWWA C 151-09
Polyvinyl Chloride Sewer Pipe	ASTM D 2321

B. INSTALLATION AND TESTING

4.09 GENERAL

The CONTRACTOR shall install all sanitary sewers and appurtenances of the size and type shown on the DRAWINGS and in accordance with these SPECIFICATIONS and shall perform all testing in accordance with the requirements of ASTM International.

4.10 MATERIALS

All materials used in the installation of sanitary sewers and appurtenances shall be as specified in Section IV.A. of these SPECIFICATIONS.

4.11 LAYING GRAVITY AND PRESSURE SEWER PIPE

a. Handling

Pipe and accessories shall be distributed at the PROJECT site and shall, at all times, be carefully handled to avoid damage. All pipes shall be rolled or lifted, care being taken not to bump or drop pipe or fittings. In order to avoid damage to the interior of the pipe, lifting hooks or bars shall not be inserted therein. Before installing any pipe, care should be taken that the interior and machined ends of all pipe shall be thoroughly cleaned and kept free from dirt and foreign matter.

b. Trench Preparation

1. The trench shall be excavated to the proper subgrade and the bedding material shall be placed in the trench at a minimum thickness of 4 inches below the bottom of the pipe. The bedding material shall conform to Section 1.06.b. of these SPECIFICATIONS. The pipe shall then be placed so that the entire length of the pipe is resting on the bedding material, not on the bells. The bedding material shall then be placed to a depth of 1'-0" above the top of the pipe. Any section of pipe disturbed after it is set must be reset by the CONTRACTOR, as directed by the AUTHORITY.

2. Pipes which are to be encased for utility or stream crossings shall be encased in Class C concrete, having a minimum compressive strength of 2,000 psi, as shown on standard Detail No. S-G-04. Pipe stubs from connections to existing manholes shall also be encased in Class C concrete.

c. Alignment and Grade

1. All pipe shall be carefully laid to the lines and grades as shown on the DRAWINGS, without offsets or unevenness at the joints. The location and grade for all piping shall be staked out by a registered surveyor licensed in the Commonwealth of Pennsylvania or by personnel under the supervision of same.

2. Alignment and grade may be set by laser equipment, if desired by the CONTRACTOR. Operation of the equipment shall be as recommended by the manufacturer. Grade boards will not be required if a laser is used.

3. The CONTRACTOR may use batter boards instead of laser equipment. If batter boards are used, grades shall be taken from established baselines and "cut sheets", both of which are the responsibility of the CONTRACTOR. If the CONTRACTOR is using batter boards, there shall be a minimum distance between stakes of twenty-five feet (25'). If the grades are flat, and the AUTHORITY so orders, the CONTRACTOR shall place intermediate boards between those normally established to avoid sag in the working line.

4. Preparation of "cut sheets" or other requirements for construction are the responsibility of the CONTRACTOR.

5. Regardless of control used, the CONTRACTOR shall provide alternative verification of grade as work progresses. Pipe not laid to proper line and grade shall be removed and reconstructed at the CONTRACTOR'S expense.

d. Installation of Pipe

1. Following trench preparation, pipe laying shall proceed upgrade with pipe laid carefully, spigot ends fully entered into adjacent hubs, and true to the lines and grades given. Every length or section of pipe shall be carefully inspected before laying and any containing cracks or other defects shall not be used. Extreme care shall be exercised to prevent breakage when the pipe is handled. The pipes shall be lowered so as to avoid unnecessary handling in the trench. Each section of pipe shall rest upon the pipe bedding material for the full length of its barrel, with recesses excavated to accommodate bells and joint. Each pipe shall be firmly held in position so that the invert forms a continuous grade with the invert

of the pipe previously placed. The interior of all pipe and the inside of the bell and outside of the spigot shall be thoroughly cleaned of all foreign matter before being lowered into the trench, and shall be kept clean during laying operations by means of plugs or other approved devices.

2. Under no conditions shall pipe be laid in water or on subgrade containing frost, and no pipe shall be laid when trench conditions are unstable for such work. In all cases, water shall be kept out of the trench until concrete cradles or supports, where used, have hardened.

3. There shall be no walking or working on the completed pipeline, except as may be necessary in tamping or backfilling, until the trench has been backfilled to a height of at least one (1) foot over the top of the pipe.

4. Any pipe that has its grade or joint disturbed after lying shall be taken up and relaid. Any section of pipe already laid and found to be defective shall be taken up and replaced with new pipe without expense to AUTHORITY.

5. No pipe shall be laid within twenty feet (20') of the machine excavating the trench nor within twenty-five feet (25') of any place where blasting is being done. In all cases, the mouth of the pipe shall be provided with a board or other stopper, carefully fitted to the pipe to prevent earth or other substances from washing into it. When excavating rock, the mount of the pipe shall be carefully protected from blasts.

6. In placing concrete cradles or fill, the methods used shall be such as to prevent mud, earth, clay or other foreign materials from becoming mixed with the concrete. In no case shall "dry-mix" concrete be placed in the trench.

7. PVC gravity sewer piping shall be installed in accordance with the "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity Flow Applications", ASTM Specification D2321. After PVC pipe is laid and the trenches completely backfilled, it will be tested in accordance with Section 4.14, herein.

8. PVC gravity sewer pipe may be utilized to a maximum depth of 15 feet. Gravity sewer pipe greater than 15 feet shall be Ductile Iron

Pipe conforming to Section 4.07 herein. Gravity sewer pipe installation greater than 20 feet deep is discouraged and only allowed with the approval of the AUTHORITY.

9. For all buried force main pipe, including low pressure sewer system force main, a six (6") inch-wide underground detectable warning tape (tracer tape) shall be placed on top of the stone bedding, directly over the force main pipe, prior to trench backfilling as shown on Detail Drawing SD-G-03. The tracer tape, which shall include a solid aluminum foil core, shall be green in color with "Caution - Sewer Line Buried Below" in 1-inch minimum lettering.

e. Joints

Joints for various type pipes shall be as previously specified. The ends of all pipes shall be thoroughly cleaned before joints are made, and all pipes shall be tightly seated and adjusted to exact line and grade without disturbing the position or previously laid pipe.

f. Fittings

All tees, lateral connections, bends and other fittings shall be commercially manufactured of the same material as the pipe and shall be installed at the locations shown on the DRAWINGS, or as directed by the AUTHORITY. Cutting of pipes to field fabricate fittings will not be permitted, unless approved by the AUTHORITY.

g. Future Extensions

Where directed by the AUTHORITY, or as indicated on the DRAWINGS, an opening shall be cut in the manhole for connections to future extensions. The opening shall then be sealed with manhole brick to provide a watertight closure.

h. Pipe Connections to Manholes/Chambers

Where sanitary sewer pipe enters and exits manholes/chambers, the connection with the manhole/chamber shall be made in accordance with the following:

1. When a precast base is used, the pipe shall be sealed into the cored hole of the base with a rubber or neoprene flexible gasket as manufactured by A-Lok Products, Inc., or AUTHORITY approved equal.

2. When tying into an existing manhole where no opening exists, the CONTRACTOR shall core drill a hole (no larger than 2 inches plus the outside pipe diameter) in the manhole section in a circular pattern as approved by the AUTHORITY, remove the "core", grout in place a "KOR–N-SEAL" as manufactured by Trelleborg Pipe Seals or "Press-Seal" gasket as manufactured by Press-Seal Gasket Corporation or "Link-Seal" as manufactured by Thunderline Corporation, and insert the pipe into the gasket or seal.

3. Force Main Connections to Manholes

   (a) The first section of new force main pipe out of the manhole must be a bell section no longer than 2 feet and set on line and grade. An approved "Link-Seal" modular seal must be placed around the pipe, centered in the middle of the manhole wall. This pipe is to be encased in Class C concrete, as a minimum, for a minimum distance of 1 foot beyond the outside wall of the manhole. The concrete is to be poured around the pipe and through the manhole wall. The CONTRACTOR shall use a non-shrink grout for filling and sealing the connection inside the manhole to provide a watertight connection.

   (b) The force main pipe within the manhole shall be secured to the manhole wall and shelf with stainless steel brackets and anchors, and shall be extended into the discharge sewer pipe as shown on the Standard Detail No. SD-S-16.

   (c) The CONTRACTOR shall relocate existing manhole steps when the alignment of such steps is in conflict with new pipe connections, as determined by the AUTHORITY. Existing steps shall be completely removed and any resulting wall openings shall be sealed with non-shrink grout. New manhole steps, conforming to Section 4.05.a.1(d) of these SPECIFICATIONS, shall be installed at the locations and in a manner to be approved by the AUTHORITY.

4.12 LAYING SERVICE CONNECTIONS

a. The CONTRACTOR shall construct, complete to the right-of-way line or other designated points, all service connections (laterals) shown on the DRAWINGS or ordered by the AUTHORITY. The open ends of all service connection piping shall be closed with an approved watertight plug

capable of withstanding the required air test. Service connections shall be laid and joined in every respect in accordance with Section 4.11, herein.

b. All laterals shall be 6-inch and 4-inch pipe as shown on Detail Drawings No. SD-S-06 and No. SD-S-07, and shall be of the same pipe material as the sewer main to which they are connected. The pipe shall conform to Section 4.06 or Section 4.07 of these SPECIFICATIONS, as applicable. The lateral pipe shall be 6 inches between the sewer main and the inspection port and 4 inches between the inspection port and the point of connection to the existing/proposed house sewer.

c. Lateral connections to the sewer main shall be made only with commercially manufactured wye branches of the same pipe material as the sewer main to which it is connected.

d. All laterals shall be laid on a minimum slope of one-quarter (1/4) inch per foot and shall be constructed as shown on the DRAWINGS. The free (upper) end of the lateral pipe shall be set at a proper depth to serve the intended dwelling, building, facility, etc. Where required, to avoid the use of an excessively deep lateral, the lateral shall be constructed with a grade adjustment or lateral riser as shown on Detail Drawings No. SD-S-08, No. SD-S-09 or No. SD-S-10, when directed by the AUTHORITY.

e. The CONTRACTOR shall construct all laterals to a designated point as shown on the DRAWINGS, where it shall be connected to the existing/proposed building sewer. All laterals must be constructed with proper bedding and backfill materials in accordance with Section 1.14 of these SPECIFICATIONS.

f. At each lateral, the CONTRACTOR shall construct an inspection port (clean-out). The clean-out shall be of the same pipe material as the lateral pipe to which it is connected. The clean-out shall be located beyond the street curb line as shown on Detail Drawings No. SD-S-06 and No. SD-S-07. Inspection port joints may be either slip joints or solvent weld glued joints. The clean-out shall be completely embedded in No. 2B aggregate material extending a minimum of 6 inches around the clean-out riser pipe to a point 6 inches below grade in grass areas and 4 inches below grade in sidewalk areas.

g. Trench excavation and backfill for all laterals shall comply with Section I of these SPECIFICATIONS. Excavation for laterals shall be opened for the entire length of the lateral before any pipe is laid. Rock in all lateral trenches must be removed to a point not less than 1 foot beyond the end of the pipe. If rock is encountered within 10 feet of any building, it must be

removed by drilling or wedging, or such other method acceptable to the AUTHORITY.

h. If water exists in the lateral trench, no lateral pipe may be placed until the water is removed by the CONTRACTOR.

i. When there are no existing dwellings or buildings, connections will be terminated at the inspection port at such depths and at such locations as the AUTHORITY may direct.

j. For all sanitary sewer lateral construction on the homeowner's or property owner's property (between inspection port and connection point to existing/proposed building sewer), a six (6") inch wide underground detectable warning tape (tracer tape) shall be placed on top of the stone bedding, directly over the sewer lateral pipe, prior to trench backfilling as shown Detail Drawings No. SD-S-06 and No. SD-S-07. At each clean out/inspection port, the tracer tape shall be affixed to and extended vertically up each clean out/inspection port to a point 6 inches below grade. The tracer tape, which shall include a solid aluminum foil core, shall be green in color with "Caution – Sewer Line Buried Below" in 1-inch minimum lettering.

k. Where service connections are specified to be made to an existing sewer main at such locations where there are no existing tee/wye branches or laterals provided, connections shall be made as follows: A neat, regular hole, which will accommodate a commercially manufactured six inch (6") tee/wye gravity saddle, shall be tapped in the existing pipe. Installation shall be in accordance with the printed instruction of the manufacturer. The connection shall then be encased in concrete for a distance extending twelve inches (12") from the center of the connection laterally and providing a minimum thickness of six inches (6") of concrete under and around the outside of the pipe. The saddle connection must be made watertight. The wye gravity sewer saddle shall be Harco, PVC Sewer, SDR-26, Gasketed Saddle Wye attached with two stainless steel straps, or AUTHORITY approved equal. The saddle must be approved by the AUTHORITY and installed in accordance with the recommendations of the manufacturer.

Unless written approval is received from the AUTHORITY, service connections shall not be installed directly into the manholes.

4.13 CONSTRUCTION OF MANHOLES

a. All manholes shall be precast reinforced concrete type, as per Section 4.05 of these Specifications, and as shown on Standard Details No. SD-S-01, SD-S-02, SD-S-03, SD-S-04 and SD-S-05. They shall be constructed at points indicated on the DRAWINGS or as directed by the AUTHORITY. All manholes shall be set to the grades surveyed and in strict accordance with the DRAWINGS.

b. Manholes may not be left open after they have been constructed. The CONTRACTOR must completely set the base, risers and top section of all manholes constructed during the working day. No manhole may be left open overnight. If a manhole is not completed by the end of the working day, the CONTRACTOR must use a safe, temporary method of covering the manhole opening, as approved by the AUTHORITY.

c. The joints for all manhole sections shall be as specified in Section 4.05 of these SPECIFICATIONS. Each ring of sealer shall be placed completely around the joints. The use of round rubber gaskets for sealing manhole joints shall not be permitted. No mortar is to be placed in the internal manhole section joints.

d. Excavation

Excavation for manholes shall be made to a vertical plane and the cut shall be made to a square or rectangular shape with dimensions two feet (2') greater than the outside of the manhole walls.

e. Manhole Bases

1. Stone foundations shall be constructed of 2B aggregate material as shown on the Standard Detail No. SD-S-02 for accommodating sewers up to twenty-seven inches (27") in diameter. When it is necessary to build wider or deeper foundations than specified or shown, such foundations shall be built as directed by the AUTHORITY. Pipe connections shall be built-in and trimmed as shown on the Details. The joint between the base and first section of the manhole shall be constructed in accordance with Section 4.05, herein.

2. Inverts shall be formed directly in the manhole base. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer entering/exiting branches shall have a smooth curve with a radius as large as the size of the manhole will

permit. Steep slopes outside the invert channel shall be avoided. Flow channels shall be equal to ¾ the diameter of the largest pipe connecting to the manhole.

3. The CONTRACTOR shall build outside drop connections, as shown on the DRAWINGS, where a drop in the pipe inverts is 2 feet or more. They must be constructed in accordance with Standard Detail No. SD-S-03 and shall be of the same pipe material used to construct the main from which the drop connection is made.

f. Surface for Frames

1. The top of the walls of precast manholes shall be properly contoured to the street surface to form a flat surface upon which the rubber riser rings and cast iron manhole frame is to rest. A minimum of two (2) courses of grade rings and rubber risers shall be used to bring the manhole frame and cover to proper elevation. Manhole bricks may not be used. Rings shall be laid to line in header courses, in full and close joints of mortar which at the inside face shall not exceed one quarter inch (1/4") in width. Rings shall be neatly plastered and troweled smoothly inside and outside, to a minimum thickness of one-half inch (1/2"), with cement mortar as specified previously.

2. The maximum height of all grade adjustments shall be 12 inches, measured from the top of the top manhole section to the bottom of the frame. If this height exceeds 12 inches, a 1 foot manhole riser section must be added to the manhole.

3. All manholes shall be provided with rubber risers (Infra-Riser as manufactured by East Jordan Iron Works) for grade adjustments. Manufacturer directions shall be followed for installation.

4. Cast iron manhole frames and covers shall be furnished by the CONTRACTOR and shall conform to Section 4.05.a.4 of these SPECIFICATIONS.

g. Coating

1. The entire exterior surface shall be coated with bitumastic to a minimum thickness of twenty (20) mils. The coating shall be Koppers Bitumastic Super Service Black, or AUTHORITY approved equal.

2. The manhole sections shall be pre-coated at the factory; however, after installation, the CONTRACTOR will be required to complete any necessary coating and/or to patch any area damaged during construction.

h. Doghouse Manholes

1. The base of all "doghouse" manholes shall be poured-in-place concrete extending a minimum of 12 inches below the invert of the existing pipe and 8 inches above the top of the pipe. All concrete must be poured against undisturbed "stable" earth, as shown on Standard Detail No. SD-S-12.

2. The annular space between the existing sanitary sewer pipe and the doghouse riser section shall be completely filled with non-shrink grout.

3. Channels and shelves shall be constructed of Class AAA concrete. The depth of the channels shall be ¾ the largest pipe diameter. All shelves shall slope toward the invert at a rate of 1 inch per foot. The channels shall be formed to provide for a minimum of turbulence between the existing and new sewer pipes within the manhole.

4. Following the satisfactory testing and acceptance of the new sanitary sewer system by the AUTHORITY, including the doghouse manholes, the CONTRACTOR shall remove the crown of the existing sewer pipe within the doghouse manhole as shown on the Standard Detail No. SD-S-12. During this operation, the CONTRACTOR shall divert existing sewage flow, if necessary, by bypass pumping. The top of the existing sewer pipe shall be cut into pieces small enough to be removed through the 24 inch diameter manhole opening. The existing pipe shall be cut flush with the manhole walls so as to form a smooth, non-jagged edge.

i. Manhole Steps

The CONTRACTOR shall provide steel reinforced copolymer polypropylene plastic manhole steps for all manholes in accordance with Section 4.05.a.1.(d), herein.

4.14 FIELD TESTING

a. General

1. During construction and at the completion of the WORK, the CONTRACTOR shall make tests, as directed by the AUTHORITY, to ascertain if the pipe is properly aligned and the joints are tight. The ENGINEER will direct and witness all tests. The CONTRACTOR is responsible for providing a pressure gauge and a metering device, if required, for the test. The CONTRACTOR shall also furnish a suitable pump and all other apparatus required. Defective work shall be repaired or replaced immediately at the CONTRACTOR'S expense.

2. All wastewater lines shall be thoroughly flushed with water to obtain free flow through all lines. All obstructions and debris in lines or manholes shall be removed and any apparent defects corrected prior to testing. Water used for flushing shall come directly from a flush truck having a minimum pressure of 1,200 psig.

3. All sewers shall be "lamped" by the CONTRACTOR, in the presence of the AUTHORITY, to determine uniformly straight alignment between manholes. Visual internal inspection shall also be made to determine breaks, cracks or other faults.

4. Television Inspection:

   (a) A television inspection of all new sewer mains shall be made by the CONTRACTOR. A digital recording of the inspection shall be provided to the AUTHORITY prior to final acceptance of the sewer system.

   (b) The television inspection and digital recording shall be made to the complete satisfaction of the AUTHORITY.

   (c) Refer to Section 4.15 herein for additional requirements pertaining to television inspection.

b. Testing of Gravity Sewers

Each sewer run shall be tested for leakage by a low pressure air test in accordance with the following procedures:

1. Each length of sewer between manholes shall be tested separately by plugging the open ends of the pipe in each manhole and each service lateral, if applicable, in the section to be tested.

2. Air from a compressor and control equipment shall be slowly admitted to this section through one of the manhole plugs until a constant test pressure of 3.5 psig is maintained. To allow for the presence of groundwater, the height in feet between the invert of the pipe sewer and the height of groundwater in the trench containing the section of pipe to be tested shall be determined, and this height shall be divided by 2.3 to establish the pounds of pressure that shall be added to the 3.5 psig stated herein.

3. By throttling the air supply, maintain 3.5 psig (or increased pressure as required above) for at least 2 minutes, prior to starting the test, to permit the air temperature within the pipe to equalize with the temperature of the pipe wall. After the stabilization period, adjust the air pressure to 3.5 psig, plus increase in pressure as required, due to the presence of groundwater and disconnect the air supply.

4. The requirements of this test shall be considered satisfied if the test pressure does not lose more than 1.0 psig in a 5 minute test period after the stabilization period.

c. Testing of Manholes

1. General

(a) The CONTRACTOR shall have the option of using the Manhole Exfiltration Test or Manhole Vacuum Test as the method of manhole testing. The required testing procedures to be utilized under each testing option shall be as specified herein.

(b) Before the "Manhole Exfiltration Test" or "Manhole Vacuum Test" is performed, the manhole shall be thoroughly cleaned and all openings sealed to the complete satisfaction of the AUTHORITY. All pipe openings in the base and the walls shall be sealed with plugs designed to provide a watertight seal.

(c) Prior to conducting the manhole testing, all manholes shall be completed and the frames and covers permanently set to final grade.

(d) All testing shall be performed in the presence of the AUTHORITY or his appointed representative.

(e) Testing shall be performed on existing manholes to which new gravity sewer lines are connected, as well as on all new manholes.

2. Manhole Exfiltration Testing Procedures

(a) After the manhole has been properly cleaned and sealed, the manhole shall be completely filled with water. In order to make allowance for the amount of water which may be absorbed, the manhole to be tested shall be completely filled with water to the bottom of the cover seat for a period of 12 hours prior to commencement of the "Manhole Exfiltration Test".

(b) At the time of commencement of the "Manhole Exfiltration Test", the manhole shall again be filled with water to the bottom of the cover seat, and this water level shall be maintained for a minimum of 12 hours, during which period an accurate record of the amount of water to be added by reason of leakage (exfiltration) will be kept.

(c) The manhole being tested shall be considered "Acceptable" when the total rate of exfiltration does not exceed a rate of 0.038 gallons per inch of diameter per vertical foot per day.

3. Manhole Vacuum Testing Procedures

(a) The vacuum test is to be performed as per the manhole tester manufacturer's recommendation along with the following:

(1) The manhole tester is to be placed in the manhole frame in order to test all grade adjustment ring joints between the bottom of the frame and the top of the manhole cone section.

(2) The initial test vacuum shall be 10 inches of mercury.

(3) The initial test vacuum may drop a maximum of 1 inch of mercury during the test period.

(4) The test periods for the various depths and sizes of the manholes are as follows:

Depth	Manhole Diameter		
	48"	60"	72"
	Testing Periods (Seconds)		
0-10 ft.	60	90	120
10-20 ft.	90	120	150
20-30 ft.	120	150	180

(5) All manholes exceeding the sizes and depths, as listed above, will require a test period of 180 seconds.

4. Failure of Tests

If the manhole (existing or new) does not satisfy these testing requirements, the source(s) causing the test failure must be located and repaired in an approved manner and retested until the testing requirements are satisfied.

d. Deflection Testing of PVC Pipe

1. PVC pipe sewer main piping shall be tested by the CONTRACTOR for deflection (reduction in vertical inside diameter) using a hand-pulled, Go-No-Go Mandrel. The maximum allowable pipe deflection shall be 5%.

2. The CONTRACTOR shall provide all labor, materials, testing equipment, and accessories necessary to perform the deflection testing. Testing shall be done in the presence of, and to the satisfaction of, the AUTHORITY. The deflection testing shall be conducted not before 30 days after a section of pipe sewer line between adjacent manholes, including the main sewer and service connections, has been properly backfilled. After the section of pipe to be tested has been cleaned to the satisfaction of the AUTHORITY, the CONTRACTOR shall pull the mandrel through the pipe sewer by hand. Any section of pipe sewer which will not permit the mandrel to pass through shall be taken up and relaid and/or repaired. The corrected section shall be retested to demonstrate that the pipe sewer meets the maximum allowable deflection specified herein.

3. The CONTRACTOR must submit a notarized certificate from the mandrel manufacturer which states that the mandrel was constructed to allow for a maximum deflection of 5% in the PVC pipe. This certificate must be submitted to the AUTHORITY.

e. Testing of Force Mains

1. After the force main or sections thereof have been installed and the trenches have been completely backfilled, they shall be tested with clear water under hydrostatic pressure. The test pressure for all public force main (to lateral assembly) shall be 100 psig and the test pressure for all private force main (lateral assembly to grinder pump) shall be 70psig. The test pressure shall be maintained for a period of not less than 4 hours. The measured leakage for each section of force main tested shall not exceed the rate of 70 gallons per day per mile per inch of pipe diameter. Temporary restraints shall be placed at limit of work of 1-1/4" laterals for testing purposes.

2. A preliminary test period for the removal of absorption of air from the lines before measuring the leakage will be permitted.

3. When the length of the force main exceeds 1,000 feet, the force main shall be tested in sections, the length of each section to be determined by the AUTHORITY.

4. The CONTRACTOR may elect to make a leakage test prior to backfilling the trenches, for his own purposes; however, the leakage tests of the force main, or sections thereof, for acceptance shall be conducted after the backfilling of the trenches has been completed.

5. Failure of Tests. If any of the above-referenced testing procedures produces unsatisfactory results, as determined by the AUTHORITY, the CONTRACTOR will be responsible to perform any required corrective work and to retest the subject line(s) until satisfactory results are obtained.

4.15 TELEVISION INSPECTION OF THE SANITARY SEWERS

a. The CONTRACTOR shall furnish all electronic equipment, appurtenances, labor, technicians, etc., required to perform a closed circuit television inspection of all sanitary sewers. The television inspection shall be performed after the completion of the pipe installation between manholes. Operation of the equipment shall be controlled by a qualified operator from a control panel inside a mobile television studio. The television studio shall be large enough to accommodate four people for the purpose of viewing the monitor while the inspection is in progress. The ENGINEER and AUTHORITY shall have access to view the television monitor at all times.

b. The radial view, color television camera used for the inspection shall be one specifically designed and constructed for sewer inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be operative in 100 percent humidity conditions and have a minimum of 600 line resolutions. Picture quality and definition shall be to the complete satisfaction of the ENGINEER and if unsatisfactory, the equipment shall be removed and replaced with equipment of satisfactory quality.

c. The operator shall have the capability of controlling the movement of the television camera by remote control. The electronic equipment shall be furnished with a digital meter capable of displaying on the monitor and on the tapes, the date of the televising and testing, the location of the sanitary sewer (manhole to manhole) and the footage of the camera location.

d. The camera shall be moved through the entire sewer length in either direction at a uniform slow rate.

e. A suitable means of communications shall be set up between the camera and the monitor control.

f. If camera should tip over during the inspection, it shall be taken out and realigned, and the line section shall be re-televised.

g. Television inspection of each sewer run between manholes shall be color videotaped. Where deficiencies and leaks are noted, the camera shall be stopped to observe the condition, record the information, and photographs taken as ordered by the ENGINEER. Repair defects shall be corrected where required by the ENGINEER.

h. The digital recordings shall contain narration by the operator and recorded on the digital file during the televising of the sanitary sewers. All digital files recorded of the sanitary sewer system shall be given to, and become the property of, the AUTHORITY.

4.16 SEWAGE FLOW BYPASS PUMPING

a. During construction of new sanitary sewer systems or replacement of existing sanitary sewer lines, including grinder pump force mains, it may be necessary to temporarily divert existing sewage flows. This shall be accomplished through bypass pumping. In no instance shall existing sewage service be interrupted and the CONTRACTOR shall ensure that, at all times, sewage flow is maintained through the sewage system. At no

time shall the upstream lines be plugged off and flow allowed to accumulate in the system.

b. Bypass pumping shall include all pumps, piping, pits, personnel and miscellaneous supplies, plus set-up and demobilization time necessary to bypass active sections of sewer.

Any proposed bypass pumping lines crossing existing roadways, driveways or other travel paths shall be protected by ramps capable of HS-20 loading. Such ramping methods must be approved by the AUTHORITY prior to construction.

c. The CONTRACTOR shall demonstrate to the AUTHORITY, prior to the flow diversion operation, that the bypass pumping operation can successfully divert the sewage flows in a means capable of maintaining the flows through the system. Diverted sanitary flows may only be discharged to sanitary manholes. At no time shall the discharge be made upon streets, into storm sewers or onto other adjacent areas.

d. Bypass pumping shall be continuously maintained by the CONTRACTOR for whatever period of time is required to complete the construction of the new sanitary sewer facilities. No sewage is to be introduced into the new sanitary sewer interceptor pipe until this line is approved by the AUTHORITY.

C. PUMP STATIONS

4.17 GENERAL

a. Intent

1. The intent of these specifications is to provide the DEVELOPER and CONTRACTOR with **General Guidelines** for the design and construction of sanitary sewage pump stations.

4.18 MUNICIPAL SEWAGE PUMPING STATIONS

a. Pumps

1. Pumps shall be submersible, non-clog pumping units as manufactured by Flygt Pumps or AUTHORITY-approved equal. Pumps shall be vertically mounted centrifugal, volute-type, single-suction, non-clog, submersible pumps with close-coupled submersible electric motors. Pumps shall be installed per the

manufacturer's recommendations. Duplex stations must be supplied for redundancy.

b. Emergency Backup Pump

A diesel-driven backup pump shall be permanently installed at all municipal sewage pumping stations. Pump shall be manufactured by Godwin Pump or Engineer-approved equivalent.

c. Structure

1. The pump station shall consist of a concrete wet well and separate concrete valve vault, with an enclosure/building for the electric controls and emergency generator. Building materials shall be approved by the AUTHORITY. Valve vault shall include an emergency bypass connection. Aluminum hatches with locking devices, designed for H-20 loading, shall be provided for the wet well and valve vault. Flanged DIP piping shall be required in the wet well and valve vault.

d. Electric and Controls

1. Pump controls shall be provided as recommended by the manufacturer. Primary controller shall be the Multi-Smart Controller by MultiTrode/Xylem. Controls shall be located within the pump station enclosure/building.

2. An emergency generator with adequate fuel storage shall be provided. Generator shall be located within the pump station enclosure/building.

3. Liquid level of the pumping station wet well shall be sensed by a Sigma Controls Series 6100 MP submersible level (pressure) transducer, or approved equal. A set of mechanical float switches shall also be installed as a backup system consisting of four (4) float switches.

4. An alarm dialer system, compatible with the existing Bedminster Municipal Authority alarm network, shall be provided.

e. Site

1. Unless otherwise indicated by the AUTHORITY, a chain link fence around the pump station shall be provided. A bituminous access

drive, adequate site lighting, and exterior hose bib shall be provided.

4.19 LOW PRESSURE SEWAGE PUMPING STATIONS

a. General

The manufacturer shall furnish complete factory-built and tested Grinder Pump Station(s), each consisting of a basin package, alarm device, unitized level control system, grinder pump and all necessary appurtenances to form a complete U.L. listed package system. Grinder pump to be listed to U.L. 778 and CSA 108, basin package shall be listed to U.L. 1951, and alarm device shall be listed to U.L. 508. All equipment in the wet well shall be capable of constant submergence in sewage to a minimum depth of ten feet without electrical power being energized. The waste handling capabilities of the grinder pump and station shall be tested and certified to NSF/ANSI 46.

1. Warranty

The manufacturer shall provide a warranty on materials and workmanship for a period of twenty-four (24) months after notice of Owner's acceptance, but no greater than twenty-seven (27) months after receipt of shipment. The Owner will return any equipment found defective to the manufacturer for inspection and validation of the defect. Defective equipment will be repaired or replaced at manufacturer's discretion and shipped back to Owner at no charge.

2. Acceptable Manufacturer(s)

Acceptable grinder pump station manufacturer(s) are the Barnes brand of Crane Pumps & Systems as supplied by CW Sales Corporation – Norristown, PA. 1-866-60-PUMPS. Operation and Maintenance Manuals can be downloaded from www.cwsalescorp.com.

3. Corrosion Protection

All materials exposed to wastewater shall have inherent corrosion protection, i.e., coated cast iron, fiberglass, polyethylene, engineered polypropylene copolymer, stainless steel, bronze, PVC or CPVC.

4. Safety

The grinder pump station shall be from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled, factory wired and tested grinder pump station shall be U.L. listed. Grinder pump stations without U.L. listing will not be acceptable.

b. Basin Packages

1. Station Configuration

Basins shall be supplied in a wet well configuration. Wet well/dry well designs shall not be acceptable. The collection tank overall depth shall be able to accept complete submergence. The wet well must have storage volumes according to the following table:

Volumetric Range	Capacity
Volume at "Off"	11 Gallons Maximum
"Off" to "On" Volume	20 Gallons Minimum
"On" to "Alarm" Volume	18 Gallons Minimum
"Alarm" to "Inlet" Volume	15 Gallons Minimum

2. Factory Wiring

All wiring in the grinder station shall be installed and functionally tested prior to shipment from the factory. All electrical cables penetrating or passing through the silhouette of the pump station must be guaranteed to be water-tight by the manufacturer and must be installed at the factory prior to shipment. The pump power cable shall be constructed to meet the requirements for direct burial cable-type cable and designed with a quick connect-type plug which secures and seals to the pump motor housing. No intermediate or junction box-type connections are allowed between the pump and the connection to the alarm panel. Direct burial cable must be factory installed in the station and arrive at the job site with a minimum length of (thirty (30)), (fifty (50)), or (one hundred (100)) feet external to the station, ready to unroll and connect the alarm panel/power source. Factory wiring and testing shall be a specified part of the U.L. listing.

3. Check Valve

The pump discharge shall be equipped with a factory-installed gravity-operated flapper-type check valve. Ball-type check valves shall not be permitted. The valve will provide a fully ported passageway when open and shall introduce a friction loss of less than six inches of water at maximum rated flow. Working parts shall be made of 300 series stainless steel and non-wicking fabric reinforced neoprene flap to ensure corrosion resistance, repeatability and dimensional stability.

4. Redundant Check Valve

Each basin package shall (require) (be supplied with) one (1) Schedule 40 PVC type II swing check valve for installation by others in the service lateral between the grinder pump station and the low-pressure main. Valves shall be 1.25 inch NPT and only require ½ pound of backpressure for complete closure.

5. Level Detection

Level detection for controlling pump and alarm operation shall be accomplished by use of a detection device specifically designed for use in a sewage grinder station. Switches utilized in the system shall be hermetically sealed in a submersible, watertight protective housing, with an integral pressure-compensating diaphragm. Level controls requiring breather tubes are not acceptable as they are susceptible to moisture infiltration issues. Level sensing devices integrally attached to pump shall not be acceptable as they require the entire pump unit to be removed for inspection and repair. Level detection device shall be Barnes ESPS 150 AUTOMATIC type design to protect switch from solids, greases, oils, fats and corrosive sewer gasses. Level detection device shall not require any regular preventative maintenance. The level detection device shall consist of two independent switches, one for each function (High Water Alarm and On/Off actuation). In addition, the device shall include a solid-state relay for directly controlling the pump motor. The level detection device shall include an automatically resetting, heat sensing thermal switch that interrupts current flow if excessive liquid temperature is detected. This thermal switch shall be part of the U.L. listing. The level switch assembly shall be provided with type 14-5 SOW cable, with color coded leads and be 100% tested prior to shipment. The power cable and switch leads shall be connected via quick connect pin terminals located within

the switch housing. Pin receptacles shall be crimped and molded to the power cord in a PVC plug. The plug assembly shall be guaranteed by the manufacturer to meet UL approval for submersion. The plug shall be secured with a stainless steel compression plate to prevent water from entering the switch housing and to provide strain relief at the point of cable entry. The control assembly shall be part of the U.L. 1951 listing. The level control shall be serviceable without confined space entry as defined by OSHA. Conventional mercury floats are not acceptable.

6. Shut-Off Valve

The pump discharge shall be equipped with a factory-installed manual ball valve. Ball valves shall be fully ported, constructed of bronze with stainless steel ball, stainless steel stem and hardware, and Teflon seats, with a minimum rated pressure of 150 PSI. All valves shall be operable from ground level with a color-coded actuation cord tagged green to open, red to close. Shut-off valve must be replaceable from above without confined space entry.

7. Anti-Siphon Valve

The pump shall be constructed for a positively primed, flooded suction. As added assurance that the pump cannot lose prime, even under negative head conditions in the discharge piping, the pump must include provision for a flapper-style valve in the discharge line prior to the check valve. The design shall provide for a maximum bypass, under normal operating conditions, of no more than 1 GPM.

8. Basin Construction and Assembly

a. The basin shall be injection-molded engineered polypropylene copolymer thermoplastic with a corrugated high-density polyethylene riser. The riser shall be sealed to the basin and cover adapter with a high surface contact engineered gasket designed specifically for use with corrugated piping. The basin shall be provided with three blanked-off inlet positions, 90 degrees apart, for field selection to simplify installation. Only one port is to be opened in the field, with connection to the 4" inlet piping with a flexible "Fernco" type fitting supplied by manufacturer. Basin dimensions shall be as shown on the contract drawings or specified herein. The basin must be designed to

withstand wall collapse or buckling based on a hydrostatic pressure of 62.4 pounds per square foot, a saturated soil weight of 135 pounds per cubic foot, and a soil modulus of 700 pounds per square foot. The basin must be constructed to withstand or exceed 200% of the assumed loading at any depth. Thermally welded tank wall seams shall not be acceptable due to their inability to absorb shear forces created by settling backfill and frost.

b. All piping within the basin silhouette shall be at a level in the station that is lower than the frost depth; i.e. no higher than the inlet. The basin package shall be furnished with a factory pre-wired waterproof power connector.

c. Cover shall be a molded LLD polyethylene, shaped to resemble a rock in order to minimize visual impact. Manufacturer to offer cover in a natural sandstone color. Cover shall attach to riser with quarter-turn to fasten in place, with hasps and safety padlock provided by the manufacturer.

d. Basin shall be U.L. listed to Standard 1951.

e. All internal discharge pipe shall be constructed of bronze and terminate outside the bulkhead with a stainless steel flexible fitting with female NPT connection. The manufacturer shall guarantee all bulkhead penetrations be watertight.

9. Each basin shall be equipped with an injection-molded engineered polypropylene thermoplastic POD to locate and position the grinder pump and level control device. Pump and control to be removable without requiring the loosening of fasteners. POD to provide automatic alignment and connection of pump to discharge piping and level control with no additional adjustment required. A ½" diameter knotted polypropylene rope harness with a minimum breaking strength of 3750 pounds shall be attached to the pump at two locations for removal and installation purposes. The POD shall be designed to facilitate removal of the shut-off valve without basin entry in the event maintenance is required.

c. Centrifugal Grinder Pumps

1. Design

A two-stage, Model OGP2022CE submersible centrifugal grinder pump shall be furnished, designed to reduce all materials found in normal domestic sewage into a finely ground slurry. The pump is to be capable of pumping the resultant slurry through small diameter piping to a gravity interceptor or treatment facility at the flows and heads specified. The pump is to be capable of continuously operating with a maximum liquid temperature of 104 F (40 C) and shall be capable of running dry for extended periods of time.

Pump shall be suitable for long-term submergence in sewage. Grinder pump shall be U.L. listed to Standard 778 and CSA listed to Standard 108, as well as to NSF/ANSI 46.

Progressive cavity-type pumps are not acceptable and equipment proposing progressive cavity pumps shall be deemed non-compliant and non-responsive.

2. Performance

In order to ensure proper operation under all conditions, pump must provide, without overheating in continuous operation, the maximum head condition required by the system. Pump must also be capable of operating at zero or negative heads without damage to the pump. Pumps must be able to operate at shut off head as specified herein which is a high pressure-no discharge condition without immediate damage.

3. Construction

The volute, seal plate and motor housing shall be constructed of high quality ASTM A-48 class 30 iron. The pump shall be painted to manufacturer's standard. All exposed hardware shall be 300 series stainless steel. Discharge connection shall be a horizontally oriented discharge flange with integral sealing diaphragm.

The pump impellers shall be of the recessed, vortex design. Pumps with standard centrifugal semi-open or enclosed impeller designs are not acceptable. The impellers shall be of 85-5-5-5 bronze construction and machined such that the upper impeller is locked against rotation by a stainless steel positioning sleeve threaded to the shaft and the lower impeller is threaded, against rotation, directly to the motor shaft. Impellers to be dynamically balanced to ISO G6.3 specifications.

The pump shall be a two bearing design consisting of upper and lower angular contact ball bearings capable of handling all radial and axial thrust loads. Bearings to be oil lubricated and selected to provide a minimum L-10 life of 100,000 hours at design operating conditions. Permanently sealed, grease lubricated bearings are not acceptable.

4. Grinder

The grinder mechanism shall be specifically designed for use in a grinder pump; garbage-disposal-style cutting mechanisms are not acceptable. The grinder shall consist of a radial cutter threaded and locked to the motor shaft, and a matching shredding ring. Grinding shall be accomplished by a slicing, rather than chopping, action. The shredding ring shall be reversible to provide twice the cutting life. The grinder components shall be constructed of 440C stainless steel hardened to a minimum Rockwell C55 and shall be finish ground for a fine cutting edge. Two-stage cutter mechanisms and those requiring external adjustment shall not be acceptable.

The grinder shall be placed directly below the pumping elements and shall be direct driven by the motor shaft. The grinding mechanism shall operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions, including starting. The grinder must be capable of handling a wide variety of solids, including cloth, paper, grit, sanitary products, and other foreign materials as defined by NSF/ANSI 46.

5. Electric Motor

Motors shall be capacitor-start capacitor-run single-phase design rated 2 HP, 240 volt with NEMA L characteristics, and shall be non-overloading throughout the entire pump curve. The motor windings shall be located within a sealed housing filled with non-toxic dielectric oil for heat dissipation and bearing lubrication, making it capable of operation in a totally submerged, or partially or fully non-submerged, condition for extended periods without damage. Air-filled motors will not be accepted. The stator assembly shall be attached to the motor housing components using threaded fasteners to ease serviceability. Motor designs incorporating shrink or press fits for mounting will not be accepted. The motor shaft shall be 416 series stainless steel.

An automatically resetting heat sensing thermal switch that interrupts current flow shall be provided to protect against excessive temperature. Such device shall be a part of the U.L. listing.

The pumps shall be equipped with type SOW power cable. The power cable shall be connected to the motor with quick connect pin terminals located on the motor housing. Pin receptacles shall be crimped and molded to the power cord in a PVC plug. The plug shall be secured with a stainless steel compression plate to prevent water from entering the connection area, and to provide strain relief at the point of cable attachment. A polybutylene terephthalate terminal plate with brass pins shall connect the power cord leads with the motor leads. The ground pin shall be longer than the power pins such that the ground connection is the first to be connected and the last to be disconnected. A Buna O-Ring shall provide isolation sealing between the terminal plate and the motor housing. The plug assembly shall be provided to meet U.L. approval for submersion.

6. Mechanical Seal

The pump shall be equipped with a floating-style mechanical seal to prevent leakage between the motor and pump. Seal faces shall be silicon carbide for both the rotary and stationary seats, lapped and polished to a tolerance of one light band. Seal shall be provided with 300 series stainless steel hardware and Buna elastomers. Ceramic/carbon mechanical seals shall not be acceptable.

7. Testing

Each grinder pump shall be submerged, operated and tested for performance compliance to its respective curve. Testing process shall be approved and periodically audited by U.L. and CSA.

d. Automatic Alarm Panel

1. General

A wall mounted alarm panel shall be supplied with each station. Alarm panel to be U.L. listed to meet Standard 508. Panel to be constructed with a NEMA 4X fiberglass enclosure and utilize stainless steel hardware and be provided with hasps for locking.

2. Controls

The alarm panel shall be equipped with a circuit breaker, ground lug and relays in order to facilitate pump operation and high-level alarm indication. Terminal strips to facilitate both input power and connection to the grinder station shall be provided.

Each alarm panel shall include a momentary pushbutton/rocker switch to manually operate the pump. The push to run button shall be wired in such a manner that it is in series with the motor circuit and does not utilize any control relays to energize the pump. The pushbutton shall be rated for the full load current of the motor and provide pump functionality in the event of a control relay/contactor malfunction.

The automatic alarm panel shall include an elapsed time meter for the pump, controlled by the panel, to indicate pump run time in hours and tenths of hours to a minimum total of 99,999.9 hours. These shall be non-resettable-type meters.

3. High Water Alarm Indication

Each alarm panel shall include both visual and audible alarm indications. The alarm circuit shall be separately fused from the motor control circuit. The visual indication shall be provided by a red fluted lens mounted to the top of the enclosure in such a manner as to maintain rainproof integrity. A 90 dB audible device shall also be provided with a NEMA 4X silence button mounted on the exterior of the enclosure. The visual alarm will remain on as long as the high water condition exists in the basin; both visual and audible alarms to automatically reset when the high water condition subsides.

e. Start Up Services

Start-up services of a trained factory-authorized technician shall be provided for each Grinder Pump Station supplied and must be performed within 24 hours of the completed installation. The authorized factory technician(s) will perform the following test on each station:

a. Make certain the discharge shut-off valve is fully open. This valve must not be closed when the pump is operating. Confirm that the isolation valve at the street main is also open.

b. Turn ON the alarm power circuit.

c. Fill the wet well with water to a depth sufficient to verify the high level alarm is operating. Shut off water.

d. Turn ON power circuit. Initiate pump operation to verify automatic "on/off" controls are operative. Pump should immediately turn ON. Within one (1) minute alarm light will turn OFF.

END OF SECTION

BEDMINSTER MUNICIPAL AUTHORITY

PART 2 – MATERIALS, INSTALLATION AND TESTING

SECTION V

SPECIAL CONSTRUCTION

INDEX

Item	Title
5.01	General
5.02	Casing Pipe
5.03	Carrier Pipes
5.04	Bored Water Service Connections
5.05	Open Trenching

SECTION V

SPECIAL CONSTRUCTION

5.01 GENERAL

a. The WORK under this Section includes furnishing all labor, materials, equipment and services required for the installation of carrier pipe and casing pipe at railroad, highway, stream or other crossings as shown on the DRAWINGS. The WORK shall include all excavation, backfill, carrier pipe and casing pipe, complete in place as shown on the DRAWINGS.

b. All such crossings shall include the complete installation of casing and carrier pipe, end seals, aggregate filler and launching/receiving pits, but shall not include any manholes or valves on either side of the crossing.

c. It shall be the responsibility of the CONTRACTOR to provide, at no expense to the AUTHORITY, any additional insurance coverage which may be required by the railroad companies, PennDOT, etc., and to reimburse the AUTHORITY for any inspection costs or other services in conjunction with highway or railroad crossings at time of construction.

d. The method of installing the casing or carrier pipe for water or sewer lines shall meet with the approval of the AUTHORITY and railroad company or companies, the Pennsylvania Department of Transportation, the Pennsylvania Department of Environmental Protection and/or other regulatory agencies having jurisdiction. The casing pipe shall be installed with even bearing throughout its entire length. The ends of the casing conduit shall be suitably sealed as shown on Standard Detail No. SD-G-01.

5.02 CASING PIPE

a. Steel casing pipe shall be provided for encasing sewer pipe and water pipe at railroad, highway, stream and other crossings at the locations as indicated on the DRAWINGS. Casing pipe shall be of the diameter as shown on the DRAWINGS; however, the CONTRACTOR may install a casing pipe of larger diameter provided that all clearances under highways, railroad tracks, streams, etc., are maintained.

b. Steel casing pipe shall conform to the following:

1. Steel casing pipe shall conform to ASTM A139, Grade B steel with a minimum yield strength of 35,000 psi, and shall be coated, both inside and outside, with a bituminous seal coat to a thickness of 0.05 inches and shall have wall thickness as follows:

Sewer Line Diameter	**Minimum Casing Inside Diameter**	**Minimum Casing Thickness**
6" through 15"	24" O.D.	0.375"
18" through 24"	30" O.D.	0.469"
30" through 36"	42" O.D.	0.625"
Water or Force Main Diameter	**Minimum Casing Diameter**	**Minimum Casing Thickness**
Less than 6"	12" I.D.	0.250"
6", 8" and 10"	18" O.D.	0.312"
12" and 14"	24" O.D.	0.375"
16" and 18"	30" O.D.	0.469"
20" and 24"	30" O.D.	0.469"

2. Casing pipe shall be fabricated in a manner to keep field welds to a minimum and shall conform to AWWA C200.

3. All joints in steel casing pipe shall be field welded to conform to AWWA C206.

4. All interior and exterior joints shall be brushed clean after field welding. A field prime paint coating shall be applied to all exterior joints and a field prime paint field lining shall be applied to all interior joints.

c. Where the specified thickness or specified strength of the casing conduit must be increased to meet additional requirements of the regulating companies or bodies, the CONTRACTOR shall furnish and install the casing conduit as required by those companies or bodies.

d. <u>INSTALLATION</u>

1. The steel casing shall be installed by means approved by the AUTHORITY, such as boring, jacking, etc. All equipment and methods shall be in conformance with the latest editions of Conrail Specifications For Pipeline Occupancy CE-8 (latest edition) and shall be approved by the ENGINEER prior to construction. All supervisory and operating personnel engaged in the installation of

the casing pipe shall be fully qualified for such work and shall have had at least 12 months experience in the operation of the equipment being used.

The casing pipe shall be installed true to line and grade, as shown on the DRAWINGS. A minimum of 30 days prior to casing pipe installation, the CONTRACTOR shall submit, to the ENGINEER, a detailed description of the method to be employed for the casing pipe installation, the equipment and materials utilized, the personnel required, and a time schedule to complete the installation. Casing pipe installation shall not commence until all required information is submitted to, and approved, in writing, by the ENGINEER.

Casing pipe installation shall include the following methods:

Boring - This method consists of pushing the pipe into the fill with a boring auger rotating within the pipe to remove the spoil. When augers, or similar devices, are used for pipe emplacement, the front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than ½ inch. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor material. The use of water or other liquids to facilitate casing emplacement and spoil removal is prohibited. Plans and descriptions of the arrangement to be used shall be submitted to the ENGINEER for approval and no work shall proceed until such approval is obtained. Any method which employs simultaneous boring and jacking for casing pipes over 8 inches in diameter which does not have the above approved arrangement WILL NOT BE PERMITTED. For casing pipes 8 inches and less in diameter, augering or boring without this arrangement may be considered for use only as approved by the ENGINEER.

Jacking - This method shall be in accordance with the current **American Railway Engineering and Maintenance-of-Way Association** Specifications, Chapter 1, Part 4.15, "Earth Boring and Jacking Culvert Pipe Through Fills." This operation shall be conducted without hand-mining ahead of the pipe and without the

use of any type of boring, augering, or drilling equipment. Bracing and backstops shall be so designed and jacks of sufficient rating used so that the jacking can proceed without stoppage (except for adding lengths of pipe) until the leading edge of the pipe has reached the receiving pit.

Bored or jacked installations shall have a bored hole essentially the same as the outside diameter of the pipe plus the thickness of the protective coating. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe (plus coating) by more than approximately 1 inch, grouting or other methods approved by the Engineer shall be employed to fill such voids.

2. Launching and receiving pits shall be constructed for the casing installation. The location of the pits shall be as shown on the DRAWINGS. The size of the pits shall be as required for the specific casing pipe installation equipment to be utilized. All launching and receiving pit excavation, protection, stabilization, etc. shall be in accordance with Part II, Sections I and II of these Specifications. All sheeting, bracing and shoring shall be designed to support all lateral forces caused by the earth and other surcharge loads. The CONTRACTOR shall submit design plans and computations for the pits and the sheeting, bracing and shoring stamped by a Professional Engineer registered in the Commonwealth of Pennsylvania, to the ENGINEER for review and approval.

   The pits shall be excavated to a depth as required for the specific casing pipe installation equipment to be utilized. Bedding material, consisting of 1B coarse aggregate material, conforming to the grading requirements specified in Section 703 of PennDOT Publication 408, shall be placed on the bottom of the pit to a depth of 6 inches.

3. The casing pipe installation operation shall be continued on a 24-hour basis, without interruption, except to install new lengths of the casing pipe, until the leading edge of the pipe has reached the receiving pit. The lengths of the casing pipe shall be joined by bevel cut full penetration welds. The joints shall be welded completely around the circumference of the pipe so as to prevent water leakage from the casing throughout its length, except through the weep hole at the low end of the casing. The weep hole shall

consist of 1/2 inch diameter, Schedule 40 PVC pipe having a minimum length of 10 inches.

4. After the casing has been installed, the carrier pipe shall be installed. The CONTRACTOR must support, brace, tie, etc. the carrier pipe to the grades indicated on the DRAWINGS. The method of support shall be as shown on Standard Detail No. SD-G-01. Prior to sealing the ends of the casing pipe, the carrier pipe shall be satisfactorily tested.

5. Upon completion of the utility crossing, including the casing pipe installation and installation of the carrier pipe, the CONTRACTOR shall immediately backfill the launching and receiving pits. The pits shall be backfilled in 8 inch lifts to a point 8 inches below the existing grade. The backfill material shall be 1B coarse aggregate for the pipe bedding and 2A aggregate material for the remainder of the pit. All tamping and backfilling operations shall be performed in accordance with these Specifications.

5.03 CARRIER PIPES

a. All carrier pipes shall be of the material and diameter as shown on the DRAWINGS.

b. Each length of water piping or force main shall be blocked at each end and at four (4) points equidistant in a manner acceptable to the AUTHORITY, to prevent excessive movement of, and to center the pipe within the casing conduit.

c. Each length of gravity piping shall be blocked at four (4) points around the perimeter of the pipe, in a manner acceptable to the AUTHORITY, to prevent excessive movement of, and to allow gravity flow, through pipe within casing conduit.

5.04 BORED WATER SERVICE CONNECTIONS

Where specifically called for on the DRAWINGS, water service connections shall be placed in bored holes under highways, railroads, streams, etc. These crossings need not be cased but shall be a continuous piece of pipe.

5.05 OPEN TRENCHING

a. In the event the CONTRACTOR wishes to trench in lieu of tunneling or jacking, written permission shall be obtained from the regulatory agency to

do so and the work schedule shall be arranged to coordinate with the operation of the agency.

b. The trench shall be excavated, shored and backfilled to satisfy the requirements of the regulatory agency.

c. The CONTRACTOR shall be responsible for the payment of all work done by a railroad company in conjunction with the WORK, including, but not limited to, inspection and signalizing costs; track removal, replacement and realignment; and the removal and replacement of the roadbed.

d. If the CONTRACTOR is permitted to employ open trench excavation, casing conduit may not be required; however, the pipe installed shall meet the strength requirements of the regulatory agencies.

END OF SECTION

BEDMINSTER MUNICIPAL AUTHORITY

PART 3

STANDARD DETAILS

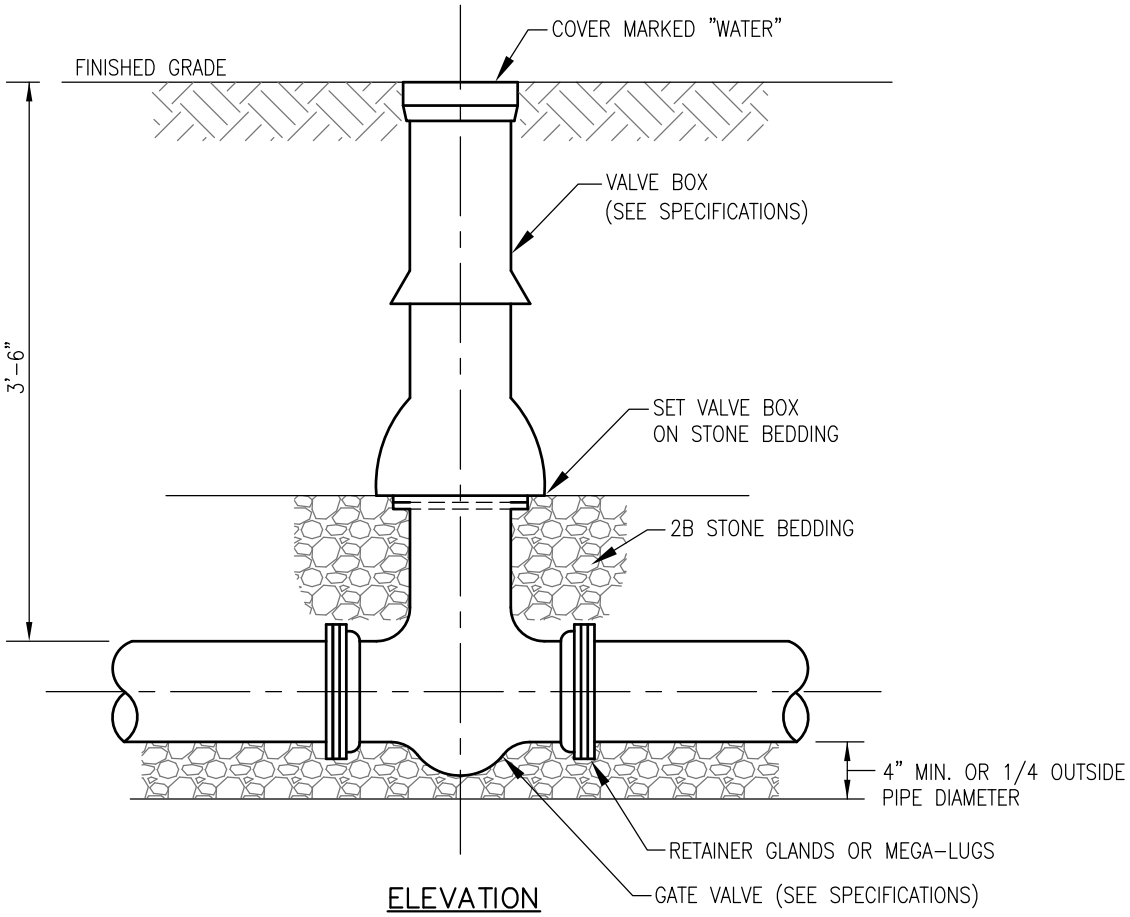
INDEX

SANITARY SEWER AND WATER SYSTEM ADDITIONS AND EXTENSIONS

Detail No.	Title
SD-W-01	Gate Valve Installation
SD-W-02	Air Release and Vacuum Valve - Installation Detail
SD-W-03	Standard Water Service - Installation
SD-W-04	Domestic Meter Settings - Meter Box (1-1/2" and 2" Meters)
SD-W-05	Water Meter Installation
SD-W-06	Fire Hydrant Installation
SD-W-07	Typical Blocking for Horizontal and Vertical Downward Thrusts up to 150 psi Working Pressure
SD-W-08	Vertical Thrusts Upward up to 150 psi Working Pressure
SD-W-09	Fire Flow Meter Pit
SD-W-10	In-Line Blow-Off Detail
SD-W-11	Blow-Off Detail - End of Line (Future Extension)
SD-W-12	Blow-Off Detail - End of Line (No Future Extension)
SD-W-13	Residential Fire and Domestic Service Detail
SD-W-14	Residential Fire and Domestic Meter Installation Detail
SD-S-01	Sectional Plans – Standard and Drop Manholes
SD-S-02	Standard Manhole Section
SD-S-03	Drop Manhole Section
SD-S-04	Standard/Watertight Manhole - Frame and Cover Installation
SD-S-05	48" Diameter Shallow Manhole
SD-S-06	Typical House Connection
SD-S-07	Sewer Lateral Connection – Commercial or Industrial
SD-S-08	Connection to Existing Lateral
SD-S-09	Lateral Grade Adjustment
SD-S-10	Lateral Riser - Typical Standpipe (Single Service)
SD-S-11	Lateral Riser - Typical Standpipe (Multiple Service)
SD-S-12	Metering Manhole - Pipe Size 6" to 12" Max
SD-S-13	Doghouse Manhole
SD-S-14	Typical Grinder Pump - Installation Schematic

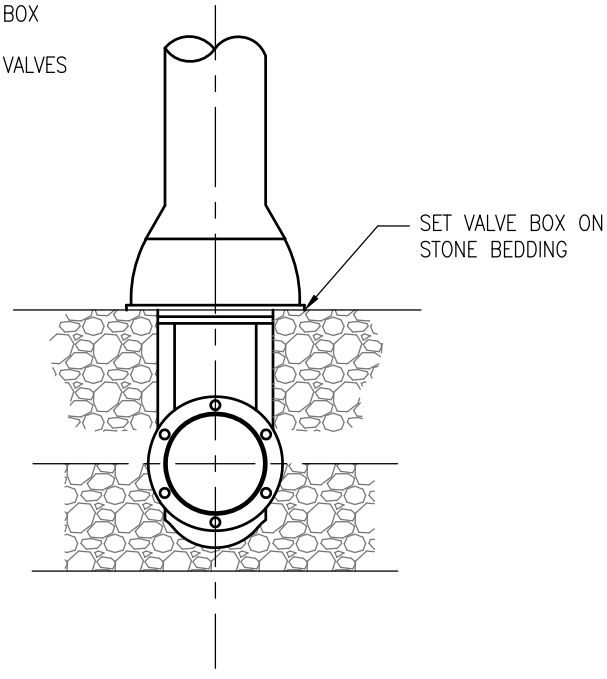
INDEX (CONT'D)

SD-S-15	Low Pressure Sewer Junction
SD-S-16	Low Pressure Sewer Cleanout and Typical Flushing Connection
SD-S-17	Force Main or Low Pressure Sewer Connection to Manhole
SD-S-18	Residential Grinder Pump (For Use with Detail No. SD-S-19)
SD-S-19	Connection to Proposed Pump Tank (For Use with Detail No. SD-S-18)
SD-S-20	Low Pressure Sewer Lateral Connection Box
SD-G-01	Carrier and Casing Pipe - Installation
SD-G-02	Reinforced Concrete Slope Anchors for Utility Lines
SD-G-03	Crushed Stone Bedding for Pipe
SD-G-04	Concrete Encasement for Pipe
SD-G-05	Temporary Pavement and Unpaved Street Restoration – Trench Backfill
SD-G-06	Permanent Municipal Street or Driveway Restoration – Trench Backfill and Paving
SD-G-07	Unimproved Area Restoration- Trench Backfill and Seeding
SD-G-08	PennDOT Roads or Driveways – Rigid Pavement Restoration
SD-G-09	PennDOT Roads or Driveways – Flexible Pavement Restoration



ELEVATION

NOTE:
2 PIECE SLIDING TYPE ADJUSTABLE VALVE BOX FOR VALVES 12-INCHES IN DIAMETER AND SMALLER AND 3 PIECE SLIDING TYPE FOR VALVES GREATER THAN 12-INCHES IN DIAMETER (SEE SPECIFICATIONS)



END VIEW

GATE VALVE DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
GATE VALVE INSTALLATION	Date: 11/29/18	Detail No. SD-W-01	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600

STANDARD DETAIL

AIR RELEASE AND VACUUM VALVE

INSTALLATION DETAIL

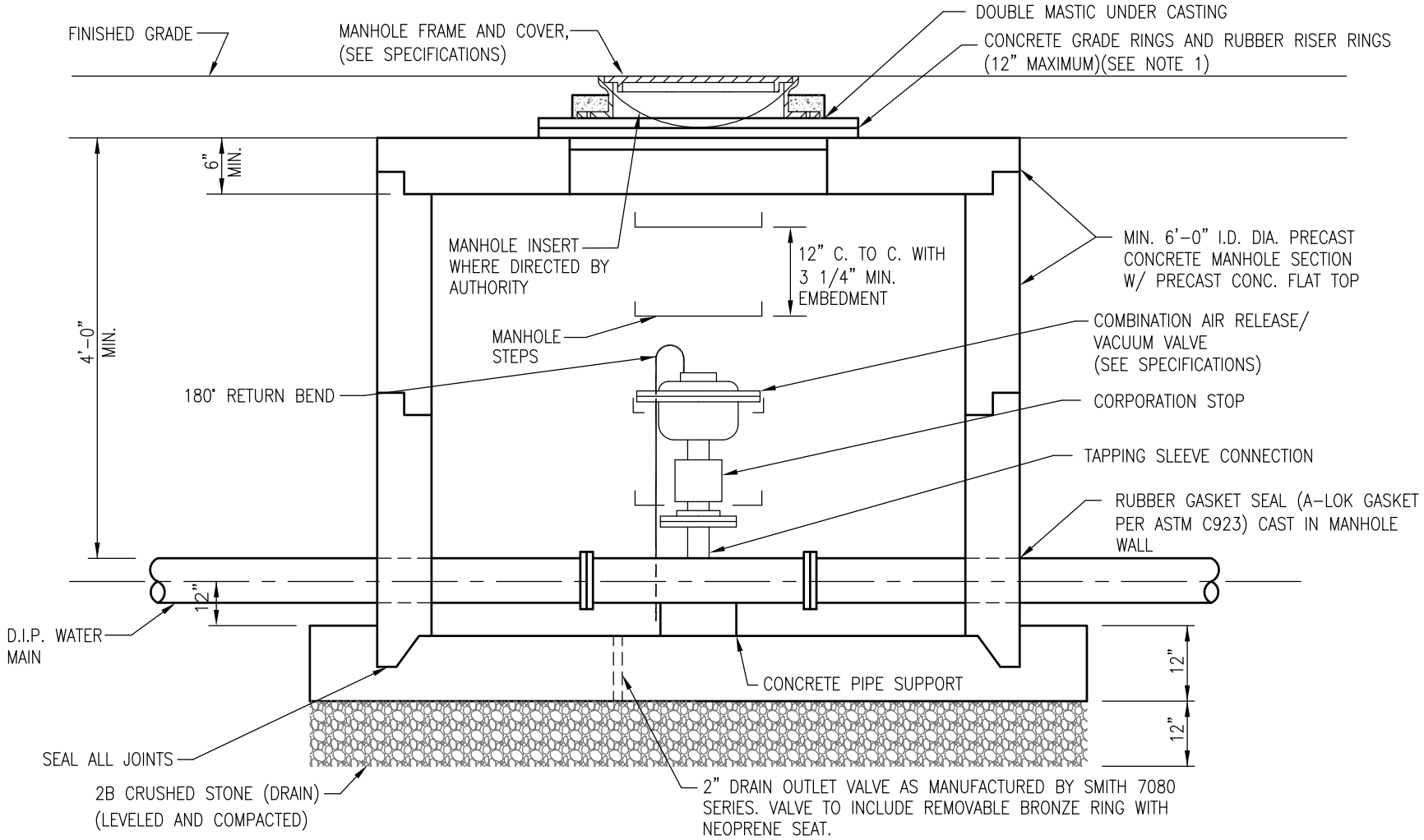
BEDMINSTER MUNICIPAL AUTHORITY

BUCKS COUNTY, PENNSYLVANIA

Date: 11/29/18

Detail No. SD-W-02

CKS Engineers, Inc.
88 South Main Street, Doylestown, PA 18901
(215) 340-0600

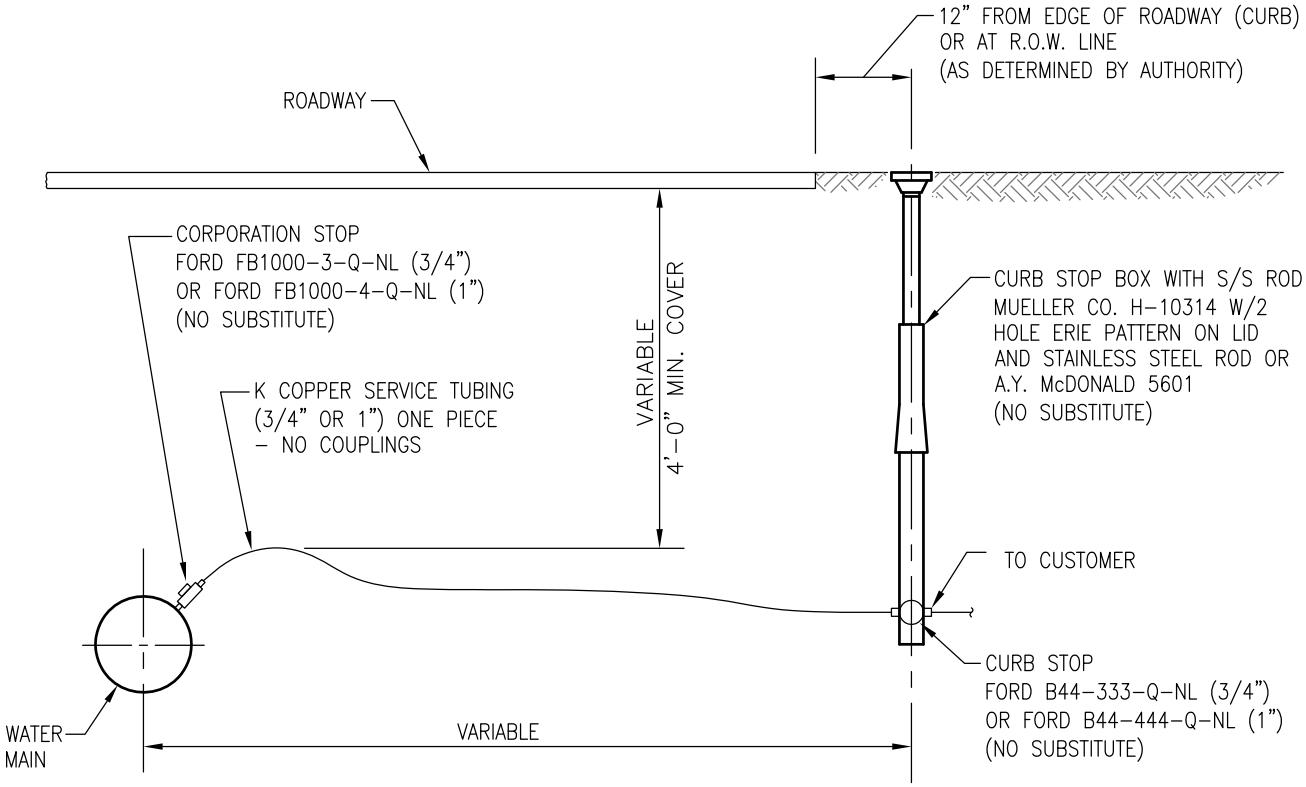


NOTES:

1. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY EAST JORDAN IRON WORKS. FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES.
2. MANHOLE SECTIONS SHALL BE LAP JOINT WITH A DOUBLE BEAD FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE OF LAP JOINT.
3. MANHOLE MANUFACTURER SHALL PROVIDE AN EXTERIOR BITUMINOUS COATING (FACTORY APPLIED). FIELD "TOUCH UP" AREAS AS APPROVED BY AUTHORITY.
4. STEEL REINFORCED CCP MANHOLE STEPS (SEE SPECIFICATIONS).

COMBINATION AIR/VACUUM VALVE INSTALLATION DETAIL

N.T.S.



ELEVATION

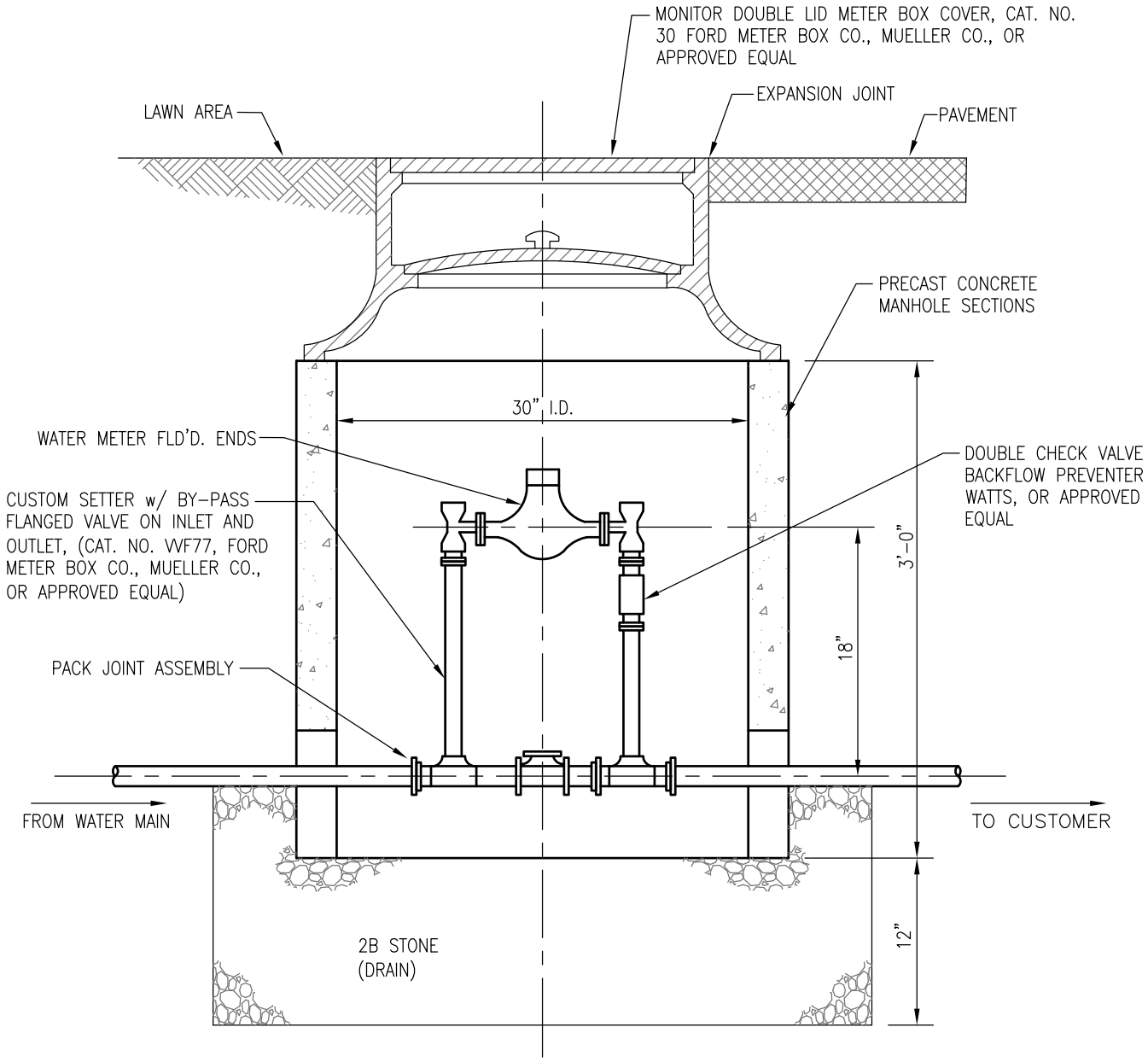
CONNECTIONS FOR 3/4" and 1" WATER SERVICES

N.T.S.

NOTES:

1. ALL CURB STOP AND CORPORATION STOP FITTINGS SHALL BE "NO LEAD".

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
STANDARD WATER SERVICE			
INSTALLATION	Date: 11/29/18	Detail No. SD-W-03	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



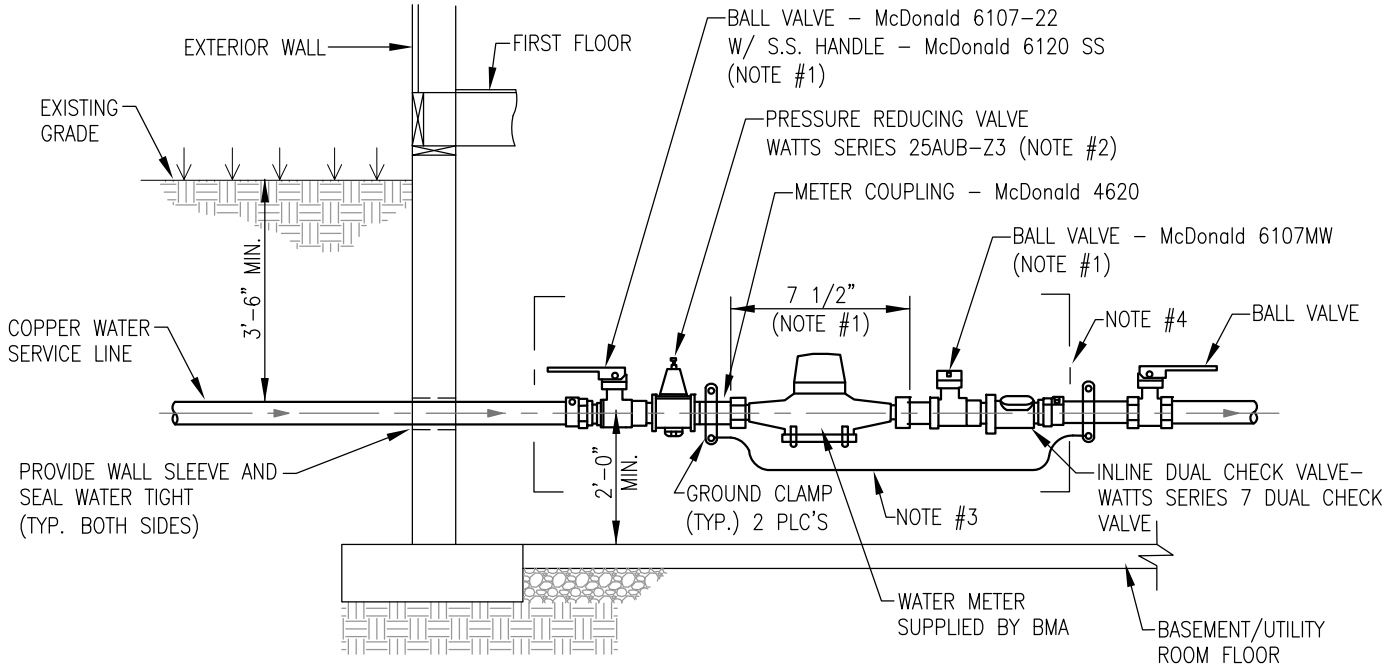
WATER METER BOX

N.T.S.

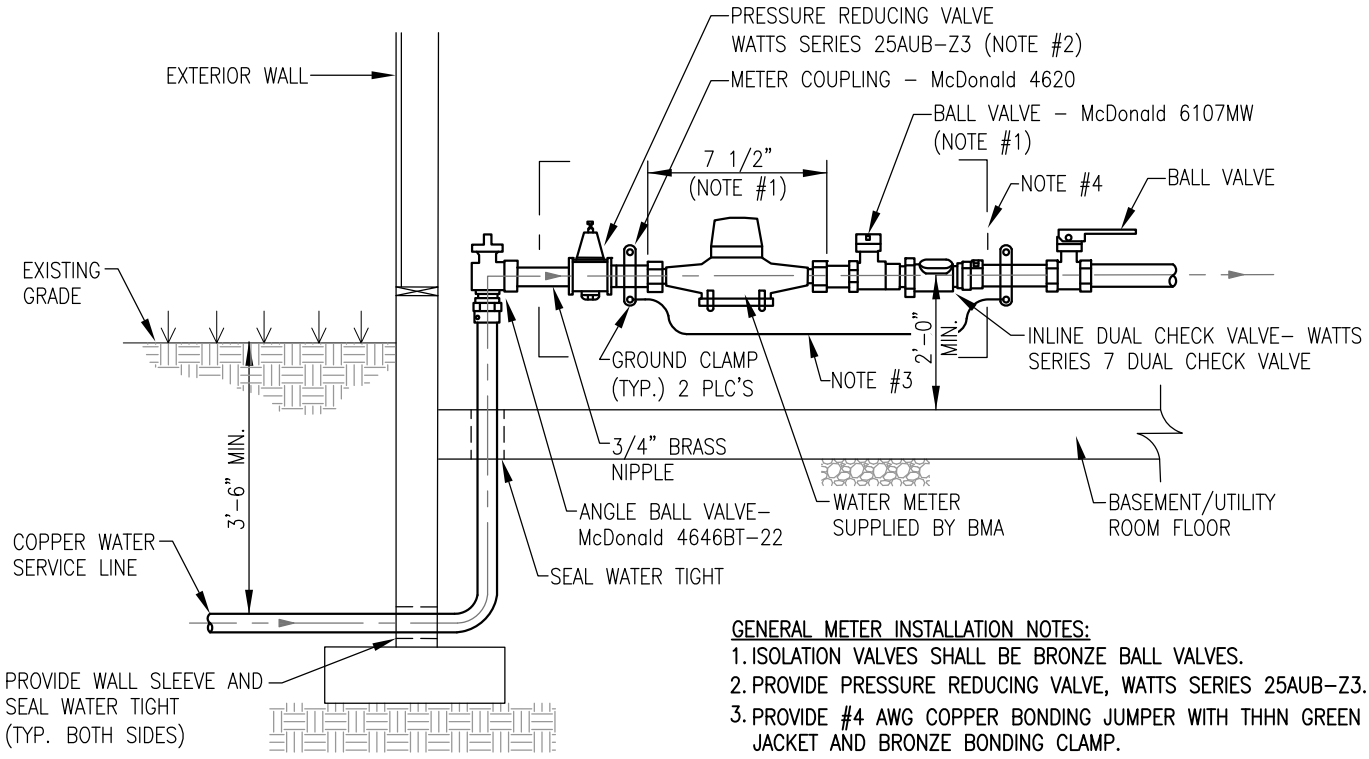
NOTES:

1. A WATER METER BOX IS APPLICABLE FOR SERVICES GREATER THAN 150 FEET IN LENGTH.
2. A CURB STOP AND BOX MUST BE INSTALLED BETWEEN MAIN AND METER BOX.
3. POLYETHYLENE WATER SERVICE TUBING WITH STIFFENERS MAY BE UTILIZED BETWEEN THE METER PIT AND BUILDING.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
DOMESTIC METER SETTINGS			
METER BOX (1 1/2" AND 2" METERS)	Date: 11/29/18	Detail No. SD-W-04	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



SLAB BELOW GRADE



SLAB AT GRADE

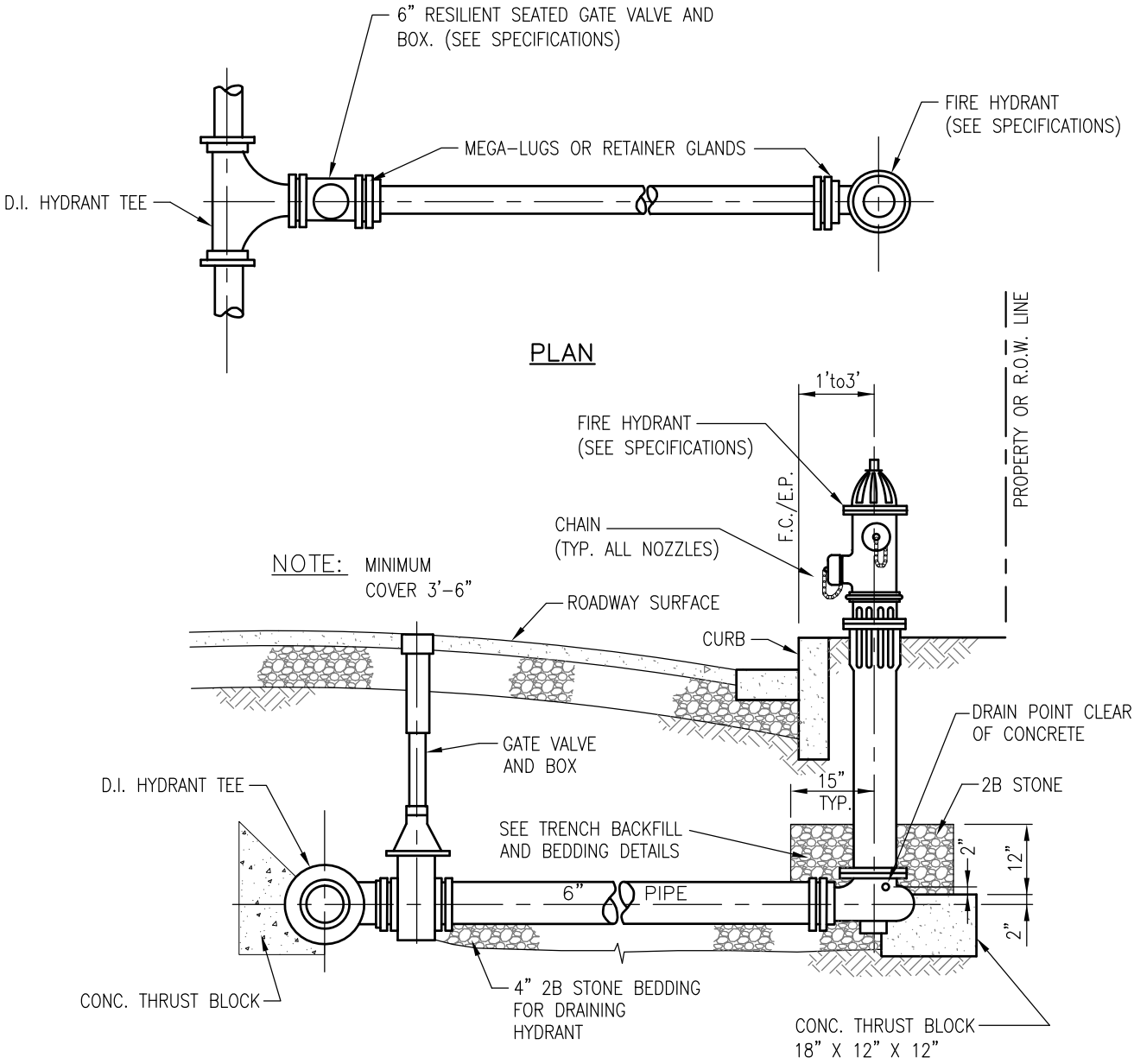
GENERAL METER INSTALLATION NOTES:

1. ISOLATION VALVES SHALL BE BRONZE BALL VALVES.
2. PROVIDE PRESSURE REDUCING VALVE, WATTS SERIES 25AUB-Z3.
3. PROVIDE #4 AWG COPPER BONDING JUMPER WITH THHN GREEN JACKET AND BRONZE BONDING CLAMP.
4. CUSTOMER SHALL MAINTAIN ADEQUATE CLEARANCE AROUND METER INSTALLATION TO FACILITATE MAINTENANCE BY BMA.
5. CUSTOMER RESPONSIBLE FOR INSTALLATION OF THERMAL EXPANSION FACILITIES ON INTERIOR PLUMBLING SYSTEM.

RESIDENTIAL WATER METER SETTING DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
WATER METER INSTALLATION	Date: 11/29/18	Detail No. SD-W-05	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



NOTES:

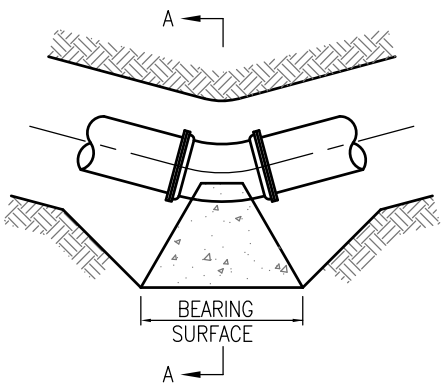
1. DO NOT COVER DRAIN HOLES WITH CONCRETE.
2. ALL FIRE HYDRANTS SHALL HAVE THE BODY OF THE HYDRANT PAINTED WITH RUSTOLEUM "SAFETY RED" #5264. THE BONNET AND NOZZLES OF THE FIRE HYDRANT SHALL BE PAINTED WITH RUSTOLEUM "GLOSS WHITE" #5292.

SECTION

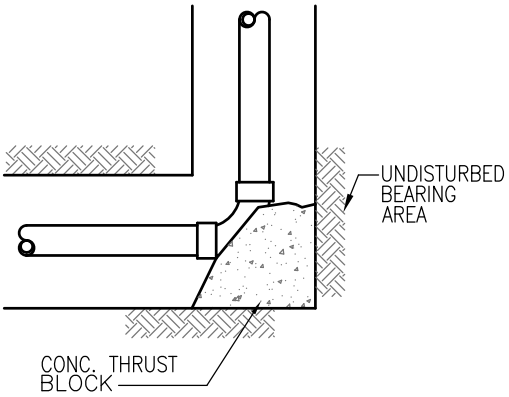
FIRE HYDRANT DETAIL

N.T.S.

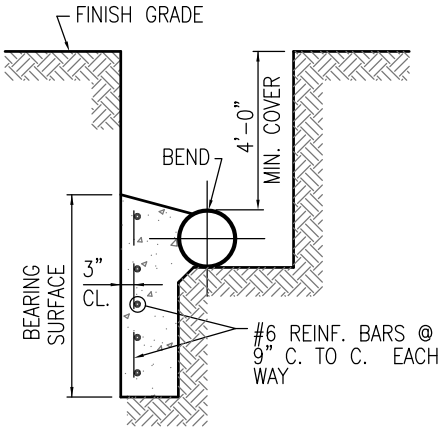
STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
FIRE HYDRANT INSTALLATION	Date: 11/29/18	Detail No. SD-W-06	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



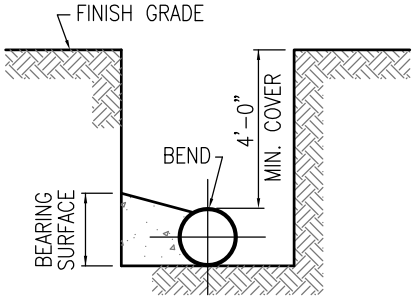
PLAN



90° BEND



SECTION A–A
ADDITIONAL BEARING AS REQUIRED



SECTION A–A

NOTES:

1. ALL CONCRETE SHALL BE CLASS 'A' HAVING A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3300 PSI.
2. ALL REINFORCING STEEL SHALL BE DEFORMED BARS.
3. NO COUPLING OR JOINTS SHALL BE COVERED WITH CONCRETE.
4. REINFORCING BAR STRAPS TO BE SHAPED TO PIPE CURVATURE.
5. ALL EXPOSED STEEL TO BE COATED WITH CARBOLINE BITUMASTIC 50 APPLIED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS WITH A MINIMUM DRY FILM THICKNESS OF 30 MILS.
6. THRUST BLOCKING FOR TEES SHALL HAVE THE SAME BEARING AREA AS 90° BENDS OF THE PIPE SIZE OF THE OUTLET. DEAD ENDS SHALL HAVE THE SAME BEARING AREA AS 90° BENDS.

BEARING AREA REQUIRED, SQUARE FEET

TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS, PSF	4"ø AND LESS DEGREE BEND				6"ø AND 8"ø DEGREE BEND				10"ø AND 12"ø DEGREE BEND			
	11¼°	22½°	45°	90°	11¼°	22½°	45°	90°	11¼°	22½°	45°	90°
LOOSE SAND OR MEDIUM CLAY – 2,000	1.0	2.0	2.7	4.0	1.5	3.0	6.0	10.0	3.0	6.2	12.0	22.0
PACKED GRAVEL AND SAND – 4,000	1.0	1.0	1.5	2.0	1.0	1.5	3.0	5.0	1.5	3.1	6.0	11.0
ROCK – 10,000	1.0	1.0	1.0	1.0	1.0	1.0	1.2	2.0	1.0	1.3	2.4	4.4

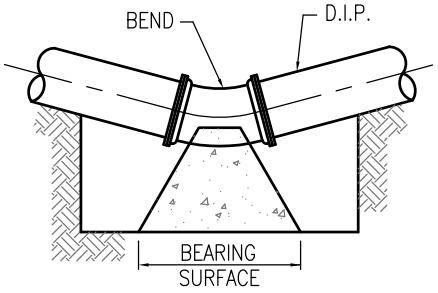
BEARING AREA REQUIRED, SQUARE FEET

TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS	14"ø AND 16"ø DEGREE BEND OR DEFLECTION				18"ø AND 20"ø DEGREE BEND OR DEFLECTION			
	11¼°	22½°	45°	90°	11¼°	22½°	45°	90°
LOOSE SAND OR MEDIUM CLAY – 2,000	6.0	12.0	22.5	40.0	9.5	19.0	37.0	67.0
PACKED GRAVEL AND SAND – 4,000	3.0	6.0	11.3	20.0	4.8	9.5	18.5	33.5
ROCK – 10,000	1.2	2.4	4.5	8.0	2.0	3.8	7.4	13.5

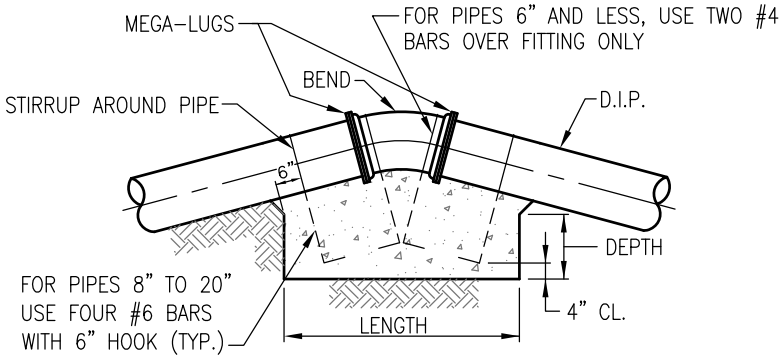
TYPICAL BLOCKING FOR HORIZONTAL AND VERTICAL DOWNWARD THRUSTS UP TO 150 PSI WORKING PRESSURE

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
TYPICAL BLOCKING FOR HORIZONTAL & VERTICAL			
DOWNWARD THRUSTS UP TO 150 PSI WORKING PRESSURE	Date: 11/29/18	Detail No. SD–W–07	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



TYPICAL SECTION
VERTICAL THRUST DOWNWARD



VERTICAL THRUST UPWARD
UP TO 150 PSI WORKING PRESSURE

NOTES:

1. ALL CONCRETE SHALL BE CLASS 'A' HAVING A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3300 PSI.
2. ALL REINFORCING STEEL SHALL BE DEFORMED BARS.
3. NO COUPLING OR JOINTS SHALL BE COVERED WITH CONCRETE.
4. REINFORCING BAR STRAPS TO BE SHAPED TO PIPE CURVATURE.
5. ALL EXPOSED STEEL TO BE COATED WITH CARBOLINE BITUMASTIC 50 APPLIED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS WITH A MINIMUM DRY FILM THICKNESS OF 30 MILS.

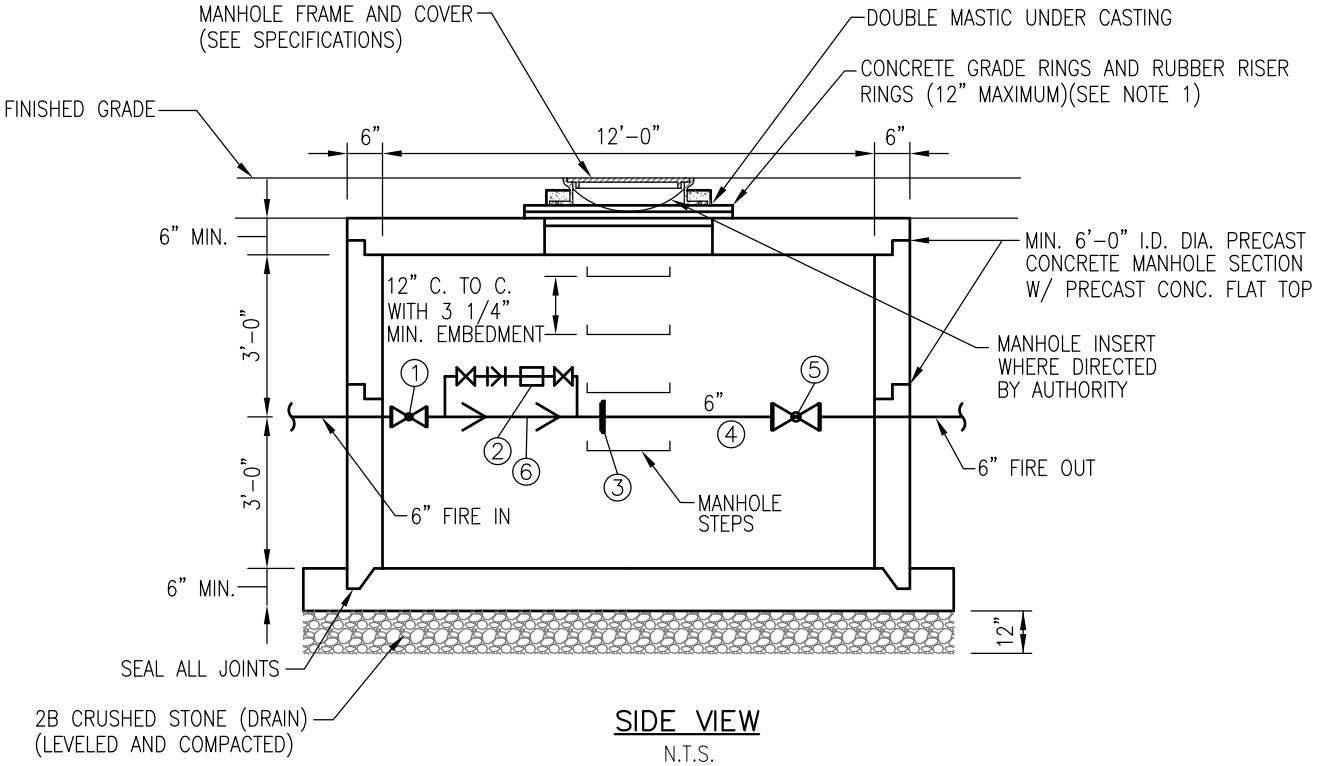
PIPE SIZES	DIMENSIONS OF CONCRETE BLOCKING								
	LENGTH			WIDTH			DEPTH		
	11¼°	22½°	45°	11¼°	22½°	45°	11¼°	22½°	45°
4"ø AND SMALLER	2.0'	4.0'	4.0'	1.5'	3.0'	3.0'	1.0'	2.0'	3.0'
6"ø AND 8"ø	3.0'	4.0'	6.0'	3.0'	3.0'	3.0'	2.0'	3.0'	4.0'
10"ø AND 12"ø	4.5'	6.0'	8.0'	3.0'	3.0'	4.0'	3.0'	4.5'	5.0'
14"ø AND 16"ø	6.0'	8.0'	11.0'	3.5'	3.5'	5.0'	3.5'	5.0'	5.0'
18"ø AND 20"ø	7.0'	9.0'	13.0'	4.0'	5.0'	5.5'	4.0'	5.0'	6.0'

SCHEDULE OF DIMENSIONS FOR CONCRETE BLOCKING OF VERTICAL BENDS WITH AN UPWARD THRUST BASED ON A WORKING PRESSURE OF 150 P.S.I.

VERTICAL THRUSTS UPWARD UP TO 150 PSI WORKING PRESSURE

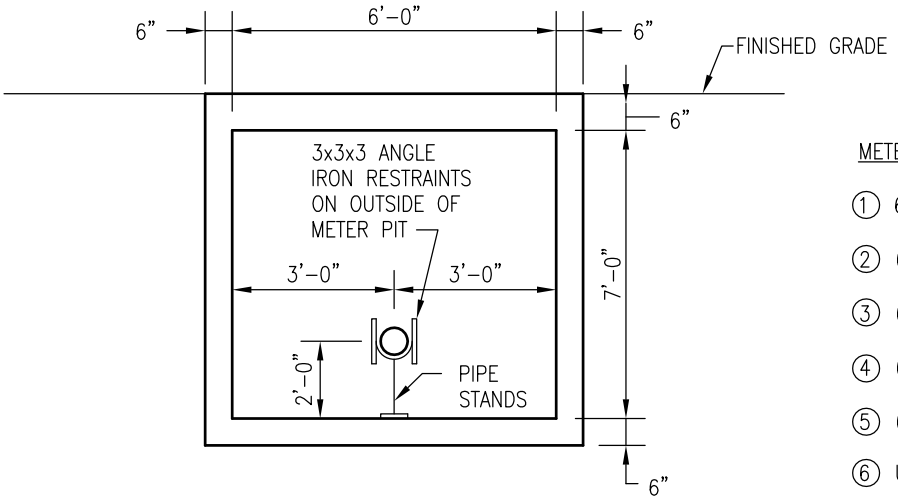
N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
VERTICAL THRUSTS UPWARD			
UP TO 150 PSI WORKING PRESSURE	Date: 11/29/18	Detail No. SD-W-08	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



SIDE VIEW

N.T.S.



END VIEW

N.T.S.

METER PIT MATERIAL LIST

1. 6" GATE VALVE (OS&Y)
2. 6" WATTS 709 DCDA (w/BYPASS METER)
3. 6" SMITH BLAIR #912 ADAPTOR
4. 6"x 6'-0" DUCTILE FLANGE, PIECE
5. 6" GATE VALVE (OS&Y)
6. U.L. APPROVED DETECTOR CHECK VALVE

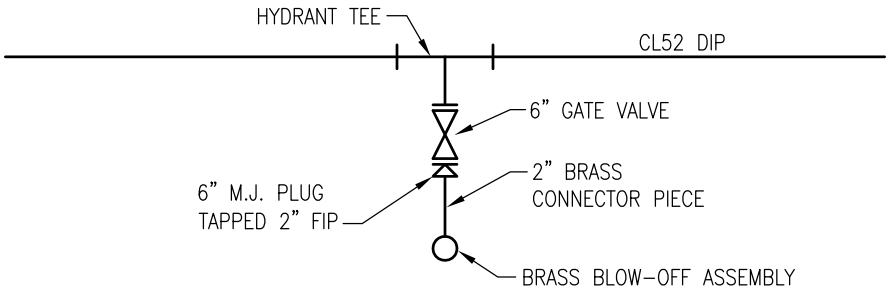
NOTES:

1. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY EAST JORDAN IRON WORKS. FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES.
2. MANHOLE SECTIONS SHALL BE LAP JOINT WITH A DOUBLE BEAD FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE OF LAP JOINT.
3. MANHOLE MANUFACTURER SHALL PROVIDE AN EXTERIOR BITUMINOUS COATING (FACTORY APPLIED). FIELD "TOUCH UP" AREAS AS APPROVED BY AUTHORITY.
4. STEEL REINFORCED CCP MANHOLE STEPS (SEE SPECIFICATIONS).
5. LINE SIZE, VALVES AND FITTINGS SHOWN HEREON BASED ON 6-INCH SERVICE. HOWEVER, ACTUAL SERVICE SIZE TO BE DETERMINED BY APPLICANT FIRE SUPPRESSION ENGINEER.

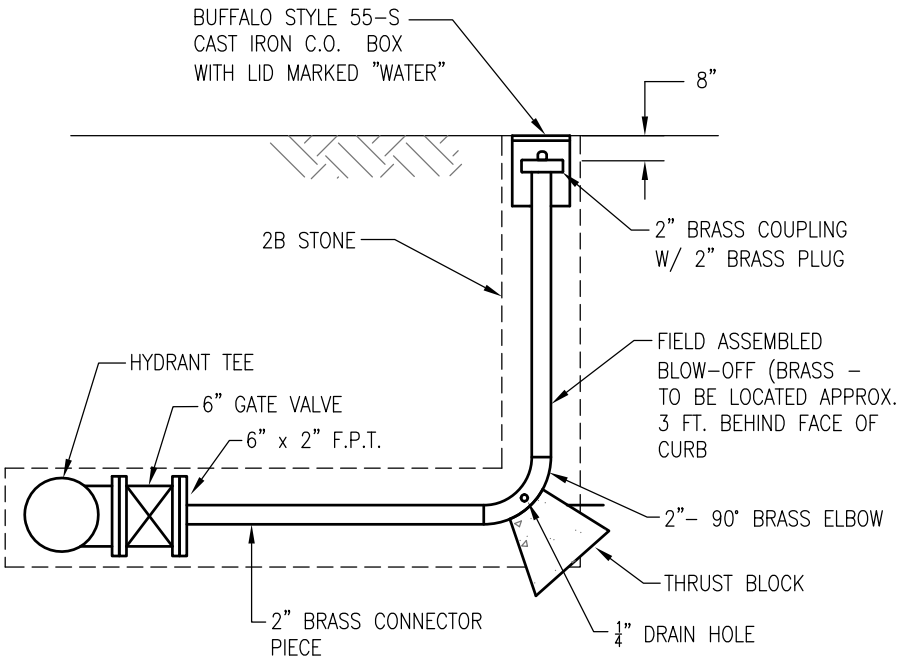
FIRE FLOW METER PIT

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
FIRE FLOW METER PIT	Date: 11/29/18	Detail No. SD-W-09	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



PLAN



SECTION

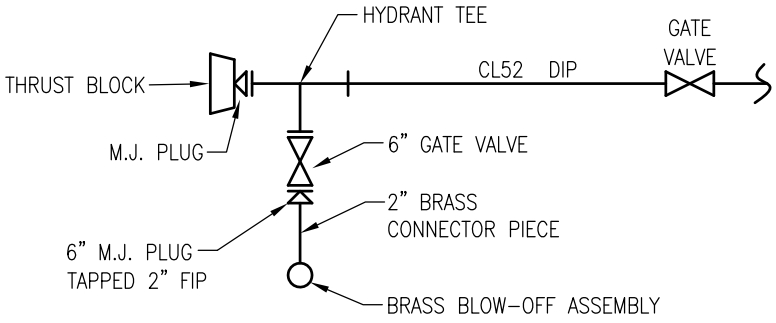
NOTE:
ONLY BRASS FITTINGS SHALL BE USED.

FIELD ASSEMBLED

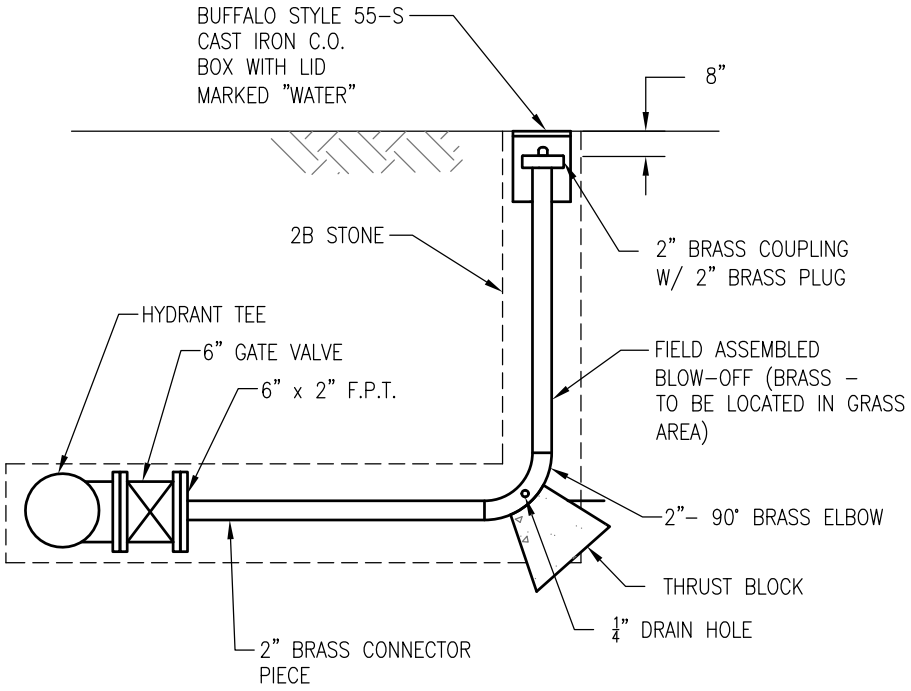
IN-LINE BLOW-OFF DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
IN-LINE BLOW-OFF DETAIL	Date: 11/29/18	Detail No. SD-W-10	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



PLAN



SECTION

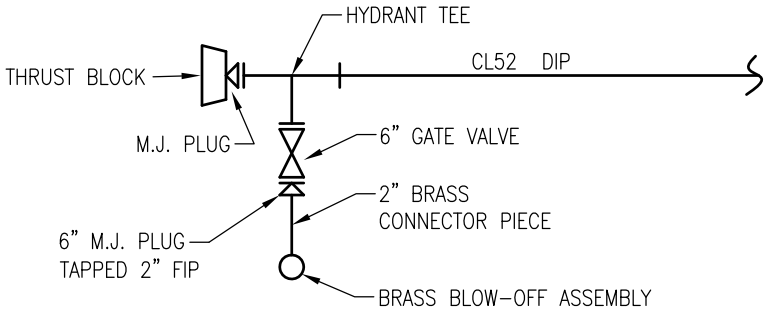
NOTE:
ONLY BRASS FITTINGS SHALL BE USED.

FIELD ASSEMBLED

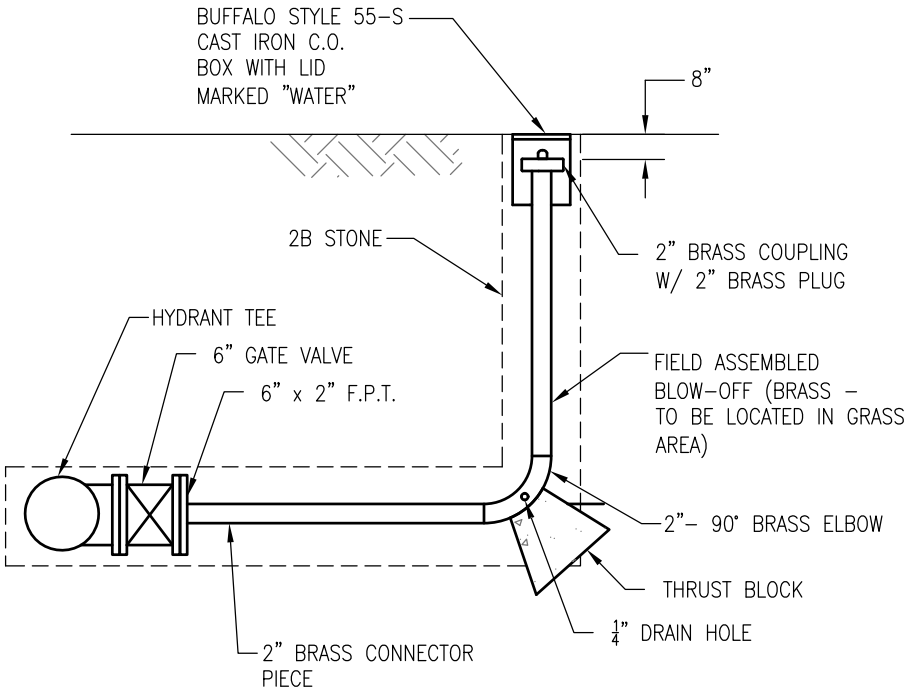
END-OF-LINE (FUTURE EXTENSION) BLOW-OFF DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
BLOW-OFF DETAIL	Date: 11/29/18	Detail No. SD-W-11	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600
END OF LINE (FUTURE EXTENSION)			



PLAN



SECTION

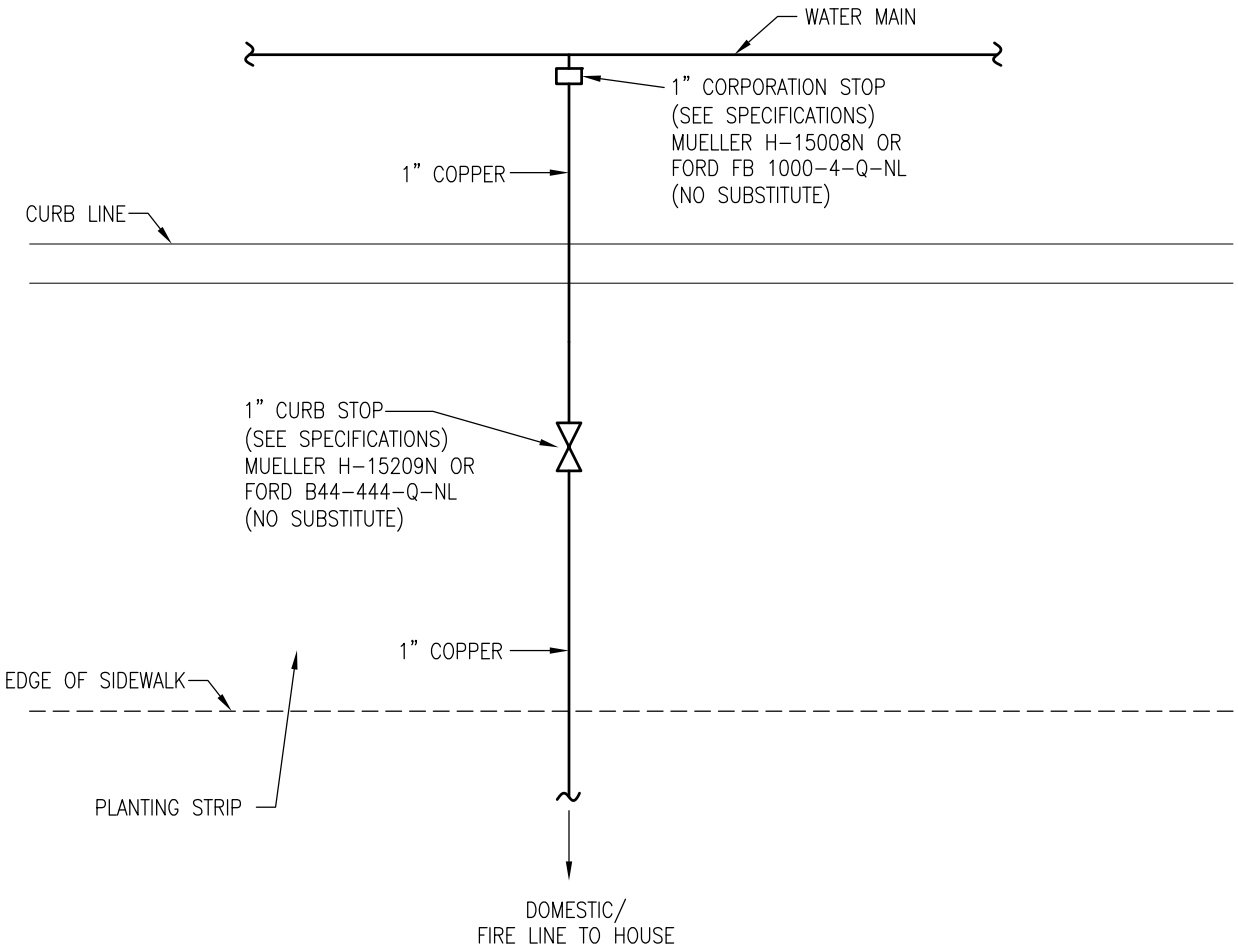
NOTE:
ONLY BRASS FITTINGS SHALL BE USED.

FIELD ASSEMBLED

END-OF-LINE (NO FUTURE EXTENSION) BLOW-OFF DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
BLOW-OFF DETAIL	Date: 11/29/18	Detail No. SD-W-12	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600
END OF LINE (NO FUTURE EXTENSION)			



PLAN

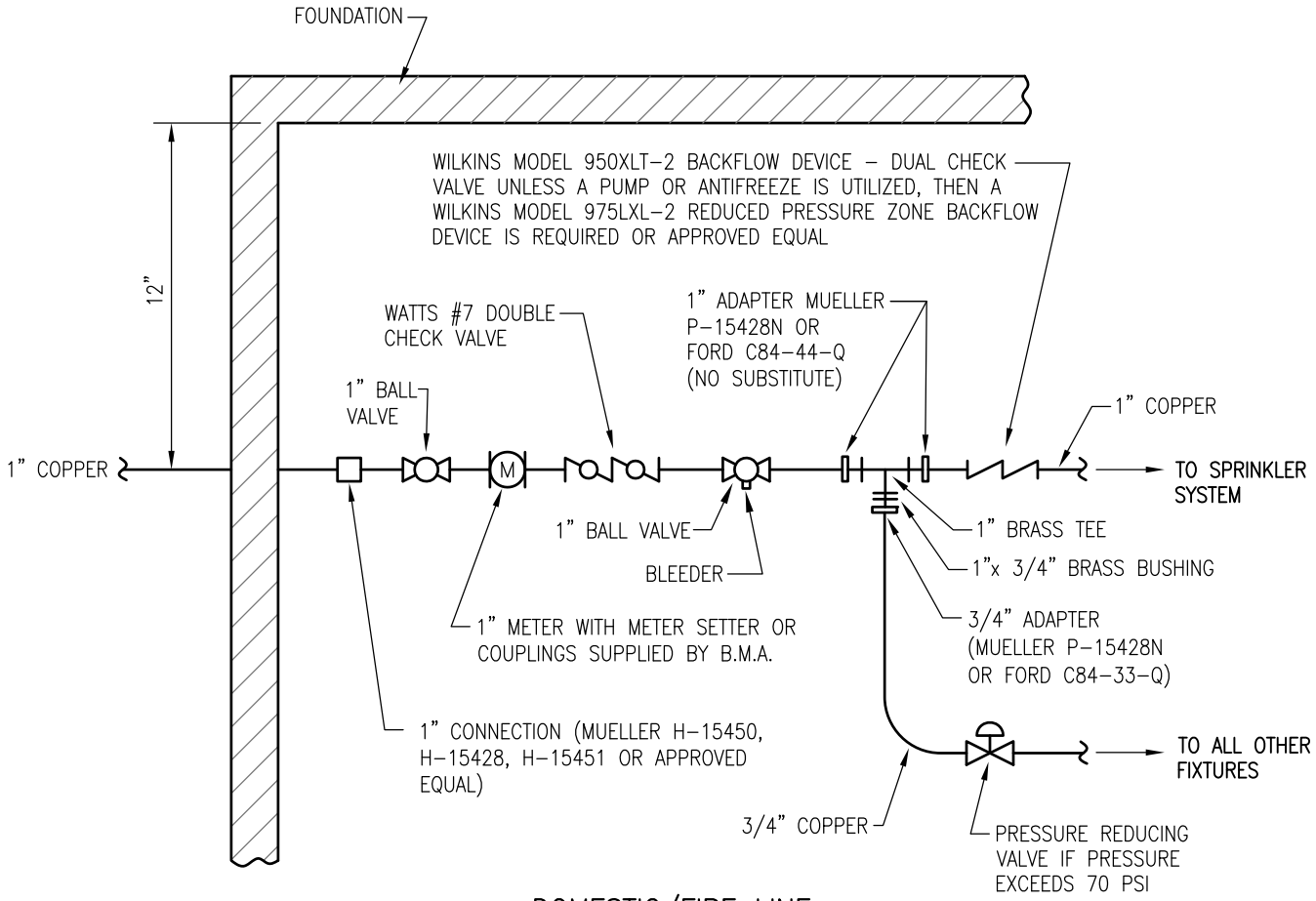
RESIDENTIAL FIRE AND DOMESTIC SERVICE

N.T.S.

NOTES:

1. ALL CURB STOP AND CORPORATION STOP FITTINGS SHALL BE "NO LEAD".

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
RESIDENTIAL FIRE AND			
DOMESTIC SERVICE DETAIL	Date: 11/29/18	Detail No. SD-W-13	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



DOMESTIC/FIRE LINE

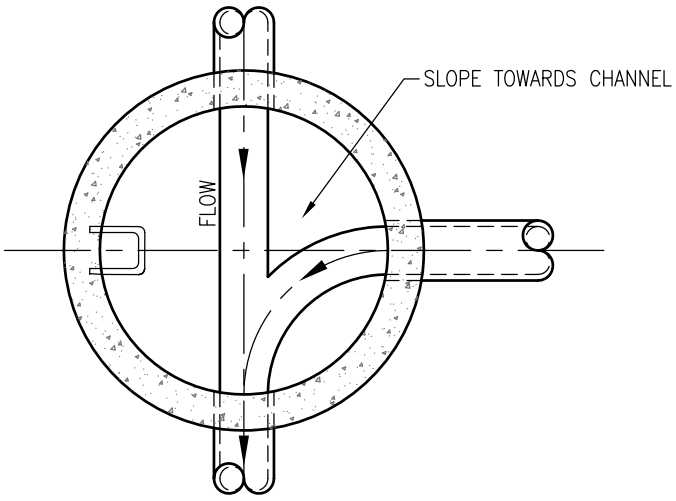
NOTES:

1. BALL VALVE – 1" MINIMUM BRASS 200 PSI A.W.W.A. APPROVED.
2. METER SETTER/COUPLINGS – FURNISHED BY B.M.A.
3. WATER METER – FURNISHED BY B.M.A.
4. SERVICE LINE – 1" MIN. TYPE "K" SOFT COPPER WITH FLARED OR COMPRESSION FITTINGS.
5. CUSTOMER TO PROVIDE BACKFLOW DEVICE. THE TYPE OF DEVICE MUST BE APPROVED BY AUTHORITY FOR DEGREE OF HAZARD. IF PUMP AND ANTIFREEZE UTILIZED, BACKFLOW PREVENTER MUST BE (RPZ) REDUCED PRESSURE ZONE DEVICE MANUFACTURED BY WILKINS MODEL 975LXL-2.
6. CUSTOMER PLUMBER TO INSTALL NO. 6 BONDING JUMPER ACROSS METER AND BACKFLOW.
7. IF PRESSURE EXCEEDS 70 PSI, PRESSURE REDUCING VALVE REQUIRED, SUPPLIED BY CUSTOMER.
8. WATER METER WILL NOT BE SET IF PIPING DOES NOT CONFORM TO SPECIFICATIONS.
9. SUPPORT AS NEEDED.
10. BRASS NIPPLES REQUIRED. NO SOLDER JOINTS ALLOWED.

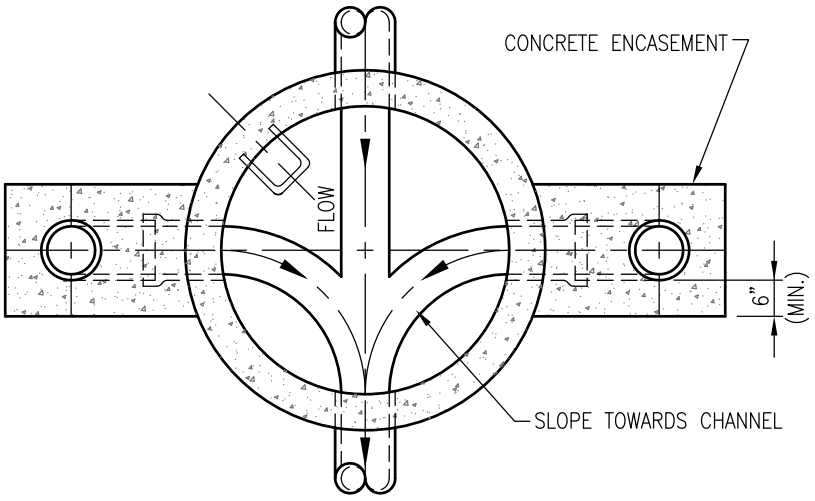
RESIDENTIAL FIRE AND DOMESTIC METER INSTALLATION

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
RESIDENTIAL FIRE AND			
DOMESTIC METER INSTALLATION DETAIL	Date: 11/29/18	Detail No. SD-W-14	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



SECTIONAL PLAN – STANDARD MANHOLE



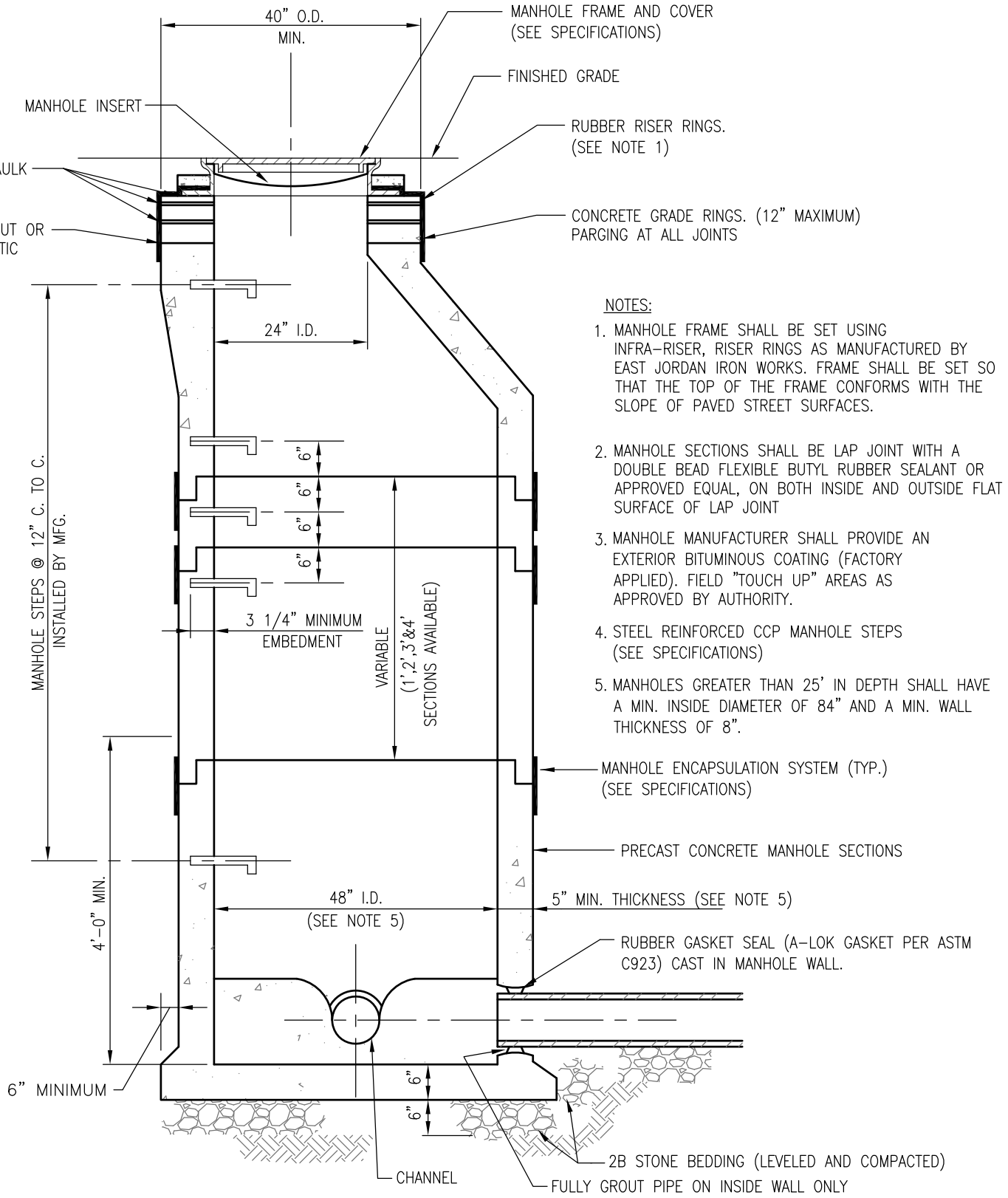
NOTE: MANHOLE INVERTS OR CHANNELS TO BE PRECAST OR FORMED IN BASE, BY THE INSTALLATION OF CHANNEL PIPE AND FITTINGS. CHANGES IN SIZE, GRADE, AND DIRECTION SHALL BE MADE SMOOTHLY AND EVENLY WITH AS LARGE OF A RADIUS AS POSSIBLE.

SECTIONAL PLAN – DROP MANHOLE

SECTIONAL PLANS
STANDARD & DROP MANHOLES

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
SECTIONAL PLANS			
STANDARD AND DROP MANHOLES	Date: 11/29/18	Detail No. SD–S–01	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



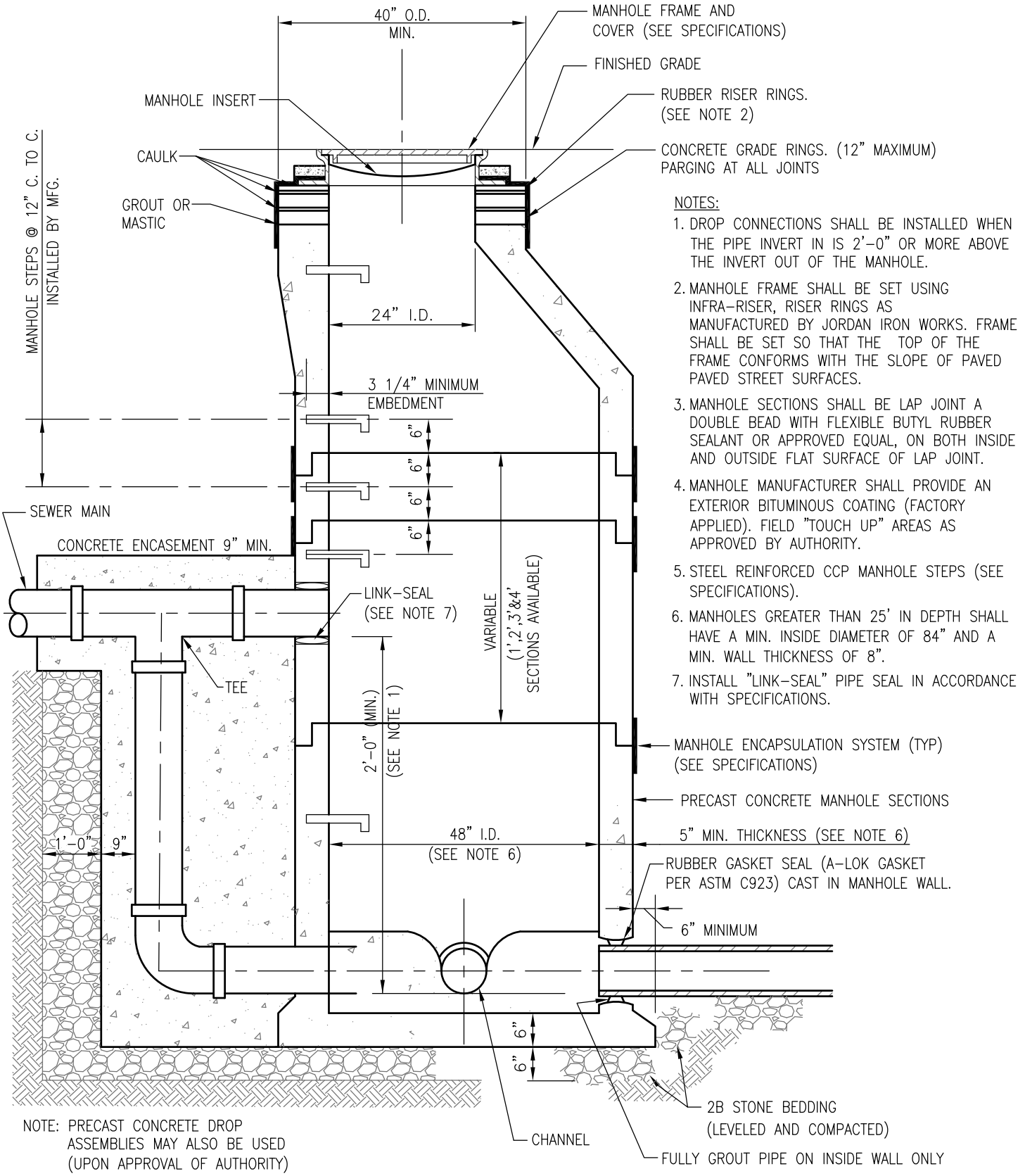
NOTES:

1. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY EAST JORDAN IRON WORKS. FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES.
2. MANHOLE SECTIONS SHALL BE LAP JOINT WITH A DOUBLE BEAD FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE OF LAP JOINT
3. MANHOLE MANUFACTURER SHALL PROVIDE AN EXTERIOR BITUMINOUS COATING (FACTORY APPLIED). FIELD "TOUCH UP" AREAS AS APPROVED BY AUTHORITY.
4. STEEL REINFORCED CCP MANHOLE STEPS (SEE SPECIFICATIONS)
5. MANHOLES GREATER THAN 25' IN DEPTH SHALL HAVE A MIN. INSIDE DIAMETER OF 84" AND A MIN. WALL THICKNESS OF 8".

STANDARD MANHOLE SECTION DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
STANDARD MANHOLE SECTION	Date: 11/29/18	Detail No. SD-S-02	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



NOTES:

1. DROP CONNECTIONS SHALL BE INSTALLED WHEN THE PIPE INVERT IN IS 2'-0" OR MORE ABOVE THE INVERT OUT OF THE MANHOLE.
2. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY JORDAN IRON WORKS. FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED PAVED STREET SURFACES.
3. MANHOLE SECTIONS SHALL BE LAP JOINT A DOUBLE BEAD WITH FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE OF LAP JOINT.
4. MANHOLE MANUFACTURER SHALL PROVIDE AN EXTERIOR BITUMINOUS COATING (FACTORY APPLIED). FIELD "TOUCH UP" AREAS AS APPROVED BY AUTHORITY.
5. STEEL REINFORCED CCP MANHOLE STEPS (SEE SPECIFICATIONS).
6. MANHOLES GREATER THAN 25' IN DEPTH SHALL HAVE A MIN. INSIDE DIAMETER OF 84" AND A MIN. WALL THICKNESS OF 8".
7. INSTALL "LINK-SEAL" PIPE SEAL IN ACCORDANCE WITH SPECIFICATIONS.

NOTE: PRECAST CONCRETE DROP ASSEMBLIES MAY ALSO BE USED (UPON APPROVAL OF AUTHORITY)

STANDARD DROP MANHOLE SECTION DETAIL

N.T.S.

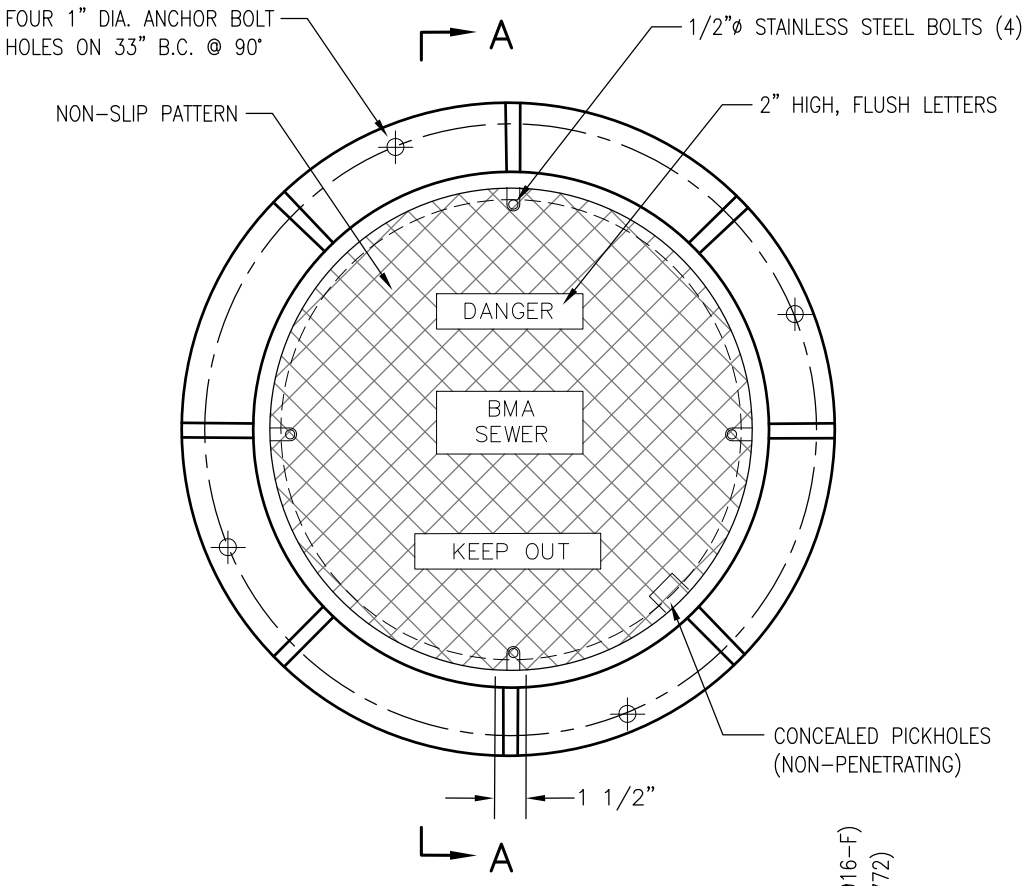
STANDARD DETAIL

DROP MANHOLE SECTION

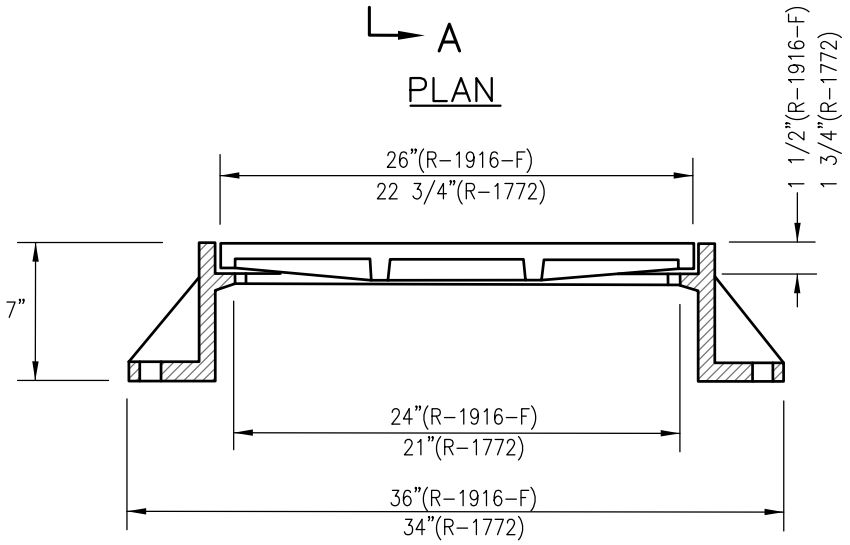
BEDMINSTER MUNICIPAL AUTHORITY

BUCKS COUNTY, PENNSYLVANIA

Date:	Detail No.	
11/29/18	SD-S-03	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



PLAN



SECTION A-A

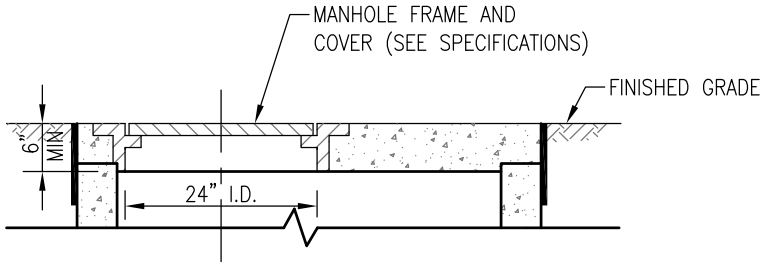
STANDARD MANHOLE FRAME AND COVER SHALL BE NEENAH R-1772.

WATERTIGHT MANHOLE FRAME AND COVER SHALL BE NEENAH R-1916-F.

MANHOLE CASTING - GRAY IRON PER ASTM A-48, 450 LBS±

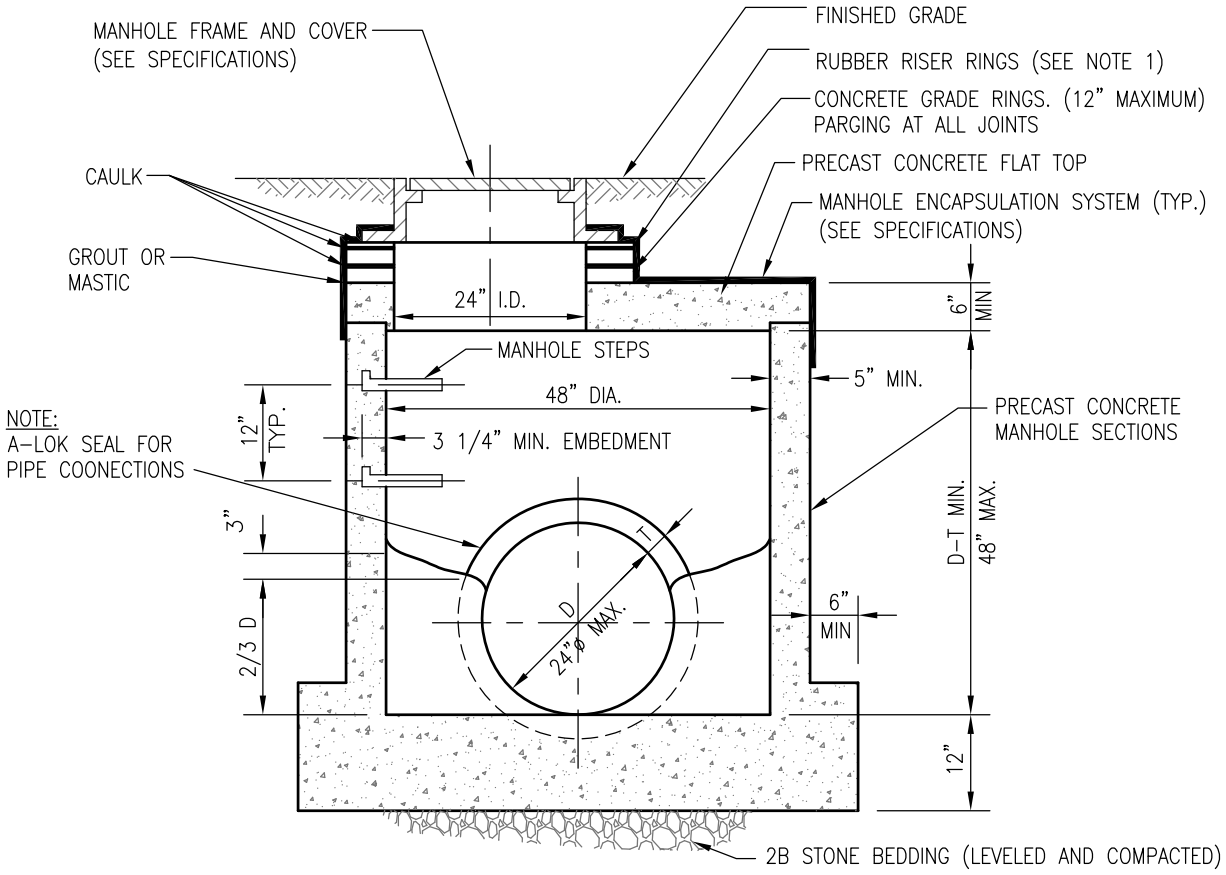
N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
STANDARD/WATERTIGHT MANHOLE			
FRAME AND COVER INSTALLATION	Date: 11/29/18	Detail No. SD-S-04	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



MANHOLE WITH FLUSH FRAME & COVER

N.T.S.



NOTES:

1. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY JORDAN IRON WORKS. FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES.
2. MANHOLE SECTIONS SHALL BE LAP JOINT WITH A DOUBLE BEAD FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE LAP JOINT.
3. MANHOLE MANUFACTURER SHALL PROVIDE AN EXTERIOR BITUMINOUS COATING (FACTORY APPLIED). FIELD "TOUCH UP" AREAS AS APPROVED BY AUTHORITY.
4. STEEL REINFORCED CCP MANHOLE STEPS (SEE SPECIFICATIONS).
5. PROVIDE RUBBER GASKET SEAL (A-LOK GASKET PER ASTM C923) CAST IN MANHOLE WALL.

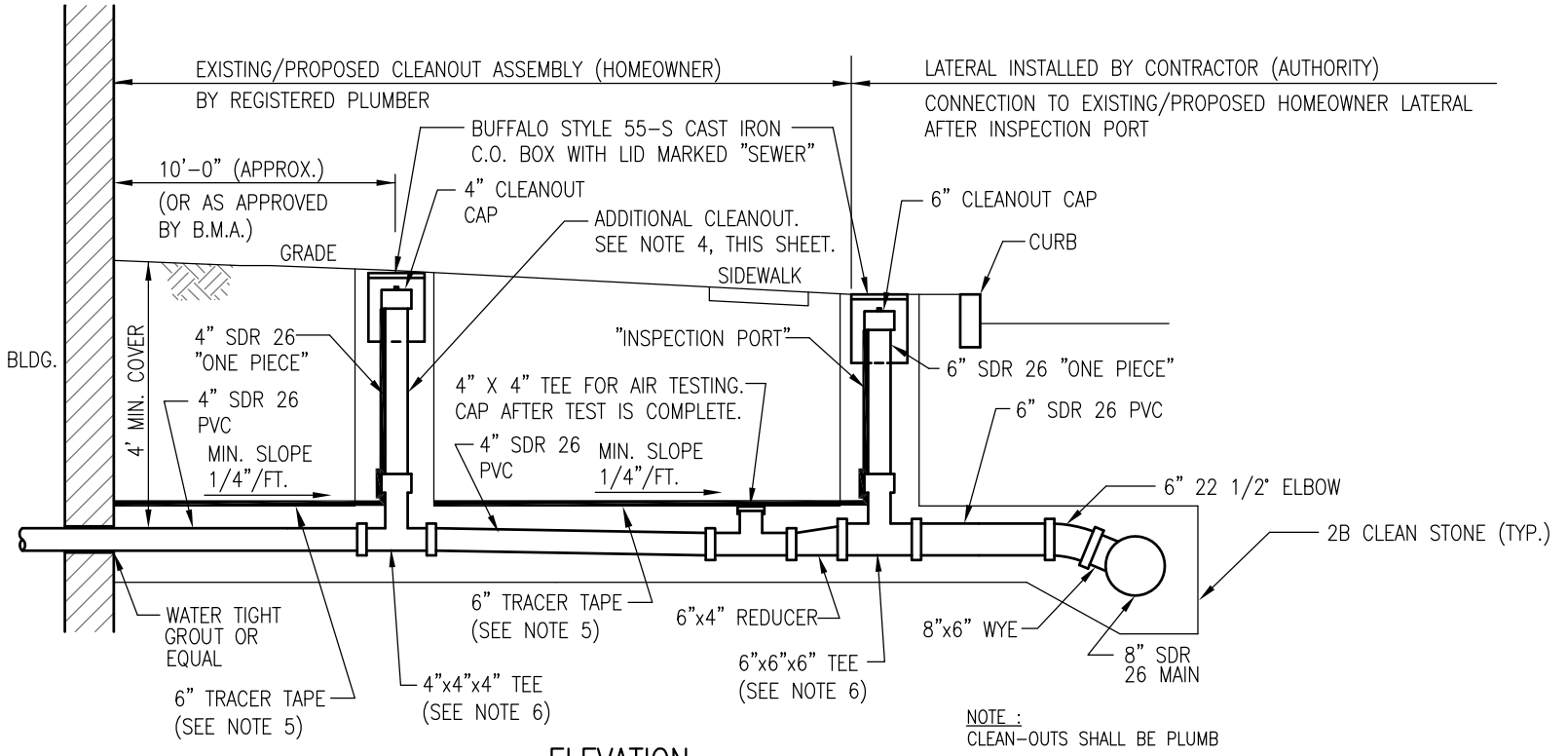
MANHOLE WITH STANDARD FRAME & COVER

N.T.S.

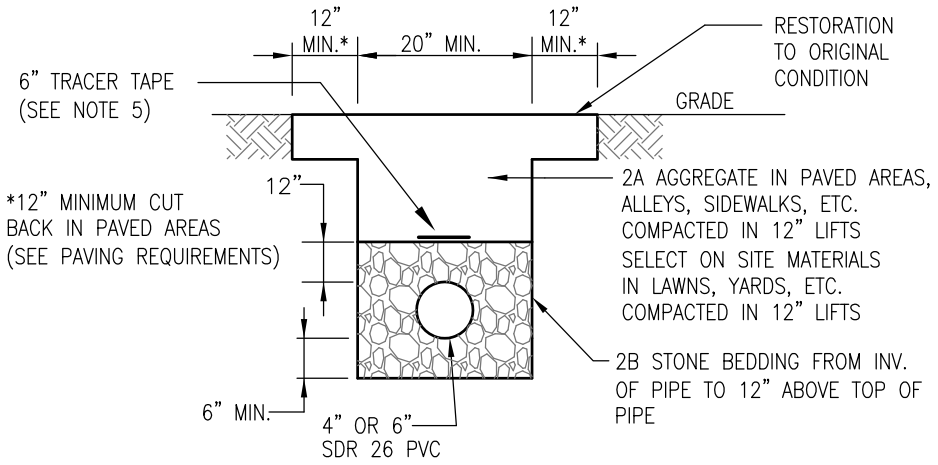
STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
48" DIA. SHALLOW MANHOLE	Date: 11/29/18	Detail No. SD-S-05	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600

STANDARD DETAIL

TYPICAL HOUSE CONNECTION



ELEVATION



SECTION

TRENCH DETAIL

N.T.S.

NOTES:

1. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND DIMENSIONS PRIOR TO ORDERING AND/OR FABRICATION OF ANY MATERIALS.
2. INSTALLATION SHALL CONFORM TO B.M.A. SPECIFICATIONS.
3. PIPE MATERIAL FROM AND INCLUDING THE CLEANOUT SHALL BE SDR 26 SEWER W/EITHER SLIP JOINTS OR SOLVENT WELD GLUED JOINTS.
4. ADDITIONAL CLEANOUTS TO BE PROVIDED :
   a. EVERY 100' OF LATERAL PIPE.
   b. AT BENDS GREATER THAN 45° (ON UPSTREAM SIDE OF BEND).
   c. WHERE BENDS ARE LESS THAN 40' APART (ON UPSTREAM SIDE OF BEND).
5. TRACER TAPE TO BE PLACED ON TOP OF STONE BEDDING IN HOMEOWNER'S SIDE OF LATERAL TRENCH. TRACER TAPE TO BE ATTACHED TO CLEAN OUTS/INSPECTION PORTS IN ACCORDANCE WITH SPECIFICATIONS.
6. ALL CLEAN OUTS/INSPECTION PORTS SHALL REST ON 2B CLEAN STONE BEDDING AS SHOWN

BEDMINSTER MUNICIPAL AUTHORITY

BUCKS COUNTY, PENNSYLVANIA

Date: 11/29/18

Detail No. SD-S-06

CKS Engineers, Inc.
88 South Main Street, Doylestown, PA 18901
(215) 340-0600

STANDARD DETAIL

SEWER LATERAL CONNECTION

COMMERCIAL OR INDUSTRIAL

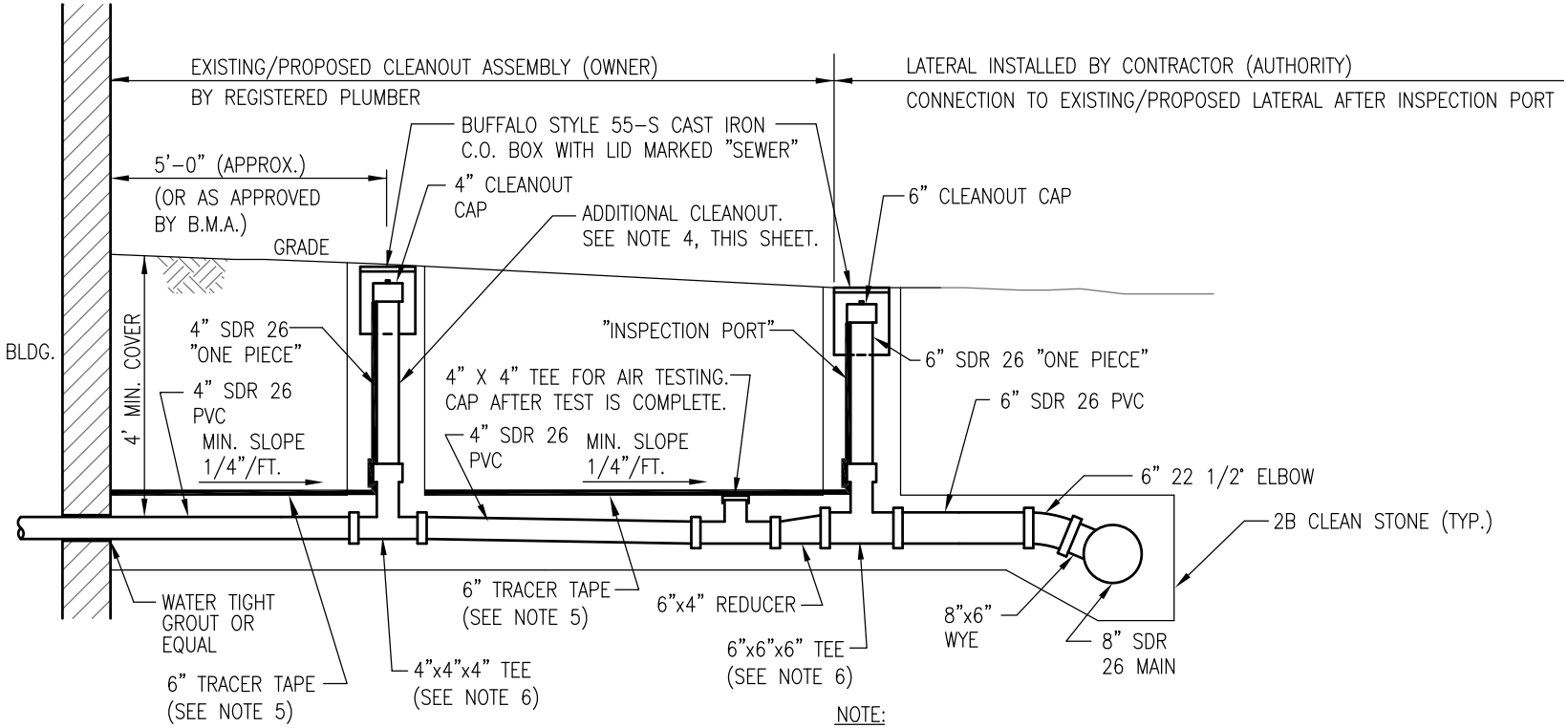
BEDMINSTER MUNICIPAL AUTHORITY

BUCKS COUNTY, PENNSYLVANIA

Date: 11/29/18

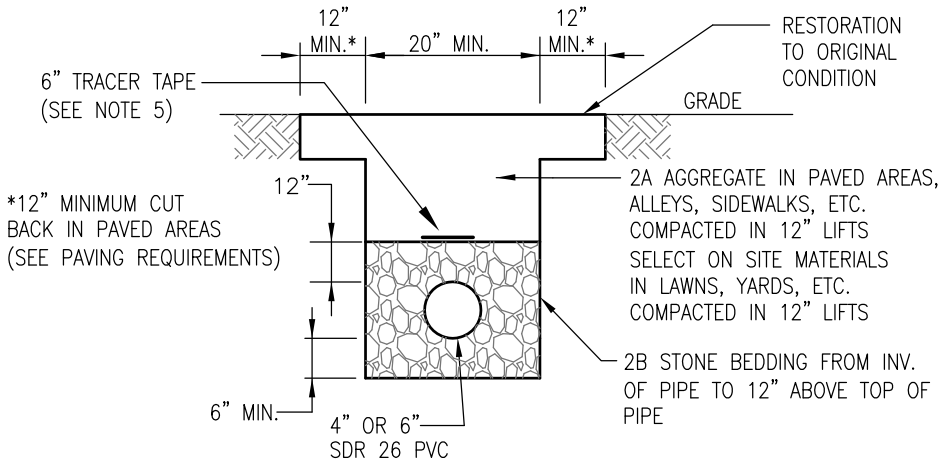
Detail No. SD-S-07

CKS Engineers, Inc.
88 South Main Street, Doylestown, PA 18901
(215) 340-0600



NOTE:
CLEAN-OUTS SHALL BE PLUMB.

ELEVATION



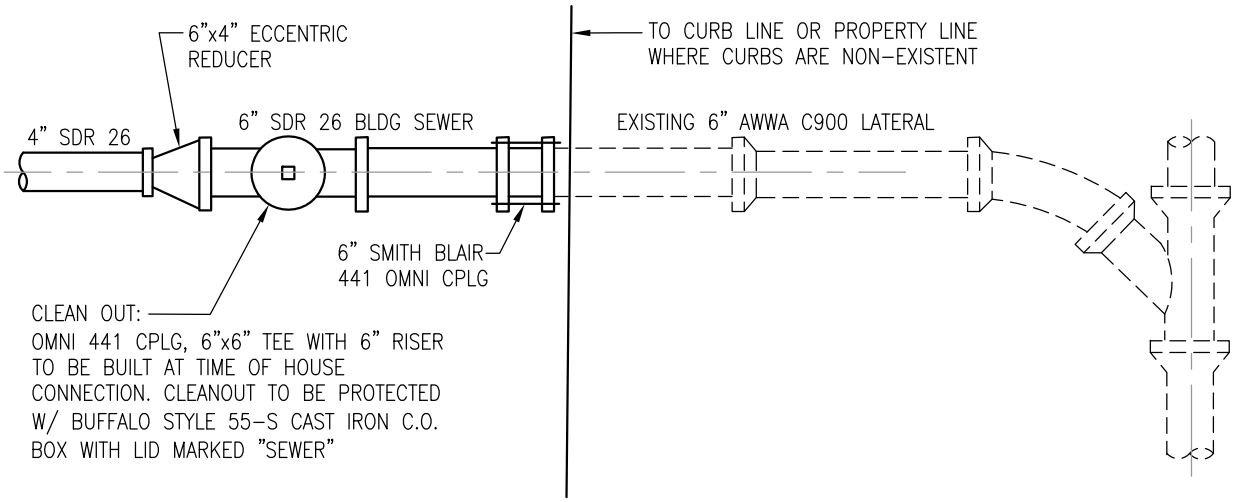
SECTION

TRENCH DETAIL

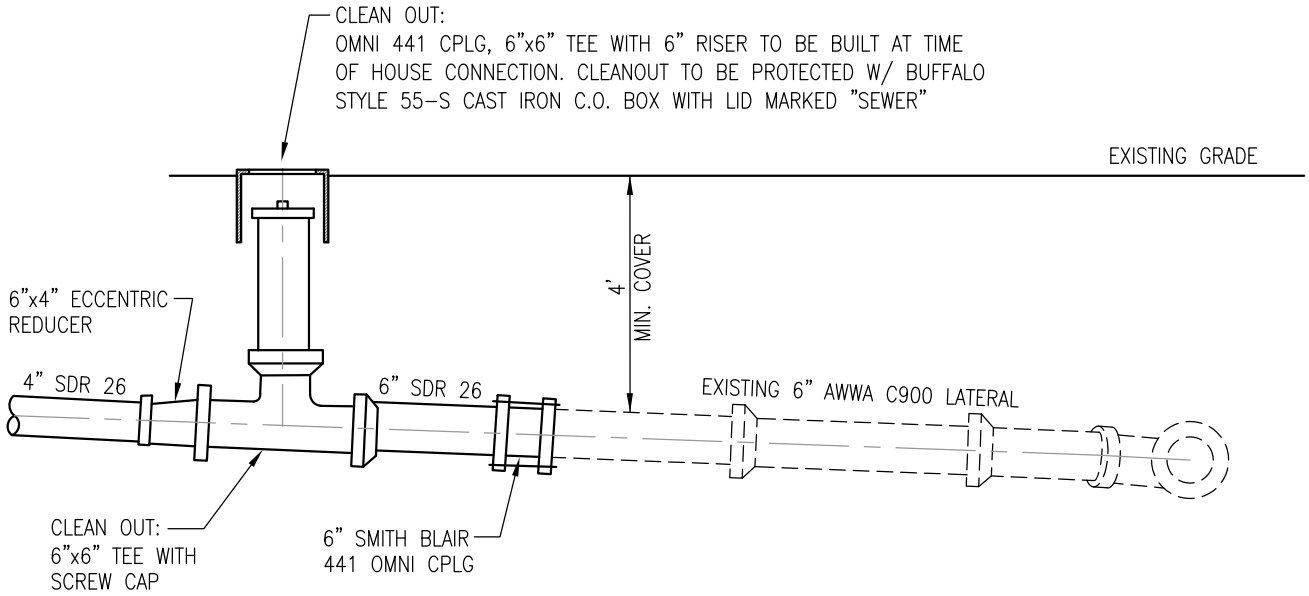
N.T.S.

NOTES:

1. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS AND DIMENSIONS PRIOR TO ORDERING AND/OR FABRICATION OF ANY MATERIALS.
2. INSTALLATION SHALL CONFORM TO B.M.A. SPECIFICATIONS.
3. PIPE MATERIAL FROM AND INCLUDING THE CLEANOUT SHALL BE SDR 26 SEWER W/EITHER SLIP JOINTS OR SOLVENT WELD GLUED JOINTS.
4. ADDITIONAL CLEANOUTS TO BE PROVIDED :
   a. EVERY 100' OF LATERAL PIPE.
   b. AT BENDS GREATER THAN 45° (ON UPSTREAM SIDE OF BEND).
   c. WHERE BENDS ARE LESS THAN 40' APART (ON UPSTREAM SIDE OF BEND).
5. TRACER TAPE TO BE PLACED ON TOP OF STONE BEDDING IN HOMEOWNER'S SIDE OF LATERAL TRENCH. TRACER TAPE TO BE ATTACHED TO CLEAN OUTS/INSPECTION PORTS IN ACCORDANCE WITH SPECIFICATIONS.
6. ALL CLEAN OUTS/INSPECTION PORTS SHALL REST ON 2B CLEAN STONE BEDDING AS SHOWN

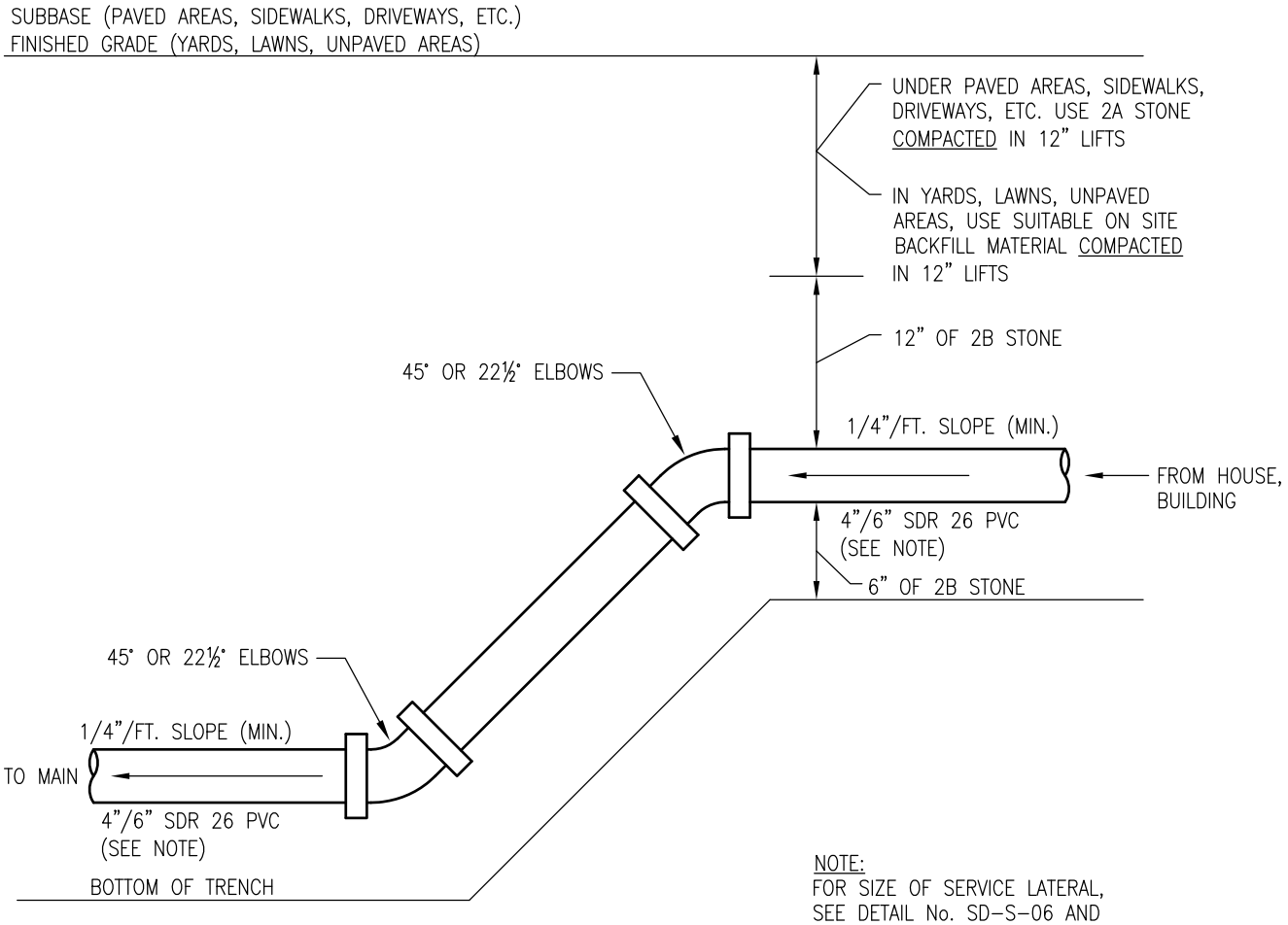


PLAN



ELEVATION

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
CONNECTION TO EXISTING LATERAL	Date: 11/29/18	Detail No. SD-S-08	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600

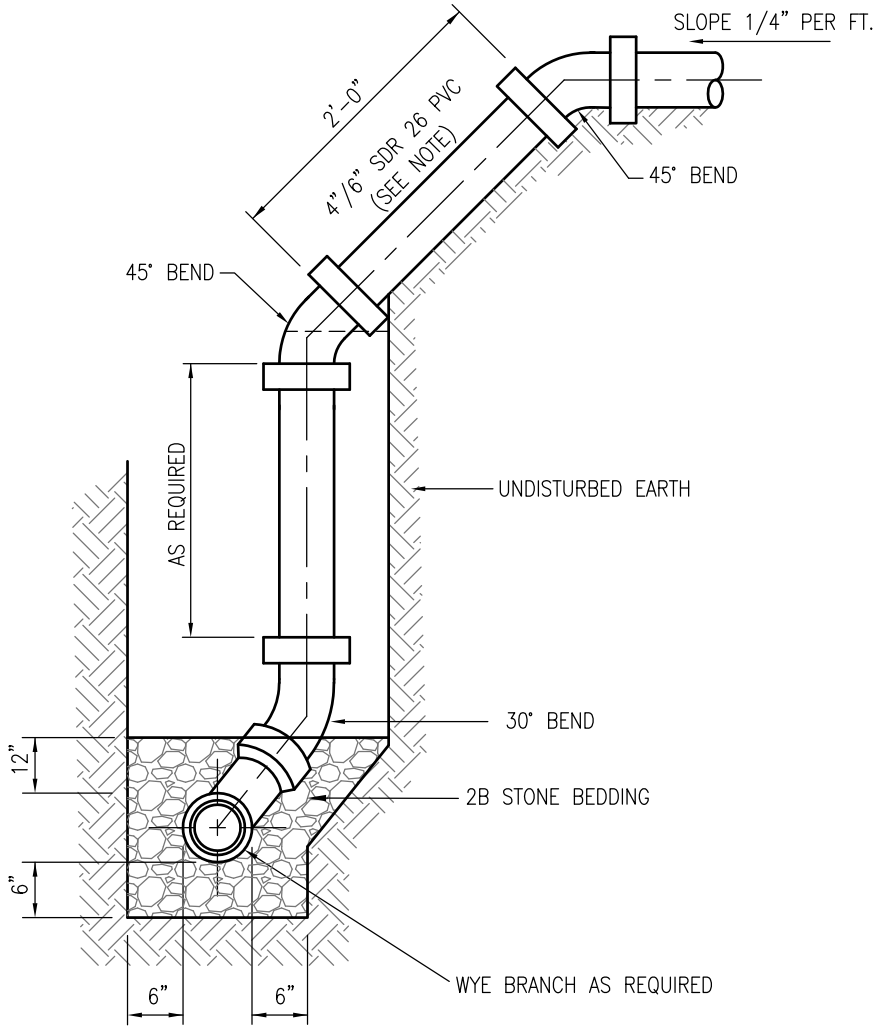


NOTE:
FOR SIZE OF SERVICE LATERAL, SEE DETAIL No. SD-S-06 AND No. SD-S-07.

GRADE ADJUSTMENT DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
LATERAL GRADE ADJUSTMENT	Date: 11/29/18	Detail No. SD-S-09	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600

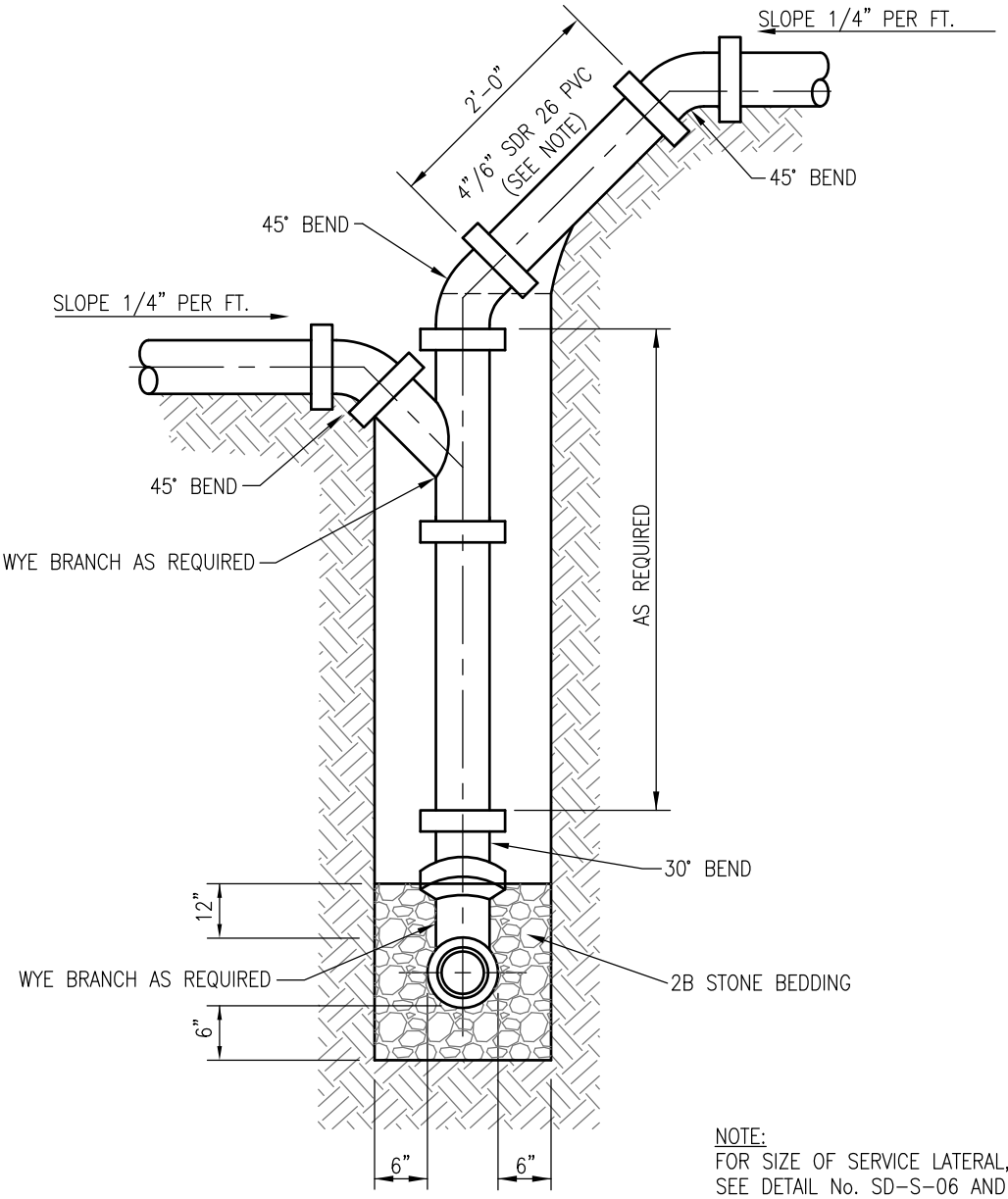


NOTE:
FOR SIZE OF SERVICE LATERAL,
SEE DETAIL No. SD-S-06 AND
No. SD-S-07.

SERVICE LATERAL RISER DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
LATERAL RISER	Date:	Detail No.	**CKS Engineers, Inc.**
TYPICAL STANDPIPE (SINGLE SERVICE)	11/29/18	SD-S-10	88 South Main Street, Doylestown, PA 18901 (215) 340-0600

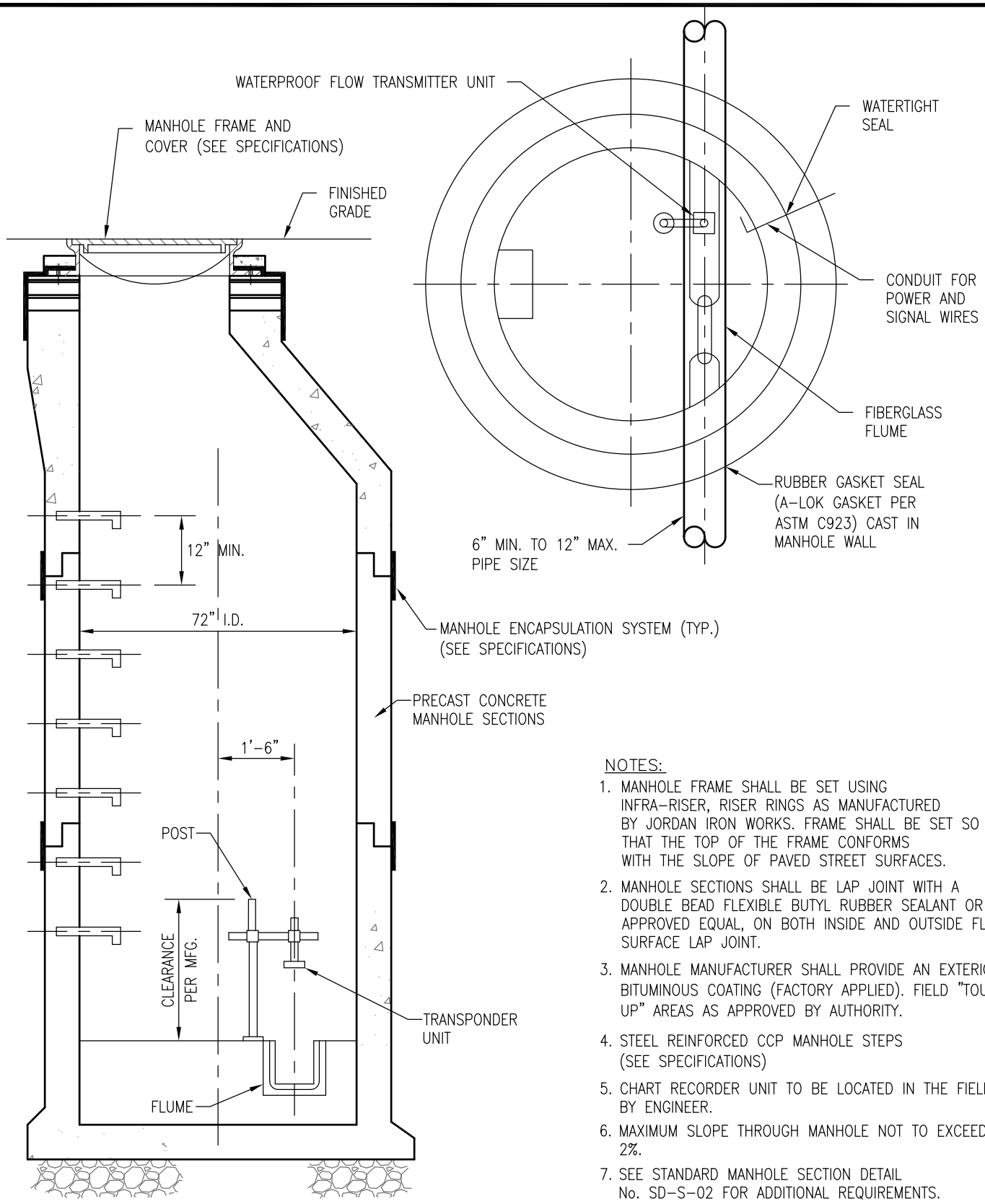


NOTE:
FOR SIZE OF SERVICE LATERAL, SEE DETAIL No. SD-S-06 AND No. SD-S-07.

MULTIPLE SERVICE LATERAL RISER DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
LATERAL RISER			
TYPICAL STANDPIPE (MULTIPLE SERVICE)	Date: 11/29/18	Detail No. SD-S-11	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



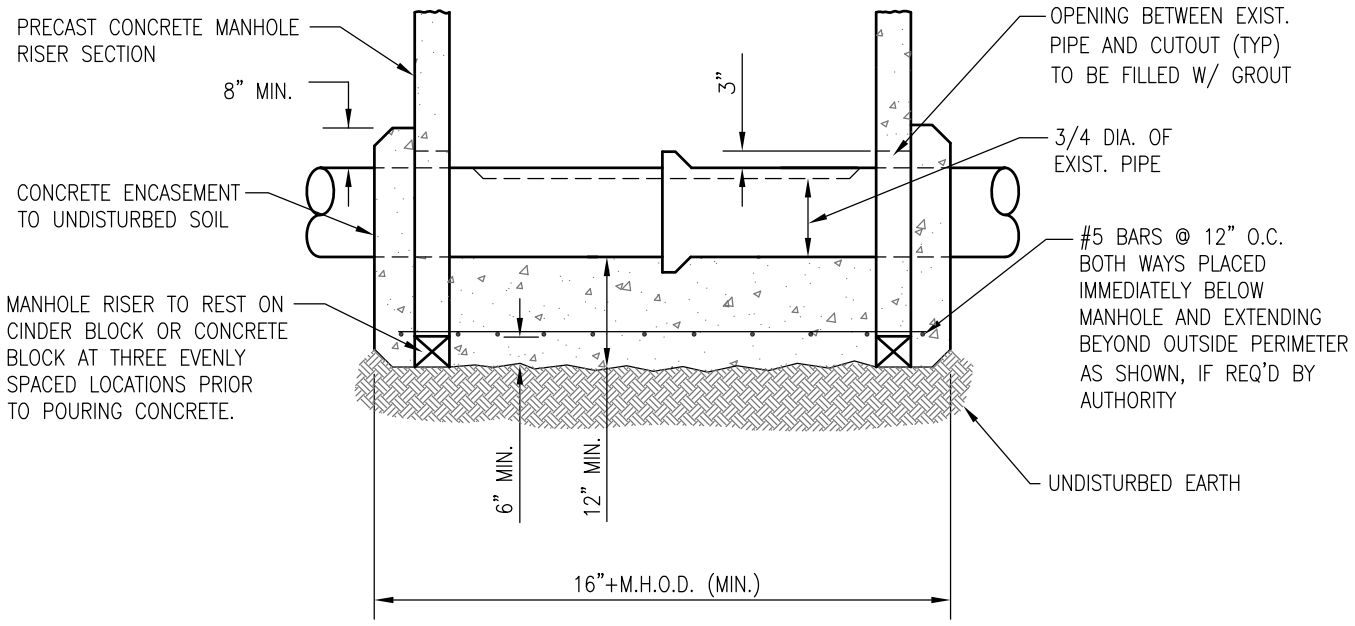
NOTES:

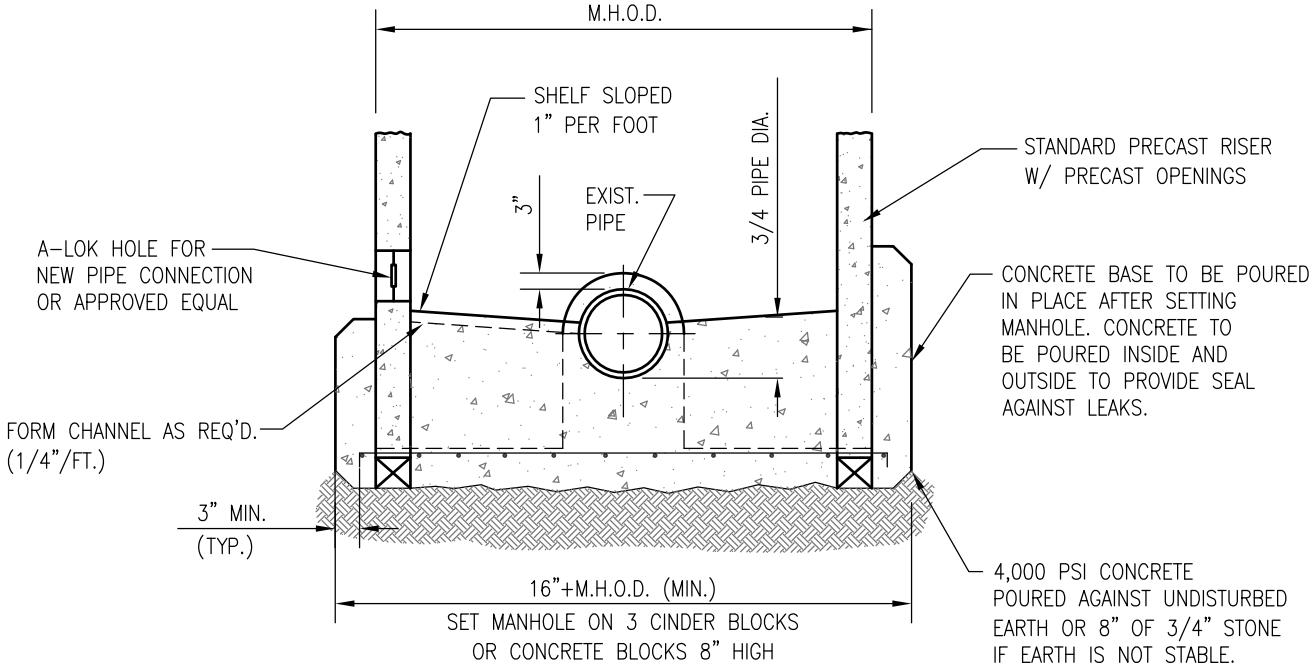
1. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY JORDAN IRON WORKS. FRAME SHALL BE SET SO THAT THE TOP OF THE FRAME CONFORMS WITH THE SLOPE OF PAVED STREET SURFACES.
2. MANHOLE SECTIONS SHALL BE LAP JOINT WITH A DOUBLE BEAD FLEXIBLE BUTYL RUBBER SEALANT OR APPROVED EQUAL, ON BOTH INSIDE AND OUTSIDE FLAT SURFACE LAP JOINT.
3. MANHOLE MANUFACTURER SHALL PROVIDE AN EXTERIOR BITUMINOUS COATING (FACTORY APPLIED). FIELD "TOUCH UP" AREAS AS APPROVED BY AUTHORITY.
4. STEEL REINFORCED CCP MANHOLE STEPS (SEE SPECIFICATIONS)
5. CHART RECORDER UNIT TO BE LOCATED IN THE FIELD BY ENGINEER.
6. MAXIMUM SLOPE THROUGH MANHOLE NOT TO EXCEED 2%.
7. SEE STANDARD MANHOLE SECTION DETAIL No. SD-S-02 FOR ADDITIONAL REQUIREMENTS.

STANDARD METERING MANHOLE DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
METERING MANHOLE			
PIPE SIZE 6" TO 12" MAX.	Date: 11/29/18	Detail No. SD-S-12	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600





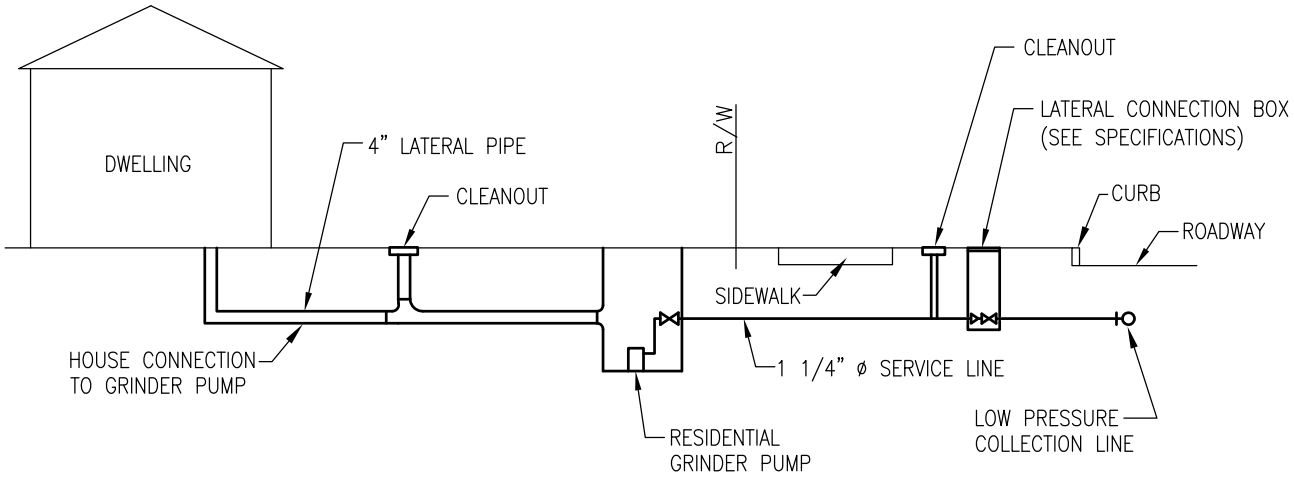
NOTES:

1. EXISTING PIPE TO REMAIN UNTIL SATISFACTORY COMPLETION OF MANHOLE.
2. REMOVE CROWN OF EXISTING PIPE FLUSH WITH CONCRETE SHELF.

DOGHOUSE MANHOLE

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
DOGHOUSE MANHOLE	Date: 11/29/18	Detail No. SD-S-13	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



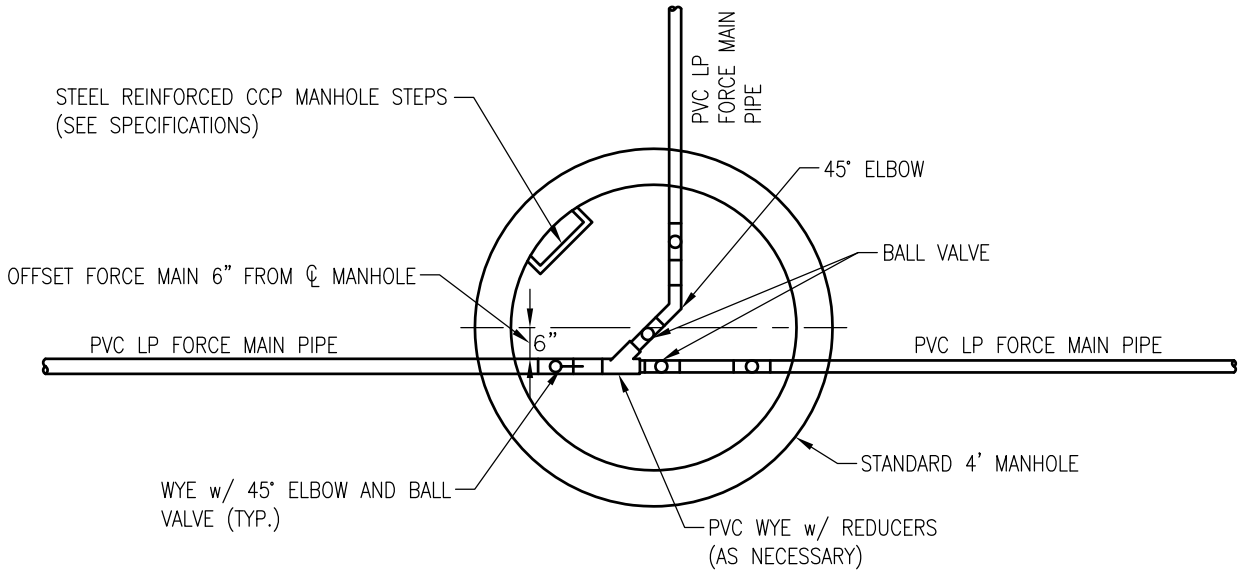
NOTES:

1. LATERAL CONNECTION BOX SHALL CONTAIN A CURB STOP AND CHECK VALVE. LID SHALL BE MARKED "SEWER". SEE SPECIFICATIONS FOR COMPLETE ASSEMBLY COMPONENTS
2. LATERAL SHALL BE INSTALLED IN SIMILAR MANNER TO THE TYPICAL HOUSE CONNECTION SHOWN ON DETAIL NO. SD-S-06.

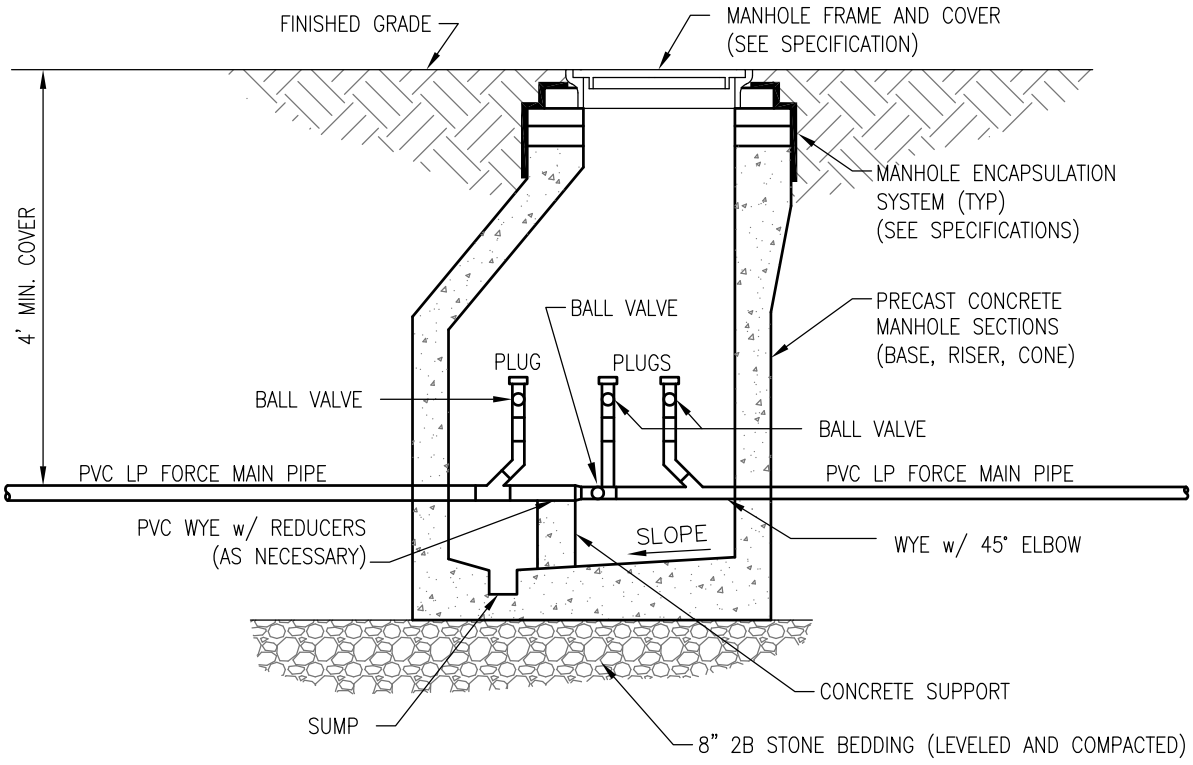
TYPICAL GRINDER PUMP INSTALLATION SCHEMATIC

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
TYPICAL GRINDER PUMP			
INSTALLATION SCHEMATIC	Date: 11/29/18	Detail No. SD-S-14	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



PLAN



PROFILE

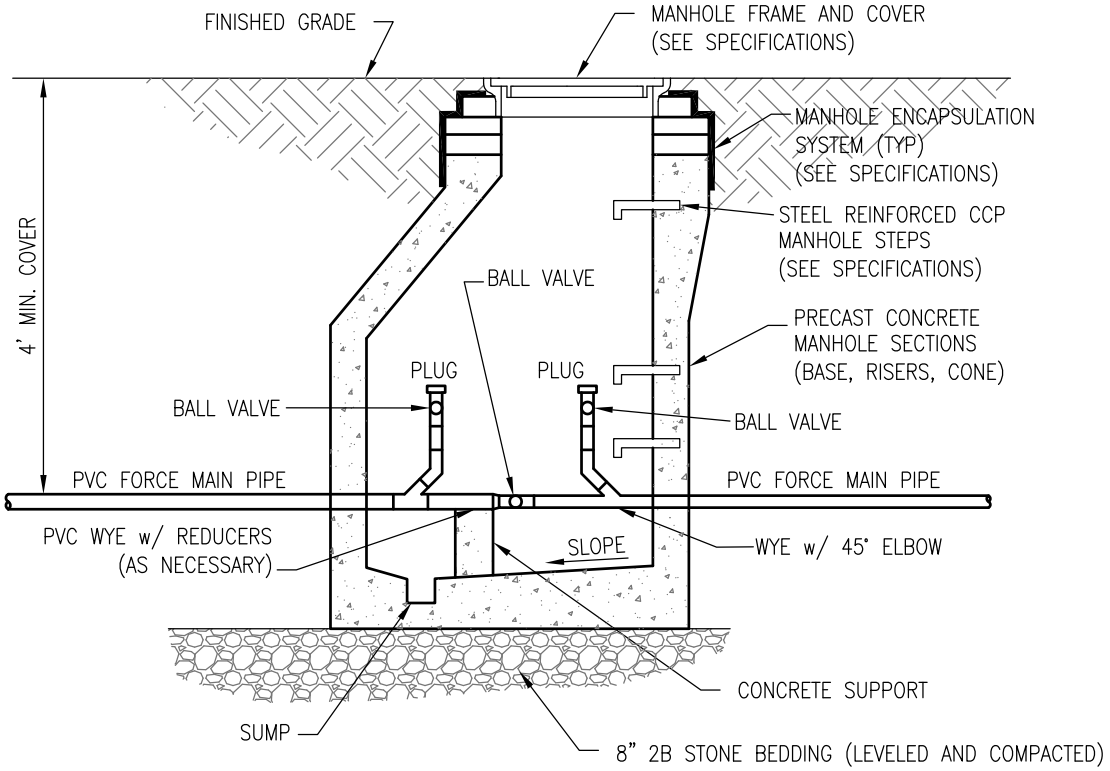
NOTES:

1. ALL VALVES SHALL BE PVC BALL VALVES WITH PLUGS ON TERMINATION POINTS.
2. ALL MANHOLE BASES SHALL BE CONSTRUCTED WITH SLOPE TOWARD THE SUMP.
3. SEE STANDARD DETAIL No. SD-S-02 FOR TYPICAL MANHOLE CONSTRUCTION NOTES.

LOW PRESSURE SEWER JUNCTION

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
LOW PRESSURE SEWER JUNCTION	Date: 11/29/18	Detail No. SD-S-15	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



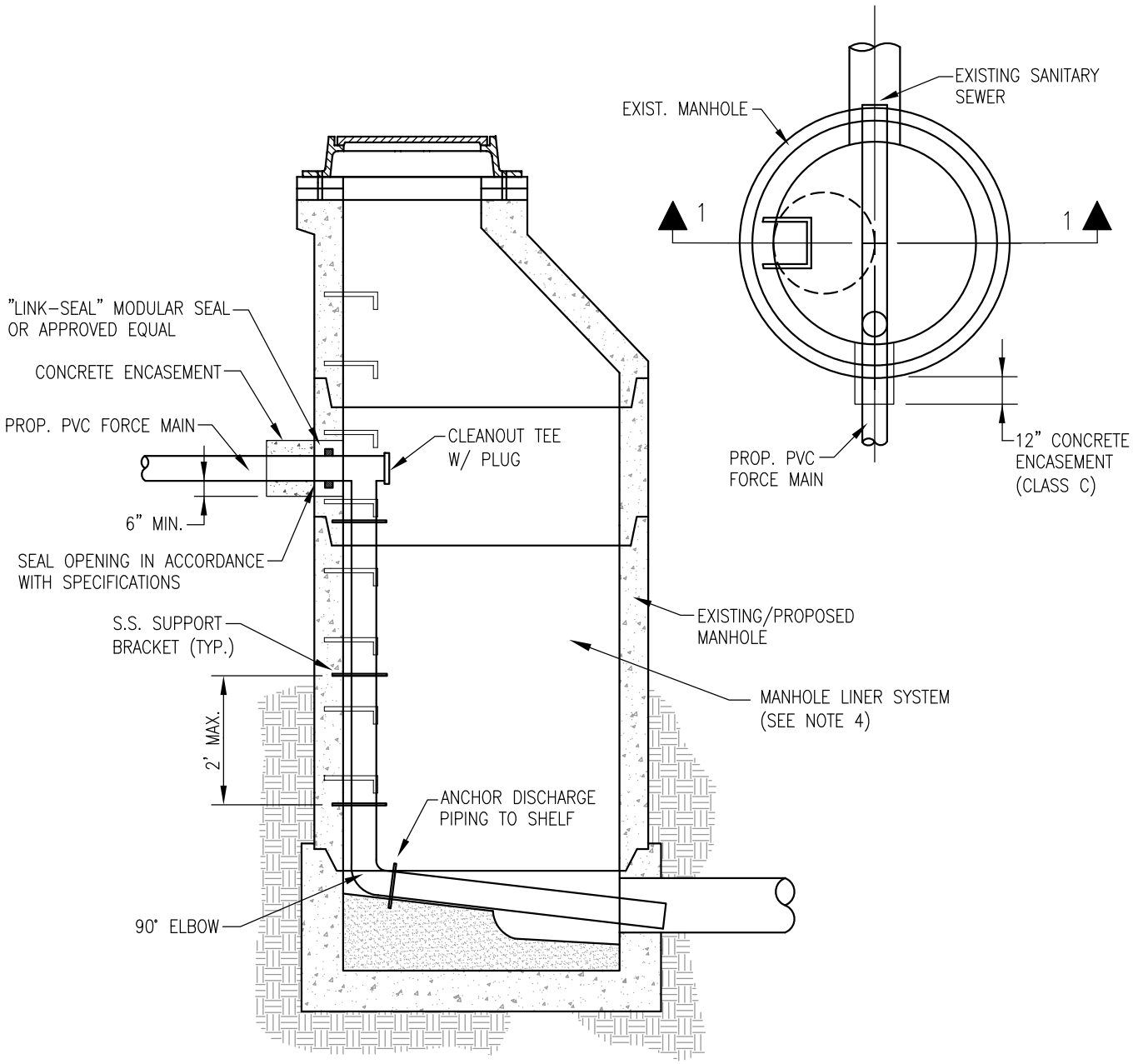
NOTES:

1. ALL VALVES SHALL BE PVC BALL VALVES WITH PLUGS ON TERMINATION POINTS.
2. ALL MANHOLE BASES SHALL BE CONSTRUCTED WITH SLOPE TOWARD THE SUMP.
3. SEE STANDARD DETAIL No. SD-S-02 FOR TYPICAL MANHOLE CONSTRUCTION NOTES.

LOW PRESSURE SEWER CLEANOUT AND TYPICAL FLUSHING CONNECTION

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
LOW PRESSURE SEWER CLEANOUT AND			
TYPICAL FLUSHING CONNECTION	Date: 11/29/18	Detail No. SD-S-16	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



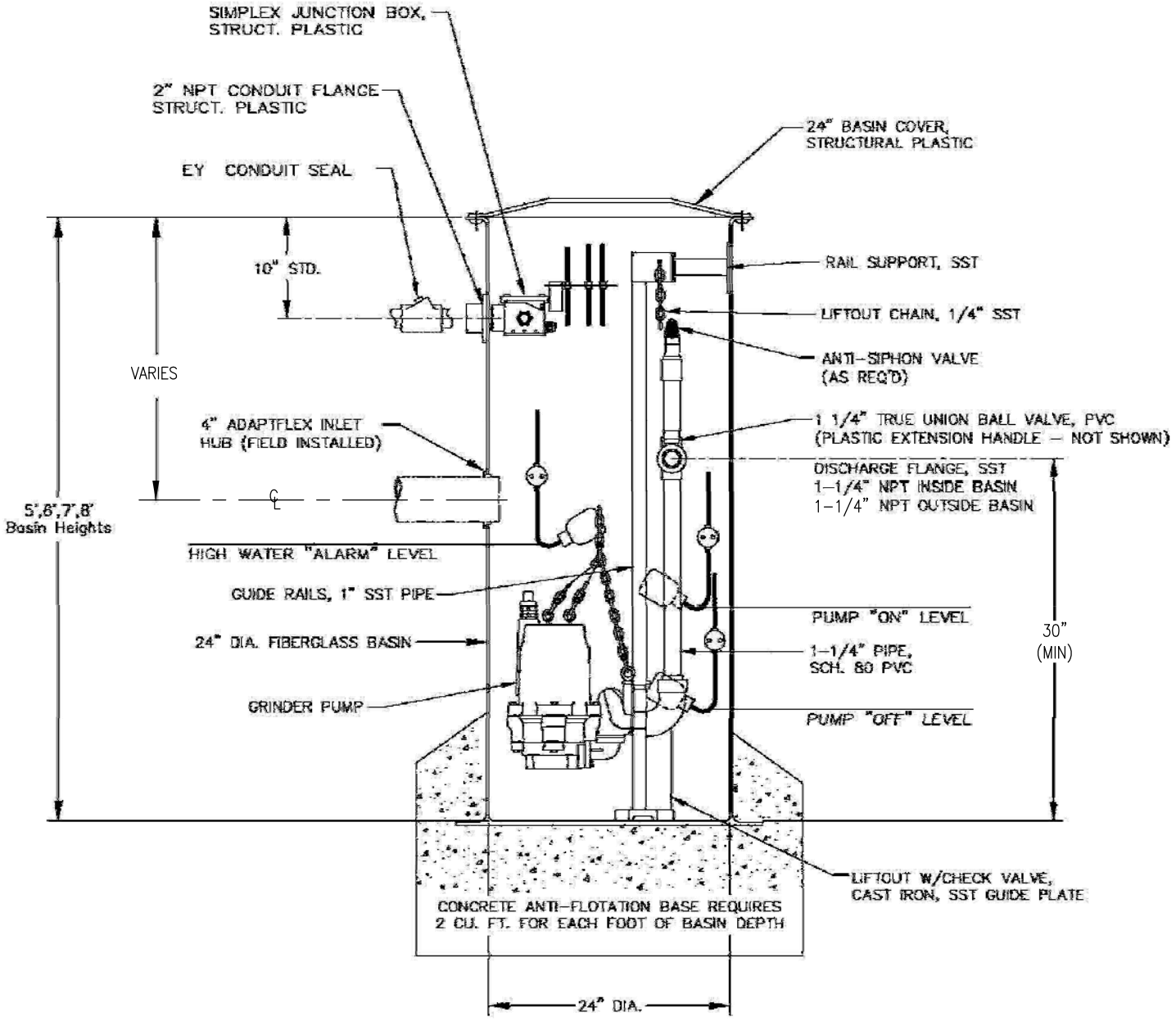
FORCE MAIN OR LOW PRESSURE SEWER CONNECTION TO MANHOLE

N.T.S.

NOTES:

1. SECURE FORCE MAIN INFLUENT PIPE TO MANHOLE WALL W/S.S. BRACKETS AND ANCHORS.
2. THE FORCE MAIN INFLUENT PIPE SHALL DROP TO THE TOP OF THE SHELF WITH AN ELBOW TO DIRECT THE FLOW INTO THE DISCHARGE SEWER PIPE.
3. RELOCATE MANHOLE STEPS IF REQUIRED TO AVOID FORCE MAIN CONNECTION.
4. MANHOLE LINER SYSTEM TO BE APPLIED TO THE EXISTING/PROPOSED MANHOLE TO WHICH THE FORCE MAIN CONNECTS AND ALSO TO THE NEXT THREE (3) DOWNSTREAM EXISTING/PROPOSED MANHOLES IN ACCORDANCE WITH SPECIFICATIONS.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
FORCE MAIN OR LOW PRESSURE SEWER	Date: 11/29/18	Detail No. SD-S-17	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600
CONNECTION TO MANHOLE			



RESIDENTIAL GRINDER PUMP

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
RESIDENTIAL GRINDER PUMP	Date: 11/29/18	Detail No. SD-S-18	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600
(FOR USE WITH DETAIL No. SD-S-19)			

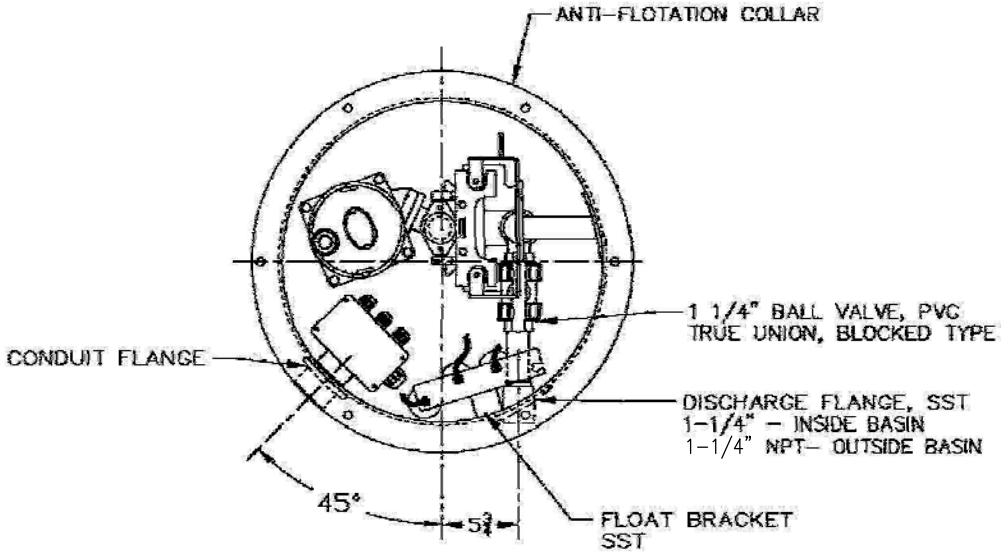
RESIDENTIAL GRINDER PUMP NOTES:

1. EACH LOT SHALL BE EQUIPPED WITH A BARNES EcoTRAN GRINDER SYSTEM CONSISTING OF ONE OR TWO SUBMERSIBLE SEWAGE GRINDER PUMPS, DEPENDING ON THE APPLICATION (1–RESIDENTIAL; 2–NON–RESIDENTIAL) WITH WALL MOUNTED J–BOX. GRINDER PUMPS SHALL BE BARNES MODEL OGP, 2 HP, 240V, 1° PHASE, 3450 RPM, 1 1/4", DISCHARGE, BY BARNES PRESSURE SYSTEMS OR AUTHORITY APPROVED EQUAL.

2. CONTROL PANELS SHALL BE REMOTE MOUNTED AT EACH HOME. EACH PANEL SHALL BE EQUIPPED WITH AN AUDIBLE AND VISUAL HIGH LEVEL ALARM, NEMA 4X FIBERGLASS ENCLOSURE, ELAPSED TIME METER, AND SEAL LEAK DETECTION.

3. THE DEVELOPER/HOMEOWNER SHALL PROVIDE SPARE GRINDER SEWAGE PUMPS TO THE BEDMINSTER MUNICIPAL AUTHORITY FOR USE AS EMERGENCY REPLACEMENT SHOULD A HOMEOWNER'S PUMP MALFUNCTION. THE NUMBER OF SPARE PUMPS WILL BE DETERMINED BY THE NUMBER OF GRINDER PUMPS INSTALLED. THE SPECIFICATION FOR INSTALLATION OF THE GRINDER PUMP AND FORCE MAIN SHALL BE AVAILABLE WITH THE PLAN SET DURING CONSTRUCTION ON SITE.

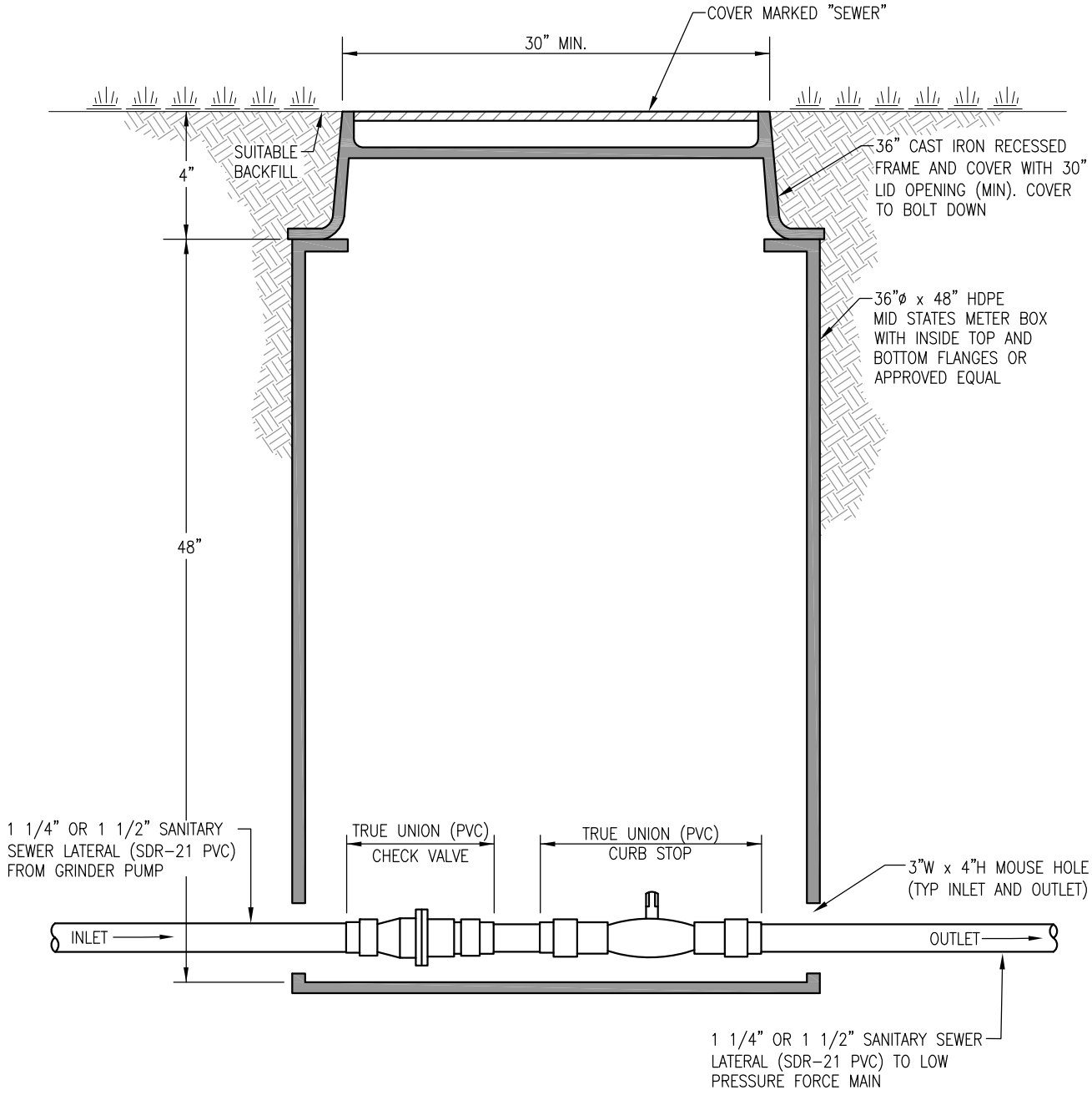
4. TANKS SHALL BE HDPE OR CONCRETE AND INCLUDE 1 1/4" FEMALE NPT DISCHARGE FLANGE(S) AND A 2" FEMALE NPT CONDUIT FLANGE. A 4" NEOPRENE INFLUENT HUB SHALL BE PROVIDED FOR MOUNTING IN THE FIELD. HUB SHALL BE SUITABLE FOR 4" SDR–26 INFLUENT PIPE.



CONNECTION TO PROPOSED PUMP TANK

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
CONNECTION TO PROPOSED PUMP TANK	Date: 11/29/18	Detail No. SD–S–19	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600
(FOR USE WITH DETAIL No. SD–S–18)			



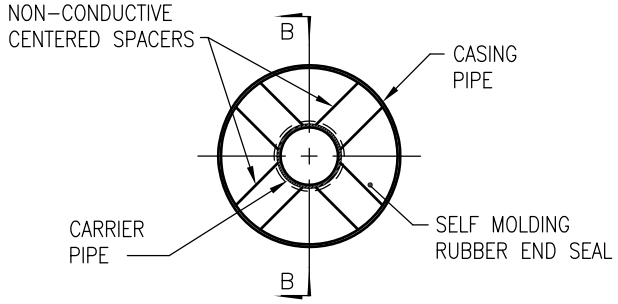
STANDARD DETAIL

LOW PRESSURE SEWER LATERAL CONNECTION BOX

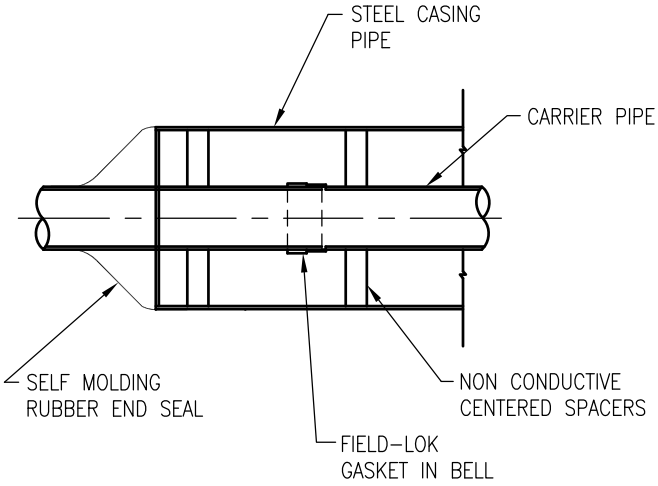
BEDMINSTER MUNICIPAL AUTHORITY

BUCKS COUNTY, PENNSYLVANIA

Date:	Detail No.	
11/29/18	SD-S-20	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



END SECTION

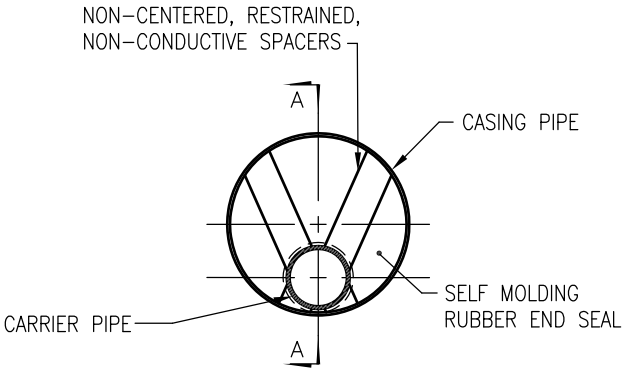


SECTION B–B

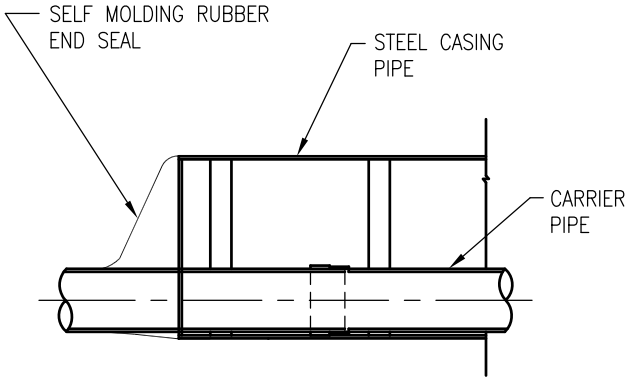
NOTE – FOR CASING PIPE REQUIREMENTS,
(SEE SPECIFICATIONS

WATER OR FORCE MAIN

N.T.S.



END SECTION



SECTION A–A

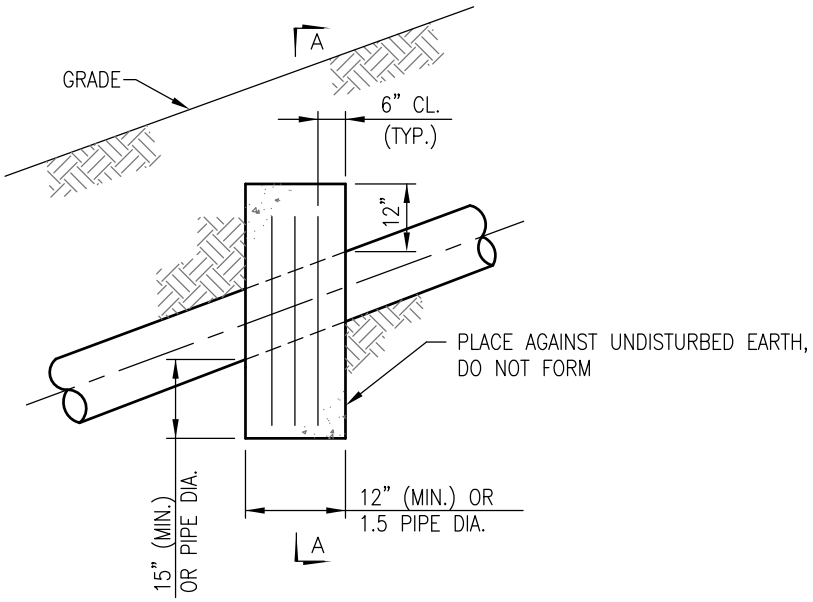
NOTE – FOR CASING PIPE REQUIREMENTS,
SEE SPECIFICATIONS

GRAVITY SEWER

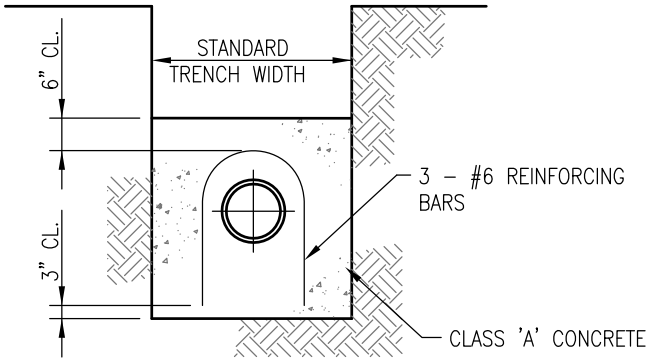
N.T.S.

NOTE:
CONTRACTOR MAY USE AGGREGATE FILLER AND BRICK AND GROUT END SEALS IF APPROVED BY AUTHORITY.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
CARRIER AND CASING PIPE			
INSTALLATION	Date: 11/29/18	Detail No. SD–G–01	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



ELEVATION



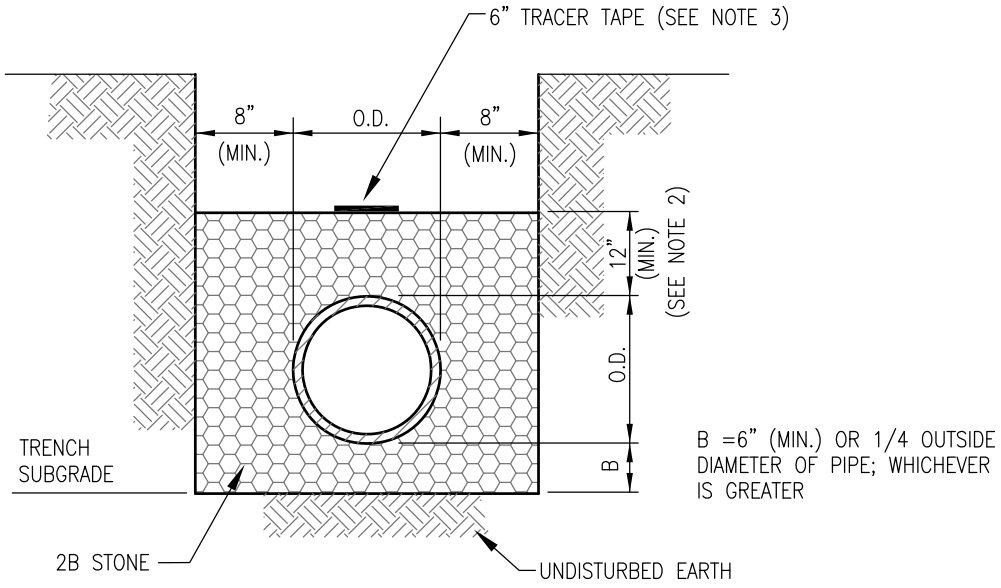
SECTION A–A

MAXIMUM SPACING	
36' C/C	20% TO 35% SLOPES
24' C/C	35% TO 50% SLOPES
16' C/C	50% OR GREATER SLOPES

REINFORCED CONCRETE SLOPE ANCHORS

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
REINFORCED CONCRETE SLOPE ANCHORS	Date:	Detail No.	**CKS Engineers, Inc.**
FOR UTILITY LINES	11/29/18	SD–G–02	88 South Main Street, Doylestown, PA 18901 (215) 340-0600



WATER MAINS, GRAVITY SANITARY SEWERS AND FORCE MAINS

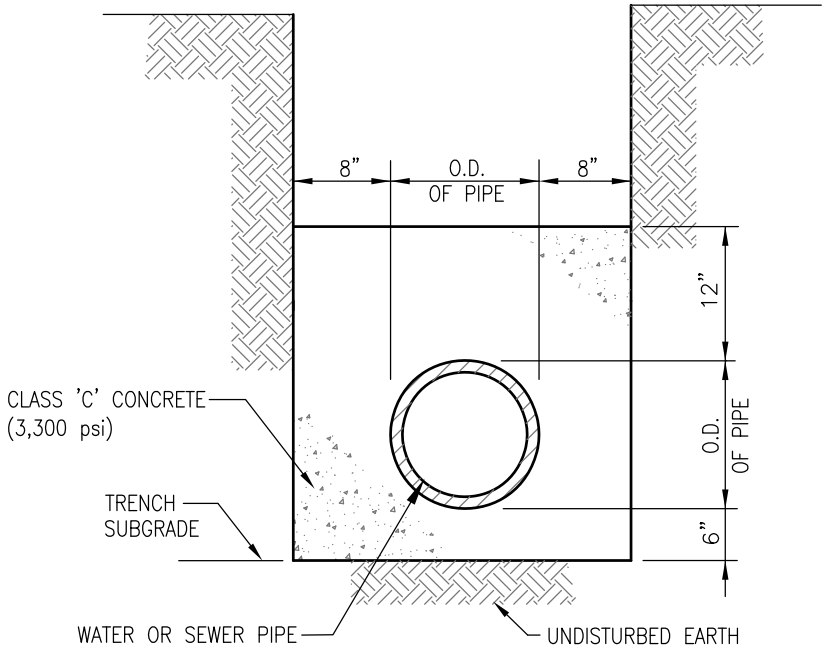
BEDDING DETAILS

N.T.S.

NOTE:

1. CONTRACTOR TO COMPLY WITH CURRENT OSHA STANDARD 29 CFR 1910/1926 FOR TRENCH DIMENSIONS, SLOPING, BENCHING, SHORING AND INSPECTIONS.
2. STONE BEDDING SHALL EXTEND 12" ABOVE PIPE UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
3. TRACER TAPE TO BE PLACED ON TOP OF STONE BEDDING ALONG ALL SANITARY SEWER FORCE MAIN AND LOW PRESSURE SEWER SYSTEM PIPING.
4. SCREENINGS MAY BE SUBSTITUTED FOR 2B STONE IN BEDDING FOR COPPER WATER SERVICE PIPE UPON APPROVAL OF THE ENGINEER.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
CRUSHED STONE			
BEDDING FOR PIPE	Date: 11/29/18	Detail No. SD-G-03	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600

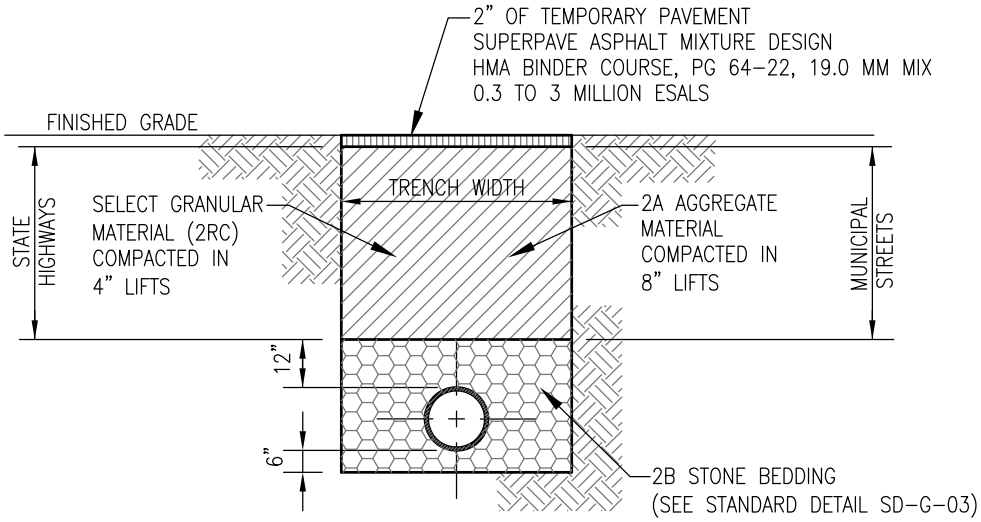


NOTE:
CONTRACTOR TO COMPLY WITH CURRENT OSHA STANDARD 29 CFR 1926 FOR TRENCH DIMENSIONS, SLOPING, BENCHING, SHORING AND INSPECTIONS.

TYPICAL CONCRETE ENCASEMENT DETAIL

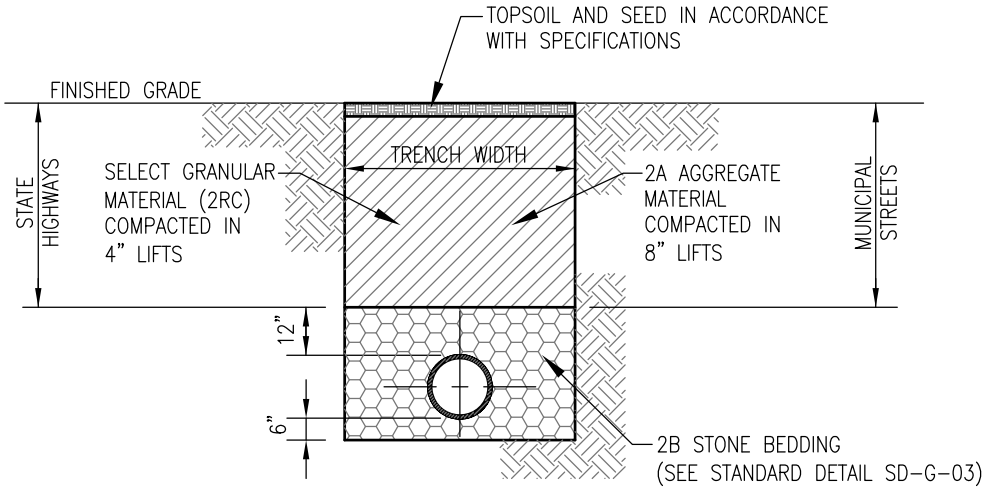
N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
CONCRETE ENCASEMENT FOR PIPE	Date: 11/29/18	Detail No. SD-G-04	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



PAVED STREET OR DRIVEWAY – TEMPORARY RESTORATION

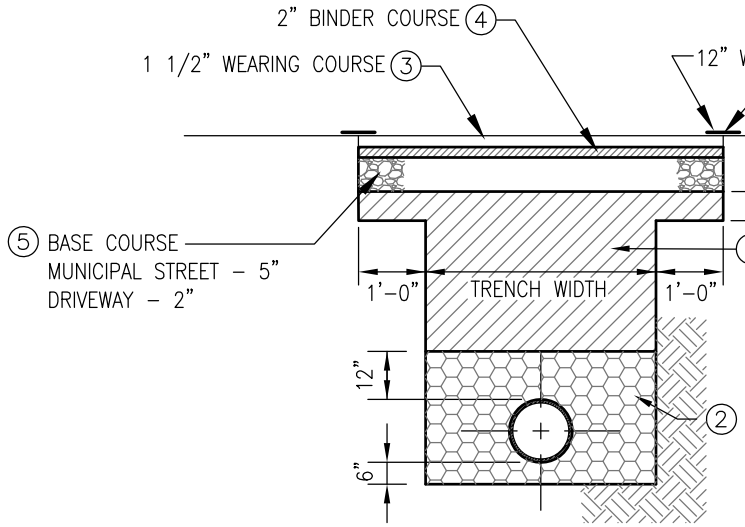
N.T.S.



UNPAVED STREET OR SHOULDER TEMPORARY AND PERMANENT RESTORATION

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
TEMPORARY PAVEMENT AND UNPAVED STREET RESTORATION	Date:	Detail No.	**CKS Engineers, Inc.**
TRENCH BACKFILL	11/29/18	SD-G-05	88 South Main Street, Doylestown, PA 18901 (215) 340-0600

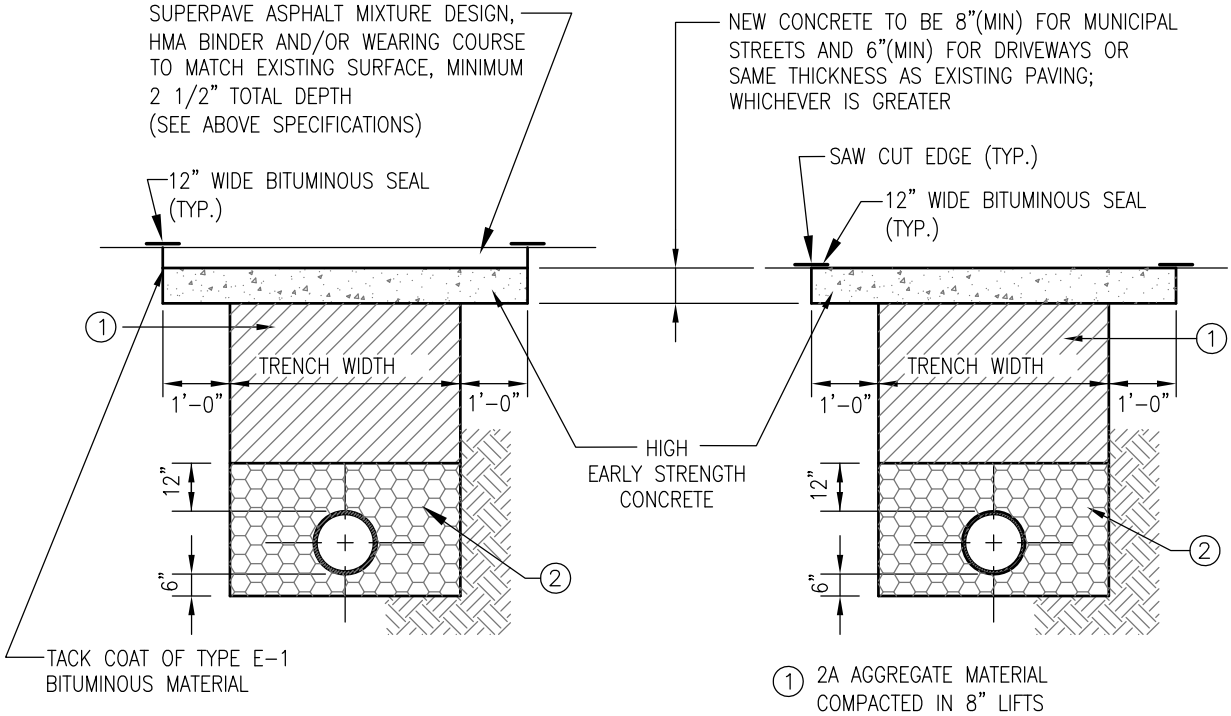


1. 2A AGGREGATE MATERIAL COMPACTED IN 4" LIFTS
2. 2B STONE BEDDING (SEE STANDARD DETAIL S–G–03)
3. SUPERPAVE ASPHALT MIXTURE DESIGN, HMA WEARING COURSE, PG 64–22, 9.5 MM MIX, SRL–H
4. SUPERPAVE ASPHALT MIXTURE DESIGN, HMA BINDER COURSE, PG 64–22, 19.0 MM MIX
5. SUPERPAVE ASPHALT MIXTURE DESIGN, HMA BASE COURSE, PG 64–22, 25.0 MM MIX

BITUMINOUS PAVING – PERMANENT RESTORATION

N.T.S.

NOTE: ESAL VALUE FOR SUPERPAVE ASPHALT MIXTURE DESIGNS SHALL BE BASED UPON ROAD CLASSIFICATION (SEE SPECIFICATIONS)



1. 2A AGGREGATE MATERIAL COMPACTED IN 8" LIFTS
2. 2B STONE BEDDING (SEE STANDARD DETAIL SD–G–03)

CONCRETE BASE WITH BITUMINOUS WEARING SURFACE

FULL DEPTH CONCRETE PAVEMENT RESTORATION

CONCRETE PAVING – PERMANENT RESTORATION

N.T.S.

STANDARD DETAIL

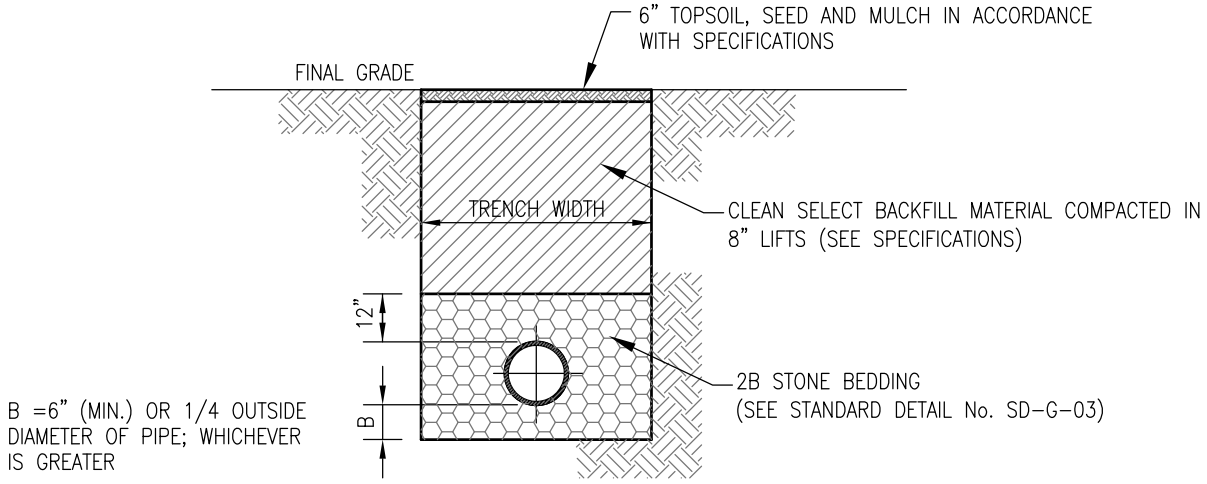
PERMANENT MUNICIPAL STREET OR DRIVEWAY RESTORATION

TRENCH BACKFILL AND PAVING

BEDMINSTER MUNICIPAL AUTHORITY

BUCKS COUNTY, PENNSYLVANIA

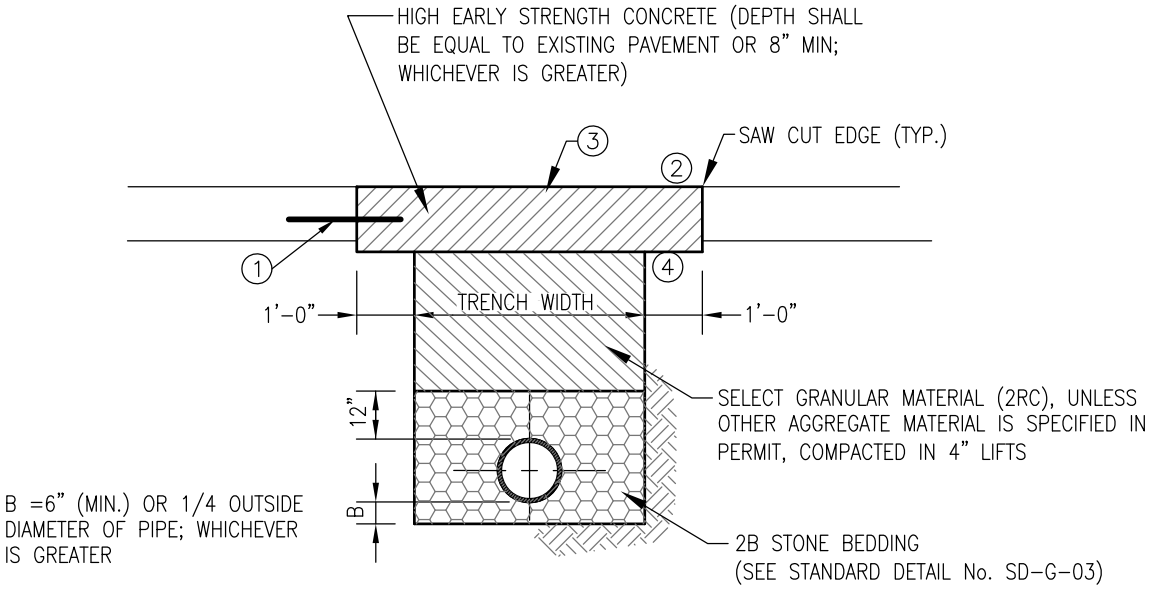
Date:	Detail No.	
11/29/18	SD–G–06	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



UNIMPROVED AREA BACKFILLING AND RESTORATION DETAIL

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
UNIMPROVED AREA RESTORATION			
TRENCH BACKFILL AND SEEDING	Date: 11/29/18	Detail No. SD-G-07	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



(1) ON REINFORCED CONCRETE PAVEMENT, PLACE REINFORCING STEEL, TIE BOLTS, AND LOAD TRANSFER DEVICES IN ACCORDANCE WITH RC-26M OF PENNDOT STANDARDS FOR ROADWAY CONSTRUCTION (LATEST EDITION)

(2) SURFACE TEXTURE SHALL BE IN ACCORDANCE WITH SECTION 501.3(k) OF PENNDOT SPECIFICATIONS, PUB. 408 (LATEST EDITION)

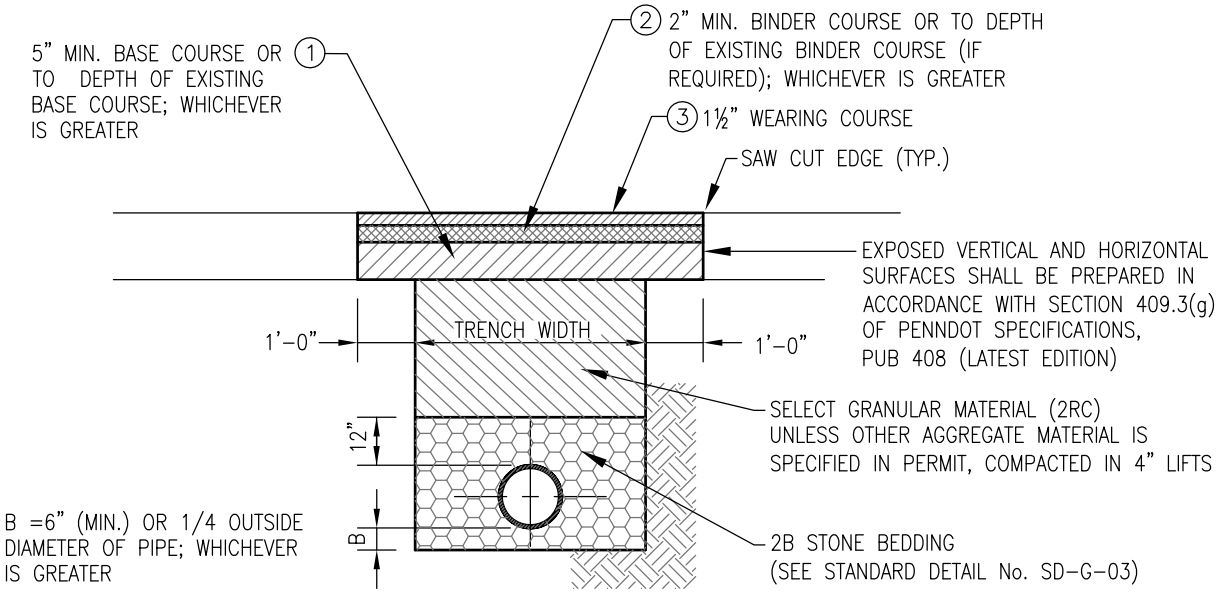
(3) LIMITS OF CONCRETE REPLACEMENT SHALL BE IN ACCORDANCE WITH SECTION 459.8(i) OF PENNSYLVANIA CODE, TITLE 67, CHAPTER 459, OCCUPANCY OF HIGHWAYS BY UTILITIES.

(4) CUT BACK IS NOT REQUIRED BEYOND A TRANSVERSE OR LONGITUDINAL JOINT OR CURB.

PENNDOT ROADS OR DRIVEWAYS – RIGID PAVEMENT RESTORATION

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
PENNDOT ROADS OR DRIVEWAYS			
RIGID PAVEMENT RESTORATION	Date: 11/29/18	Detail No. SD-G-08	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600



① SUPERPAVE ASPHALT MIXTURE DESIGN,
HMA BASE COURSE,
PG 64-22, 25.0 MM MIX

② SUPERPAVE ASPHALT MIXTURE DESIGN,
HMA BINDER COURSE,
PG 64-22, 19.0 MM MIX

③ SUPERPAVE ASPHALT MIXTURE DESIGN,
HMA WEARING COURSE,
PG 64-22, 9.5 MM MIX

NOTE: ESAL VALUE FOR SUPERPAVE ASPHALT MIXTURE DESIGNS SHALL BE BASED UPON ROAD CLASSIFICATION (SEE SPECIFICATIONS)

PENNDOT ROADS OR DRIVEWAYS – FLEXIBLE PAVEMENT RESTORATION

N.T.S.

STANDARD DETAIL	BEDMINSTER MUNICIPAL AUTHORITY BUCKS COUNTY, PENNSYLVANIA		
PENNDOT ROADS OR DRIVEWAYS			
FLEXIBLE PAVEMENT RESTORATION	Date: 11/29/18	Detail No. SD-G-09	**CKS Engineers, Inc.** 88 South Main Street, Doylestown, PA 18901 (215) 340-0600