STANDARD SPECIFICATIONS AND DETAILS FOR SEWER LATERAL CONNECTIONS, PIPE ADDITIONS AND EXTENSIONS TO THE SANITARY SEWER SYSTEM

Norristown Municipal Waste Authority
Montgomery County, Pennsylvania

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RV&B REMINGTON VERNICK & BEACH ENGINEERS

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PART 1 - GENERAL INFORMATION

A. Definitions

1. Authority - The Norristown Municipal Waste Authority (NMWA).

2. Contractor - The person(s), firm, or corporation with whom the DEVELOPER has executed a contract, formally or informally, for the construction of the PROJECT. All Contractors shall be licensed in the Commonwealth of Pennsylvania and be registered locally with the Municipality to perform work.

3. Developer – The person(s), firm, or corporation with whom the AUTHORITY has executed an improvement Agreement covering the WORK to be performed, and shall be responsible for the completion of the work.

4. Developer Drawings - The DRAWINGS 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 or the MUNICIPALITY, or both.

5. Engineer - The consultant appointed and whose services are retained by the AUTHORITY or the MUNICIPALITY, or both, for the performance of engineering services.

6. Licensed Plumber – The contractor constructing the sanitary sewer components of the PROJECT must be a Master Plumber licensed in the Commonwealth of Pennsylvania and be registered as such in the MUNICIPALITY.

7. Municipality – The Municipality of Norristown.

8. Project - The entire construction to be performed as provided in the DRAWINGS and SPECIFICATIONS.

9. Specifications - The Technical Section(s) and Standard Detail(s) adopted by the AUTHORITY or the MUNICIPALITY, or both, and as may be amended from time to time.

10. Work - Any and all obligations, duties, and responsibilities necessary to 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, supervision, engineering and inspection, and other incidentals.

B. Scope

These specifications cover the requirements for lateral connections, pipeline additions, extensions and repairs to the Authority's sanitary sewer system. All work, including connections, additions, extensions and repairs shall be completed in accordance with the requirements of the *Norristown Municipal Waste Authority Rates, Rules & Regulations* and these specifications. The work shall include furnishing of all plans, labor, supervision, engineering and inspection, 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 licensed contractors, employing qualified, careful and experienced workmen.

The Municipality and Authority reserve the right to establish special supplemental requirements for any given connection, addition, extension or repair based upon unique features of the specific project, recent changes in standard sewer system operating and construction practices which may not be reflected within the specifications as herein contained, or for other legal or administrative reasons which the Municipality and/or Authority may identify, including, but not limited to, quality of wastewater discharged to the Authority sewer system.

C. Submittals

Prior to the start of construction, the developer shall submit to the Authority utility plans, designed and sealed by a Professional Engineer, Architect or Land Surveyor, licensed in the Commonwealth of Pennsylvania, for the project. The Authority will approve requests for sewer service only after it has approved the utility plans. Single service connections may be submitted by a developer or licensed contractor.

These sewer pipeline addition and extension plans may be part of subdivision of land development plans prepared to meet regulatory requirements pertaining to land development activities, or the plans may be specifically prepared to meet the requirements of the Authority. Four (4) copies of each set of submission documents must be submitted to the Authority. When the plans describing the proposed work are found to be acceptable for construction by the Authority, four (4) copies of the final plans, 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" plans 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, and other necessary sewer 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, along with the location of the existing sanitary sewer, the existing and proposed sewer mains, and all other proposed and existing underground utilities within the project site.

All drawings shall contain details for the proposed sanitary sewer facilities. Details should be sufficient for construction of the facilities, and should include, but not necessarily be limited to, restoration details, excavation, pipe bedding, backfill, utility crossing details, standard installation details for sanitary sewer manholes, sanitary sewer laterals, pumping stations 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 plans which reasonably address the Authority's requirements. It shall not be the Authority's responsibility to design such extensions or additions.

Shop Drawings: Two (2) sets of Shop Drawings for any material or equipment shall be submitted to the Authority prior to the installation of such material or equipment.

D. Authority Review Costs

The developer shall agree to pay all engineering, inspection, legal and administrative costs incurred by the Authority in the review of the utility plans, in accordance with Article III of the Authority's *Rates, Rules and Regulations*. These costs shall be in addition to and separate from any costs which may be required by the Municipality or the Montgomery County Planning Commission.

E. Developer's Agreements

In all cases where a sanitary sewer will be extended, the Developer shall enter into a Developer's Agreement with the Authority before commencing any work on the project, in accordance with the Article III of the Authority's *Rates, Rules & Regulations*.

F. Construction Completion Security

The Developer shall provide the Authority with security to insure completion of the sewer facilities. This security shall be in the amount of one hundred ten percent (110%) of the estimated construction cost of the sewer facilities as determined and sealed by a professional engineer licensed in Pennsylvania. Said security shall be in the form of a completion bond (i.e. performance bond) issued by a reputable insurance company, or surety, licensed to do business in Pennsylvania and approved by the Authority's Solicitor as to form and manner of execution. At the Authority's discretion, an irrevocable letter of credit drawn on a bank or lending institution acceptable to the Authority, in the form and manner approved by the Authority's Solicitor may be substituted for the completion bond.

Similarly, a cash escrow deposit to be maintained by the Authority in a non-interest bearing escrow account may also be substituted for the maintenance bond.

G. Inspection of Work

The Developer shall establish with the Authority an escrow account in an amount sufficient to cover the established cost of construction inspection, 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 Authority a minimum of two (2) days in advance of the commencement of construction work, so that appropriate construction inspection time may be scheduled. No work shall be performed in the absence of construction inspection, and any work performed without construction inspection may need to be re-excavated, exposed and observed by the Authority's representatives as ordered by the Authority at the developer's expense. Any defective work or work not conforming to the specifications will be replaced to the satisfaction of the Authority at no expense to the Authority. The allowable working days are Monday through Friday of any week, excluding holidays. Allowable working hours are seven (7) AM to four (4) PM. Additional working hours and days may be requested by the Developer. 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 of the construction.

H. Record Plans

Before acceptance of the system extensions and additions, the Developer shall prepare and deliver to the Authority, as built record plans consisting of one (1) set of reproducible mylars, three (3) sets of paper prints and one (1) digital copy of the data delineating the sanitary sewer facilities actually installed. The as built record plans shall clearly show the location, size, material and depth of all sanitary sewer facilities and shall be free of extraneous markings which may obscure the sewer facilities. The material, size and location of all facilities shall be shown, and the plans shall be signed and sealed by a professional Engineer or Land Surveyor licensed in the Commonwealth of Pennsylvania. The adequacy of the record plans will be determined by the Authority, in its sole discretion.

I. Acceptance of System Extensions and Additions

After the sewer facilities have been added to or extended from the existing system, and after these facilities 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 facility shall become the responsibility of the Norristown Municipal Waste Authority until a deed of dedication has been fully executed by the Developer and 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 but not less than $5,000.00. Said security shall be in the form of a maintenance bond issued by an insurance company, or surety, licensed to do business in Pennsylvania. At the Authority's discretion, an irrevocable letter of credit drawn on a bank or lending institution acceptable to the Authority, in the form and manner approved by the Authority's Solicitor, may be substituted for the maintenance bond. Similarly, a cash escrow deposit to be maintained by the Authority in a non-interest bearing escrow account may also be substituted for the maintenance bond. 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 government agencies including applying for and obtaining the necessary permits and approvals. Agencies include, but are not limited to, the Department of Environmental Protection, the Montgomery County Conservation District, and Pennsylvania Department of Transportation.

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

All roadway 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 Three - Standard Details of this exhibit are provided as a reference only. Actual restoration requirements shall be confirmed with the Department of Transportation and Municipality, or other local municipal government prior to submission to the Authority for review.

K. Septic Tank Closure

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

1. The existing lateral shall be cut off at the building wall foundation and permanently sealed.
2. The contractor shall connect new piping in accordance with the 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 requirements.
4. The existing septic tank shall be backfilled with 2A modified stone.

5. Closure of the septic tank shall be inspected by the Authority, local municipality and Montgomery County, as applicable.
6. All such work shall also comply with any requirements of Pennsylvania DEP and Montgomery County.

L. Low Pressure Sewer Systems and Package Grinder Pump Stations

When site conditions do not permit the construction of a standard gravity sewer lateral, the AUTHORITY will consider allowing a low-pressure force main and grinder pump connection. Such installations will require special approval by the AUTHORITY, and in such case, the Developer shall meet or exceed the minimum design requirements for a low pressure sewer system and package grinder pump station as provided in the Pennsylvania Department of Environmental Protection's Domestic Wastewater Facilities Manual, latest edition, and as specified by the AUTHORITY. The AUTHORITY will specify the grinder pump and assembly requirements for such installations The AUTHORITY will also require execution of a maintenance agreement with the DEVELOPER to allow the AUTHORITY access to the force main and grinder pump appurtenances in the event that the DEVELOPER fails to maintain the system.

M. Standard Notes

The following notes and/or notations shall be clearly shown on the plans during preparation by the DEVELOPER and/or the DEVELOPER'S engineer:

1. Pipes should be buried a minimum of 4 feet to top of pipe with a minimum of 18 inches vertical separation or a minimum horizontal separation of 10 feet from other utilities and that all requirements of PADEP apply.
2. The sanitary sewer pipes and appurtenances must be constructed in accordance with the requirements of the Norristown Municipal Waste Authority.
3. A notation should be placed on the plans stating that the sewer pipes and appurtenances will (or will not) be dedicated to the Authority.

N. New Connections to Existing Laterals

When development takes place on a property previously served by an existing sanitary sewer lateral, the AUTHORITY may allow the DEVELOPER to connect to an existing sewer lateral. Before such a connection will be approved, the DEVELOPER must first locate and uncover the existing lateral on the property and perform closed-circuit television (CCTV) inspection of the existing lateral out to the sanitary sewer main. A copy of the CCTV inspection video must be submitted to the AUTHORITY for review by its Engineer. If the lateral is properly connected to the sanitary sewer system and is in acceptable condition, the AUTHORITY will approve connection to and use of the existing lateral. Otherwise, the AUTHORITY will inform the DEVELOPER of any repairs required before approval can be granted.

O. Individual Residential Connections

In the special circumstances of applications for sanitary sewer lateral connections to serve a single (1) EDU residential property, the Authority will work with the applicant to streamline the approval process in obtaining the sewer connection approval. The Authority requires that all work to construct the lateral connection be performed by a licensed plumber. The applicant must provide the name and contact information for the licensed plumber to the Authority before construction begins.

PART 2 - STANDARD TECHNICAL SPECIFICATIONS

SECTION 02225	TRENCH EXCAVATION, PROTECTION, BACKFILL AND MAINTENANCE
SECTION 02575	TRENCH REPAVING AND RESTORATION
SECTION 02730	MATERIALS, TESTS AND INSTALLATION – SANITARY SEWER SYSTEMS
SECTION 02999	SPECIAL CROSSINGS

NORRISTOWN MUNICIPAL WASTE AUTHORITY
Montgomery County, Pennsylvania

STANDARD SPECIFICATIONS

SECTION 02225

TRENCH EXCAVATION, PROTECTION, BACKFILL AND MAINTENANCE

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SECTION 02225

TRENCH EXCAVATION, PROTECTION, BACKFILL AND MAINTENANCE

1.1 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 shown otherwise on the DEVELOPER'S approved 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 structures above or below ground; in which case, hand excavation methods shall be employed. No tunneling, boring, or forcing will be allowed without prior 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 DEVELOPER'S approved drawings, as specified herein, or as directed by the AUTHORITY. All excavated materials not required or suitable for backfill shall be removed from the job site and disposed of in a legal manner by the CONTRACTOR, or otherwise disposed of as directed or specified.

C. Where required by the Montgomery County Conservation District, or the Pennsylvania DEP, the CONTRACTOR shall install silt fence or other protective measures around stockpiled excavated material to prevent erosion.

D. 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.

1.2 REMOVAL OF PAVEMENT AND STORAGE OF MATERIALS

A. The CONTRACTOR shall remove all pavements, road surfaces, curbing, driveways, and sidewalks within the lines of excavation. Concrete pavements shall be opened by sawing and asphalt pavements by cutting to neat straight lines with channeling machines, hand operated pneumatic tools, or by such other methods as will furnish a clean cut in the pavement and base without undue shattering. All concrete curbing, driveways, or sidewalks within the lines of excavation shall be broken up and removed and disposed of in a legal manner 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 grub and clear the surface and 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 the excavated materials 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 perishable, deleterious 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 disposed of in a legal manner by the CONTRACTOR. 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 and shall replace such material at no cost to the AUTHORITY.

C. The CONTRACTOR shall remove paving to the widths as shown on the Standard Details. If the CONTRACTOR during the course of the Work, 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 streets, the CONTRACTOR shall provide suitably tight vehicles, including covering the material with a tarp, for this purpose. The CONTRACTOR shall provide street cleaning equipment when required to keep the street free of dirt, mud, gravel or other unwanted material.

1.3 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, the trench shall be protected in accordance with the requirements of any and all regulatory agencies having jurisdiction.

C. All sheeting, sheet piling, bracing, and shoring 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 a 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 or 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.

1.4 PROTECTION OF PROPERTY AND STRUCTURES

A. The CONTRACTOR shall maintain in place and 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, 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 the 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.

1.5 REMOVAL OF OBSTRUCTIONS

A. Should the position of any utility, pipe, conduit, pole, or other structures, above or below the ground, whether or not shown on the DEVELOPER's drawings, be such as to, in the opinion of the AUTHORITY, require its removal, realignment, or change in position due to the Work to be done under this Contract, the removal, realignment, or change in position will be done by, or in a manner approved by the owner of the obstructions. The CONTRACTOR shall uncover and maintain the utility or structures 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 utilities, pipes, conduits, poles, or other structures; 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.

1.6 WIDTH AND DEPTH OF TRENCHES

A. Trench Widths

1. Sides of trenches shall be kept as nearly vertical as possible, and the trenches shall be excavated true to line so that a clear space 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 eight inch (8") dimension 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. If 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 stone as approved by the AUTHORITY. In earth excavation, the trench shall be excavated as follows:

a. Gravity Sanitary Sewers and Force Mains

The trench shall be excavated to subgrade as shown on Standard Detail S-G-03. A cradle of crushed stone shall be formed to support the lower half of the pipe, with depressions being formed for the bells or couplings, and the pipe having full bearing on the bedding for its entire length. Should the trench not be excavated neatly or excavated beyond the specified subgrade, the trench shall be backfilled to the proper subgrade with crushed stone or concrete, if encasement is required.

b. Where concrete encasement of the pipe is required, either on the DEVELOPER'S approved drawings, or by order of the AUTHORITY, trench subgrade and encasement shall be as shown on Standard Detail S-G-04.

C. Unstable Subgrade

1. When the material encountered at subgrade is determined to be unstable by the AUTHORITY, it shall be removed from under and on each side of the pipe for a distance of one (1) diameter of the pipe, or as otherwise ordered by the AUTHORITY. The trench shall then be backfilled to the proper subgrade as specified in paragraph 1.6.B.1.a.

D. Unyielding Subgrade

1. When any unyielding material, such as rock, is encountered at subgrade, it shall be removed to the depths below the bottom of the pipe, as shown on Standard Detail S-G-03; and the trench shall be backfilled to the proper subgrade with crushed stone, 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 backfilled to the proper subgrade with crushed stone, or concrete if encasement is required, so that the pipe is supported along its entire length to specified lines of excavation with concrete, as directed by the AUTHORITY.

1.7 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, but in no case shall more than four hundred feet (400') of trench be opened at any one place in advance of the completed pipe.

B. Trench excavation shall be fully completed, except for the forming of the trench

subgrade, at least twenty feet (20') in advance of the pipe placement, and shall be kept free from obstruction; except that at the close of the Work day, 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 two hundred feet (200'). In state highways, all trenches in the cartway 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.

D. If Work is discontinued on any trench, except by order of the AUTHORITY, and the excavation remains open for an unreasonable length of time, in the opinion of the AUTHORITY, the CONTRACTOR shall backfill such trench, if so directed by the AUTHORITY. The CONTRACTOR shall assume all cost related to backfilling of trenches.

1.8 ACCOMMODATION OF TRAFFIC

A. The Work in all streets and highways shall be governed by the regulations of the governmental agency having jurisdiction, and the CONTRACTOR shall comply with these requirements.

1. Work zone traffic control shall be in accordance with PennDOT Publication 203, latest edition.

B. Streets shall not be obstructed; unless the AUTHORITY, in writing, shall authorize or order 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. The roadway on at least one side of the trench shall be kept open at all times. The CONTRACTOR shall provide properly trained traffic flagmen when required for the safe movement of vehicular and or pedestrian traffic. The CONTRACTOR shall assume all cost related to traffic safety.

C. The CONTRACTOR shall construct and maintain bridges over excavations as may be necessary 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 access to fire hydrants.

D. A straight and continuous passageway for pedestrian use, at least three feet (3') in width, shall be maintained clear from all obstruction on sidewalks and over crosswalks, where the Work to be performed does not lie under the sidewalk. If the Work lies under the sidewalk, the sidewalk may be closed to pedestrian traffic as

needed to perform the work. An 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 garages and other places.

F. The CONTRACTOR shall, in all cases, so arrange the Work to cause the least inconvenience to property owners consistent with the proper and safe execution of the Work, as determined by the AUTHORITY.

1.9 ACCOMMODATION OF DRAINAGE

A. The CONTRACTOR shall keep all excavation free from surface or subsurface water while the Work is in progress. The CONTRACTOR shall use all means necessary for this purpose, including temporary pumps to lowering the water table below the trench subgrade. The CONTRACTOR shall provide for the disposal of the water removed from excavations in such manner as shall not cause injury to the public health, to 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. The safe pumping of ground or surface water shall comply with any State or County regulation over such pumping operation.

B. Gutters, storm sewers, drains, swales and ditches shall be kept open at all times to accommodate surface drainage. The CONTRACTOR shall not direct any flow of water across pavements, except through pipes or troughs.

C. The draining of the trench shall be such that no water will be permitted to rise upon or flow through newly installed pipe, nor accumulate in the trench until after any concrete has been properly cured. 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 the trenches.

D. In open watercourses, swales, ditches, or pipes, encountered during the progress of the Work, the CONTRACTOR shall provide for the protection and securing of a continuous flow in such watercourses or pipes and shall repair any damage that may be done to them, in the course of the Work, at no cost to the AYTHORITY.

1.10 EXCAVATION OF UNYIELDING MATERIALS

A. Unless otherwise directed by the AUTHORITY, unyielding material shall be removed at least twenty-five feet (25') in advance of pipe laying, to the depths and widths as specified in Paragraph1.6.

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, catch basins, inlets, or other special 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 Developer's 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. Protective measures must be used to ensure safety to adjacent property and surrounding utilities. The CONTRACTOR shall be solely responsible for injury to persons or damage to property that may result from the use of explosives. All blasting shall be performed under the supervision of a licensed blaster, and shall be subject to federal, state, county, and local regulations.

B. Only small amounts of explosives shall be kept at any one place and shall be kept under lock and key. The key shall be entrusted only to a responsible person. Caps and detonators shall not be kept in the same place as 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 Paragraph 1.6. All methods of tunneling proposed for use shall be subject to the approval of the AUTHORITY.

B. Where tunneling or jacking is performed under state highways or railroads, Work shall be performed in accordance with the regulations of the affected agency.

C. Casing conduits – see paragraph 1.2 in Section 02999, Special Crossings.

1.13 PIPE LAID IN EMBANKMENTS

A. When pipe is to be installed in fill, the embankment shall be constructed to at least one foot (1') above the proposed top of the pipe. The embankment shall then be excavated to the proper form and grade, in accordance with Item 1.6 and the pipe installed. The embankment shall then be constructed to not less than three and one-half feet (3-1/2') above the top of the pipe. The CONTRACTOR shall take all precautions not to damage the newly installed pipe during the construction of the embankment.

1.14 BACKFILLING

A. Extent of Backfill

1. Backfilling shall include all filling, ramming, or rolling, the re-grading of adjacent disturbed areas, the replacing of drains, and other surface and subsurface structures, the placing and maintaining of temporary sidewalks and driveways, furnishing of additional suitable backfill materials, if necessary, reseeding or resodding of lawns, and replacing trees and shrubbery damaged by the CONTRACTOR, together with all related Work.

B. Backfill Material

1. Only 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 across entire width of trench, or for backfilling around structures and appurtenances. For sanitary sewer pipe, storm sewer pipe, water mains, and force mains, this material shall consist of 2B stone as described in paragraph 1.6.B.

2. If the trench is located within a street, street right-of-way, a sidewalk area or a potential future street right-of-way (as determined by the municipality), the remainder of the trench shall be backfilled using No. 2A modified aggregate as defined by the Specifications of the Pennsylvania Department of Transportation (PennDOT) Form 408, latest Edition, and shown in the Standard Details S-G-05 and S-G-06. Other backfill material other than No. 2A modified aggregate 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 grassed areas such as yards and lawns, backfilling under and along the sides of the pipe and to a height of one foot (1') over the top of the pipe and across the entire width of trench shall be as described in paragraph 1.14.B.1. From one foot (1') above top of pipe to the surface grade elevation, material excavated from the trench may be used if free of stones larger than four inches (4") in size and free of wet, frozen, organic or deleterious materials. Foreign material meeting the same requirements may be used.

C. Method of Backfilling

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

   a. For rigid conduits, after the pipe and its appurtenances have been installed, the trench shall be backfilled to the ground surface with

material, as described in paragraph 1.14.B, in twelve inch (12") layers and in such a manner as not to disturb the pipe. The fill material shall be solidly compacted around the pipe. The fill material shall be carefully placed by hand with shovels to a level at least one foot (1') above the top of the pipe.

b. For flexible conduits, after the pipe and its appurtenances have been installed, fill 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 fill 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 in twelve inch (12") layers and in such a manner as not to disturb the pipe.

c. Unpaved municipal streets, street right-of-way, sidewalk area, or a potential future street right-of-way (as identified by the municipality) shall be backfilled to the existing surface with No. 2A modified aggregate as shown on Standard Detail S-G-05.

2. Paved Municipal Streets

a. The CONTRACTOR shall backfill the trench as described in paragraph 1.14.C.1 above, and temporary paving shall be placed as described in Item SECTION 02575 – TRENCH REPAVING AND RESTORATION of these Specifications and Standard Detail S-G-05.

3. State Highways and State Highway Shoulders

a. CONTRACTOR shall comply with backfilling requirements of the PA Department of Transportation, Publication 408, latest Edition. In the absence of any specific requirements from PADOT, the CONTRACTOR shall comply with paragraph b. below.

b. After the pipe and its appurtenances have been installed, the trench shall be backfilled to a height of one foot (1') above the top and across full width of trench of the pipe with 2B stone deposited in 12 inch (12") layers and in such a manner as not to disturb the pipe. The fill material shall be placed by hand with shovels and solidly compacted around the pipe. The trench shall then be backfilled with No. 2A modified aggregate, as defined by the Specifications of the Pennsylvania Department of Transportation (PA DOT) Form 408, latest Edition, compacted in layers not to exceed twelve inches (12"),

using a mechanical tamper, to a level as shown on Standard Detail S-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 Work. The CONTRACTOR shall leave all roads, 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 layers not to exceed twelve inch (12") 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, the CONTRACTOR shall demonstrate the compaction by in-place density tests. For backfill in streets or other paved areas, the actual tests that the method of compacting proposed will produce an in-place density of at least ninety-five percent (95%) of maximum laboratory density as determined by ASTM D 698. For backfill in grass or other non-paved areas, the actual tests that the method of compacting proposed will produce an in-place density of at least ninety percent (90%) of maximum laboratory density as determined by ASTM D 698.

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

D. Compaction Requirements

1. If compaction tests indicate Work does not meet the specified requirements, it shall be removed, replaced, and retested until compliance is achieved at no additional costs to the AUTHORITY.

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").

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

a. Bituminous or concrete roadways (other than PADOT 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 Publication 408 Specification, latest Edition.

d. Grassed or other non-paved Areas: 90%.

1.15 TOPSOIL, SEEDING, AND LANDSCAPING

A. Methods of placing topsoil, seeding, and landscaping shall be as specified in SECTION 02575 – TRENCH REPAVING AND RESTORATION.

1.16 TEMPORARY REPAVING AND MAINTENANCE OF TRENCH SURFACES

A. In paved and unpaved highways, streets, alleys, sidewalks, or shoulder, after the trench has been properly backfilled and compacted to the proper depths below the street grade, the trench shall be temporarily repaved in accordance with SECTION 02575 – TRENCH REPAVING AND RESTORATION. After the trench has been temporarily repaved, 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 02575 – TRENCH REPAVING AND RESTORATION.

B. The CONTRACTOR shall maintain the surfaces of all trenches, which have been temporarily repaved a minimum of ninety (90) calendar days, or longer, as directed by the AUTHORITY, until permanent pavement is placed.

C. Along 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 sinking of the trench shall be repaired by constructing to the original ground surface with clean approved fill material.

D. The CONTRACTOR shall maintain the surfaces of all trenches which have been backfilled a minimum of ninety (90) calendar days or longer, as directed by the AUTHORITY, until final restoration is performed as described in SECTION 02575 – TRENCH REPAVING AND RESTORATION.

END OF SECTION

NORRISTOWN MUNICIPAL WASTE AUTHORITY
Montgomery County, Pennsylvania

STANDARD SPECIFICATIONS

SECTION 02575

TRENCH REPAVING AND RESTORATION

INDEX

SECTION 02575

TRENCH REPAVING AND RESTORATION

1.1 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 guard rails or fences, sidewalks, curbs and gutters, driveways, or other items as directed by the AUTHORITY, which have been damaged or removed in the course of the WORK. They shall conform in size and shape, and be equal in quality of material and workmanship of the original structures prior to being disturbed.

C. All materials specified in this Section shall be as described in the specifications of the Pennsylvania Department of Transportation (PennDOT) Form 408, latest Edition.

D. Maintenance, temporary and permanent repaving, and restoration of trenches in State Highways and Municipal Roads shall be in accordance with the specifications of PennDOT Form 408, latest revision and 67 PA Code, Chapter 459, latest revision.

E. Where Work is performed in a Municipality other than the Municipality of Norristown, the DEVELOPER shall provide written confirmation from that municipality that Paragraphs 1.3.A. Sidewalks; 1.3.B. Unpaved Municipal Streets and Unpaved Shoulders; and 1.3.C. Paved Municipal Streets – Bituminous Paving and Concrete Paving of this Section 02575 are acceptable. If these specifications are not acceptable to the municipality, the DEVELOPER shall provide written documentation as to what construction specifications will be acceptable to the applicable municipality.

1.2 TEMPORARY REPAVING

A. In streets, highways, alleys, driveways, or sidewalks, after the trench has been backfilled and properly compacted to the depths below the street or pavement grade hereinafter described, temporary repaving shall be installed as follows:

1. Sidewalks

Trenches shall be temporarily restored by placing and compacting No. 2A modified aggregate in accordance with SECTION 02225.

2. Unpaved Municipal Streets and Unpaved Shoulders

Trenches shall be temporarily restored by placing and compacting of No. 2A modified aggregate, in twelve inch (12") lifts as shown on Standard Detail S-G-05. This shall constitute both temporary and permanent restoration.

3. Municipal Paved Streets

Trenches shall be temporarily restored by placing and compacting twelve inches (12") of 2A aggregate followed by the following method:

Bituminous stockpile patching material, PennDOT Bulletin 27, shall be applied with a minimum thickness of two inches (2"), thoroughly rolled and compacted.

1.3 PERMANENT REPAVING

A. Sidewalks

1. Unless otherwise ordered by the AUTHORITY, or required by local regulations, the CONTRACTOR shall remove or compact the top four inches (4") of aggregate and a concrete sidewalk four inches (4") thick shall be constructed to replace sidewalk removed as a result of the WORK. Sidewalk width shall be the same as the width of the sidewalk replaced. All concrete shall conform to SECTION 02730 of these specifications, shall be air entrained and the total air content shall be six percent (6% +/- 1%) by volume. The air-entraining admixture shall conform to ASTM C 260.

B. Unpaved Municipal Streets and Unpaved Shoulders

Permanent restoration of unpaved municipal streets and shoulders shall be as outlined in Paragraph 1.2.A.2 of this Section and Standard Detail S-G-05.

C. Paved Municipal Streets – Bituminous Paving and Concrete Paving

The temporary 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 cartway surface and base without undue disturbance to subgrade or fragmentation of surrounding areas for a distance of twelve inches (12") on both

sides of trench area. Prior to the placement of permanent materials, the area shall be thoroughly rolled and compacted. Permanent placement of bituminous paving shall be as outlined on Standard Detail S-G-06.

D. State Highways

1. CONTRACTOR shall determine temporary and permanent surface restoration requirements of the Pennsylvania Department of Transportation, should any of CONTRACTOR'S work occur in state highways. In the absence of any specific requirements from PADOT, the CONTRACTOR shall comply with PennDOT Publication 408, latest edition or Standard Details S-G-08 and S-G-09 at the direction of the AUTHORITY.

E. Bituminous Sealer

When the wearing course is placed adjacent to curbs to form a bituminous gutter, 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. On concrete surfaces, all joints between existing and new construction shall be sealed with a bituminous sealer. The bituminous sealer shall be a product in accordance with PennDOT Publication 408, latest Edition.

1.4 TOPSOIL, SEEDING AND LANDSCAPING

A. Temporary Seeding

1. All areas shown on the DEVELOPER'S drawings, all disturbed areas where construction activity has or will cease for more than thirty (30) days, and where otherwise directed by the AUTHORITY shall be seeded with the following, according to season, at a rate of one (1) pound per one thousand (1,000) square feet.

   a. Annual Rye Grass - March 1 to June 15
   b. Sudangrass - May 15 to August 15
   c. Winter Rye - September 15 to October 15

2. All seed shall be labeled, dated and of quality consistent with paragraph B.

B. Permanent Seeding and Landscaping

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

2. A minimum of four inches (4") of topsoil shall be spread over areas to be seeded. Topsoil shall be free of stones, sticks, waste material and similar debris. Frozen ground shall not be spread as topsoil, and topsoil shall not be spread on frozen ground. 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 AUTHORITY.

3. After spreading and raking the topsoil, the following shall be spread and worked in to depths of three inches (3") to four inches (4"):

   a. Hydrated lime or Agricultural ground Limestone - 90 to 100 pounds per 1,000 square feet.
   b. 0-20-20 Fertilizer - 50 to 75 pounds per 1,000 square feet.

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

5. Grass seed shall not be planted after a heavy rain or watering and not sooner than one (1) week after applying lime and fertilizer, as described above.

6. Immediately before seeding, the following shall be spread and worked in to a depth of one inch (1"):

   a. 10-10-10 Fertilizer - 10 to 12 pounds per 1,000 square feet.

7. All seeds used shall be labeled in accordance with the U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in Effect at the time of purchase, which shall be later than the date of this 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 be retested for germination rate no more than ninety (90) days prior to use.

8. Seeding and planting shall be as follows:

a. Sloped Areas 30 degrees and less

Seed	Parts	Purity Percentage	Seed Spreading Rate/1,000 S.F.
Kentucky 21 Fescue	100	100	8 lbs.
Or			
Kentucky Blue Grass	100	100	2.5 lbs.

b. Sloped Areas Greater than 30 degrees

Seed	Parts	Purity Percentage	Seed Spreading Rate/1,000 S.F.
Penngift Crown Vetch	25	99	3 lbs.
Kentucky Tall Fescue	75	95	3 lbs.

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 rain washed gullies with top soil, reseeding, replanting, mowing and watering during periods of drought and removal of large and obnoxious weeds, all as directed by the AUTHORITY.

C. Mulching

After temporary or permanent seeding, the CONTRACTOR shall furnish, place, anchor and maintain a mulch at the locations shown on the DEVELOPER'S drawings and as directed by the AUTHORITY. Mulching material shall be either hay or straw, or a combination of both, 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 seventy-five (75) to one hundred (100) pounds per one thousand (1,000) square feet.

D. Jute Matting

1. Jute matting shall be placed as shown on the DEVELOPER'S drawings or as otherwise directed by the AUTHORITY. Jute matting shall consist of

undyed jute yarn woven into a uniform open plain weave mesh with approximately one inch (1") square openings and weighting not less than ninety (90) pounds per one hundred (100) square yards.

2. It shall be furnished in rolls not less than forty-eight inches (48") wide. After soil areas have been prepared and seeded, the jute matting shall be unrolled parallel to the direction of flow without stretching and be anchored as described below with No. 8 gage steel wire staples, bent U-shaped with a throat width of one (1) to two (2) inches, and with an effective driving depth of not less than six inches (6"). The matting shall be spread evenly and smoothly and be in contact with the soil or mulch at all points. The up channel end of each roll or section shall be buried a minimum depth of six inches (6") in a vertical slot, which shall be backfilled and tamped, and shall be overlapped twelve inches (12") by any subsequent up channel sections.

3. Where two (2) or more widths of matting are placed side by side, the upper mat shall overlap the lower by not less than four inches (4"), and shall be stapled along the overlap at three foot (3') intervals. The unlapped edges of all matting shall be stapled at six-foot (6') intervals.

4. The CONTRACTOR shall maintain the jute matting until all the WORK has been completed and accepted by the AUTHORITY.

1.5 MAINTENANCE AND RESTORATION

A. In paved and unpaved highways, streets, alleys, sidewalks and shoulders, temporary repaving shall be maintained for a minimum of 90 days, or as otherwise directed by the AUTHORITY, before permanent paving is installed. During this period, any sinking or other deterioration of the trench shall be repaired in accordance with the requirements of paragraph 1.2. 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) days after backfilling, or as otherwise directed by the AUTHORITY before permanent restoration is made. During this period, any sinking of the trench shall be repaired by constructing to grade with clean, approved fill material.

C. Trenches shall be restored to the condition existing prior to 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 curbing, driveways, walkways, guard rails or fences.

D. The CONTRACTOR shall repair any sinking 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.

E. Should the CONTRACTOR fail to perform any maintenance and restoration Work, the AUTHORITY take whatever steps it deems necessary to have the maintenance and restoration Work performed by a qualified contractor and withhold that cost from payment to the CONTRACTOR.

END OF SECTION

NORRISTOWN MUNICIPAL WASTE AUTHORITY

Montgomery County, Pennsylvania

STANDARD SPECIFICATIONS

SECTION 02730

MATERIALS, TESTS AND INSTALLATION - SANITARY SEWER SYSTEMS

INDEX

SECTION 02730

MATERIALS, TESTS AND INSTALLATION - SANITARY SEWER SYSTEMS

PART 1 MATERIALS AND TESTS

1.1 GENERAL

A. Unless otherwise specified, all materials used in the Work under this Contract shall conform and shall be tested in accordance with the requirements of the Specifications of the American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), and American Water Works Association (AWWA) which are current on the date of the contract to perform the Work as outlined in this Specification.

B. No material shall be used until it has been inspected and approved by the AUTHORITY's inspector 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 inspected by the AUTHORITY. The CONTRACTOR shall be at all times liable for rejection of material or workenmanship when discovered, until completion of the maintenance period as required by the Agreement between the DEVELOPER and AUTHORITY.

C. Only materials called for in these Specifications will be permitted. The methods of installation of the materials described in this section are detailed in PART II of these Specifications.

1.2 CONCRETE AND CONCRETE WORK

A. All concrete and concrete Work shall conform to all the requirement of ACI 301, "Specifications for Structural Concrete for Buildings", and as specified and designated hereinafter. References to items, sections, and chapters are to those of the ACI 301. The current edition of the standards of the American Society for Testing and Materials (ASTM) and the American Concrete Institute (ACI) which are current on the date of the contract for Work are declared to be a part of this Specification the same as if fully set forth herein.

B. The specified ultimate compressive strength, of concrete shall be 4,000 psi after 28 days of curing. The cement shall conform with the requirements of ASTM C150, Type I. All concrete shall be air-entrained and the total air content shall be five percent (5%) (±1%) by volume. The air-entraining admixture shall conform with ASTM C 260. A water reducing admixture, conforming to ASTM C 494, may be

used, and shall be either "WRDA" with Hycol, a product of W. R. Grace & Co., or "Pozzolith", a product of Master Builders, or 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.

C. All reinforcing bars shall conform to the requirements of "Specification of Deformed Billet-Steel Bars for Concrete Reinforcement", ASTM A 615, Grade 60. Welded wire fabric shall conform to the requirements of "Specification for Welded Steel Wire Fabric for Concrete Reinforcement", ASTM A 185.

D. Loose material or backfill used to support fresh concrete shall be compacted sufficiently to maintain settlement within the dimensional requirements of ACT 347.

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

F. The AUTHORITY reserves the right to have tests performed to ensure that the concrete as furnished meets the requirements of these Specifications. If the strength tests fail to meet the concrete requirements, then the AUTHORITY may 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.

1.3 MORTAR

A. The mortar for masonry shall be either a prepared mortar conforming with the requirements of ASTM C 91, Type II, or shall be made of one (1) part 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, Type I. The lime shall be hydrated lime conforming to the requirements of ASTM C207, Type S. The sand shall conform to the requirements of ASTM C144. Water shall be potable water added to the dry ingredients in accordance with the current ACI recommendations.

1.4 GROUT

A. The grout mix shall be one (1) part cement to two (2) parts sand, plus the minimum amount of water necessary for proper placement, which shall not exceed a water to cement ration of 0.49 by weight. When permitted to stand until setting takes place, the grout should neither bleed nor segregate. Cement shall conform to the requirements of ASTM C150, Type I, 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.

1.5 CONCRETE CHAMBERS

A. Precast chambers or monolithically cast-in-place chambers, as specified below, may be used.

1. Precast Chambers

a. Manholes made of precast, reinforced concrete sections shall conform with the current edition of ASTM C478, "Precast Reinforced Concrete Manhole Sections". Special chambers and vaults made of precast, reinforced concrete sections shall conform with ASTM C857, "Standard Recommended Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures", and ASTM C858, "Standard Specifications for Underground Precast Concrete Utility Structures". Precast bases shall include an integral wall of sufficient height so that there is a minimum of two inches (2") of inside wall height below all wall openings, and a minimum of eight inches (8") of inside wall height above all wall openings. No poured-in-place bases will be permitted. The CONTRACTOR is required to submit shop drawings, which will include complete fabricated details and design calculations for each type structure.

b. Inverts shall be precast. General conformance with Standard Detail S-S-01 shall be maintained.

2. Manhole Steps

Manhole steps shall be polypropylene as manufactured by M. A. Industries, Inc. of Atlanta, Georgia, or equal. Manhole steps shall be cast into the wall.

3. Manhole Frames and Covers

a. Castings for manhole frames and covers shall be Quirin, MHR 431-8 as shown on Standard Detail S-S-04, and shall conform with the requirements of ASTM A 48, Class 30. The covers shall be self-sealing.

b. Where located in streets or subject to traffic loads, castings shall be capable of safely supporting an H-20 loading, in accordance with specifications of the American Association of State Highway and

Transportation Officials (AASHTO), with the allowance for impact included in the design.

c. Castings shall be true to pattern in form and thickness, free from cracks, gas holes, flaws, excessive shrinkage, sound, cleaned by means of sandblast, and neatly finished.

d. Runners, fins, 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.

e. Castings shall have metal bearing areas machine ground and finished to ensure satisfactory seating so that it will be impossible to rock the cover after it has been seated in its proper position in the frame. Covers shall include a flexible gasket installed in a machined groove in the lid of the casting for a watertight seal. Pickholes shall not extend completely through the cover.

f. All covers shall have **"NMWA"** cast in raised letters, which shall have a lettering height of not less than two inches (2").

1.6 POLYVINYLCHLORIDE (PVC) SEWER PIPE

A. The following materials shall be acceptable 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. Pipe 15" diameter and smaller shall conform to ASTM D3033 or ASTM D3034, SDR-35 or Type PS-46, ASTM F789.

2. Pipe 18" to 27" diameter shall conform to ASTM F679.

3. Joints: Push-on type, integral bell with elastomeric gasket shall conform to ASTM D3212 and ASTM F477.

4. PVC pipe, SDR 35, may be used for the Building Sewer on private property, except that Schedule 40 pipe will be required under any concrete building slabs.

C. Pressure Sewer Pipe and Fittings (for pipe less than 3 inches in diameter)

1. Pressure-Rated Pipe

   a. AWWA C900, PVC pressure rated pipe SDR-21 (200 psi) with ductile iron equivalent O.D. and integral bell and gaskets ASTM D2241 and ASTM F477.

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

3. Fittings: Mechanical joint-type, conforming to ANSI A21.10 and A21.11, coat inside and out with bituminous seal coat.

4. Appurtenances

   a. Cleanouts: Schedule 80 PVC pipe, fittings, couplings, and transition gaskets, installed as shown on the DEVELOPER'S drawings. Cleanouts shall have a threaded brass pipe plug with raised operating unit.

1.7. DUCTILE IRON PIPE (for pipe equal to or greater than 3 inches in diameter)

A. Pipe: ANSI A21.51, minimum thickness Class 52, with push-on type joints with rubber gaskets and cement lining.

B. Fittings: Ductile iron, mechanical joint type complying with ANSI A21.10.

C. Coating: All ductile iron pipe and fittings shall be coated inside and out with a bituminous seal coat in accordance with ANSI A21.51.

D. Rubber gaskets, lubricants, glands, bolts and nuts: ANSI A21.11.

1.8 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, at no cost to the AUTHORITY.

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

1.9 FIELD TESTS

A. All sewers shall be tested in the field after installation, in the presence of the AUTHORITY together with a representative of the CONTRACTOR, in the manner prescribed. The CONTRACTOR shall diligently follow a testing program, in a manner acceptable to the AUTHORITY, in order that approval and acceptance of completed lines may be given. In the event the CONTRACTOR fails to conform to a testing program, such failure shall be considered by the AUTHORITY as non-completion of construction.

B. All testing shall be performed after backfilling of both main line sewer and laterals; so that it is representative of the "in service" condition.

1. Visual Tests

All sewers shall be "lamped" to determine uniformly straight alignment between manholes. Visual internal inspection shall also be made to determine breaks, cracks, or other faults.

2. Television Inspection

a. A television inspection of all sewer mains shall be made. A video tape recording of the inspection shall be provided, reviewed and approved by the AUTHORITY prior to any discharge into sewer mains.

b. The cost of the testing and inspection shall be borne by the CONTRACTOR.

3. Low Pressure Air Test

Unless otherwise directed by the AUTHORITY, gravity flow sewer systems shall be tested for leakage by a low-pressure air test. The test procedure shall be, in general, as recommended by the Bay Area Committee on Air Testing, Berkeley, California. The test procedure shall be as follows:

a. The inside of the pipe shall be thoroughly cleaned, removing all debris and mortar. The sewer shall be thoroughly flushed with water to clean and wet the pipe.

b. The sewer shall be plugged at the upper and lower manholes by the

use of inflatable air-tight plugs, one of which shall be equipped with an air hose to the pipe interior.

c. The test equipment shall consist of a compressor with air bleed valve, throttling valve, and sensitive air pressure test gauge with gauge cock. This equipment shall be connected with the air hose connection to the sewer.

d. If the sewer is laid in groundwater, the elevation of groundwater level shall be determined and compensation will be made in the test pressure at the direction of the AUTHORITY.

e. Air shall be slowly added to the sewer until the pressure reaches five (5.0) psi in excess of the groundwater head. Plugs shall be checked for leaks.

h. Each sewer line joint shall be pressure tested to determine if leakage could occur, upon completion of the installation of the sewer main.

4. Infiltration Tests

In manhole sections of gravity flow sewer laid in groundwater the AUTHORITY may direct that an infiltration test be made in addition to other tests. This test shall be made by plugging all laterals and the upstream manhole and measuring the infiltration flow with a "V-notch" weir set in the sewer at the downstream manhole. The allowance for this flow shall be one hundred (100) gallons per inch of diameter per mile of pipe per day.

5. Exfiltration Test

The AUTHORITY may direct that gravity flow sewer systems be tested for leakage by an exfiltration test in addition to other tests. In general, this test shall consist of placing a suitable plug manufactured for that purpose in the sewer at the lower manhole, and filling the section with water to a head of at least one foot (1') above the top of the sewer in the upper manhole. The drop in water level in the upper manhole shall be measured and timed, in order to calculate the actual rate of exfiltration. When the difference in sewer elevations between the upper and lower manholes exceeds ten feet (10'), the CONTRACTOR will be allowed additional exfiltration, as may be determined by the AUTHORITY.

One hundred (100) gallons per inch of diameter per mile of pipe per day shall be the allowance for acceptance by this test.

6. Deflection Test of Flexible Pipe

a. All PVC pipe shall be tested for pipe deflection after backfilling. The deflection test shall be conducted after the pipe has been backfilled for at least thirty (30) days, but not longer than twelve (12) months.

b. The maximum allowable deflection for installed flexible sanitary sewer pipe shall be 5% of the original vertical internal diameter.

c. Deflection testing shall be performed with a deflectometer, calibrated internal television camera or with a properly sized go, no-go mandrel. The mandrel(s), or other testing equipment, shall be provided by the CONTRACTOR at the CONRACTOR'S expense. Mandrels shall be sized at 95% of the original vertical internal diameter of the pipe. Mechanical pulling devices for mandrels shall not be used.

d. Pipe, which exceeds the allowable deflection, shall be located, excavated, replaced, and retested by the CONTRACTOR at no expense to the AUTHORITY.

7. Testing Pressure Sewer Pipelines

a. Sewer force mains shall be tested for leakage by means of a hydrostatic pressure test as described in paragraph 1.10.

C. If the AUTHORITY believes the CONTRACTOR has damaged any utility line installed either by the CONTRACTOR or by someone else, the AUTHORITY may direct additional inspection and testing to be done on that line by the CONTRACTOR. In the event of damage, the CONTRACTOR shall repair the line at no expense to the AUTHORITY and the CONTRACTOR shall not be paid for additional inspection or testing. If no damage is found, the AUTHORITY will reimburse the CONTRATOR for the additional inspection and testing.

1.10 HYDROSTATIC PRESSURE TEST

A. All sewer lines shall be tested in the field, in the presence of the AUTHORITY together with a representative of the CONTRACTOR in the manner prescribed. The CONTRACTOR shall follow an approved testing program, in order that approval and acceptance of completed lines may be given. In the event the CONTRACTOR fails to conform to an approved testing program, such failure shall be considered by the AUTHORITY as non-completion of construction. Where any section of main is provided with concrete thrust blocks for fittings or bases, the hydrostatic pressure test shall not be made until at least five (5) calendar days after the installation of the thrust blocks, unless otherwise approved by the AUTHORITY.

B. After the pipe has been laid and backfilled, and all service connections and fire hydrants have been installed, each section of pipe between valves or temporary plugs shall receive the following hydrostatic tests. The CONTRACTOR may elect to partially backfill between joint before conducting hydrostatic tests.

C. The pipe shall be slowly filled with water and tested at a pressure fifty percent (50%) above normal working pressure, as determined by the AUTHORITY, but in no case less than one hundred fifty (150) psi, based on the elevation of the lowest point of the line or section under test. The pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the AUTHORITY. A meter to measure make-up water shall also be installed. The pump, pipe connections, taps into the pipe, and all necessary apparatus shall be furnished by the CONTRACTOR. Before applying the specified test pressure, all air shall be expelled from the pipe.

1.11 COST OF TESTING

A. Payment for all laboratory tests, mill inspections, and tests conducted by testing laboratories or agencies at the shops or mills of the manufacturers will be made by the CONTRACTOR or the DEVELOPER.

B. In addition, the CONTRACTOR shall furnish all necessary supervision, labor, equipment, and materials for field tests.

1.12 LEAKAGE TESTS FOR MANHOLES

A. All manholes shall be tested in accordance with one of the following two (2) procedures:

1. Exfiltration Test

a. The manhole to be tested shall be filled with water to within one foot (1') of the proposed top elevation of the manhole. The test shall be placed on the manhole for a period of thirty (30) minutes after which the drop in water level shall be measured. The drop shall not exceed ¼ inch.

b. In addition, no visible infiltration shall be permitted. All infiltration into each manhole shall be eliminated prior to final acceptance of the system at the date of substantial completion. Internal parging to correct infiltration shall not be permitted.

2. Vacuum Test

a. Each manhole shall be tested after assembly and prior to backfilling. All life holes shall be plugged with an approved non-shrink grout. All pipes entering the manhole shall be plugged, taking care to

securely brace the plug from being drawn into the manhole. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturers' recommendations.

b. A vacuum of ten inches (10") of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine inches (9"). The manhole shall pass if the time is greater than sixty (60) seconds for 48" diameter are, seventy-five (75) seconds for 60" diameter, and ninety (90) seconds for 72" diameter manholes.

c. If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout while the vacuum is still being drawn. Re-testing shall proceed until a satisfactory test is obtained.

PART II INSTALLATION

2.1 GENERAL

A. The CONTRACTOR shall install all sanitary sewers and appurtenances of the size and type shown on the DEVELOPER'S approved drawings and in accordance with this SPECIFICATION and pertinent recommendations of the manufacturer.

2.2 MATERIALS

A. Sanitary sewer pipe shall consist of sections of materials of the diameters and with jointing materials specified, and conforming to the requirements of PART I of this Section. Manholes and other components of the sanitary sewer system shall be as specified in PART I of this Section and SECTION 02225 – TRENCH EXCAVATION, PROTECTION, BACKFILL, AND MAINTENANCE.

2.3 LAYING GRAVITY FLOW SEWER PIPE

A. Handling

Pipe and accessories shall be distributed at the project site and at all times carefully handled to avoid damage. All pipes shall be rolled or lifted, care being taken not to bump or drop pipe or fittings. The interior and machined ends of all pipes shall be kept free from dirt and foreign matter.

B. Trench Preparation

The trench shall be excavated in accordance with SECTION 02225 of these specifications. Unless otherwise specified, a bedding of crushed stone shall be

provided for the entire sewer system. Concrete encasement shall be provided where shown on the drawings. Where rock is encountered in the excavation, or the subgrade is unstable, bedding shall be as described in SECTION 02225, paragraph 1.6.

C. Alignment and Grade

1. All pipe shall be carefully laid to the lines and grades as shown on the DEVELOPER'S approved drawings, without offsets or unevenness at the joints.

2. Alignment and grade may be set by the laser beam method, 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. The AUTHORITY recommends that the CONTRACTOR employ a registered professional engineer or licensed land surveyor in the preparation of "cut sheets ".

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

D. Installation of Pipe

1. Following the trench preparation, pipe laying shall proceed upgrade with pipe laid carefully, spigot ends fully entered into adjacent hubs, and true to 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 bed for the full length of its barrel, with recesses excavated to accommodate bells and joints. 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 unsuitable 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 mouth 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.

E. Joints

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 wye, lateral connections, bends and other fittings shall be commercially manufactured and shall be installed at the locations shown on the DEVELOPER'S approved 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 DEVELOPER'S approved drawings, an opening shall be cut in the manhole for connections to future

extensions. The opening shall then be sealed with manhole brick in accordance with previous items.

H. Joints at Manholes

Where the sanitary sewer pipe enters and exits manholes, the joint with the manhole 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 sleeve as manufactured by A-Lok Corp., Lock Joint Division of Interpace Corp.; Link-Seal as manufactured by Thunderline Corp., or approved equal.

2. When tying into an existing manhole where no opening exists, the CONTACTOR shall core drill a hole in the precast section in a circular pattern as approved by the AUTHORITY, remove the "core," grout in place, a 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.

2.4 LAYING SERVICE CONNECTIONS

A. The CONTRACTOR shall construct, complete to the right-of-way line or other designated points, all service connections shown on the DEVELOPER'S approved drawings or as ordered by the AUTHORITY. These connections shall be installed using pipe of the same material as the main sewer, unless otherwise specified. The ends of all service connections shall be closed with plugs. Service connections shall be laid and joined in every respect in the manner specified under paragraph 2.3. The end of the service connection shall be marked with a steel pipe or rebar a minimum of two feet in length and extending to within six (6) inches of the ground surface.

B. Wherever a stone, brick or concrete sidewalk or curb exists, service connections, which are plugged at the curb, shall be evidenced by a cut mark in the form of an arrow. Wherever there are no sidewalks or curbs, service connections that are plugged at the curb or property line, shall be evidenced by a metal or treated wooden marker placed across the end of the pipe, and not less than six inches (6") below the finished grade. The top one (1) foot of the marker shall be metal so that it can be located in the future using a metal detector.

C. Sewer service curb connections shall be constructed as shown on Standard Details S-S-06 and S-S-07, except that the pipe shall be installed to the right-of-way line, and shall be laid in accordance with the specifications for main Work.

D. Between the right-of-way line and the building line, the depths of inverts will vary, depending upon the depths of the basements, craw spaces or cellars of all properties to be served. Unless otherwise directed, service connections will be brought to the

right-of-way line or property line at such an elevation that a pipe can be laid, on a grade of one-quarter (1/4) inch per foot, below the level of the basement or cellar floor for the entire length of the building; but the depths to inverts of service connections at the right-of-way lines shall not be less than four feet (4'), unless otherwise allowed by the AUTHORITY.

E. Excavation for service connections shall be opened for the entire length of each service connection before any pipe is laid. If rock is encountered in a service connection excavation within ten feet (10') of any building, it must be removed by drilling and wedging or by a method acceptable to the AUTHORITY.

F. When there are no existing buildings, connections will be terminated at the curb line at such depths and at such locations as the AUTHORITY may direct.

G. Wye branches, of the size specified, shall be installed at the locations shown on the DEVELOPER'S approved drawings, or as directed by the AUTHORITY.

H. Where service connections are specified to be made to an existing sewer at such locations where there are no wye branches or laterals provided in the sewer line, connections shall be made as follows: A neat, regular hole, which will accommodate a commercially manufactured six inch (6") wye saddle acceptable to the AUTHORITY, shall be cut in the existing pipe. Installation shall be in accordance with the printed instruction of the manufacturer. The joint shall then be encased in concrete for a distance extending twelve inches (12") from the center of the joint laterally and providing a minimum thickness of six inches (6") of concrete under and around the outside of the pipe. A watertight joint will be required. Mechanically connected saddles, approved by the AUTHORITY and installed in accordance with the recommendations of the manufacturer, may be used.

1. Standpipes

   In general, where the depth of the sewer invert is more than twelve feet (12'), and elsewhere as directed, service connections shall enter the sewer through standpipes. Standpipes shall be of the same material as the main sewer, unless otherwise directed, and shall enter the sewer through wye or tee branches. The upper ends of standpipes shall be either wye branches or bends, as may be directed. Double wye branches shall be used, where directed, to allow two (2) or more service connections to enter the sewer through one (1) standpipe.

2. Plugs

   Install an approved watertight plug, braced to withstand pipeline test pressure thrust, at the termination of the service connection.

2.5 CONSTRUCTION OF MANHOLES

Precast concrete manholes shall be constructed at the locations shown on the DEVELOPER'S approved drawings, as described previously and as shown on Standard Details S-S-01, S-S-02, S-S-03, S-S-04, S-S-05, S-S-12, and S-S-13.

A. Excavation

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

B. Manhole Bases

1. Foundations or bases shall be constructed as shown on the Standard Detail S-S-02 for accommodating sewers up to twenty-seven inches (27"). 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 drawings. The joint between the base and first section of the manhole shall be constructed as outlined in section 1.5, A of this specification.

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 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.

3. Drops shall be encased in concrete as shown on Standard Detail S-S-03.

C. 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 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.

2. All manholes shall be provided with rubber risers (Infra-Riser as manufactured by GNR Technologies, Inc.) for grade adjustments. Manufacturer directions shall be followed for installation.

3. Cast iron manhole frames and covers shall be furnished by the CONTRACTOR and shall conform to specifications section 1.5, A.

D. Coating

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

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

2.6 CONNECTION INTO EXISTING SEWER SYSTEM

A. Connection into the existing sewer system must be made in paved areas to which the Authority has access.

B. Connection into the existing sewer system through adjacent properties through proposed easements are not permitted.

END OF SECTION

NORRISTOWN MUNICIPAL WASTE AUTHORITY
Montgomery County, Pennsylvania

STANDARD SPECIFICATIONS

SECTION 02999

SPECIAL CROSSINGS

INDEX

SECTION 02999

SPECIAL CROSSINGS

1.1 GENERAL

A. The Work under this Section includes furnishing all supervision, labor, materials, equipment and services required for the installation of carrier pipe and casing conduit at railroad, highway and stream crossings as shown on the DEVELOPER'S approved drawings. The Work shall include all excavation, backfill, carrier pipe and conduit installation, complete in place as shown on the DEVELOPER'S approved drawings.

B. Railroad and highway crossings include the complete installation of casing conduit, brick Work, concrete encasement, cast iron or ductile iron carrier pipe, and the transition, if required, from the cast iron or ductile iron pipe to other pipe material in the system, but not including any manholes or valves on either side of the crossing.

C. Stream crossings include the complete installation of the pipe, fittings, valves, concrete encasement, stream diversion and restoration.

D. 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 Company or PennDOT and reimburse the AUTHORITY for any inspection costs or other services in conjunction with highway and railroad crossings at time of construction.

E. The method of installing the casing conduit or carrier pipe for sewer service shall meet with the approval of the AUTHORITY and Railroad Company or companies, Pennsylvania Department of Transportation, Pennsylvania Department of Environmental Protection and/or other governmental agencies having jurisdiction. The casing conduit 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 S-G-01.

1.2 CASING CONDUIITS

A. Casing conduits shall be provided for encasing sewer pipe at the railroad and highway crossings in the locations as indicated on the DEVELOPER'S approved drawings. Casing conduit shall be of the diameter as shown on the DEVELOPER'S approved drawings; however, the CONTRACTOR may install a casing conduit of larger diameter, upon approval by the AUTHORITY, providing that all clearances under highways, railroad tracks and other structures are maintained.

B. Casing conduit shall conform to the following:

1. Steel Pipe

Steel casing shall conform to ASTM A139, Grade B, 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 Diameter	Minimum Casing Thickness
6" through 15"	30" O.D.	0.500"
18" through 24"	36" O.D.	0.500"
30" through 36"	48" O.D.	0.500"
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.	0.500"
20" and 24"	36" O.D.	0.500"

2. Tunnel Liner Plate

The CONTRACTOR may install tunnel liner plate, with the approval of the AUTHORITY, as an acceptable casing conduit. The thickness of metal for tunnel liner shall not be less than U.S. Standard Gauge No. 8. The tunnel liner plate shall be factory coated on both surfaces with a bituminous seal coat to a thickness of 0.05 inches and shall be fabricated from smooth plate to form a circular cross-section.

3. Reinforced Concrete Pipe

The CONTRACTOR may install reinforced concrete pipe, with the approval of the AUTHORITY, as an acceptable casing conduit. The pipe shall be tongue and groove pipe conforming to ASTM C76 and shall not be less than Class V.

C. Where the specified thickness or specified strength of the casing conduit must be increased to meet additional requirements of the companies or bodies granting permits, the CONTRACTOR shall furnish and install the casing conduit as required.

1.3 CARRIER PIPES

A. All carrier pipes shall be of the material and diameter as shown on the DEVELOPER'S approved drawings.

B. When installing a Sanitary Force Main Pipe, each length of pipe shall be blocked at each end 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. When installing a Sanitary Gravity Pipe, 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.

1.4 OPEN TRENCHING

A. In the event the CONRACTOR wishes to trench in lieu of tunneling or jacking, written permission shall be obtained from the authority granting the permit to do so and the Work schedule shall be arranged to coordinate with the operation of the governing bodies.

B. The trench shall be excavated, shored and backfilled to satisfy the requirements of the authority or governing body have jurisdiction.

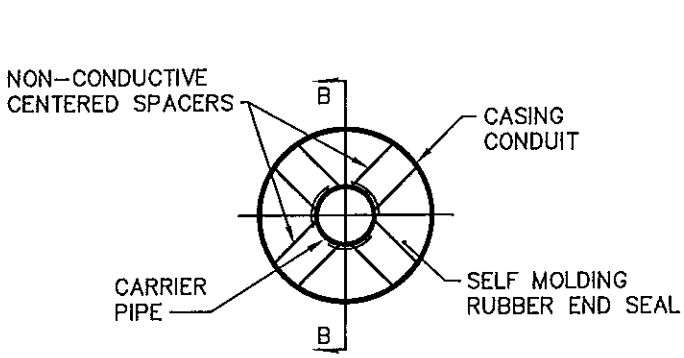
C. The CONTRACTOR shall be responsible for the payment of all Work done by the Railroad in conjunction with the WORK, including, but not limited to, inspection and signaling costs; track removal, replacement and realignment; and the removal and replacement of the roadbed.

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 governing bodies.

PART 3 - STANDARD DETAILS

Drawing S-S-01: Sectional Plans for Standard and Drop Manholes
Drawing S-S-02: Standard Manhole Section
Drawing S-S-03: Drop Manhole Section
Drawing S-S-04: Watertight Manhole (Standard) Frame and Cover Installation
Drawing S-S-05: 48" Diameter Shallow Manhole
Drawing S-S-06: Typical House Connection
Drawing S-S-07: Sewer Lateral Installation for Commercial or Industrial
Drawing S-S-08: Typical Blocking for Horizontal & Vertical Thrusts up to 150 PSI
Drawing S-S-09: Grade Adjustment
Drawing S-S-10: Typical Standpipe (Single Service)
Drawing S-S-11: Typical Standpipe (Multiple Service)
Drawing S-S-12: Metering Manhole
Drawing S-S-13: Doghouse Manhole
Drawing S-G-01: Carrier Pipe and Casing Conduit Installation
Drawing S-G-02: Reinforced Concrete Slope Anchors for Utility Lines
Drawing S-G-03: Crushed Stone Bedding for Pipe
Drawing S-G-04: Concrete Encasement for Pipe
Drawing S-G-05: Municipal Street Restoration
Drawing S-G-06: Permanent Municipal Street Restoration (Bituminous and Concrete)
Drawing S-G-07: Grassed Area Backfilling and Restoration
Drawing S-G-08: PADOT Roads Rigid Pavement Restoration
Drawing S-G-09: PADOT Roads Flexible Pavement Restoration

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
CARRIER PIPE AND CASING CONDUIT INSTALLATION	**RV & B** CONSULTING ENGINEERS	APP'D.	4/12 DATE	S-G-01 DRAWING NUMBER	REV.



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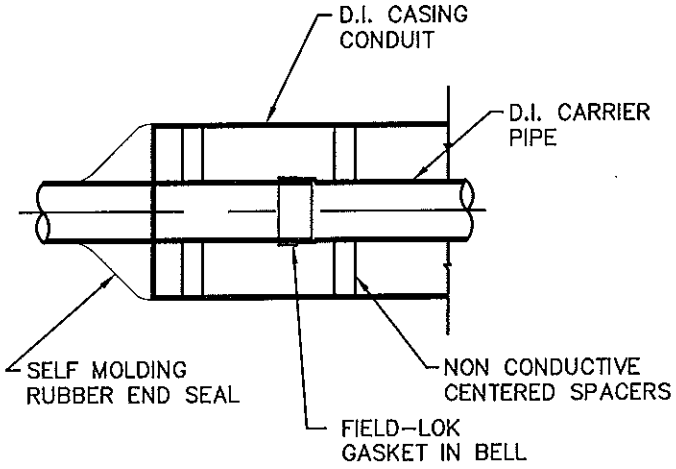
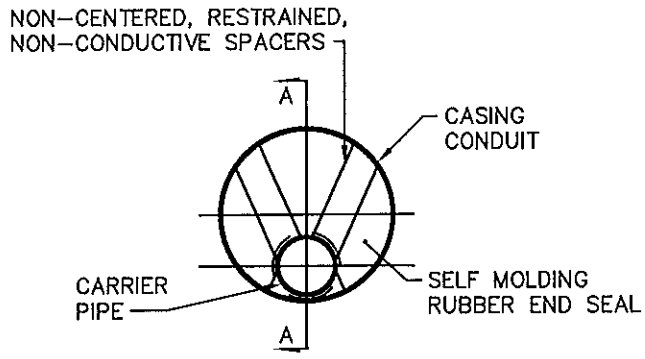


SECTION B-B

NOTE - FOR CASING CONDUIT REQUIREMENTS, SEE SPECIFICATIONS

WATER OR FORCE MAIN

NO SCALE



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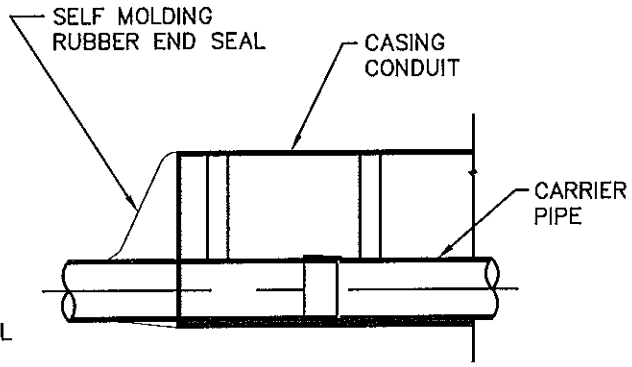


SECTION A-A

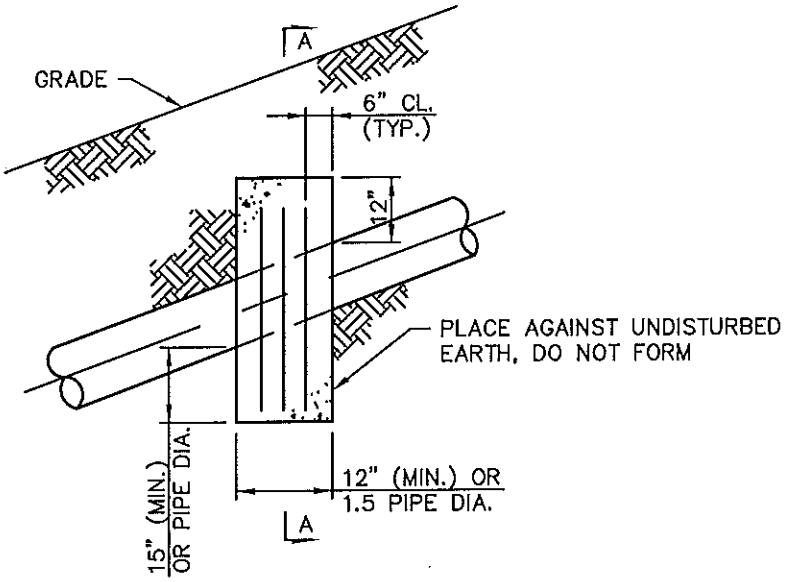
NOTE - FOR CASING CONDUIT REQUIREMENTS, SEE SPECIFICATIONS

GRAVITY SEWER

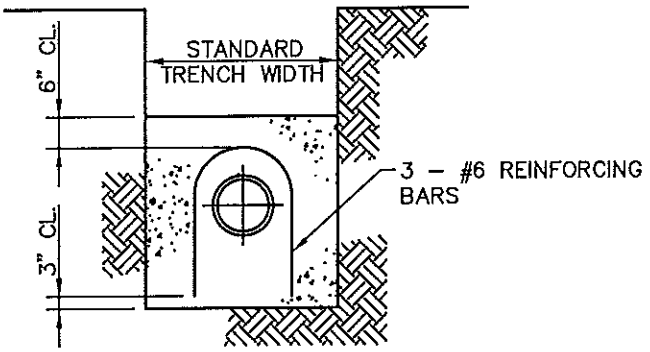
NO SCALE

NOTE:
CONTRACTOR MAY USE SAND FILL AND BRICK AND GROUT END SEAL IF APPROVED BY AUTHORITY.

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
REINFORCED CONCRETE SLOPE ANCHORS	**RV & B**		4/12	S-G-02	
FOR UTILITY LINES	*CONSULTING ENGINEERS*	APP'D.	DATE	DRAWING NUMBER	REV.



ELEVATION



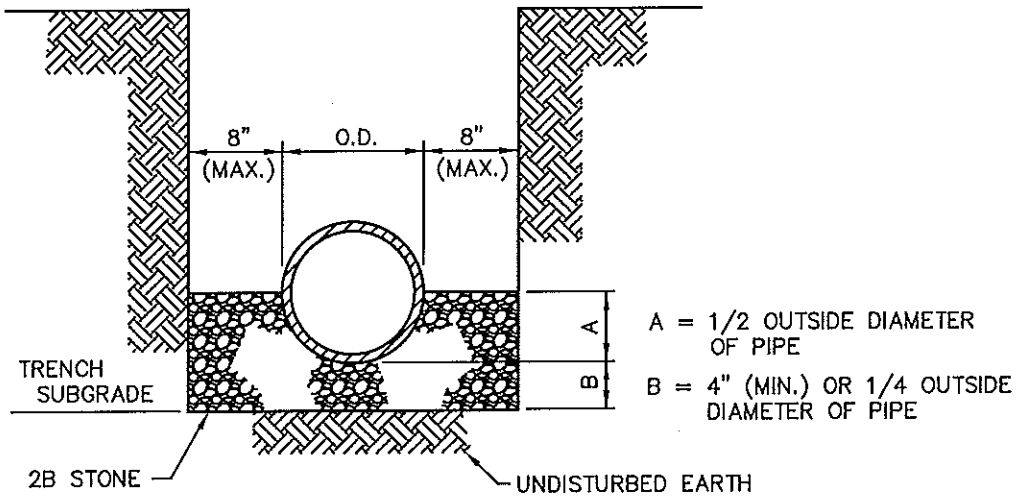
SECTION A-A

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

NO SCALE

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
CRUSHED STONE	**RV & B**		4/12	S-G-03	
BEDDING FOR PIPE	*CONSULTING ENGINEERS*	APP'D.	DATE	DRAWING NUMBER	REV.



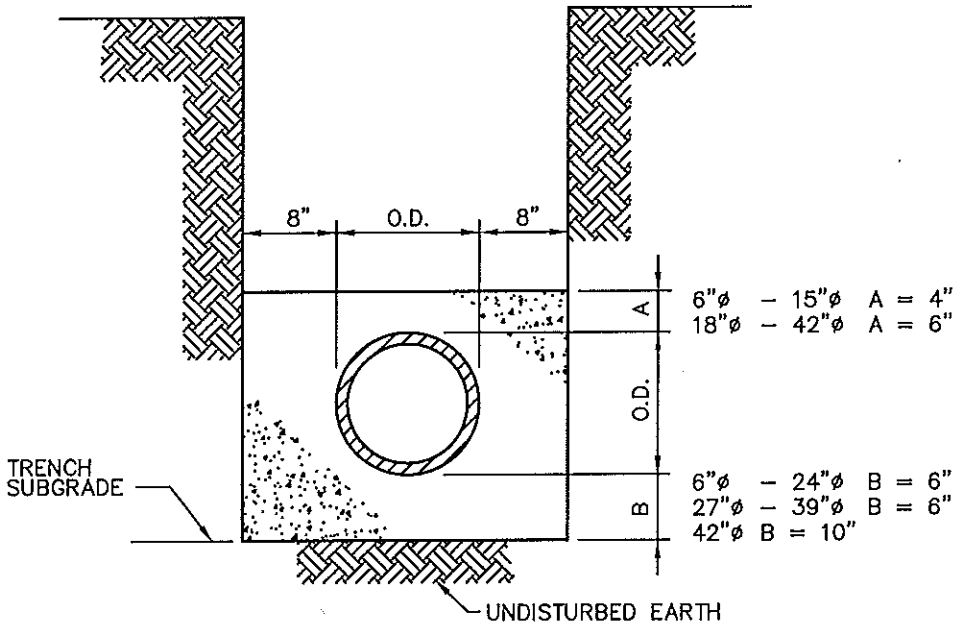
GRAVITY SANITARY SEWERS AND FORCE MAINS

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

BEDDING DETAILS

NO SCALE

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
CONCRETE ENCASEMENT FOR PIPE	**RV & B**		4/12	S-G-04	
	CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.

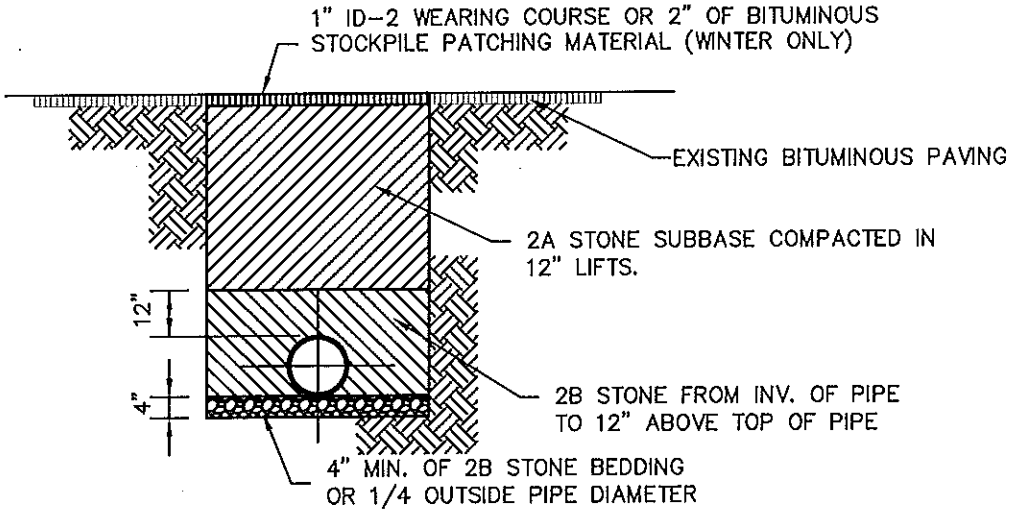


NOTE:
CONTRACTOR TO COMPLY WITH CURRENT OSHA STANDARD 29 CFR 1926 FOR TRENCH DIMENSIONS, SLOPING, BENCHING, SHORING AND INSPECTIONS.

TYPICAL CONCRETE ENCASEMENT DETAIL

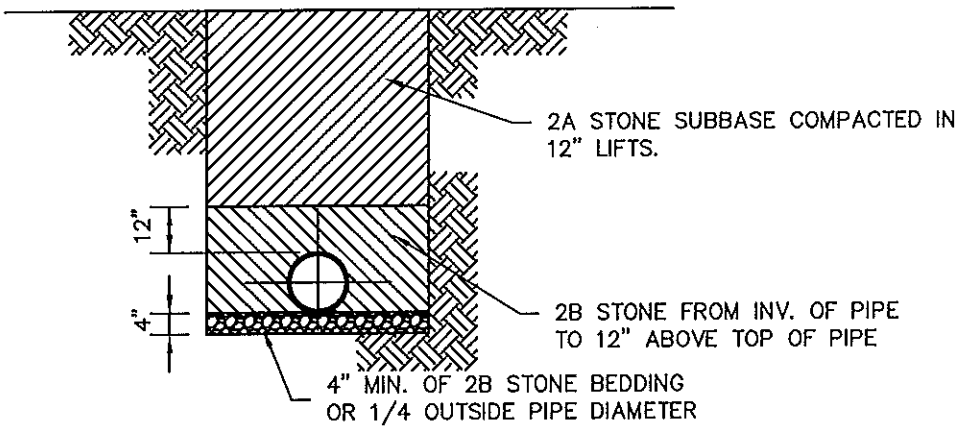
NO SCALE

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
MUNICIPAL STREET RESTORATION	**RV & B**		4/12	S-G-05	
	CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.



PAVED STREET TEMPORARY RESTORATION

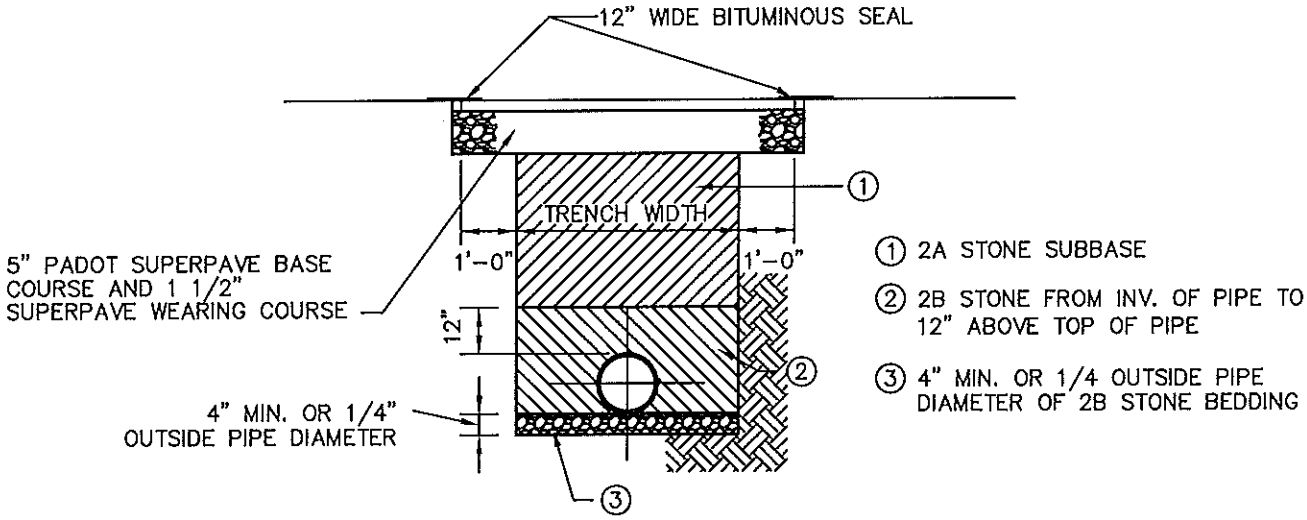
NO SCALE



UNPAVED STREET OR SHOULDER TEMPORARY AND PERMANENT RESTORATION

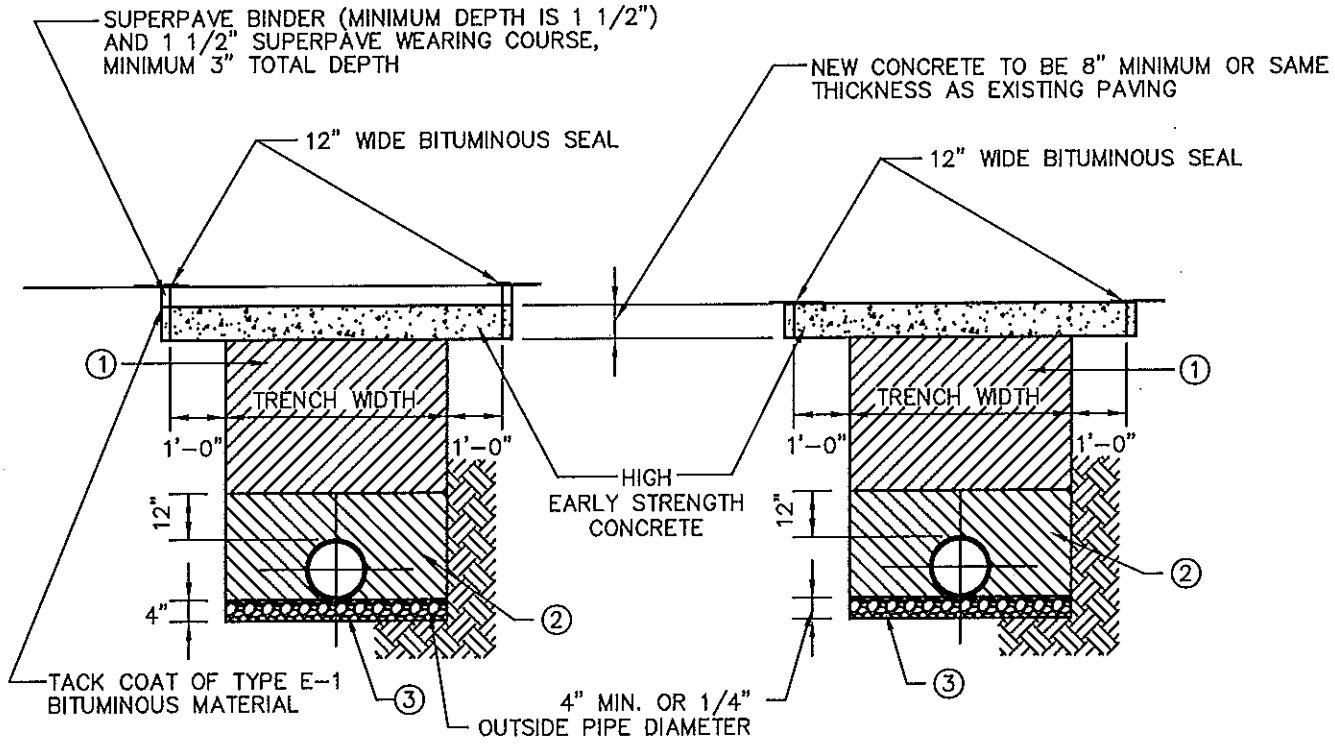
NO SCALE

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
PERMANENT MUNICIPAL STREET RESTORATION	**RV & B**		4/12	S-G-06	
BITUMINOUS AND CONCRETE PAVING	*CONSULTING ENGINEERS*	APP'D.	DATE	DRAWING NUMBER	REV.



PADOT SUPERPAVE – PERMANENT RESTORATION

NO SCALE



CONCRETE BASE WITH SUPERPAVE WEARING SURFACE

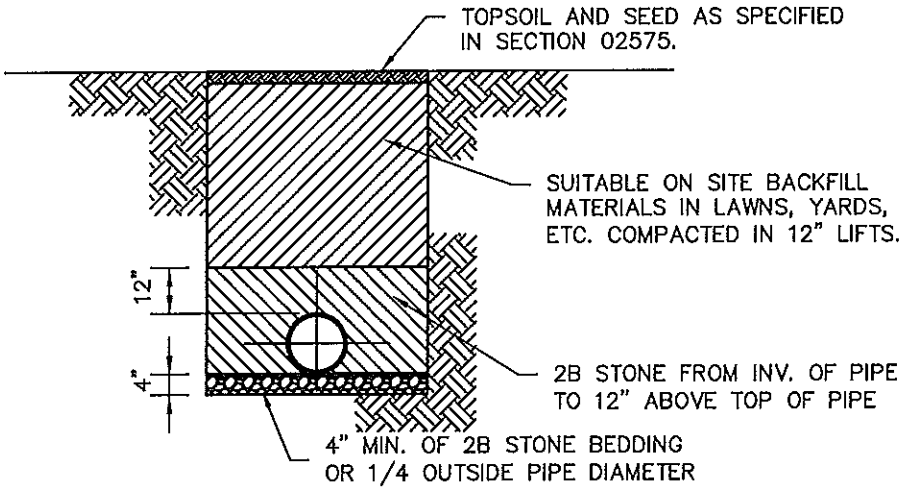
FULL DEPTH CONCRETE PAVEMENT RESTORATION

CONCRETE PAVING – PERMANENT RESTORATION

NO SCALE

FOR TEMPORARY PAVING SEE S-G-05

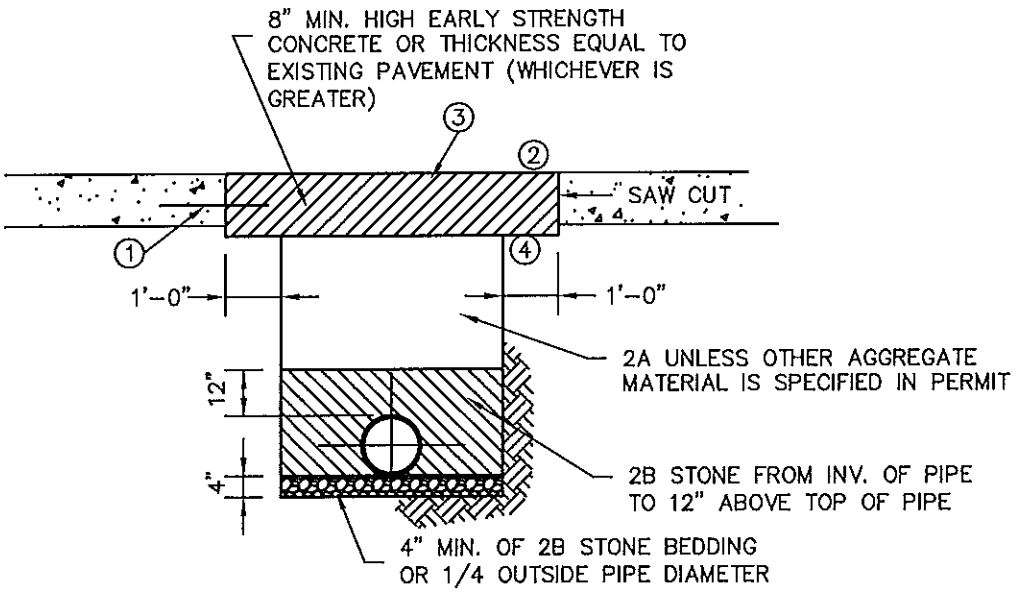
STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
GRASSED AREA BACKFILLING AND RESTORATION	**RV & B** *CONSULTING ENGINEERS*	APP'D.	4/12 DATE	S-G-07 DRAWING NUMBER	REV.



GRASSED AREA BACKFILLING AND RESTORATION DETAIL

NO SCALE

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
PA–DOT ROADS	**RV & B**		4/12	S–G–08	
RIGID PAVEMENT RESTORATION	CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.

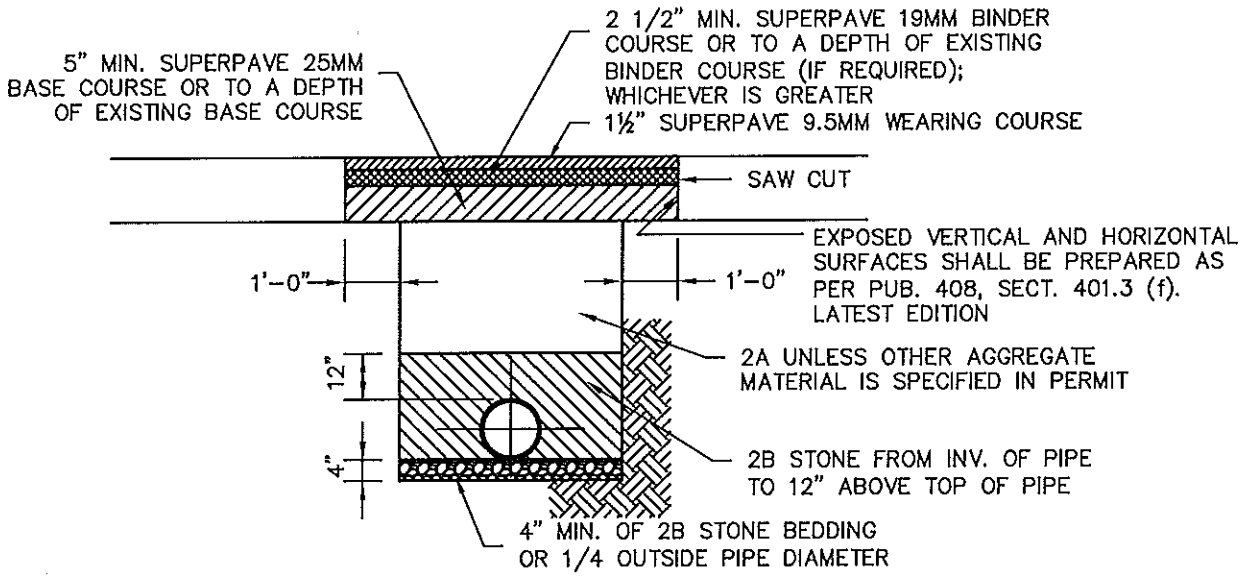


1. ON REINFORCED CONCRETE PAVEMENT, PLACE REINFORCING STEEL, TIE BOLTS, AND LOAD TRANSFER DEVICES AS PER REINFORCED CONCRETE 26.
2. SURFACE TEXTURE AS PER PUBLICATION 408, SECTION 501.3(K). LATEST EDITION
3. FOR LIMITS OF CONCRETE REPLACEMENT SEE PA–DOT REG. 459, SECTION 459.8(1)(4). LATEST EDITION
4. CUT BACK IS NOT REQUIRED BEYOND A TRANSVERSE OR LONGITUDINAL JOINT OR CURB.

PA–DOT ROADS – RIGID PAVEMENT RESTORATION

NO SCALE

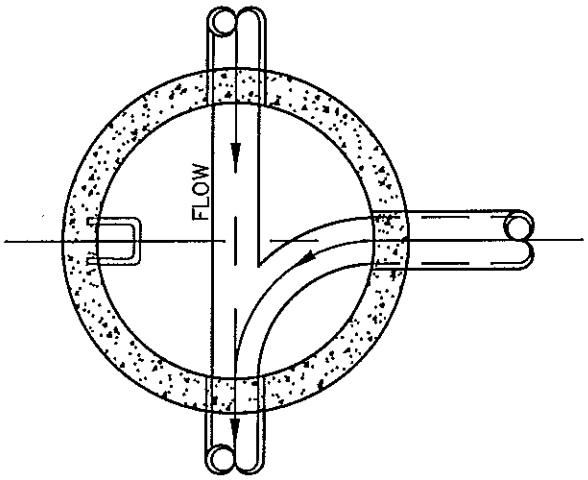
STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
PA–DOT ROADS	**RV & B**		4/12	S–G–09	
FLEXIBLE PAVEMENT RESTORATION	*CONSULTING ENGINEERS*	APP'D.	DATE	DRAWING NUMBER	REV.



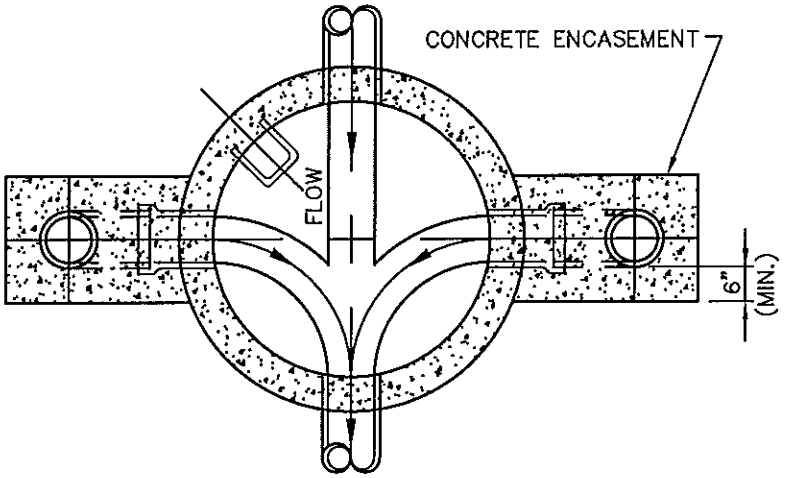
PA–DOT ROADS – FLEXIBLE PAVEMENT RESTORATION

NO SCALE

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
SECTIONAL PLANS	**RV & B**		4/12	S-S-01	
STANDARD AND DROP MANHOLES	*CONSULTING ENGINEERS*	APP'D.	DATE	DRAWING NUMBER	REV.



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 TO BE MADE SMOOTHLY AND EVENLY WITH AS LARGE OF A RADIUS AS POSSIBLE.

SECTIONAL PLAN – DROP MANHOLE

SECTIONAL PLANS
STANDARD & DROP MANHOLES

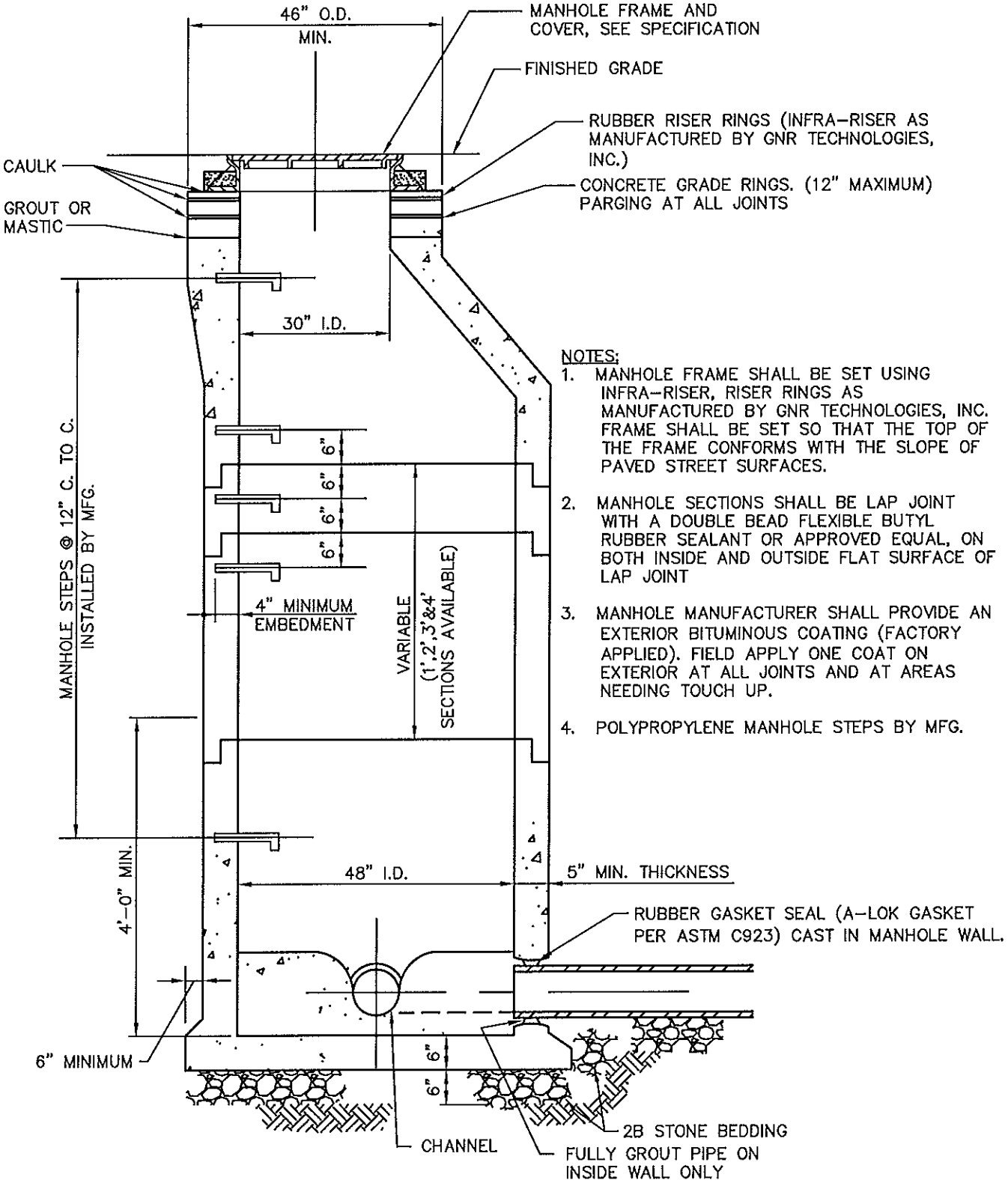
NO SCALE

STANDARD DETAIL

STANDARD MANHOLE SECTION

NORRISTOWN MUNICIPAL WASTE AUTHORITY
MONTGOMERY COUNTY, PENNSYLVANIA

RV & B		4/12	S-S-02	
CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.



NOTES:

1. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY GNR TECHNOLOGIES, INC. 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 APPLY ONE COAT ON EXTERIOR AT ALL JOINTS AND AT AREAS NEEDING TOUCH UP.
4. POLYPROPYLENE MANHOLE STEPS BY MFG.

STANDARD MANHOLE SECTION DETAIL

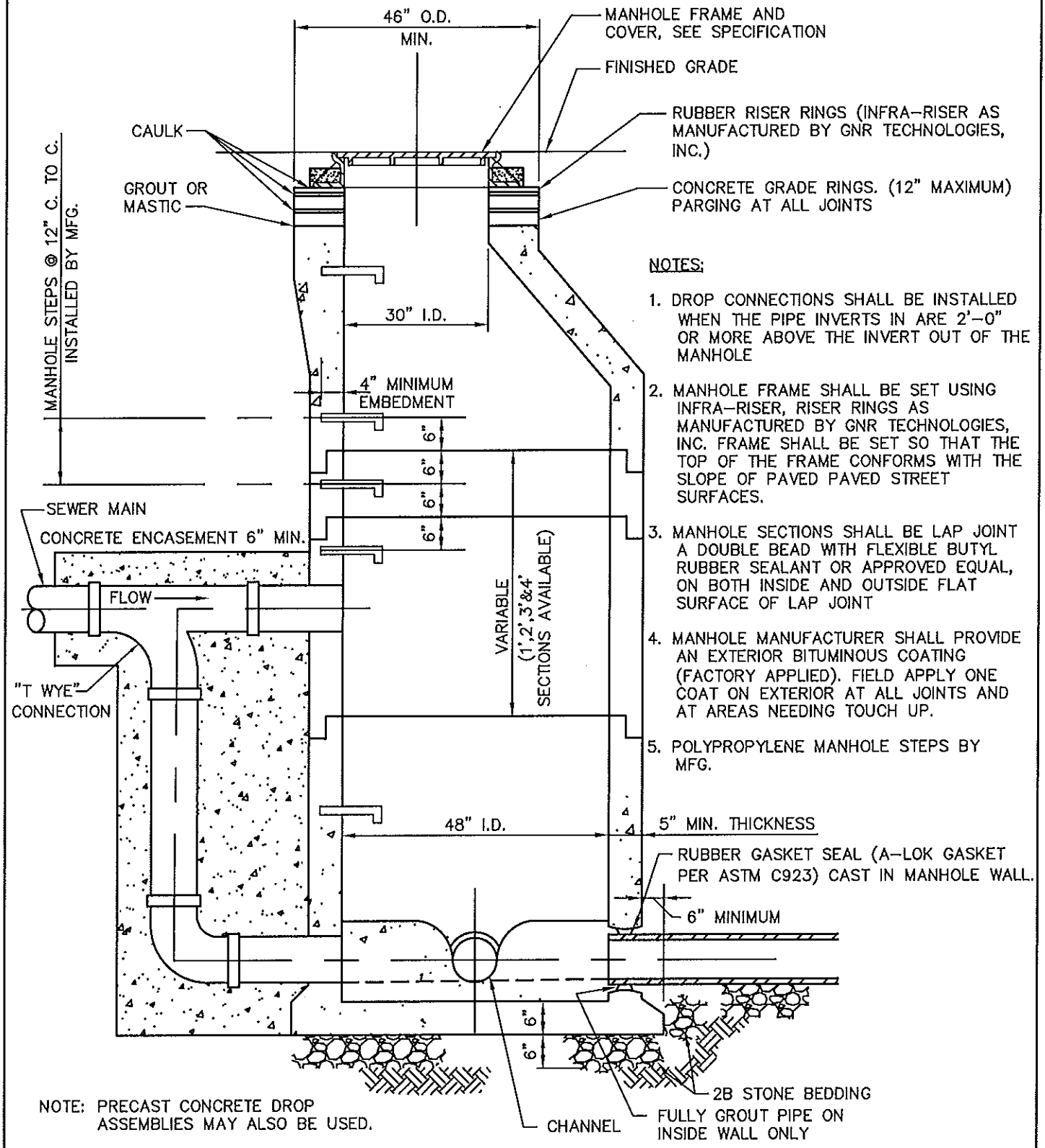
NO SCALE

STANDARD DETAIL

DROP MANHOLE SECTION

NORRISTOWN MUNICIPAL WASTE AUTHORITY
MONTGOMERY COUNTY, PENNSYLVANIA

RV & B		4/12	S-S-03	
CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.



NOTES:

1. DROP CONNECTIONS SHALL BE INSTALLED WHEN THE PIPE INVERTS IN ARE 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 GNR TECHNOLOGIES, INC. 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 APPLY ONE COAT ON EXTERIOR AT ALL JOINTS AND AT AREAS NEEDING TOUCH UP.
5. POLYPROPYLENE MANHOLE STEPS BY MFG.

NOTE: PRECAST CONCRETE DROP ASSEMBLIES MAY ALSO BE USED.

STANDARD DROP MANHOLE SECTION DETAIL

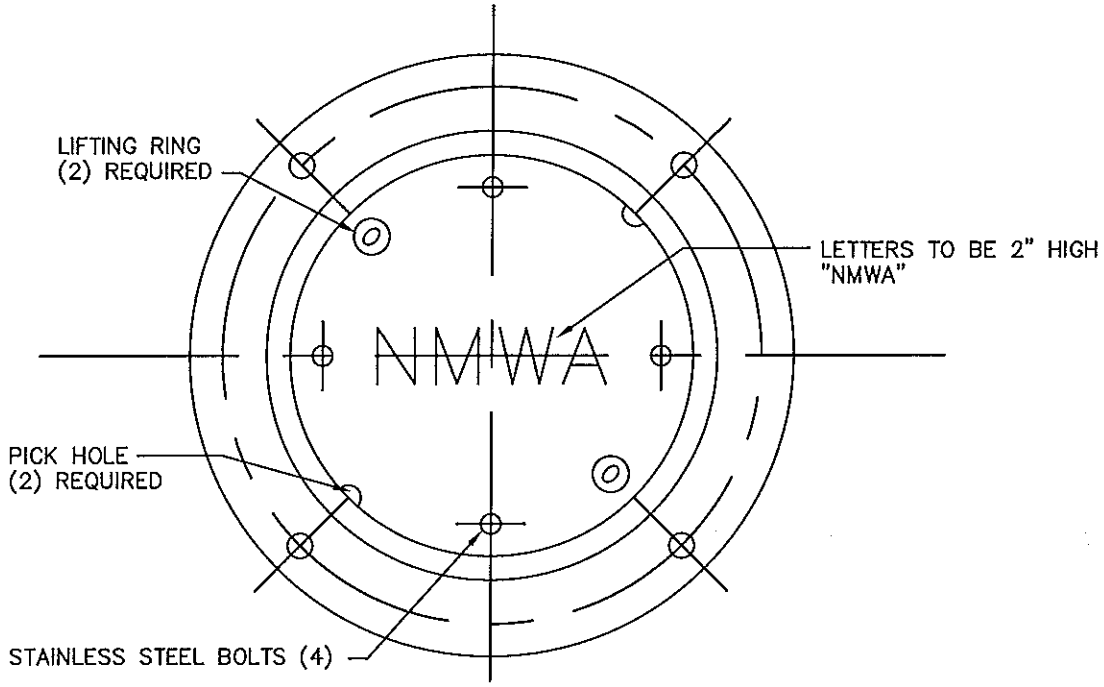
NO SCALE

STANDARD DETAIL

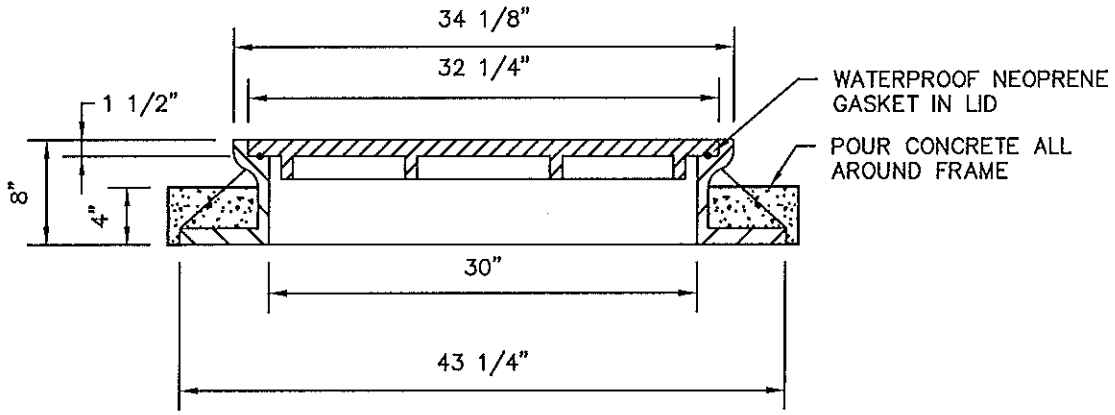
WATERTIGHT MANHOLE (STANDARD)
FRAME AND COVER INSTALLATION

NORRISTOWN MUNICIPAL WASTE AUTHORITY
MONTGOMERY COUNTY, PENNSYLVANIA

RV & B		4/12	S-S-04	
CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.



PLAN



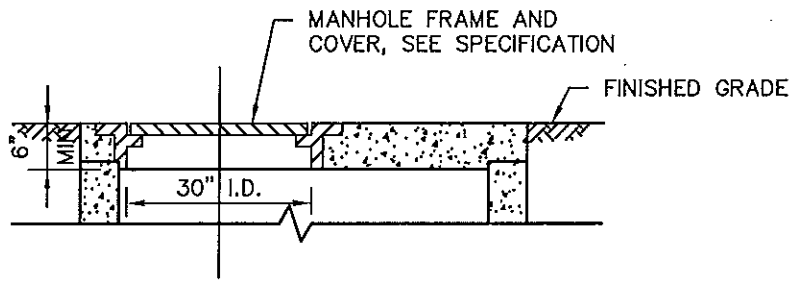
SECTION

NOTE:
WATERTIGHT MANHOLE FRAME AND COVER PATTERN
QUIRIN MHR-431-8 TO BE MFG. BY E.A. QUIRIN FOUNDRY
CO. OR APPROVED EQUAL

CAST IRON WATERTIGHT MANHOLE FRAME & COVER

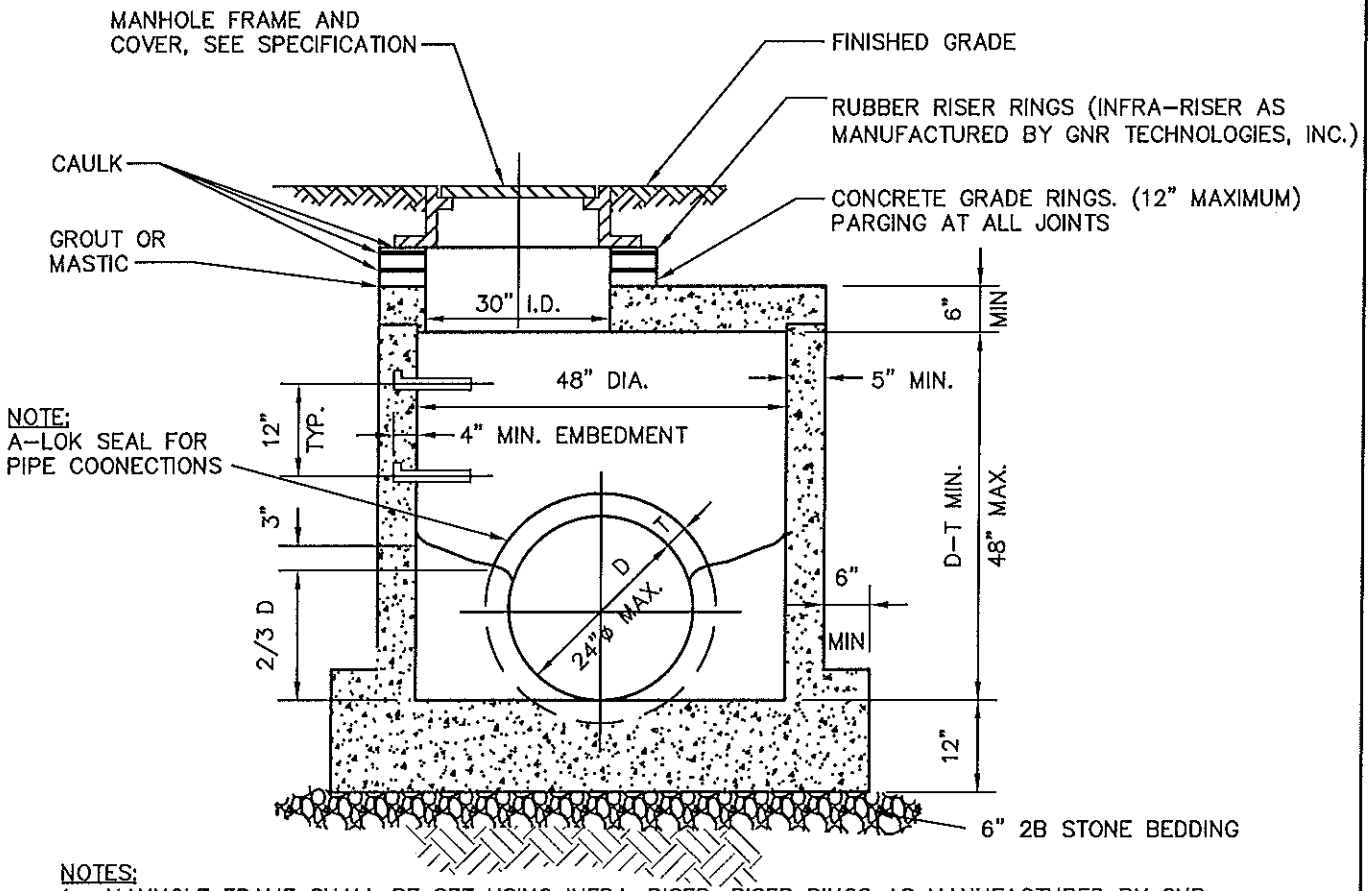
NO SCALE

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
48" DIA. SHALLOW MANHOLE	**RV & B** *CONSULTING ENGINEERS*	APP'D.	4/12 DATE	S-S-05 DRAWING NUMBER	REV.



MANHOLE WITH FLUSH FRAME & COVER

NO SCALE



NOTES:

1. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY GNR TECHNOLOGIES, INC. 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 APPLY ONE COAT ON EXTERIOR AT ALL JOINTS AND AT AREAS NEEDING TOUCH UP.
4. POLYPROPYLENE MANHOLE STEPS BY MFG.
5. PROVIDE RUBBER GASKET SEAL (A-LOK GASKET PER ASTM C923) CAST IN MANHOLE WALL.

MANHOLE WITH STANDARD FRAME & COVER

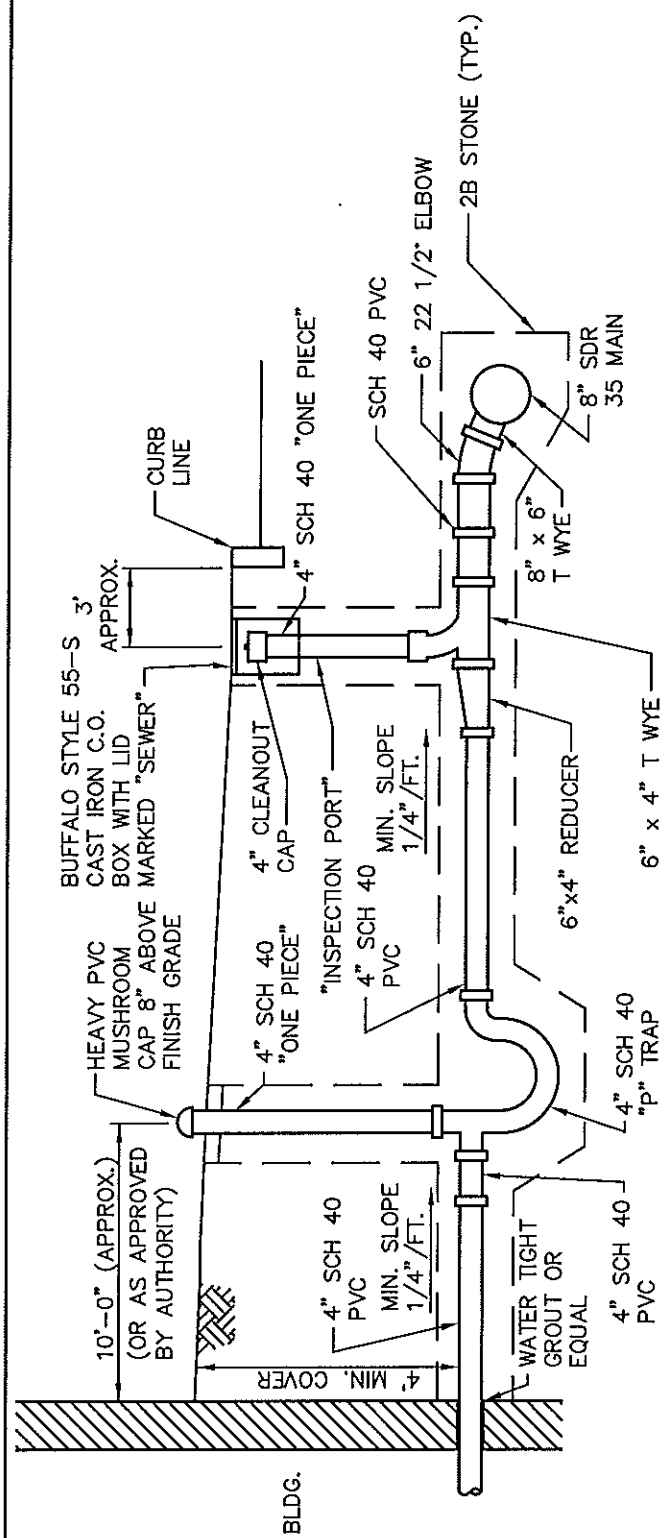
NO SCALE

STANDARD DETAIL

TYPICAL HOUSE CONNECTION

NORRISTOWN MUNICIPAL WASTE AUTHORITY
MONTGOMERY COUNTY, PENNSYLVANIA

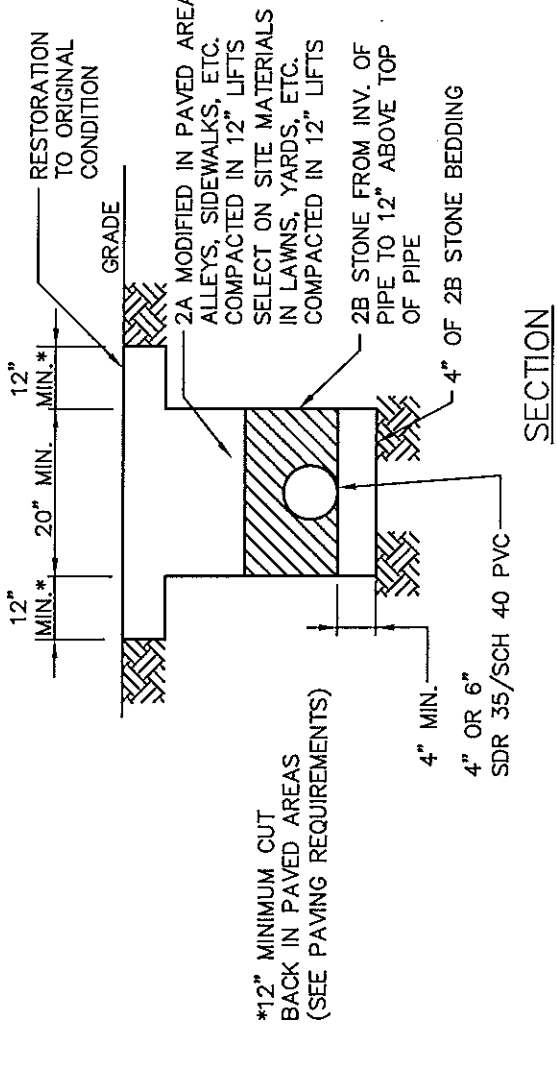
RV & B		4/12	S-S-06	
CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.



ELEVATION

NOTES:

1. CONTRACTOR SHALL FIELD VERIFY EXIST. CONDITIONS AND DIMENSIONS PRIOR TO ORDERING AND/OR FABRICATION OF ANY MATERIALS.
2. INSTALLATION SHALL CONFORM TO N.M.W.A. SPECIFICATIONS.
3. SCHEDULE 40 PVC PIPE SHALL BE GLUED AT ALL JOINTS.



SECTION

TRENCH DETAIL
NO SCALE

STANDARD DETAIL

SEWER LATERAL INSTALLATION

COMMERCIAL OR INDUSTRIAL

NORRISTOWN MUNICIPAL WASTE AUTHORITY

MONTGOMERY COUNTY, PENNSYLVANIA

RV & B		4/12	S-S-07	
CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.

ELEVATION

NOTE: CLEAN OUT SHALL BE PLUMB.

NOTES:

1. CONTRACTOR SHALL FIELD VERIFY EXIST. CONDITIONS AND DIMENSIONS PRIOR TO ORDERING AND/OR FABRICATION OF ANY MATERIALS.
2. INSTALLATION SHALL CONFORM TO N.M.W.A.. SPECIFICATIONS.

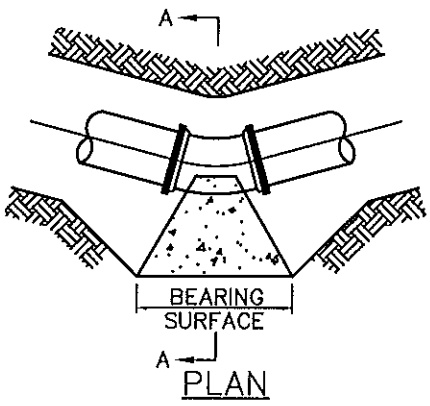
TRENCH DETAIL

NO SCALE

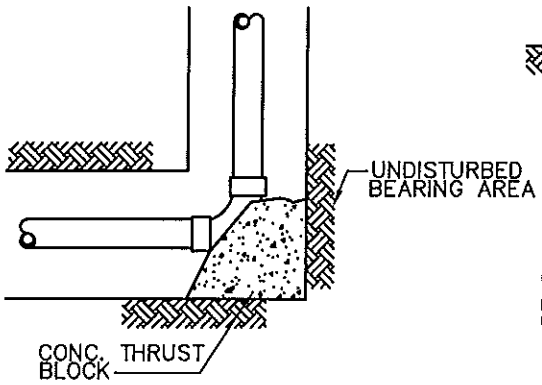
STANDARD DETAIL

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

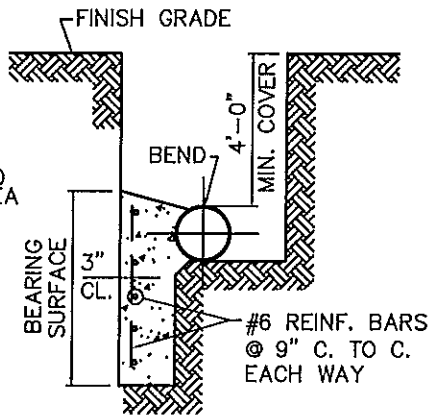
NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA					
RV & B *CONSULTING ENGINEERS*		APP'D.	4/12 DATE	S–S–08 DRAWING NUMBER	REV.



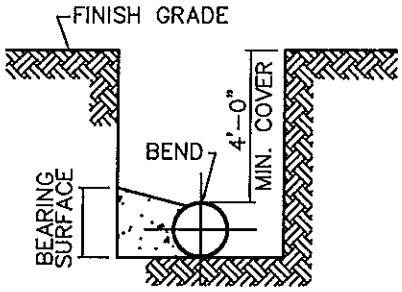
PLAN



90° BEND



SECTION A–A
ADDITIONAL BEARING AS REQUIRED



SECTION A–A

NOTES:

1. ALL CONCRETE SHALL HAVE 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" AND LESS DEGREE BEND				6" AND 8" DEGREE BEND				10" AND 12" 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

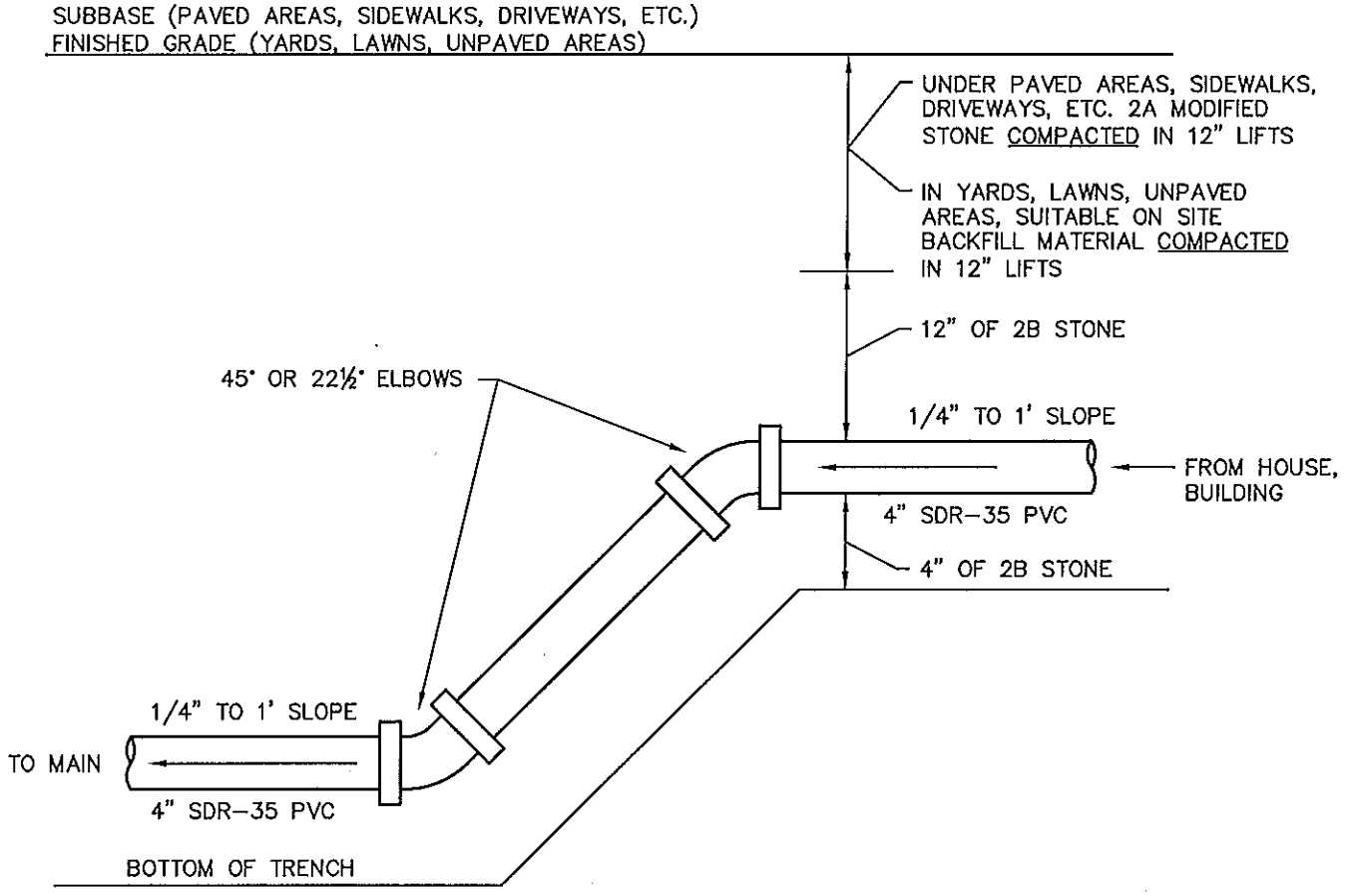
BEARING AREA REQUIRED, SQUARE FEET

TYPE OF BEARING MATERIAL AND ALLOWABLE LOADS	14" AND 16" DEGREE BEND OR DEFLECTION				18" AND 20" 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

NO SCALE

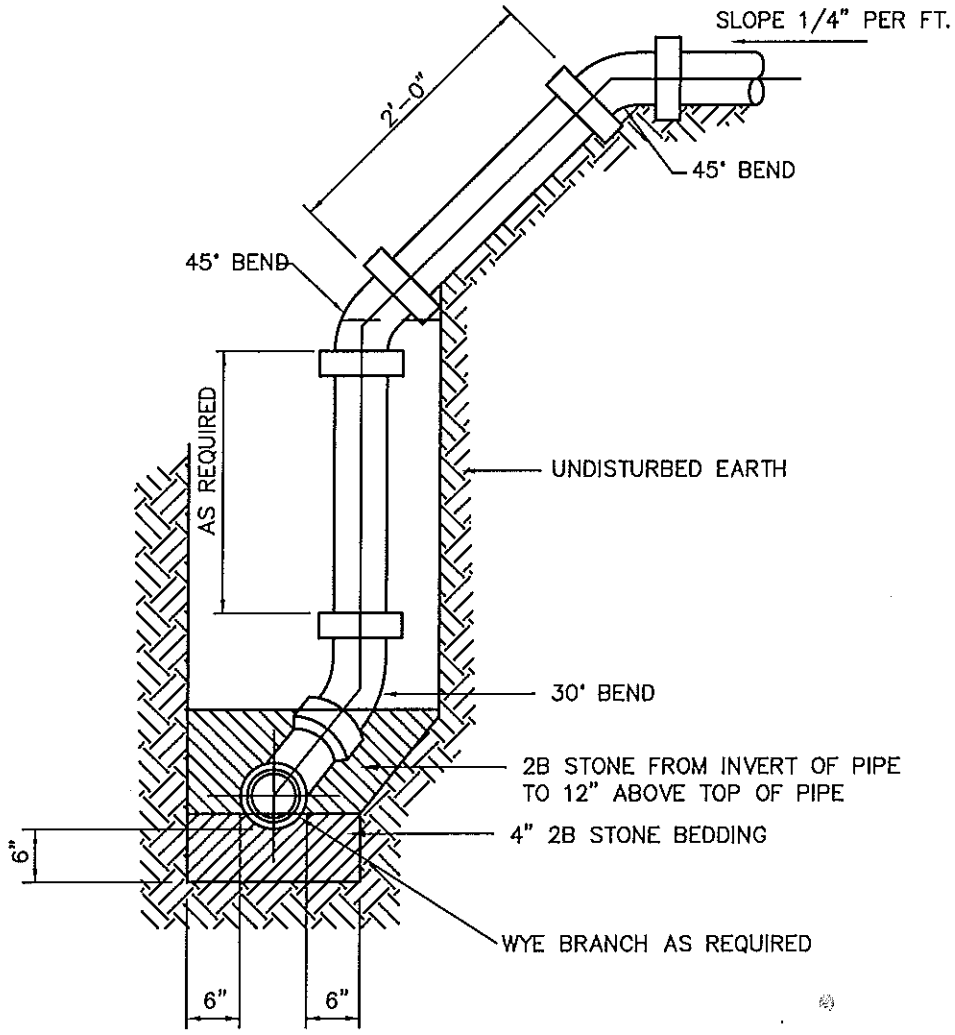
STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
GRADE ADJUSTMENT	**RV & B** *CONSULTING ENGINEERS*	APP'D.	4/12 DATE	S-S-09 DRAWING NUMBER	REV.



GRADE ADJUSTMENT DETAIL

NO SCALE

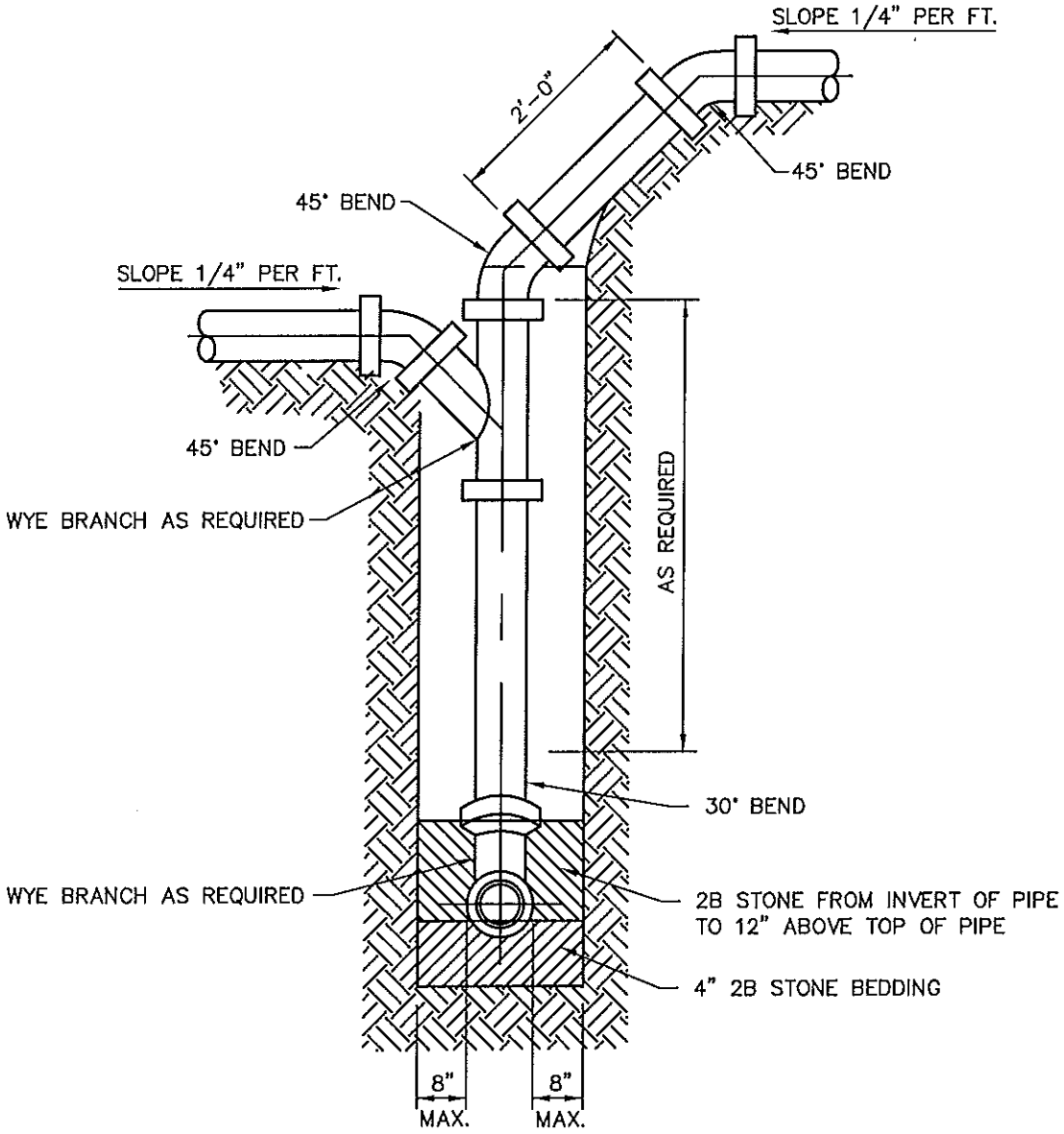
STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
TYPICAL STANDPIPE	**RV & B**		4/12	S-S-10	
SINGLE SERVICE	CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.



SERVICE LATERAL RISER DETAIL

NO SCALE

STANDARD DETAIL	NORRISTOWN MUNICIPAL WASTE AUTHORITY MONTGOMERY COUNTY, PENNSYLVANIA				
TYPICAL STANDPIPE	**RV & B**		4/12	S–S–11	
MULTIPLE SERVICE	*CONSULTING ENGINEERS*	APP'D.	DATE	DRAWING NUMBER	REV.



SERVICE LATERAL RISER DETAIL
MULTIPLE SERVICE

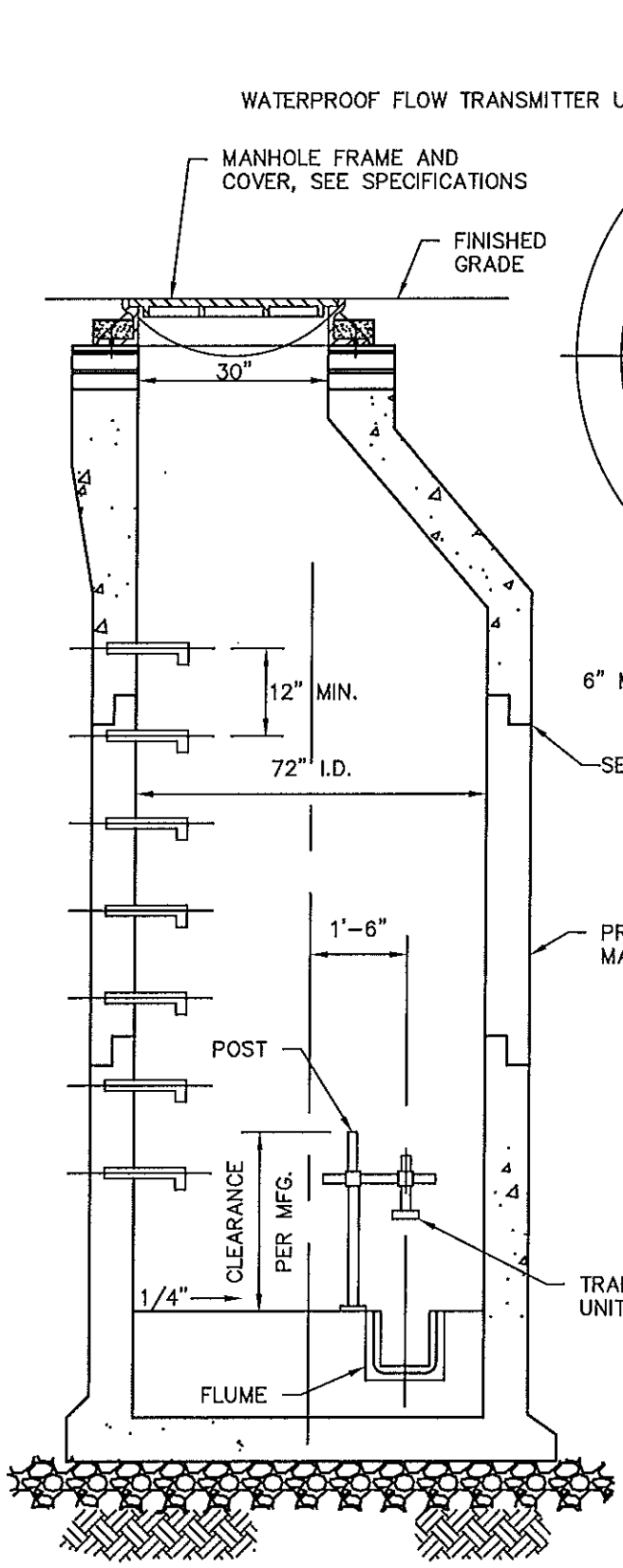
NO SCALE

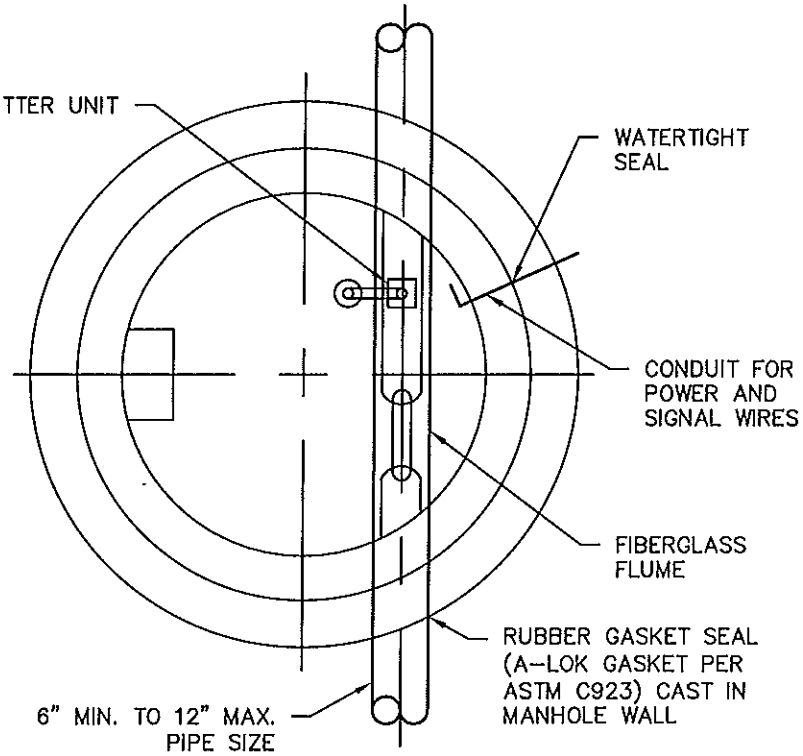
STANDARD DETAIL

NORRISTOWN MUNICIPAL WASTE AUTHORITY
MONTGOMERY COUNTY, PENNSYLVANIA

METERING MANHOLE
PIPE SIZE 6" TO 12"

RV & B		4/12	S-S-12	
CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.





NOTES:

1. MANHOLE FRAME SHALL BE SET USING INFRA-RISER, RISER RINGS AS MANUFACTURED BY GNR TECHNOLOGIES, INC. 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 APPLY ONE COAT ON EXTERIOR AT ALL JOINTS AND AT AREAS NEEDING TOUCH UP.
4. POLYPROPELENE MANHOLE STEPS BY MFG.
5. CHART RECORDER UNIT TO BE LOCATED IN THE FIELD BY ENGINEER.
6. MAXIMUM SLOPE THROUGH MANHOLE WILL NOT EXCEED 2%.
7. SEE STANDARD MANHOLE SECTION DETAIL S-S-02 FOR ADDITIONAL REQUIREMENTS.

STANDARD METERING MANHOLE DETAIL

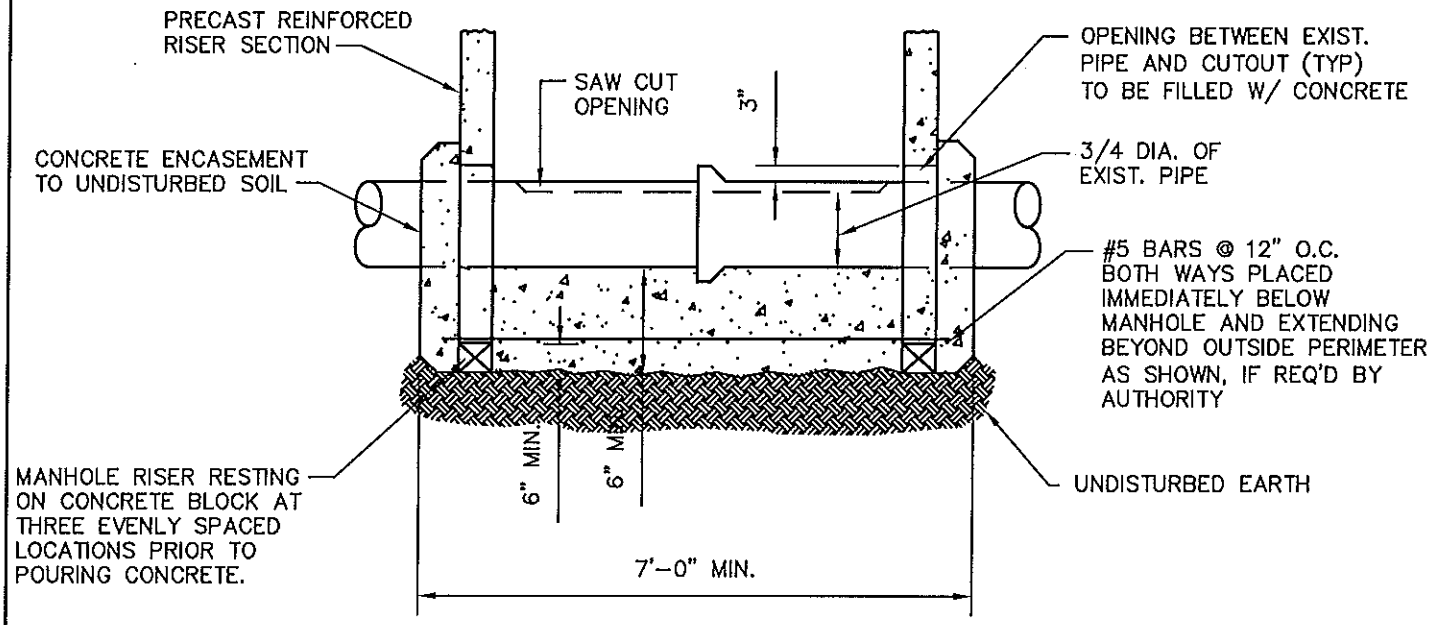
NO SCALE

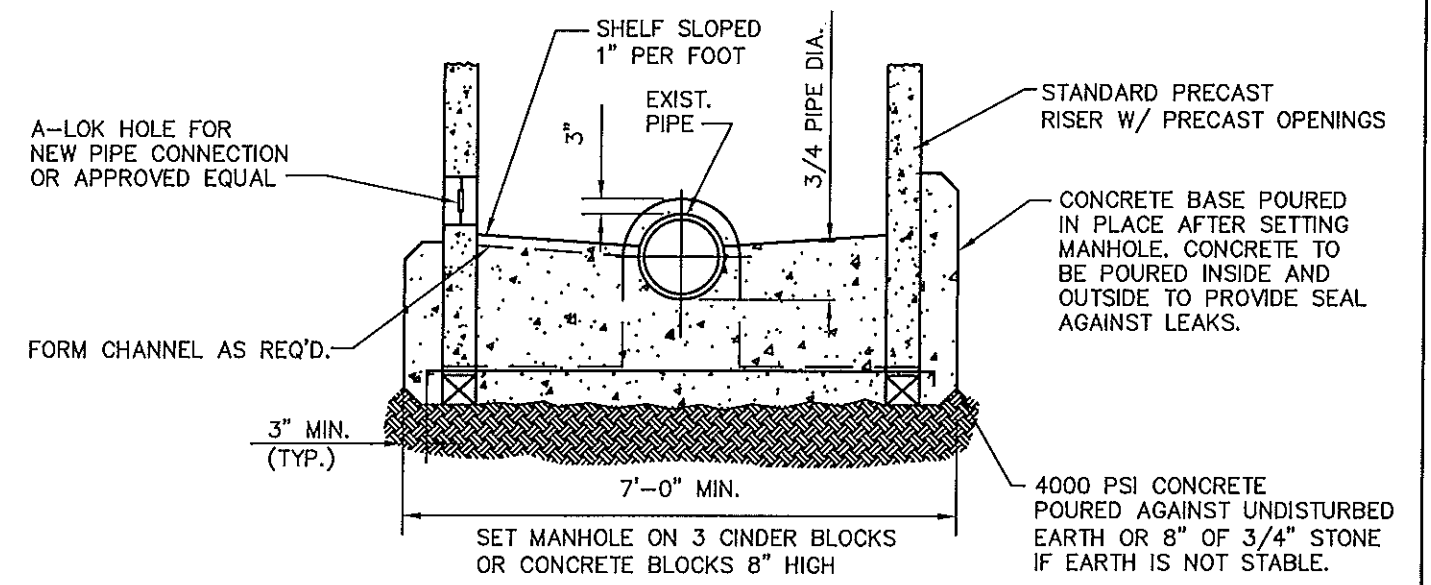
STANDARD DETAIL

DOGHOUSE MANHOLE

NORRISTOWN MUNICIPAL WASTE AUTHORITY
MONTGOMERY COUNTY, PENNSYLVANIA

RV & B CONSULTING ENGINEERS	APP'D.	DATE	DRAWING NUMBER	REV.
		4/12	S-S-13	





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

DOGHOUSE MANHOLE

NOT TO SCALE