

Peters Township Sanitary Authority

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Appendix A

Specifications for the Construction of Sanitary Sewer Lines and Appurtenances

**PETERS TOWNSHIP SANITARY AUTHORITY
SEWER USE RULES AND REGULATIONS
APPENDIX A
Specifications for Construction of
Sanitary Sewer Lines and Appurtenances**

Adopting Resolution: _____

Effective for Permits Issued After: _____

And for all Installations After: _____

PART I - GENERAL REQUIREMENTS

1. Introduction

- A. These specifications cover the requirements for construction of all of the Authority's sewer line facilities. These specifications are intended for and apply to all such projects whether directly constructed by (a) Contractor(s) under contract to the Authority, or constructed by a land developer who in turn employs (a) construction Contractor(s) to construct sewers that will ultimately be dedicated to the Authority for ownership.
- B. These specifications are to be used in conjunction with a companion document – Peters Township Sanitary Authority Rules and Regulations, as amended.
- C. The Rules and Regulations describes and identifies procedural requirements, relative to engineering work, payment of fees, certain facility design criteria and parameters, private sewer service facility requirements, time restraints, certain terms which will be incorporated in an agreement with the Authority before the commencement of construction and other factors relating to the sewage system facilities desired to be constructed in connection with the development of the Township.
- D. This document covers the construction work.
- E. Where the term "Authority" is used herein, it shall mean the Peters Township Sanitary Authority, its employees, management, or Board, as is appropriate for each occurrence of use of the term. When necessary or appropriate the Authority may call upon its engineering and/or legal consultants for advice and direction.
- F. The Authority shall reserve the right to require special specifications be adhered to for any sewer installation not considered typical as deemed by the Authority. Such conditions and requirements shall include but are not limited to construction in fill, flood prone areas, or

wetlands, requirements for additional depth, and other construction as applicable.

- G. As regards the interpretation of the application of these specifications, the Authority and or the Authority Manager shall make all final determinations.

2. Observation of Construction Work

- A. All work performed in connection with the extension, modification or improvement of public wastewater facilities within the Township shall be required to conform with all Authority rules and regulations and shall be observed during construction by an authorized representative of the Authority.
- B. All completed work shall be required to meet the approval of the Authority and shall be changed, modified, replaced, removed or otherwise corrected by the Contractor to such extent as directed by the Authority.
- C. The work will be periodically or continuously observed during its progress and when completed, shall be inspected jointly, by the Authority and the Contractor and a list of uncompleted or corrected work will be developed. After all listed items are completed, the work will be declared substantially complete. When the work is declared to be substantially complete and is accepted by the Authority, the eighteen-month maintenance bond period shall commence. During the term of the maintenance bond the Contractor shall return when and as required to reconcile any problems resulting from construction, such as leakage, mechanical malfunctions, trench settlement, pavement failure, surface restorations, drainage, etc. In addition, a maintenance-bond inspection shall be made by the Authority at a date between twelve (12) and eighteen (18) months following the date of declaration of completion of construction.
- D. The Contractor shall keep on site, and make available upon request by the Authority, a surveyor's rod and level or laser equipment for the purpose of spot checking elevations as the work progresses.
- E. The Contractor shall also keep and make available a 300' surveyors tape for the purpose of spot checking distances and for the purpose of the Contractor providing off-set measurements as the work progresses.

3. Rights-of-Way

- A. The alignments and locations of the proposed pipelines and appurtenances are shown on the plans on which street, highway and/or other acquired rights-of-way limits have also

been superimposed. No pipeline shall be relocated outside of the street or other right-of-way within which it is shown without obtaining the formal written approval for such change from the Authority.

- B. Where a special pipe line right-of-way is obtained through private property, the minimum permanent width for operation and maintenance purposes shall be 25 feet; the width of the temporary right-of-way obtained through such private properties for initial pipe line installation and construction purposes shall be 40 feet, 10 feet of which shall be located adjacent to and on the outside of both limits of the permanent right-of-way. The minimum distance between the center of any longitudinal pipe line and the right-of-way limit line shall be 5 feet. All construction activities shall be confined within the 40 feet wide construction right-of-way.
- C. The Contractor shall, however, make his own arrangements for office space, materials storage yards, change trailers, sanitary facilities, utility services, debris disposal sites, and; for ingress and egress to any location along the pipe line project for which the Contractor desires or requires use and, for which the Authority has been granted no such right-of-way.
- D. Proposed pipe lines and appurtenances may also encroach upon right-of-way occupied by pipelines or other facilities owned, operated and/or maintained by other utility companies. It shall be the responsibility of the Contractor to notify the appropriate representatives of those agencies in advance of performing any work therein and, to conduct all construction activities in accordance with the respective regulations appertaining thereto. The Contractor shall utilize the PA OneCall System as required by law. The PA One Call telephone number is 1-800-242-1776.
- E. The position of sewer lines proposed to be constructed in connection with land development projects shall be such that, regardless of the sequencing of various utility line construction (gas, power, telephone, water, storm sewer, sanitary sewers, etc.) no pipe line shall be aligned longitudinally, along the sanitary sewer lines, any closer than three (3) feet. It is imperative that such minimum distance be maintained along all sanitary sewer and water lines to provide space required for future maintenance and/or repairs.
- F. In accordance with the regulations of the Pennsylvania Department of Environmental Protection, the separation between water and sewer pipe shall be as is shown in Appendix A-2, SD-003.

4. Control of Pipe Line Elevations and Alignments

- A. The elevations of all Authority facilities shown on record drawings dated prior to 1988, are

on the Datum of the United States Geological Survey NAVD 29. The Contractor shall confirm the elevation of all existing facilities to which proposed facilities will connect, as well as the profile of the existing and/or finished (in the case of land development projects) ground lines, prior to commencement of construction, to confirm compatibility with new designs prepared in accordance with the PA State Plane Coordinate System South which recognizes NAD 83 and NGVD 88.

- B. All sewer lines shall be required to be constructed and the elevations and alignment shall be controlled by the use of laser equipment. Sewer line construction shall begin at the manhole with the lowest invert elevation unless prior approval is granted by the Authority.
- C. The Contractor shall employ competent field survey personnel as may be required to control grades and/or alignment of proposed facilities and to assist the Authority by obtaining information during construction progress, and for purposes of preparing as-built record drawings.

5. Traffic Warning Signs, Barricades, Lights and Control

- A. Where pipe lines and/or other facilities are constructed along State Highways and/or Township Streets, and where construction activities may otherwise impede normal vehicular traffic patterns on said highways or streets, the control of traffic shall be accomplished in accordance with the details set forth in Publication 203A of the Pennsylvania Department of Transportation, the title of which is "Short Term Work Zone Traffic Control Guide".
- B. The position of work zone signs, erection of signs, sizes of signs, details and configuration of signs, traffic channelizing, tapered lengths/spacing, cones, drums, vertical panels, lighting devices, arrow boards and all flagging conduct and activities shall conform to the details described in Publication 203A. The location and configuration of traffic control methods shall conform to those graphically illustrated on the appertaining Table 5 and Figures 5 through 23 shown in Publication 203A. The Contractor shall submit a traffic control plan and procedure (conforming to Publication 203A) to the Authority for approval, prior to commencing with field construction.

6. Exploratory Excavations

- A. Some of the proposed pipelines and appurtenant structures are somewhat flexible with respect to alignment. Therefore, in those existing streets, roadways, berms or other areas expected to have a number of underground utility lines, where there are large trees which may be saved by realignment, and where the Authority so directs, the contractor shall make appropriate exploratory excavations for the purpose of locating said lines.

- B. In all instances, the costs associated with exploratory excavations shall be the responsibility of the Contractor, and any realignment of pipelines shall be approved by the Authority.

7. Existing Utility Lines - Location, Protection and Hazards

- A. The plans show those underground water lines, gas lines, electric lines, cable TV lines, telephone lines, sanitary sewers, storm drains, conduits and other similar utility lines and appurtenances for which said location information was either made available to the designer, or was observed in the field. Neither the number of such underground facilities nor their respective types, sizes and/or locations can be assured or guaranteed and it is, therefore, the responsibility of the Contractor to obtain such additional information as is required to properly complete the work in compliance with the specifications, and; to contact the owners of the various utilities in the area prior to starting and during performance of the work in accordance with PA Act No. 287 of 1972 and As Amended by PA Act 187 of 1996 known as the Underground Utility Line Protection Act.
- B. The approximate location of any power and telephone poles and guy poles along the route of the work is shown on the drawings and the overhead lines supported by all such poles shall be observed and located by the Contractor prior to commencement of the work.
- C. The Contractor shall be completely and solely responsible for any and all property damages, bodily injuries, financial losses and interruption of service that results from or are attributable to his construction activities and, which affect water lines, gas lines, electric lines, telephone lines, drain lines, sanitary and storm sewer lines and all appurtenances and service facilities connected thereto. Restoration of all such disturbed facilities shall be accomplished immediately after incurrence thereto.
- D. Water, sewer, gas, power and telephone service to dwellings or places of business shall be maintained with a minimum of interruption throughout the construction of the contract work. No such service shall be intentionally interrupted without the approval of the respective utility company concerned, and without first giving due warning to the occupants of said dwelling or business establishment. At least three (3) days notice of an interruption in service shall be given to the Authority so that the Authority may notify its customers.
- E. In some cases, it may be found that existing pipelines are in a location where construction of the proposed work cannot reasonably proceed until the utility has been relocated. The Contractor shall make all necessary sub-surface investigations and shall locate such utility mains far enough in advance of the trenching work so that work progress is not unnecessarily interrupted.

- F. Attention is directed to the fact that the proposed work could be in close proximity to overhead power lines which transmit electric current at high voltages and which, if disturbed or contacted during construction, would be hazardous to construction personnel and/or other persons. The Contractor shall, therefore, properly protect such wires, pole supports or other power line appurtenances to avoid disturbance to those facilities, and shall operate all machinery and conduct all other construction activities in a manner that will assure protection of all construction personnel and other persons against said hazards.
- G. Work in the vicinity of the existing underground gas lines and appurtenances is also hazardous because, under certain conditions, such materials are flammable and/or explosive and, the Contractor shall avoid all temporary and permanent supports and other required protection to prevent exposure of the same to construction personnel and/or other persons.
Where such lines are exposed during construction and leakage is detected, construction work in those areas shall be immediately suspended, the owner of the pipe line shall be immediately advised of the condition and the construction work shall not resume until all repairs have been properly completed.
- H. The construction activities required to be performed in the conduct of the work may necessitate the inter-connection, interception, surveying, inspection, removal, replacement and repair of certain existing manholes, sewer pipes and appurtenances. Said items are conveying all wastes and runoff discharged to and infiltrating into the public sewer system within the area served, which wastes may contain and/or generate toxic, noxious, oxygen depleting or other liquid or gaseous substances harmful to human beings.
- I. The Contractor shall also provide all personnel with all tools, clothing and other devices necessary for such safe practice, including appropriate waterproof clothing, respirators, protective glasses, mechanical air blowing equipment to pre-ventilate manholes and other chambers, explosive atmosphere detectors, ladders, safety harnesses, etc. No work shall be performed under any unsafe conditions and if same is detected at any time, the Contractor shall, therefore, thoroughly instruct all personnel involved in such work so that appropriate and complete safety practices are observed at all times.

8. Shop Drawings and Materials Submittals

- A. All materials proposed to be utilized for construction of any Authority facilities are required to be approved for use, in advance of shipment to the job site. No materials shall be incorporated in any sewer lines or appurtenances, which have not received the prior approval of the Authority.
- B. Such approvals shall be obtained by submitting five copies of shop drawings, catalog cuts,

materials specifications, bills of materials and/or such other printed information which clearly illustrates the details of all pipe, joints, pipe line structures and appurtenances, supports, mechanical details, specific installation requirements, etc.

- C. The Authority will review, make corrections on, reject and/or approve said submitted shop drawings and materials information and will return one copy to the developer/contractor within twenty-one calendar days; resubmittal shall be made by the Contractor as required to obtain approvals - prior to installation of the material in the construction work.
- D. The review and approval of any separate submittal item shall not eliminate alter or otherwise affect the responsibility of the Contractor to coordinate all of such submittals with the performance and progress of the work to assure completion of the intended project.
- E. Digital drawing files of the approved construction plans and profiles in AutoCAD format or equivalent shall be submitted to the Authority prior to start of construction. All digital file plan and profile drawings shall be supplied utilizing State Plane Coordinates and USGS datum.

9. Independent Commercial Testing Laboratory Services

- A. When a proposed project or series of projects involves installation of more than a total of 3,000 lineal feet of polyvinyl chloride sewer pipe or reinforced concrete sewer pipe (regardless that different diameter pipe may aggregate that amount) the Authority may elect to require that the Contractor shall furnish, during pipe delivery and construction, reports of an independent commercial testing laboratory.
- B. Said reports shall set forth critical pipe characteristics such as materials tests; hydrostatic tests (infiltration); pipe dimensions; gasket testing; deflection (PVC); absorption (RC) and such other test results which will confirm conformance with these and the referenced ASTM, AWWA and other standards contained herein. One pipe section of every 200 sections manufactured and delivered, regardless of length of each pipe, shall be selected at random by the testing laboratory representative and transported to the commercial lab for such purposes.

10. As Built Drawings

- A. The Contractor shall retain one (1) reasonably clean set of drawings of the proposed improvements at the job site, on which he shall note changes in pipe line alignments and elevations and, any other changes from the pre-construction approved plans. He shall also reference the locations of the ends of sewer service laterals so that the same may be

uncovered and connected at future times.

- B. The set of prints on which such field information is recorded shall be turned over to the Authority providing a daily construction progress record and identify all noted changes to the project, prior to Authority acceptance of the facilities as well as, as-Built information shall include, but not be limited to, manhole inverts, line lengths, slopes, wye locations, offset dimensions, and detailed information on all other aspects of the construction of the facilities.
- C. A professionally licensed Engineer or Surveyor appointed by the Authority shall conduct a survey of as-built conditions to verify the actual grades, elevations, distances, etc. and that all sewer facilities were constructed within rights of way and easements.
- D. The Engineer or Surveyor appointed by the Authority will provide a certification to the Authority that all lines are constructed in accordance with these specifications and within the rights-of-way identified on the subdivision plans. The Engineer or Surveyor will also provide record drawings in the format, media and number to the Authority for record and distribution purposes.

END OF PART I

PART II - SITE WORK AND PREPARATION

1. Clearing and Grubbing

- A. Certain work to be performed will require clearing. The Contractor shall cut, clear and remove all brush, sapling, scrub and other wild growth along the route of the pipelines. Beyond the limits and boundaries of the Developers property, no trees shall be cut, however, without the specific approval and prior designation for cutting, by the Authority and or the adjacent property owner. It is the intent of these specifications to minimize the removal of trees on adjacent lands and, therefore, only those which will positively prevent the application of reasonable construction methods and procedures will be permitted to be removed.
- B. Brush, scrub growth, stumps, saplings and tree limbs and trunks so directed to be cut and removed, shall be completely removed from the site of the work. No such debris shall be included in any backfill and as part of the clean-up work shall be required to be removed and transported away from the site to the contractors dump site.
- C. Contractor shall remove all salvageable surface items in the area to be excavated. Contractor shall properly separate, classify, store, protect, and preserve such materials and items for use in backfilling, resurfacing, replanting, restoring, or otherwise replacing the area of construction to its original conditions prior to construction, except as may hereinafter be noted.
- D. All fencing, mailboxes, drainage pipes, doghouses, clothesposts, steps, moveable storage sheds, ornamental lawn fixtures etc., shall be carefully removed, and placed temporarily in a place convenient to the property owner unit construction is completed, and protected against damage or theft. Upon completion of construction, the improvements shall be replaced or reinstalled in their original position and condition.
- E. In cultivated or landscaped areas, all shrubbery, hedges, and small trees in the area of construction shall be carefully removed, stored, and preserved for reuse upon completion of construction, unless authorized otherwise by Engineer. Large trees that cannot be safely transplanted or reasonably replaced shall be left standing unless permission is specifically granted by the Engineer to remove the tree.

2. Open Excavation and Backfill

- A. CONTRACTOR is directed to the provisions of the Underground Utility Line Protection

Law Act 287 (1974), as amended by Act 187 of 1996, and full compliance therewith is required of the CONTRACTOR.

- B. Except where jacking, boring or tunneling is indicated on the plans and/or profiles, pipelines and appurtenances may be constructed by the open trench excavation method. All excavation shall be unclassified and no extra payment shall be made for hand excavation or for the removal of any rock, boulders, stumps, tree roots, shale, muck, masonry, curbing, paving or other natural or man-made materials.
- C. Limit daily trench excavation to a length of pipe placement and backfilling that can be completed the same day.
- D. The width of all trenches shall not exceed the maximum of four feet or the outside diameter of the pipe, plus two feet, from the bottom of the respective pipe trench to a horizontal plane located one foot above the top of the pipe. That section of the trench is identified as the pipe zone and its configuration is graphically illustrated in Appendix A-2, SD-002. In the event that the Contractor's construction methods/activities result in a trench wider than four feet or the pipe diameter plus two feet within that pipe zone, he shall install concrete bedding or encasement or shall make such other provisions as may be directed by the Authority to protect and assure the structural integrity of the pipe.
- E. All ductile iron pipe and reinforced concrete pipe may be installed directly on exposed trench bottoms, where no rock or other unyielding material or where no soft unstable conditions exist.
- F. Where the exposed trench bottom consists of rock or other unyielding material the trench shall be overcut a minimum of 4" and the ductile iron or reinforced concrete pipe shall be installed on bedding material, which is specified later within this manual.
- G. When soft and/or unstable trench bottoms are exposed, they shall also be overcut and stabilized to the satisfaction of the Authority with the same bedding material before the pipe is installed. Trench bottoms shall be overcut at joints where pipe bells will occur to assure that all pipe barrels are continuously supported for the entire barrel lengths. If this method does not provide adequate pipe support, as determined by the Authority, concrete caissons shall be installed as required at no expense to the Authority.
- H. All polyvinyl chloride pipe shall, regardless of the character of the exposed trench bottom, be installed on bedding material at least 6" in thickness, except where concrete cradle and/or encasement is required.

- I. The excavation material from the trench may be stored along its alignment on rights-of-way obtained for construction purposes. It may not, however, prohibit traffic flows along the streets and roadways, access to private properties, or access to existing utility lines by the respective utility companies.
- J. The temporary storage of excavated material shall not obstruct or alter the flow of surface water runoff to the detriment of the operation of existing surface water drainage facilities and ditches and, shall be placed at a location which will not superimpose excessive loading on the trench walls and/or the sheeting, shoring or bracing installed within the trenches.
- K. At all locations along ductile iron or reinforced concrete pipelines, the backfill material placed in the pipe zone (that is, that material located above the top of the trench bottom or bedding material to an elevation located one foot above the top of the pipe), shall be select material which shall be thoroughly compacted and placed in such a manner to avoid disturbance or displacement of the pipe and other appurtenances. The pipe zone material shall contain no rocks or hard shale that have a maximum dimension exceeding two inches. Pipe barrels shall be continuously supported on trench bottoms for their entire length and no rocks, bricks, on edges or other point supports will be permitted. Bedding material shall be used, where necessary, to compensate for irregular trench bottoms and provide such continuous support.
- L. Locations where concrete cradle and/or encasement are necessary for the full width of the trench to support the anticipated loads on the pipe are shown on the profiles. Contractor is cautioned that in the event the trench width is greater than that specified, Engineer may require Contractor to furnish at Contractor's own expense, concrete encasement in place of concrete cradle indicated on the drawings, or concrete cradle where none is indicated on the Drawings.
- M. Expenses associated with excavation made beyond the specified limits shall be at the Contractor's expense.
- N. At all locations along polyvinyl chloride pipelines the backfill material placed within the pipe zone to an elevation of twelve (12) inches above the top of the pipe shall be the same as that material specified hereinafter for the bedding of the pipe as depicted in Appendix A-2, SD-001.
- O. Backfill material placed in trenches above the pipe zone, where such trenches are located within Township Streets or State Highways shall consist (for the entire trench width and depth) of material conforming to the Township or State requirements specified for bedding.

- P. Backfill material in trenches above the pipe zone in traveled roadways, road shoulders and or berms and at all other locations where trench settlement must be avoided, shall be crushed stone select backfill material placed in lifts not exceeding eight inches in thickness and shall be thoroughly and mechanically compacted by the use of vibratory or reciprocating tamping equipment - for the full depth and length of the trench and in accordance with Part II, Section 5, Compaction Testing.
- Q. At other locations along the alignment of the pipes, it shall be at the discretion of the Authority to require mechanical compaction of the trench. The means by which mechanical compaction shall be achieved shall be submitted by the Contractor and approved before construction. The compaction of the backfill may be verified at the Authority's option and at the Contractor's cost. Means of verification shall be chosen on a case-by-case basis. Where trench settlement is not of concern and, where designated by the Authority during construction progress, backfill above the pipe zone may be loosely placed by machine mounded over the trench. After settlement has satisfactorily occurred, and subject to a time approved by the Authority, the excess material shall be leveled and blended with the slope of adjacent ground surfaces in a manner which does not adversely impede the flow of surface water or otherwise have a deleterious affect on the finished landscape.
- R. When the trench excavation is being backfilled, the disturbed area shall be graded to final contours and appropriate temporary erosion and sediment pollution control measures/facilities shall be installed. Seeding and mulching of all disturbed areas beyond the limits and boundaries of property owned by a Developer extending the sewer shall be done within three days of final grading.
- S. If daily backfilling is delayed, the disturbed area shall be graded to final contours, appropriate temporary erosion and sediment control measures/facilities shall be installed, and the areas seeded and mulched within the next two calendar days.
- T. No material shall be used for backfill at any location that, in the opinion of the Authority, is too wet, frozen, mucky or contains debris, tree stumps or an excessive amount of rocks.
- U. All excess excavated material resulting from the construction of the pipelines and appurtenances shall be disposed at a location and in a manner which shall be the Contractor's responsibility to determine at no cost to the Authority.
- V. The Contractor shall schedule construction activities and provide all required equipment and personnel such that the backfilling of trenches located along or crossing streets, street berms, roadways, driveways and other traveled ways, results in resumption of normal

traffic patterns immediately after pipe construction has been completed for the day.

- W. Engineer may require that the trench be fully backfilled at the close of each workday, with no additional compensation to Contractor.
- X. If work is stopped on any trench for any reason and in the opinion of Engineer the trench excavation is left open for an unreasonable length of time, either in advance of or after pipe installation, Contractor shall refill such trench, or Owner has the right to do so and deduct the cost for doing so from monies owed Contractor. If trench is left open excessively in advance of construction, Contractor shall, at his own cost, refill trench and re-excavate when construction can proceed at that location opened in advance.

3. Construction Site Safety

- A. Safety on the construction site shall be the absolute responsibility of the Contractor.
- B. Where necessary to maintain the required trench configuration in the pipe zone, in confined areas where trench walls above the pipe zone cannot be sloped, or for the protection and safety of construction personnel, sheeting, shoring and/or bracing shall be installed in accordance with the requirements of the appertaining regulatory agencies.
- C. Said sheeting, shoring and/or bracing shall be designed by the Contractor and shall be adequate to withstand the loads to be imposed during the construction operations. Its placement and removal shall be carefully performed to avoid displacement or disturbance of the entrenched pipe. All trench supports shall also be required to provide complete safety to construction personnel working within. Trench boxes may be utilized however their design, fabrication, structural adequacy, handling, placement and removal shall be the responsibility of the Contractor.
- D. Trenches at any and all locations where pedestrian or vehicular traffic hazards would result shall not be left open during non-construction hours, unless they are suitably covered with a steel plate which is adequately anchored and reinforced to sustain pedestrian and/or vehicular traffic loads which may be imposed. All excavations within road rights-of-way shall be closed over night and over weekends and marked with a flashing traffic marker to warn motorists and pedestrians.
- E. All structure excavations and open trenches shall be constructed in accordance with the regulations set forth under subpart P, "Excavation, Trenching and Shoring" published as a part of the Safety and Health Regulations for construction by the U.S. Department of Labor, as amended, as the same pertains to the shape of trenches, trench side-wall

supports, the construction methods employed, the general protection requirements, the general excavation requirements, and the minimum requirements for the respective contractor for the conditions encountered. Methods of installation shall be compatible with assuring the protection against disturbance of adjacent facilities and/or grounds and, the safety of construction and other personnel.

4. Bedding and Specially Graded Backfill Material

- A. All pipe line bedding material, all material placed within the pipe zone of trenches in which PVC pipe is constructed and, all material placed above the trench bottom and below the concrete trench slab (where trenches cross or are located within Township Streets, County or State Roads) shall be 2B stone, complying with the gradation and classification of the Pennsylvania Department of Transportation, or AASHTO No. 57 or 67. Earth, sand, river gravel, granulated slag and open hearth slag are not acceptable materials.
- B. All bedding material shall be manually shoveled sliced and or mechanically compacted to the Authority's inspector.

5. Compaction Testing

- A. In areas where the excavated material is utilized as backfill in areas designated in Part II, Section 2, Item P, the compacted backfill shall achieve a density of 95% as determined by the Standard Method A, Proctor Test.
- B. To assure proper sewer installation, tests will be performed at the discretion of the Authority and at the expense of the Contractor to assure that such compacted densities prevail. In the event that the placed backfill does not comply with the 95% density requirement, the work shall be re-excavated and re-compacted and the costs of the subsequent re-testing after replacement shall be the Contractor's responsibility.

6. Blasting

- A. Blasting will not be permitted unless authorized by the Authority and the Township. In the event blasting is authorized, procedures will be made available

7. Dewatering

- A. All excavation shall be dewatered thoroughly in advance of the installation of any of the construction work; no facilities shall be constructed in any excavation where water flows or is pooled, or where groundwater infiltration or surface water inflow is not immediately removed.

- B. Water that accumulates in the open trench shall be completely removed by pumping before pipe placement and/or backfilling begins at the Contractors expense.
- C. Where dewatering does occur, the Contractor shall conduct those operations in a manner that complies with regulations on the subject of Soil Erosion and Sediment Pollution Control as promulgated by The Pennsylvania Department of Environmental Protection. No such discharges shall be permitted to erode or otherwise adversely effect any public or private property and all such discharges shall be trapped, settled, rough-filtered, retained and/or checked (depending upon the clarity, turbidity, and concentration of suspended solids within such discharges) in accordance with detailed requirements of Pennsylvania Department of Environmental Protection, Office of Resources Management, Bureau of Soil and Water Conservation, Division of Soil Resources and Erosion Control.

8. Minimizing Water Pollution from Soil Erosion

- A. All Contractors shall conduct their activities and shall program trenching and restoration operations in such a manner as to minimize pollution of the ditches, streams and creeks and their tributaries from erosion of the freshly excavated and/or backfilled material during periods of excavation and surface water runoff.
- B. The Contractor shall reduce the area and duration of exposure of all erodible soils by the greatest extent practicable and to that end, hydro-mulching, reseeding and other surface restoration shall be required to closely follow backfilling operations. Where the Authority so directs in the field, sediment traps, hay bales, and/or other means to retard runoff rates shall be installed; similar holding basins or other sediment trap arrangements shall also be required to be installed at the discharge of dewatering pumps.
- C. Temporary erosion control measures shall be established prior to or concurrent with clearing and grubbing.
- D. Discretion shall be exercised in selecting the number and location for encroachments during construction both in and along the creeks such that a minimum of stream disturbance and erosion pollution results. As previously referenced, the appended Standard Detail drawings in Appendix A-2, illustrate the temporary facilities, which will be required to be installed.
- E. Prior to earthmoving activities the Contractor shall install the necessary erosion protection devices required as outlined below, and as detailed in the latest edition of the Erosion and Sediment Pollution Control Program Manual, as published in the Bureau of Soil and Water Conservation of the Pennsylvania Department of Environmental Protection.

1. Immediately downstream of stream or creek crossings and where directed by Authority, the Contractor shall install a temporary short term stream disturbance sedimentation check.
 2. For equipment stream crossings, the Contractor shall use the same criteria as established for channel disturbance.
 3. Where the pipeline is located in wooded or planted areas the downstream side of the area to be excavated will be protected by installation of fabric fence or straw bales.
 4. Where the pipeline is located in traveled roadways or road berms, drainage facilities and ditches immediately downstream of the construction area to be protected by constructing a straw bale debris filter in the existing drainage ditch. After construction, the ditch is to be removed of straw bales and all silt and debris and returned to its original condition.
- F. During construction, there shall be no discharge of petroleum products from construction equipment into ditches, streams, creeks, storm sewers or on ground surfaces and, water removed during the trench dewatering operation shall be free of suspended material and/or mud, or shall be pumped to sediment trap before conveyance to the stream.
- G. All excavation and grading shall be accomplished in a manner that complies with all requirements and standards set forth in the Erosion and Sediment Pollution Control Manual published by the Pennsylvania Department of Environmental Protection, unless more stringent requirements are indicated herein.

9. Dust and Mud Control on Streets and Other Traveled Ways

- A. Dust control palliatives shall be utilized where and when necessary and as directed by the Authority to satisfactorily maintain roads, streets, berms and other traveled ways for vehicular traffic. In addition, the accumulation of mud and/or dirt from the excavation, backfill and trenching operations shall be cleaned off the surfaces to properly maintain the roadway in a condition satisfactory to the Authority and the Township.

10. Stream Crossings

- A. Where sanitary sewer lines cross creeks or streams, such crossing shall be accomplished by using ductile iron pipe or PVC pipe encased in a minimum of 6" of concrete all around the pipe, and fittings conforming to the requirements of the appertaining sections of these specifications.
- B. The pipe shall be tied to 8" concrete blocks laid on the trench bottom and shall be encased

in concrete all around the pipe. The concrete encasement shall be at least six (6) inches thick. The minimum depths of pipe; that is, the vertical distance between the lowest elevation of the stream along the pipe alignment and the top of the pipe, shall be three (3) feet. Where rock is encountered within the trench bottom, bedding material (as also specified herein) shall be utilized.

- C. The concrete encasement of the pipe shall extend between the tops of the stream on creek banks, or where such banks are not evident, a minimum distance of 5 feet each side beyond the normal stream channel.
- D. Backfill around the stream crossing shall consist of the excavated material unless the same is deemed unsuitable by the Authority at the time of excavation.
- E. Disturbed bank areas shall be stabilized immediately upon completion of the crossing.
- F. As shown on the construction drawings, rip-rap shall be installed to prevent erosion of the slopes, stone shall be minimum weight of 155 lbs per cubic foot durable rock, as computed by multiplying the specific gravity (bulk saturated, surface dry basis, ASSHTO Test T 85) times 62.3 pounds per cubic foot. The rip-rap shall meet NSA requirements and shall be placed on a filter blanket meeting the requirements of the Department of Environmental Protection. Installation of rip-rap shall be per Pennsylvania Department of Environmental Protection requirements and regulations.

11. Tunneling, Jacking or Boring

- A. At those locations indicated on the plans and/or profiles open cut excavation will not be permitted and, therefore, the Contractor shall tunnel, jack or bore the casing pipes and/or sewers, or force mains.
- B. No additional compensation will be paid for tunneling, whether necessary for sewer line construction, house connections, other connections, crossing under existing conduits, or any other purpose.
- C. All boring and jacking shall be unclassified. No extra payment will be made for rock, boulders, shale, timber, logs, concrete, masonry, or other natural or manufactured substances encountered in the boring and jacking operation.
- D. After installation of casing pipes or tunnel liners, the carrier pipe shall be threaded within. The method of placement shall be determined by the Contractor, however, care shall be exercised to not displace or disturb the interior pipe. The Contractor shall submit to the

Authority for approval his method of placement.

- E. Where tunneling is employed, the tunnel liner plate shall be designed by the Contractor for the particular diameter or shape which he elects to use. The plate shall be designed and assembled in accordance with the manufacturer's published recommendations for the material encountered in the tunnel excavation.
- F. Tunnels shall be carefully excavated by experienced tunnel workers and shall be trimmed to such a size and shape as to allow the proper placing of the sanitary sewers and force main to the lines and grades shown on the plans after the liner is in place. Care shall be exercised in excavating tunnels so that voids outside the casing and disturbance of the surrounding material are kept to a minimum. Large voids are to be filled immediately with grout. The space between the tunnel bore and the casing shall be completely filled with an approved sand-cement mortar.
- G. All sheeting, shoring, bracing, lining, etc., required for the construction of tunnels, shafts, portals, etc. shall be furnished and installed by the Contractor. All work relative to the installation of liners and carrier pipes by means of jacking, boring, or tunneling shall be performed in accordance with regulations set forth under Subpart S, "Tunnels and Shafts, Caissons, Cofferdams and Compressed Air" published as a part of the Safety and Health Regulations for Construction by the U. S. Department of Labor.
- H. The Contractor shall make all arrangements necessary for the location, construction and operation of any intermediate shafts and/or drifts he may require.
- I. The Contractor shall excavate the tunnel and support the surrounding earth so that no movement of the earth over or adjacent to the work shall occur at any time. In case, due to unforeseen conditions or otherwise, any such movement does occur, the Authority may order the Contractor to stop any and all work except that which assists in making the tunnel secure and in preventing further movement of the ground over or adjacent to the work.
- J. The Contractor shall resume tunneling at the place at which such movement occurred only when, in the opinion of the Authority, he has taken all necessary precautions to prevent movement.
- K. Where boring and jacking is employed, a minimum 1/2" thick steel shield at least 24" long shall be required to extend beyond the forward end of the casing pipe, liner or plate, or conduit being jacked. The outside radius of the shield shall not exceed the outside diameter of the pipe by more than 1". Excavation ahead of the casing, liner plate, or conduit shall not progress beyond the end of the shield being used.

- L. The casing pipe shall at all times follow immediately behind the boring auger at a distance no greater than 2 feet. The method of auguring the entire hole and then pushing the pipe through will not be permitted.
- M. Should an obstruction or misalignment be encountered during any boring or jacking so as to prevent continuation of operations, the auger shall be removed, and any excess pipe cut off and capped. The casing interior and any void spaces outside of the casing shall be completely pressure grouted with an approved cement grout to fill all voids before establishing a new boring or jacking site.
- N. The ends of the casing pipe shall be sealed using neoprene boot seals with stainless steel clamps or sealed with concrete brick and concrete mortar to prevent water from entering and flowing through the casing pipe.
- O. The space between the carrier pipe and the casing pipe shall be filled with an approved material to a depth not less than $\frac{3}{4}$ of the diameter of the casing pipe. The space must not be completely filled. The fill material shall not be washed into place.
- P. Casing Spacers located within the casing pipe and supporting the carrier pipe shall be properly sized to accommodate the two pipes. Casing spacers shall be as manufactured by Advance Products & Systems, Inc., Power Lone Star, Inc., or approved equivalent. The use of timber skids and stainless steel bands is not acceptable.
- Q. It is the intent of these specifications to permit the Contractor to select any of the three above-mentioned methods of installing pipelines where open cut is not permitted, provided construction details and methods employed comply with the requirements of the authorities having jurisdiction, in addition to the requirements of these specifications.
- R. Regardless of whether tunneling, jacking or boring is employed, the Contractor shall be responsible for construction of the various pipelines true to line and grade and shall be held fully responsible for protection against surface subsidence, damages or disturbances to the satisfaction of the Authority.
- S. The Contractor shall be responsible for reimbursing all agencies owning property where boring, jacking or tunneling is required for any inspection and/or flagmen costs incurred and deemed necessary by those agencies at any and all locations where work under this contract is performed, to ensure safe traffic conditions and safe conduct of the work. Submission of the previously described details, subsequent approvals and responsibility for inspection costs for either parallel or longitudinal occupancies shall be required and shall also be provided for in the bid prices.

- T. Failure to comply with any of the foregoing, as well as all damages to facilities and highway traffic interference or impedance, shall be the responsibility of this Contractor and he shall be required to rectify all such conditions to the satisfaction of the Authority.

12. Cast-in-Place Concrete for Structures, Bedding, Paving, Thrust Restraints, Trench Caps in Roadways, Encasements, Underpinning, Etc.

- A. Construction of all concrete work shall be in accordance with the applicable portions of "Specifications for Structural Concrete for Buildings" ACI 301 of the latest revision, except as modified hereinafter. Concrete shall be ready-mixed and shall be batched, mixed and transported with sufficient facilities to deliver the concrete at the rate required and in accordance with the standards set forth in ASTM Specification C-94.
- B. Mixing and flushing water in transit mixtures shall be equipped with a calibrated glass gage. The ready-mix concrete supplier shall furnish the Authority a certified statement that the concrete furnished to the job conforms to the provisions of these specifications.
- C. All concrete shall be dense, workable and shall be placed utilizing pneumatic vibrators.
- D. Concrete shall be required to develop a comprehensive strength of 3,500 psi in 28 days.
- E. Reinforcing steel shall conform to the requirements of ASTM A-615, Grade 60; mesh reinforcement shall conform to ASTM A-185 requirements.

13. Underground Detectable Marking Tape

- A. Marking tape shall be installed at a depth of two (2) feet below the finished surface above the pipe along the alignment of all sewer lines, including sewer services. It shall be a minimum of three-inch (3") wide, vivid green with foil backing and marked "Gravity Sewer Line" at Gravity Sewers or marked "Intermittent Pressure Sewer" at Force Main Sewers.
- B. The tape shall be magnetically detectable with conventional location equipment and therefore shall be encased aluminum foil or other similar materials.

14. Pavement Removal and Restoration

- A. All roads, driveways, streets, traveled ways, berms, sidewalks, etc. disturbed during construction shall be reconstructed by the Contractor to their original condition, unless noted otherwise.
- B. At all locations where trenching, excavation, and/or other construction activities destroy or damage pavement surfaces of Township roads and streets, restoration shall be in accordance with Township road specifications.
- C. At all locations where trenching, excavation, and/or other construction activities destroy or damage pavement surfaces of County roads and streets, restoration shall be in accordance with County road specifications.
- D. All roads under the jurisdiction of the Commonwealth of Pennsylvania shall be restored in accordance with the requirements of the Pennsylvania Department of Transportation.
- E. All bituminous material shall be installed and compacted by methods and with equipment approved by the Pennsylvania Department of Transportation.
- F. All painted traffic lines and markings destroyed during the construction of this project shall be replaced. All painted traffic lines and markings shall be installed according to the Commonwealth of Pennsylvania Department of Transportation Specifications, Form 408, Section 962, and all other applicable sections.
- G. The CONTRACTOR is cautioned that damage caused by tracked equipment on any finished road, street, driveway, sidewalk, etc. surface outside of the trench area will be restored by the CONTRACTOR at his cost.

15. Top Soil in Cultivated Areas

- A. In lawns and gardens, and in other improved areas (except for streets, roadways, and traveled ways), the top of the backfill material shall be placed to an elevation approximately 6" below the finished ground surface.
- B. Commercial topsoil shall be placed and lightly rolled in the top 6" of all excavated areas and other places where construction equipment and activities impose damage to ground surfaces.
- C. Commercial topsoil shall be obtained by the CONTRACTOR from a local garden supplier

or nursery for areas where topsoil is not of adequate quantity.

- D. Required topsoil shall be "loam" and a soil sample grain size analysis and organic content analysis shall be submitted with shop drawings for approval. Organic content shall be 4% minimum. The Contractor shall also provide samples of topsoil when requested by Owner.

16. Restoration of Lawns and Other Improved or Cultivated Areas

- A. After the topsoil has been spread, all lawns shall be restored by properly rolling, tilling and hand raking the area disturbed during construction and an application of an approved fertilizer at a rate of 50 lbs. per 1,000 square feet shall be made. Said area then shall be completed with peat moss, mushroom manure, or other approved mulch material after which an approved grass seed shall be sown in accordance with an approved Erosion and Sedimentation Pollution Control Plan and the specifications herein. The Contractor shall be responsible for restoration of all settlements and for properly preparing the topsoil, applying fertilizer and mulch and planting the seed.
- B. Grass seed shall match that planted or shall be of same type that already exists and be applied at the rate of 5 lb. Per 1000 square feet, unless otherwise prescribed by seed mixture. The Authority shall retain the right to select the seed. Seeding and mulching of disturbed areas shall be accomplished by the end of each week.
- C. All seeded areas shall be kept constantly wet to a depth of 3 in. for 10 days immediately after seeding. All areas that do not show prompt catch of grass shall then be reseeded as required. In any event, the Contractor shall insure a good final stand of grass as specified above, and he shall maintain the seeded areas until the lawn, as such, is free from bare spots and off color areas and until final acceptance of the entire project.
- D. Contractor shall be responsible for the first cutting of the grass. Future care for the grass will be handled by the Owner.
- E. Where the pipeline is located within road rights-of-way, or where indicated on the Construction Drawings, the Contractor shall place jute mats for erosion control where directed by the Authority.
- F. All shrubbery which is removed temporarily to accommodate construction of pipelines shall be promptly replaced after backfilling is completed and shall be fertilized and otherwise treated to insure restoration to a condition existing prior to the installation of the sewer. Shrubby which is not successfully removed and replaced, and hence, does not survive, shall be subsequently replaced or otherwise made good by the Contractor for the period of

the 18 month Maintenance Bond.

- G. Where the proposed sewer crosses existing asphalt driveways or private roadways all bituminous paving shall be restored by neatly and uniformly cutting the edges and placing a binder course and surface course over the trench fill in accordance with requirements contained herein. The binder course shall be a 3-inch bituminous binder course, after compaction. The surface course shall be ID-2 installed in one wearing course totaling one inch after compaction. Seal edges with hot bituminous liquid. All bituminous material shall be installed and compacted by methods and with equipment approved by the Pennsylvania Department of Transportation.
- H. Where the proposed sewer crosses existing concrete driveways all concrete paving shall be restored by neatly and uniformly cutting the edges and placing a 6" thick reinforced concrete slab. The concrete shall be reinforced with 6x6x10 gauge wire mesh. Any slab of concrete disturbed shall be replaced in its entirety.
- I. Where the proposed sewer crosses existing stone, slag, or gravel driveways the driveway shall be restored by placing a 4" thick lift of crushed limestone for the full width of the disturbed area. The limestone shall consist of hard, tough, durable stone free from slaty texture or cleavage planes. The limestone shall be secured from a Pennsylvania Department of Transportation approved supplier. Sandstone, shale, slag, etc., will not be an acceptable substitute.
- J. All properties damaged due to construction operations and restored in accordance with the foregoing, shall be inspected by the Contractor and the respective property owner, and when determined satisfactory by that Owner, the Contractor shall obtain a signed release by such Owner and file copy of same with the Authority. Contracts will not be considered final until all such releases have been obtained.
- K. The plans do not show the location of existing mail boxes, traffic signage, certain sidewalks, retaining walls, and other miscellaneous improvements which are visible on the surface of the ground and which may require removal and replacement or, are damaged or destroyed during the course of (or in order to accommodate) construction activities. All such facilities shall be required to be restored as soon as is practicable after removal and/or destruction, in accordance with the directions of the ENGINEER.

END OF PART II

PART III - MATERIALS AND INSTALLATION

1. Gravity Sewer Pipe

- A. Building sewers shall be installed as indicated on the applicable standard detail drawings and shall be a minimum of 6" in diameter for commercial properties and 4" in diameter for residences. Where building sewers are to be connected to an existing sewer, they shall consist of a wye and repair sleeve conforming to these specifications. The work shall be scheduled with the Authority and the existing line cored and saddle installed by Authority Staff. No "Break-in" connections will be permitted.
- B. All main line sewer pipe shall be a minimum of 8" diameter and have a minimum laying length of not less than ten feet.
- C. All building sewer pipe and fittings and all collector or interceptor sewer pipe and fittings 27" diameter and smaller, unless otherwise indicated on the plans and profiles shall be extruded polyvinyl chloride conforming to ASTM D3034, SDR-35 for 4" through 15" pipe sizes, and ASTM F679 for 18" through 27" pipe sizes. Flexible elastomeric seals shall be provided conforming to ASTM D3212 and ASTM F477. Each section of pipe shall be stamped with a manufacturers certification of conformance to the referenced specification.
- D. All gravity sewer pipe larger than 27" in diameter shall be large diameter polyvinyl chloride (PVC) sewer pipe or reinforced concrete pipe (RCP) provided with steel end ring joints and o-ring gaskets. The PVC pipe shall conform to ASTM F 794. The RC pipe shall conform with the structural strength requirements set forth in the ASTM C76 specifications - Class III - unless otherwise stipulated on the plans and profiles. The jointing arrangements shall include steel end rings welded to the pipe wall reinforcement and o-ring gaskets, both of which shall conform to the appertaining provision of the AWWA C302 standards. The outside annular ring of the joint shall be completed, after installation of the pipe, by filling with a mortar mix specified hereinafter.
- E. Where determined by the Authority or its Engineer that a hazard would be created, sewer pipe shall not be removed from shipping pallets until ready for installation.
- F. All sewer extensions requiring connection to existing facilities shall be plugged and blocked in the manhole from which the extension originates to prevent extraneous material (water, dirt, debris, etc.) from entering the existing sewer system. The system shall be blocked and plugged by an inflatable ball plug chained to the manhole steps or by means approved by the Authority. The plug shall remain in place until the Authority approves the sewer for use.

Where an inflatable plug is utilized, the plug shall be checked daily by the Contractor for proper pressure and seal. Once Authority approval is provided, all extraneous water, dirt, debris, etc. shall be removed from the sewer by the Contractor at his own cost and consistent with the requirements of all other governing regulatory agencies.

- G. The minimum cover for pipelines conveying sewage shall be 4 ft. unless otherwise indicated on plans approved by the Authority.
- H. Under no circumstances is raw sewage to be discharged. The Contractor shall provide sufficient materials and equipment to pump or otherwise convey raw sewage if necessary to avoid discharge of sewage.
- I. All gravity sewers shall be installed in general conformance to ASTM D2321 and as required by these specifications.

2. Assembly of PVC Sewer Pipe

- A. The installation of gravity sewers shall start at the lower end of the line and proceed upgrade so that the spigot ends point in the direction of flow. The pipe shall be carefully laid to line and grade. Grade shall be maintained with the use of a laser directed through the center of the pipe. The handling, placing and jointing of pipe shall be in strict accordance with the pipe manufacturer's recommendations. Completed sewers shall show a full circle of light between manholes.
- B. Care shall be taken to ensure that pipe is always kept clean of any debris and shall be adequately plugged to prevent entrance of debris during construction. Any damage resulting from failure to removal all debris shall be the responsibility of the Contractor.
- C. Pipe joints shall be carefully lowered into the excavated trenches to avoid damage to the pipe barrel and the bell and spigot pipe ends. All rubber gaskets shall be examined to assure there is no apparent damage during handling and shipment.
- D. Both the bell and spigot ends shall be wiped clean with a reasonably dry cloth. The spigot end of the pipe shall then be lubricated by application of a suitable grease-like product, which will not adversely affect either the gasket or pipe wall. The entire circumference of the spigot shall be coated and the lubricated spigot shall be inserted into the bell. The pipe shall be shoved home by hand or by use of a bar and block without damage to gaskets.

3. Assembly of Reinforced Concrete Pipe Joints

- A. The installation of gravity sewers shall start at the lower end of the line and proceed upgrade so that the spigot ends point in the direction of flow. The pipe shall be carefully laid to line and grade. Grade shall be maintained with the use of a laser directed through the center of the pipe. The handling, placing and jointing of pipe shall be in strict accordance with the pipe manufacturer's recommendations. Completed sewers shall show a full circle of light between manholes.
- B. Care shall be taken to ensure that pipe is always kept clean of any debris and shall be adequately plugged to prevent entrance of debris during construction. Any damage resulting from failure to removal all debris shall be the responsibility of the Contractor.
- C. Pipe joints shall be carefully lowered into the excavated trenches to avoid damage to the pipe barrel and the tongue and groove end. The steel end rings shall be wiped clean and the gaskets shall be lubricated as recommended by the pipe manufacturer, after which the pipe shall be shoved home without damage to gaskets.
- D. The joint shall then be completed by the use of a cloth diaper which shall be securely wound around the outside lower three-fourths of the joint, which shall be poured full of a thin mortar mix consisting of one part cement to two parts sand in water. A stiffer mortar mix shall be traveled over the upper one-fourth of the pipe joint.

4. Manholes

- A. Manholes constructed for Authority pipelines shall be fabricated of precast concrete in accordance with the requirements of ASTM C478. The manhole structures may be furnished with prefabricated base sections or, the bases may be cast-in-place of reinforced concrete as shown on the appertaining Standard Detail SD-007 in Appendix A-2. Bases shall be "extended bottom" unless the Authority specifically approves the use of "mono-bottom" manhole base sections. Precast concrete base slabs and precast concrete base riser sections shall be poured monolithically with the base riser section having a minimum height of two feet above the top of the base slab and the base slab extending a minimum of 6" beyond the outside diameter of the precast base riser section.
- B. Manhole barrel sections shall be sealed with bitumastic materials placed in the field, as manufactured by Concrete Sealants, Inc or equivalent. Two rings of said material shall be installed - one on the inside of the joint in the groove and the other on the outside of the tongue. The exterior of the manholes shall be sealed with an asphaltic compound such as a foundation sealer or other material suitable for this application per the requirements of the

PADEP.

- C. Manholes furnished with prefabricated base sections shall be installed on 12" minimum thickness crushed stone or washed gravel conforming to the requirements of "Bedding and Specially Graded Backfill Material" as specified elsewhere herein. Said material shall also be placed in the bottom of the manhole excavation - between the limits of the influent and effluent pipe trenches - to an elevation one foot above the top of the connecting pipes. In other words, all sewer pipe connections to manholes shall be completely supported (to the bottom of the excavation) on bedding and, shall be enveloped in the same material to an elevation located one foot above the top of the pipe.
- D. Manholes where the largest connecting sewer is 18" diameter or less shall have a 4 feet inside diameter barrel section; where any connecting sewer exceeds 18" diameter, manhole barrel sections shall be 5 feet inside diameter. All manholes with a depth greater than 20 feet shall have a minimum inside diameter of 5 feet.
- E. All manholes shall be provided with steps located 12" on center, which shall conform with the latest requirements of ASTM C-478 and in general, to the configuration shown in Appendix A-2 SD-018; the steps shall be ASTM A 615, Grade 60 deformed steel encapsulated with injection molded Copolymer Polypropylene. The steps shall be capable of withstanding the design loading required in ASTM C-478.
- F. Frames and covers conforming to Appendix A-2 SD-015 shall be fabricated of cast iron Class 30 or better, conforming to the most recent revision of ASTM A48 and shall be free of bubbles and other sand or air imperfections. Contact surfaces shall be machined, and hatches and covers shall be inscribed with "PTSA SANITARY SEWER". Frames and covers shall be coated with a corrosion resistant bitumastic material, where directed by the Authority, that will be subject to the approval of the Authority, which shall be smooth and durable, and will not scale or chip off. The standard manhole frame and cover shall conform to Allegheny Foundry Patterns 109 and 110, Neenah Pattern R-1753, or approved equal. On each manhole two (2) complete rings of a ½ diameter approved flexible butyl rubber joint sealant shall be installed between the bottom of the frame and the top of the concrete of the manhole. Four (4) ¾" anchor bolts shall be provided for all frames. The lid on the last manhole in a run, that with the highest invert elevation, shall have one center vent hole not larger than one (1) inch in diameter. Watertight covers shall be installed on all manholes located in areas subject to submergence by water. In unimproved areas, manhole lids shall be set to an elevation one (1) feet above the ground surface.
- G. In approved areas, the final setting of manhole castings shall be such that the tops conform with the existing ground slopes and/or final design elevations and shall be set to exclude surface water. Grade adjustments shall be accomplished with maximum one-foot high

precast concrete rings and/or a single cast iron paving rings (in paved areas) as shown in Appendix A-2 SD-009.

- H. Invert channels shall be smooth and accurately shaped to a semi-circular bottom conforming to the inside of the adjacent sewer section. Inverts may be formed directly in the concrete of the structure base, or where reinforced concrete culvert pipe is used, may be built up of mortar or may be constructed by laying full section of sewer pipe straight through the structure and breaking out the top half after the base is constructed. Where necessary, invert channels in manhole bottoms shall be shaped and smoothed with Parson's Parsonpoxy or approved equivalent. Precast inverts shall be subject to satisfactory inspection by PTSA.
- I. The size and depth of the inverts will vary to suit the size of the pipe used and shall have a height of at least three-quarters of the effluent pipe diameter in inches for collector sewers and a depth equivalent to the effluent pipe diameter in inches for interceptor lines.
- J. Changes in grade within manhole inverts shall be made gradually and evenly. Changes in the direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the structure will permit. Changes in the pipe size shall be made gradually and evenly by dropping the invert in the manhole a distance equal to the difference in diameter of the pipe entering and leaving the manhole.
- K. Elevations shown on the plans indicate invert elevations of the center of manhole unless indicated otherwise. No manhole bottoms which result in collection of solids or in pooling of wastewater will be accepted. Gradients in manholes which accommodate smooth gravity flows must be provided. All manholes shall have a minimum fall of 0.2 feet between the inlet and outlet inverts.
- L. The landing or shelf that surrounds the channel shall slope one (1) inch in twelve (12) inches, and be given a brush finish to enhance traction for workers yet allow debris to be easily swept or flushed off into the channel.
- M. All prefabricated manhole bases/barrels shall, where pipes connect, be furnished with resilient and/or flexible connectors to accommodate the respective pipe diameters per Appendix A-2 SD-012.
- N. All manholes shall also be furnished with manhole inserts or inflow protectors which shall be fabricated to fit the specified frames and covers. Inflow Protectors at all manholes shall be a Manpan of ABS construction or equal and without vents.

- O. The exterior surfaces of all Precast Concrete Manhole Barrel Sections shall be waterproofed. Waterproof coating shall be two coats bitomastic material or Coal Tar Solution. Each shall have a minimum dry film thickness of eight mils.
- P. Manhole eccentric cone sections, precast base sections, flat top sections, and barrel sections shall not have more than two lifting holes per section for handling and installation purposes. After installation, the holes shall be sealed (both inside and outside) and made completely watertight.
- Q. Connection of new sewers to existing or new manholes where a cast in place boot has not been provided, shall be core drilled. The opening shall be provided with a rubber water stop and shall be sealed with concrete on both the inside and the outside of the manhole.
- R. At locations where new manholes are constructed over existing clay pipe sewers, the clay pipe shall be removed for one equivalent length of PVC Pipe (thirteen feet). The new manhole shall be set with one full length of PVC Pipe placed through the manhole pipe openings. Pipe connections shall be made utilizing dresser couplings. The Manhole invert shall be formed around the PVC pipe and upon satisfactory vacuum testing of the manhole the crown of the PVC pipe shall be cut and removed.
- S. Any developer adjusting topographic grades, whether through road paving or site development, shall seek Authority approval prior to any adjustment made and provide two (2) weeks notice to the Authority. The Developer shall perform the work to adjust all manhole grades. All costs to adjust manhole grades shall be borne by the developer.

5. Sewer Connections to Manholes

- A. Where the elevation of the invert of-a sewer entering the manhole is above the manhole invert, but less than two feet above, the elevation of the sewer carrying sewage out of the manhole, a channeled concrete fillet shall be constructed to prevent the flow from splashing into the manhole and to provide a continuous smooth flow line through the manhole from the flow line of each incoming pipe to the flow line of the discharge pipe.
- B. Where the elevation of the invert of a sewers entering a manhole exceeds two feet above the elevation of the invert of the sewer carrying sewage out of the manhole, a drop connection shall be constructed on the outside of the manhole.
- C. Where drop connections are indicated on the plans and profiles they shall be installed in accordance with the details shown in Appendix A-2 SD-014. In general, drop connections

should be avoided except for extreme changes in elevations and in any event, will not be permitted for application on sewer pipes greater than 10" diameter.

- D. The type of drop connection used shall conform to the requirements identified on Appendix A-2 SD-014. Inside drop connections shall require the Authority approval and shall require use of a manhole 5 feet in diameter. The drop pipe shall be secured with stainless steel straps.
- E. Sewer connections to existing manholes shall be performed by neatly core drilling manhole and installing an approved watertight flexible boot.

6. Force Main

- A. All wastewater force mains shall be fabricated of ductile iron pipe conforming with the ANSI A21.50 and A21.51 specifications, Thickness Class 52, or Polyvinyl Chloride (PVC) Pressure Pipe meeting the requirements of AWWA C900. PVC Pipe shall be class 200 Pipe meeting the requirements of DR14.
- B. All PVC pipe suitable for use as pressure conduit shall be standard laying lengths 20 feet (plus or minus 1") for all sizes. At least 85% of the total footage of pipe of any class and size shall be furnished in standard lengths. The remaining 15% can be furnished in random lengths. Random lengths shall not be less than 10 feet long. Each standard and random length of pipe shall be tested to four times the class pressure of the pipe for a minimum of 5 seconds. The integral bell shall be tested with the pipe. The bell shall consist of an integral wall section with a locked in solid cross-section elastomeric ring which meets the requirement of ASTM F-477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C900.
- C. The ductile iron pipe shall be furnished with a double cement mortar lining coated per ANSI A21.4, and shall be coated with a standard bituminous coating.
- D. Fittings shall also be fabricated of ductile iron conforming to ANSI A21.10 or A21.53 (short body) (gray iron fittings are not acceptable). All pipe fittings shall be furnished with a double cement mortar lining per ANSI A21.4. Fittings shall be rated for at least 350 pounds per square inch (psi) service.
- D. Unless otherwise approved by the Authority, all Force Mains shall be installed at a minimum depth of 4.5 feet cover over the top of the pipe and shall maintain a positive grade where possible. Air/Vacuum relief valves shall be installed at all highpoints subject to air accumulation.
- E. Manholes shall be provided for all valves required along forcemains. The construction of the manholes shall conform to the requirements of this document.

- F. Where determined by the Authority that a hazard would be created, pipe shall not be removed from shipping pallets until ready for installation.

7. Assembly of Ductile Iron Pipe

- A. Pipe joints shall be carefully lowered into the excavated trenches to avoid damage to the pipe barrel and the bell and spigot ends.
- B. After the bell hole has been prepared and the joint is ready for assembly and where push-together joints are specified, the bell and spigot shall be wiped clean and a non-toxic lubricant shall be applied.
- C. The pipe may be shoved home by use of a bar and block or some other suitable tools.
- D. Gaskets shall be furnished and handled as recommended by the pipe manufacturer.
- E. When mechanical joints are specified, thorough cleaning of the surface to be mated shall be done after which the gland and the gasket shall be slipped over the plain end. The gasket shall then be inserted into the socket and the gasket shall be evenly seated. The gland shall then be inserted and the bolts and nuts drawn finger-tight. The joint shall then be completed by uniformly tightening the bolts in such a manner that the distance between the gland and the face of the flange is maintained approximately uniform.
- F. In general, ductile iron pipelines shall be installed in conformance with the standards set forth in AWWA C600.
- G. In areas where the pipes are installed in fill, or in tight locations where the installation of thrust blocking will not be practical, pipes will be secured with the use of Field-Loc Gaskets or EBAA Iron Mega-Lug Restraint Fittings at the discretion of the Authority.

8. Assembly of PVC Pressure Pipe

- A. Pipe is to be inspected for defects and cleanliness. All foreign matter and dirt is to be removed from the Pipe interior.
- B. Pipe section shall be carefully lowered into the prepared trench bed in such a manner as to prevent damage to the pipe. Pipe should never be dropped into the trench.
- C. Inspect bell end and wipe clean and insert rubber ring gasket.

- D. Clean pipe spigot end and lubricate as recommended by the manufacturer.
- E. Pipe may be shoved home by the use of a bar and block or other suitable tools.
- F. When connecting PVC pipe to ductile iron fittings use mechanical joint rubber ring with M.J. fittings. Do not use PVC rubber ring in a cast iron bell or fitting.

9. Thrust Restraints

- A. Concrete blocks shall be cast in place in accordance with the configurations shown in Appendix A-2 SD-025. Such blocks shall be required to be poured, after installation of the adjacent piping at all fittings installed along the pipeline.
- B. The concrete shall be placed such that it is supported against undisturbed earth along the excavated trench wall and the trench bottom and shall be thoroughly worked and vibrated to insure complete contact with the walls of the fittings being restrained.
- C. No trench backfill shall be placed at the locations of the thrust blocks until twenty four hours after placement, and/or until the Authority has inspected the installation. Refer to cast-in-place concrete specification for minimum strength of concrete.
- D. Where existing conditions and/or available space do not permit the installation of concrete thrust blocks, restraining fittings as described in III.7.G above shall be used.

10. Steel Casing Pipe

- A. All steel casing pipe furnished where boring and jacking is required or, where otherwise required, shall conform to the ASTM A53 specifications and shall have a minimum yield strength of 35,000 psi.
- B. Joints shall be full-circumference welded and the pipe shall be the diameter indicated on the plans and/or profiles. Wall thicknesses and minimum interior diameters shall conform to those listed in Appendix A-2 SD-006. All casing pipe shall be new.
- C. Casing Spacers located within the casing pipe and supporting the carrier pipe shall be properly sized and spaced to accommodate the two pipes. Casing spacers shall be as manufactured by Advance Products & Systems, Inc., Power Lone Star, Inc., or approved equivalent. The use of timber skids and stainless steel bands is not acceptable. Spacing shall be a maximum of 3'-0" or per manufacturer recommendations.

- D. Provide and install neoprene boot seals, with stainless steel attachment bands, as described previously in this Specification.

11. Marking Sewer Services

- A. All ends of service lines and service sewers, not permanently connected, shall be marked with minimum 2" x 2" lumber placed at the end and depth of said service and extending above the ground surface a minimum of 2 feet. Sewer service markers shall be painted green.

12. Inspection Ports

- A. Inspection ports shall be installed in all building sewers at the property line by a plumber or contractor certified by the Authority at the time when the dwelling is to be connected to the public sewer. The inspection port shall consist of a tee, a riser pipe with a minimum diameter of 6" and a tamper-resistant cap (male end). Where inspection ports are installed on slopes that may compromise pipe stability, the tee and one foot of riser pipe shall be encased in concrete.

13. Grinder Pumps

- A. Grinder pumps shall only be used where connection to the main sewer cannot be accomplished by gravity and shall be subject to approval by PTSA.
- B. Design of sewers shall be performed in such manner as to minimize conditions under which grinder pumps must be utilized.
- C. Grinder pumps shall be purchased, operated and maintained by the property owner.
- D. Building sewer installations discharging from grinder pumps shall conform to the requirements of Appendix B: Standard Specifications and Procedures for the Construction of Building Sewers.

END OF PART III

PART IV - TESTING AND ACCEPTANCE

1. Testing of Gravity Sewers

- A. Each section of gravity sewer between manholes shall be cleaned, tested and inspected. Any defects discovered by this final testing shall be repaired, or replaced, promptly by the Contractor at the Contractor's cost.
- B. All sewer pipes not subjected to latent external hydrostatic ground water pressure shall be tested by inducing low-pressure air, internally, into the pipe. Said test shall not be performed until the backfill has been in place for at least 10 days. Air shall be slowly introduced into the section of pipe to be tested, until the air pressure is raised to approximately 4.0 psi and the test pipe section is stabilized for 2 minutes without drop. The pressure shall then be slowly decreased to 3.5 psi before starting the test. The time required for the pressure to drop from 3.5 psi to 3.0 psi shall be compared to the required time to decide if the rate of air loss is allowable. Minimum holding times required by pipe diameter are shown in Table 1 below. In the event loss does occur before the minimum time displayed in the table below or more than 0.5 psig, appropriate repairs or reconstruction shall be made and, the test procedure shall be rerun until the test criteria as displayed in the Table I is successfully accomplished.
- C. In the event where ground water elevations prevail higher than the top of the sewer pipe being tested, 0.5 psi per foot of hydrostatic head above the top of the sewer pipe shall be added to the test pressure.
- D. The Contractor may desire to perform an air test for his own purposes prior to backfilling; however, the "acceptable air test" shall be performed after backfilling has been completed and in the presence of an Authority Representative.
- E. All PVC pipes shall also be tested for pipe deflection. Said tests shall not be performed until the backfill has been in place for at least 30 days. The maximum acceptable deflection shall be 5% of the vertical internal diameter. The Contractor may desire to perform said testing using a mandrel similar or equal to that manufactured by Cherne Industries, Inc.; however the "acceptable mandrel test" shall be performed utilizing the Authority owned mandrel and in the presence of an Authority Representative.
- F. In the case of deflection test failure, the pipeline shall be excavated, replaced if necessary, and the crushed stone bedding and haunching reinstalled and reconsolidated, the excavation backfilled, and the test repeated after another 30 day period for deflection to occur. The

test and results will be approved by the Authority's Representative.

Table 1 Minimum Specified Time Requirement for a 0.5 psig Pressure Drop for Size and Length of Pipe

Pipe Diameter inches	Minimum Time min:sec	Length (L) For Minimum Time ft	Time for Longer Length S/L	Specification Time for Length (L) Shown, minuses							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450ft
8	3:47	298	0.760/L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187/L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709/L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671/L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846/L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235/L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837/L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.563/L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683/L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
32	15:35	72	12.926/L	21:23	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384/L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23

NOTE: Reprinted from ASTM 1417-92

- G. The Authority will lamp each section of sewer pipe between manholes by placing a light at one end and observing the pipe at the other end. Sewers not constructed on uniform line and grade, and therefore not showing a full circle of light during lamping, will not be accepted by the Authority.

2. Hydrostatic Testing of Force Mains

- A. All force mains shall be hydrostatically tested for leakage after installation is completed. Said testing shall be performed in accordance with the applicable sections of the AWWA C standards. Prior to performance of the testing work the CONTRACTOR shall submit to the ENGINEER the following:
 - 1. A testing schedule.
 - 2. A listing of equipment intended to be used, including general information on the pump, pressure gauge, pressure relief and water meter.
 - 3. Certification that the pressure gauge has been calibrated to 0.1 psi within the past 3 months.
- B. The CONTRACTOR will provide the water required for testing purposes and shall provide all required temporary fittings to complete testing prior to connection to the existing force main including temporary removal of air relief valves for testing purposes.
- C. Each section of pipe to be tested shall be slowly filled with water during which time air shall be expelled from the pipeline through the air release valves. After all air is expelled, the air release devices shall be closed and line pressures shall be raised to the test pressure directed by the ENGINEER. Test pressures shall be 1.5 times the expected working pressure predicated upon the elevation of the lowest point in the line, corrected to the evaluation of the test gauge. Any joint, cracked pipe or other appurtenances revealing leakage during the pressure test shall be corrected after which the pressure test shall be rerun. Pressure tests shall be conducted for a 30 minute time period.
- D. After performance of the successful pressure test, a leakage test shall be performed over a duration period of two hours at a pressure to be determined by the ENGINEER. Leakage is defined as the quantity of water supplied to the test section of pipe, which is required to maintain pressure within 5 psig of said test pressure during the entire testing period. Pipe construction so tested shall be deemed to have failed the leakage test if the leakage resulting is greater than 10 gallons per inch diameter per mile of pipe per day.

3. Vacuum and Water Testing of Manholes

- A. After erection of the manholes, connection of the sewers, and placement of the backfill to approximately the finished ground elevation, each manhole shall be vacuum testing for water tightness. Connecting pipes shall be securely plugged and a vacuum testing device similar to that manufactured by Cherne Industries, or equal, shall be placed and sealed within the manhole frame/cover section.
- B. A vacuum of 10" of mercury (Hg) shall be drawn after which the vacuum pump shall be shut off. If the indicated vacuum pressure drops to 9" in less than three (3) minutes, the test apparatus shall be removed and appropriate repairs/plugging shall be performed. The test shall be repeated, as necessary, until a time period of a minimum of three (3) minutes occurs before the vacuum pressure drops one inch (1") and there is no visual indication of water leakage.
- C. Appropriate repairs/plugging is defined as sealing the grade rings and inside joints with Parsons Epoxy Compound, Parsonpoxy FG, or approved equivalent. Sealing the pipe perimeter inlet with cement or grout or "doghouses" are not considered repairs nor will the installation of rigid grout near or around the flexible boot that counteracts the functionality of the boot, be permitted.
- D. A vacuum test will be required for existing manholes if the manhole structure is altered to extend sewers out of the manhole.
- E. The contractor may elect to complete the required testing of new manholes utilizing a water exfiltration test in lieu of performing the aforementioned vacuum test.
 - 1. All pipe openings to each manhole shall be plugged prior to testing.
 - 2. The water level in the manhole shall be at the rim of the casting on which the manhole lid rests. After initial filling of water, the manhole under test shall be given a minimum one (1) hour pretest period for allowance of manhole maximum absorption of water. After this initial absorption period, the water level shall be returned to its original elevation to commence the test period.
 - 3. The length of test period shall be eight (8) hours.
 - 4. For the test, the manhole shall be considered vertical sections of pipe and the allowable leakage rate is 100 gallons per inch diameter per mile per day.
 - 5. If exfiltration leakage exceeds the specified amount, the CONTRACTOR shall make the necessary repairs or replacements required to permanently reduce the leakage to within the specified limits and testing shall be repeated until the manhole

passes the test.

6. In situations where the manhole is in saturated ground, the pipes entering and leaving the manhole shall be plugged and the amount of water leaking into the manhole measured and calculated directly.

4. Televising and Internal Inspection of Sewers

- A. The Authority reserves the right to require television inspection of any and all sewer lines. At the discretion of the Authority, 10% of the pipe shall be televised. The Authority shall determine the locations. Based upon the results of the television inspection, the Authority may require additional inspection.
- B. After cleaning, and at the direction of the Authority, and prior to acceptance of the sewers by the Authority, sewer sections shall be visually inspected by the Contractor by means of closed-circuit television. The inspection shall be done one manhole to manhole section of pipe at a time.
- C. The Contractor is permitted to attach a mandrel to the camera, for a camera so equipped, to perform the television inspection and mandrel test simultaneously.
- D. The television camera used for the inspection shall be one specifically designed and constructed for such inspection and shall be capable of pan and tilt direction movement to view lateral connections and defects. Lighting for the camera shall be suitable to allow a clear color picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor and other components of the video system shall be capable of producing a color picture quality to the satisfaction of the Authority; and if unsatisfactory, equipment shall be removed and the line inspected when equipment and conditions are suitable to providing a satisfactory inspection.
- E. The camera shall be utilized to record the condition of all manhole interior conditions.
- F. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary and at lateral connections and shall tilt and pan each lateral connection to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute.
- G. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole.

- H. Any section of gravity sewer that is found by internal TV inspection to be defective; to contain silt and/or debris; or to be otherwise unacceptable to the Authority, shall be corrected and re-televised at the expense of the Contractor.
- I. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to ensure good communications between members of the crew.
- J. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the Authority.
- K. Documentation of the television results shall be as follows:
 - a. Television Inspection Logs: Printed location records shall be kept by the Contractor and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance such as locations of building sewers, unusual conditions, broken pipe, and other discernible features will be recorded and a copy of such records will be supplied to the Authority.
 - b. Videotape Recordings: The purpose of video recording shall be to supply a visual and audio record of condition of the lines. Video recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. All original videos shall become the property of the Authority. The format of the video recording shall be either color VHS format or color DVD at the Authority's discretion.

End of Part IV

END OF APPENDIX A