

**GENERAL REQUIREMENTS AND SPECIFICATIONS FOR
CONSTRUCTION OF
SANITARY COLLECTION AND CONVEYANCE SYSTEMS
UPPER MERION TOWNSHIP
MONTGOMERY COUNTY, PA**

UPPER MERION MUNICIPAL UTILITY AUTHORITY

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Prepared by

Shoemaker Environmental Consultants
P.O. Box 330
Hatfield, PA 19440
(215) 822-9596

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INTRODUCTION

PURPOSE

The general requirements and construction specifications contained herein have been adopted by the Upper Merion Municipal Utility Authority (Authority). These general requirements and construction specifications are intended to define the normal criteria for construction of all sanitary wastewater collection and conveyance systems in Upper Merion Township (Township). The Authority may impose additional/supplemental requirements where circumstances, in its sole judgement, necessitate the protection/expansion of its existing system or that system which is being proposed. For example, the Authority shall normally require all new developments to connect their new sewers into an existing manhole with a minimum slope on 8-inch lines to be 0.5 percent and initial line runs to have a slope approaching 1 percent.

All construction scheduled to extend or connect to the existing Authority sanitary system must be in compliance with these specifications and any other agency having jurisdiction. Final determination as to a proposed extension or connection compliance or variance for the Authority specifications shall be made in the sole judgement of the Authority.

Specification sections provided for pumping stations are for informational purposes only to give general guidance to the Developer's Engineer for planning assistance. The Authority, if it determines pumping is the only viable solution in its judgement, will provide specific information to suit the application. After acceptance of the station, the Developer shall be responsible to pay all Authority operating, maintenance, repair and utility costs for the eighteen month maintenance period. Where in the opinion of the Engineer a pumping station is not required and is being provided (proposed) by the Developer to reduce cost versus providing a gravity sewer or regrading the development to permit gravity flow, etc., the Authority may require the Developer to post sufficient capital funds to support the annual operating cost of this pump station under design flow conditions.

Without exception, all construction work must be in compliance with local, state, and federal code requirements. Where local, state or federal codes contradict the intent of the Authority's construction specification, the code shall supersede the construction specifications. Where the construction specifications reference standard construction codes, including, but not limited to ASTM, AWWA, etc., the latest revision shall apply. For all projects where road restoration is involved, it is recommended that the Developer contact the Township as well as PaDOT relative to road restoration requirements. The information provided in this document for restoration is for general guidance purposes.

DEFINITIONS

Wherever used in these specifications or in other documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

- AUTHORITY** The Upper Merion Municipal Utility Authority
- CONTRACTOR** The person, firm or corporation responsible for construction, in part or whole, of sanitary collection and conveyance systems.
- DEDICATION** The formal transfer of ownership of sanitary collection and conveyance systems from DEVELOPER to AUTHORITY.
- DEVELOPER** The person, firm or corporation with whom the AUTHORITY and/or TOWNSHIP has entered into an ESCROW AGREEMENT for the review of plans and the construction of sanitary wastewater collection and conveyance systems and is responsible for the construction of development.
- EASEMENT** Property identified and recorded at the office of recorder of deeds wherein the rights of access by identified holder are granted.
- ESCROW AGREEMENT** An agreement entered into between the DEVELOPER and the AUTHORITY and/or TOWNSHIP.
- ENGINEER** The person, firm or corporation named as the technical representative for the AUTHORITY, whom shall generally be referred to as the Authority's Consulting Engineer.
- OWNER** The Upper Merion Municipal Utility Authority
- SOLICITOR** The person or firm named as the legal representative for the AUTHORITY, whom shall generally be referred to as the Authority's Solicitor.
- TOWNSHIP REPRESENTATIVE**- A Township representative that may be assigned the responsibility of the ENGINEER on certain WORK by the AUTHORITY. The word "Representative" shall mean officials, agents and employees of the Township.
- SUBCONTRACTOR** An individual, firm or corporation having a direct contract with CONTRACTOR or any other subcontractor for the performance of a part of the work.
- TOWNSHIP** Upper Merion Township
- WORK** The entire completed construction of the various separately identifiable parts thereof required to be furnished under the contract specifications. Work is the result of performing services, furnishing labor, and furnishing and incorporating materials and equipment into the construction, all as required by the

contract specifications.

PROCEDURES

Any person, partnership, corporation, etc. (Developer) intending to construct a sanitary collection and conveyance system within the Township is required to comply with Authority's general guidelines and construction specifications. The Developer is required to submit plans and specifications which are in strict accordance with the Authority's adopted construction specifications and any other requirements found necessary, in the sole judgement of the Authority, to protect the overall system and/or to reduce future potential maintenance issues or problems.

The Authority owns the sanitary system in the Township and will review and approve the construction of proposed sanitary collection and conveyance systems. All proposed designs for sanitary collection and conveyance systems shall be submitted to the Authority/Township for review and approval. (Normally, the Township Representative will review wastewater collection and conveyance system development plans for the Authority.)

All Developers are required to indicate deviations and/or variances from the Authority's construction specifications on development plans and specifications submitted to the Authority for review and approval. Further, any changes made to plans during the review stage must be clearly identified in the next submission. Note that the Authority will not re-review for changes any sections which have already been reviewed. Accordingly, any changes made to plans during the review stage must be clearly identified in the next submission. Therefore, approvals given which do not account for subsequent changes, and failure to have those changes reviewed and approved prior to final approval, may cause construction to be delayed or completed work to be rejected in the field.

Prior to the start of construction, the Developer shall be required to enter into a Escrow Agreement with the Authority and/or Township. This agreement(s), in part, will cover the Authority's requirements that will include such items, as warranties, training, performance bonds, maintenance period, etc., dedication of easements, construction installation, as-built plans and will quantify the construction and Authority oversight costs for escrow purposes.

The Authority and/or Township will inspect the construction of any sanitary system within the Township. During construction of any sanitary system, all deviations from the construction plans previously approved by the Authority must be submitted in writing to the Authority for approval. Only minor modifications may be approved in the field by the Engineer and/or Township Representative. Construction of deviations from the approved construction plans, without written Authority approval shall, at the Authority's discretion and at the Developer's cost, be removed.

The Developer shall notify the Township of the anticipated construction work a minimum of seven (7) calendar days prior to commencement of construction work. A schedule of construction activities shall be provided on a thirty (30) day basis and updated monthly that clearly delineates times when wastewater collection and conveyance system construction activities will take place.

All Developers are required to obtain all necessary local, state, and federal permits prior to construction.

EASEMENTS AND DEDICATION

All developments within the Township which contain sanitary collection and conveyance systems outside of public rights-of-way are required to provide Easements for said facilities. All Easements shall be prepared in accordance with the following:

1. Sanitary systems (gravity lines and force mains) shall be constructed within a twenty (20) foot wide permanent easement. The gravity line or force main shall be located at the center of the easement. No other utilities, structures, foundations, or permanent facilities shall be constructed within the permanent easement.
2. All sanitary system easements, regardless of location, shall be recorded at the Office of Recorder of Deeds for Montgomery County, in favor of the Authority, following review and approval by Engineer and Solicitor and, upon recommendation, the Authority.
3. All easement descriptions shall be written to reference sanitary system manholes as monuments.
4. Any sewage pumping stations or other facilities to be dedicated to the Authority shall be constructed on property to be dedicated to the Authority. The parcel to be dedicated shall include adequate area available for vehicular access to the facilities.
5. All above-described easements or parcels shall be dedicated to the Authority as defined by an executed Escrow Agreement. The Developer shall provide written descriptions and exhibits (plans) of each easement or parcel for approval prior to dedication.
6. All easements and dedicated parcels shall be indicated on as-built plans of the development.

DEVELOPMENT PLANS

All development plans, submitted to the Authority for approval and/or dedication, shall be in accordance with the following:

1. All development plans and support documents submitted for pre-construction approval shall contain two (2) full sets of information. Submittals shall be made through the Township and not directly to the Authority. They shall be as follows:

- A. General

- The technical information shall be submitted on 24" x 36" drawings. All elevations shall be based upon existing sewer datum, unless otherwise approved. The normal scale for plans shall be 1" = 50' for plan and 1" = 5' for profile. The plans shall indicate that all construction shall be in accordance to the Authority's standards and the appropriate figures relating to bedding, manholes, etc. shall be shown on the plans.

- The drawings shall include the Designer Engineer and his seal and signature, the name of the Developer and development, date of the plan and last revision and, where appropriate, a index list of drawings.

- B. Drawings

- The drawings shall indicate all existing and new features including size, material of construction, elevations for underground utilities; whether basement or first floor service is to be provided; details on connection(s) to existing facilities; referenced plan and profile sheets; numbering of manholes in plan and profile; invert(s) and rim elevations on all manholes in profile and size, distance, slope, material of all pipe in profile.

2. All development plans submitted for dedication shall include three (3) sets of sealed, as-built drawings including one mylar reproducible and shall contain the following:

- A. Field verified distances between manholes.

- B. Identification of manholes.

- C. Flow line elevations of manholes.

- D. Identification of pumping stations or sewage treatment facilities (if applicable), and field-verified distances, dimensions, and elevations of all piping facilities, units, items, etc.

- E. Identification of sanitary system easements.

- F. Identification of parcels to be dedicated to the Authority (required for pumping stations and other facilities).

- G. Identification of rights-of-way to be dedicated to the Authority (required for pipelines -- gravity sewer and force mains -- not constructed within dedicated roadways).

- H. Location for signatures of Developer and Developer's Engineer or Surveyor relative to dedication

and certification and of acceptance by Authority. Signatures shall be original on all prints.

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

This section covers a variety of different types of documents, drawings, materials, guarantees, warranties, parts lists, etc. which the Contractor is to provide to the Engineer for approval, information or use.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL - SUBMISSIONS

3.1.1 Each submittal to the Engineer shall contain one (1) reproducible and five (5) copies of all detailed shop drawings, manufacturer's specifications, guaranteed test curves, etc. for all equipment, tools and furnishings to be supplied under this Project including those of all subcontractors. Detailed shop drawings shall be submitted for all piping, manholes, pre-cast concrete items, structural steel, reinforcing steel, mechanical equipment, fabricated items, electrical components, instrumentation, etc.

Each submittal shall be accompanied by a letter of transmittal listing the items being submitted. Each submittal (shop drawing) shall be marked with the name of the Development, the Contractor, the date and be consecutively numbered.

3.1.2 The Contractor shall be responsible to schedule his submittals to prevent a delay to his work.

3.1.3 Each submission must be complete in every respect so that a logical and orderly review might follow. Piecemeal submissions are not permissible and all submissions for approval must be complete in all respects.

3.1.4 All dimensional information specific to this project shall be certified by the manufacturer as correct for this project.

3.1.5 It is recommended that no material, equipment or specialty item be purchased or fabricated until approved by the Engineer through the approval of a submitted shop drawing. No shop drawing shall be used for construction, ordering, fabrication, etc. unless marked "No Exceptions Taken" or "Make Corrections Noted" by the Engineer.

3.1.6 Shop drawings shall not be smaller than 8-1/2" x 11" nor larger than 24" x 36" in size. Reproductions of the plans shall not be acceptable as shop drawings.

3.1.7 Before submitting any shop drawings, the Contractor shall check and sign all drawings noting thereon any deviations from these Authority Standard Specifications or other requirements imposed by the Authority.

3.1.8 The Engineer will review submitted data within a reasonable time after receipt of such information in his office considering the complexity and completeness of such submission. The Engineer shall determine at his sole discretion whether the information submitted is sufficient to render a decision.

The Contractor understands that approval of any shop drawings, manufacturer's specifications, etc. by the Engineer shall not relieve the Contractor of responsibility for:

- o Errors in shop drawings or setting of schedules.
- o Deviations from the plans or Authority Specifications or other imposed requirements unless the Contractor has given written notice to the Engineer of any such deviations at the time of submission.
- o Responsibility for proper performance of his work.
- o Safety and security on the job site.

3.1.9 Where required the Contractor shall furnish material samples, color samples or other items to represent the items to be used in the project. Samples shall be retained.

3.1.10 The Guarantees for each submittal shall be provided for review. Final approval may not be granted until the guarantee is reviewed and approved.

3.1.11 Where shop drawings are marked "Returned for Correction" or "Not Approved", the Contractor shall resubmit the one (1) reproducible and five (5) copies. This submittal shall meet all requirements of this section.

3.2 OPERATING AND MAINTENANCE INSTRUCTIONS

3.2.1 The Contractor shall furnish five (5) bound sets of operating and maintenance instructions, including all shop drawings and manuals, completely covering the operation and maintenance of all equipment, electrical, instrumentation, etc. items. In conjunction with the above, the manual shall include:

- o Manufacturer's descriptive literature
- o Maintenance instructions
- o Troubleshooting and repair information
- o Installed wiring and control diagrams
- o Full operating instructions
- o Performance data
- o List of spare parts and quantity to be maintained

** END OF SECTION **

SECTION 02220

EXCAVATION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

This section includes:

- o Excavation of every description
- o Field Measurements and grades
- o Removal of roadway
- o Stripping
- o Support of utilities and foundations
- o Maintenance
- o Sheeting and/or shoring
- o Dewatering
- o Disposal

1.2 RELATED SECTIONS

1.2.1 Section 02230, BACKFILLING

1.2.2 Section 02270, EROSION AND SEDIMENT CONTROL

1.2.3 Section 02550, MANHOLES

1.2.4 Section 02560, SANITARY SEWERS AND APPURTENANCES

1.2.5 Section 02570, PUMPING STATIONS

1.2.6 Section 02580, SEWERS IN RELATION TO WATERWAYS

1.3 FIELD MEASUREMENTS AND GRADES

1.3.1 Pipes shall be laid true to the lines and grades shown on the approved plans.

1.3.2 Contractor is responsible for maintaining the grade. The grade alignment of the pipe shall be done by laser beams. Laser beams will be operated by trained personnel and the proper safety precautions adhered to either as required by the manufacturer, as suggested by the manufacturer or as required by governmental rules, regulations, laws, etc.

1.4 TRENCHING REGULATIONS

- 1.4.1 In open trenching on State, County and Township highways, the Contractor shall be governed by the conditions, restrictions, and regulations made by the PADOT, the County Commissioners, and Township officials. All such regulations shall be in addition to the requirements set down in these specifications.
- 1.4.2 All excavations and trenching must be conducted in accordance with the requirements of the Construction Safety Code, Occupational Safety and Health Act of 1970, Subpart P, Sections 1926.650/1926, as amended.
- 1.4.3 The Authority and/or Township, its agents, employees and Engineer shall not be responsible to determine whether the contractor is complying with governmental trenching and shoring regulations. This shall be the strict responsibility of the contractor.

1.5 QUALITY ASSURANCE

Reference SECTION 02230, BACKFILLING

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PREPARATION

- 3.1.1 Identify required lines, levels, contours, and datum.
- 3.1.2 Identify known underground, aboveground, and aerial utilities. Stake and flag locations.
- 3.1.3 Notify utility company to remove and relocate utilities.
- 3.1.4 Protect above and below grade utilities which are to remain.
- 3.1.5 Protect plant life, lawns, rock outcropping, and other features remaining as a portion of final landscaping.
- 3.1.6 Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.2 STRIPPING

- 3.2.1 The Contractor shall remove all paving, subpaving, slabs-on-grade, landscaping, curbing, gutters, brick, paving block, granite curbing, or flagging, or grub and clear the surface over the area to be excavated.
- 3.2.2 All materials removed shall be properly classified, separating them as required. The Contractor shall properly store, guard, and preserve such material as may be required for future use in backfilling, etc. All materials taken from the excavation, may be stored, if practical, in suitable parts of the roadway or such other suitable place and in such manner as the Engineer shall approve.
- 3.2.3 In case more materials are created from any trench than can be backfilled over the completed pipe or stored in the street, the excess material shall be removed to an approved place provided by the Contractor. This location

must meet all requirements as it relates to soil erosion control.

3.3 EXCAVATION

- 3.3.1 Underpin adjacent structures which may be damaged by excavation work, including utilities and pipe chases.
- 3.3.2 Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving, site structures, and construction operations.
- 3.3.3 Excavate to working elevation(s) for piling work. Coordinate special requirements for piling.
- 3.3.4 Machine slope banks. Machine slope banks to angle of repose or less, until stored.
- 3.3.5 Excavation cut shall not interfere with normal 45 degree bearing of foundation.
- 3.3.6 Grade top perimeter of excavation to prevent surface water from draining into excavation.
- 3.3.7 Hand trim excavation and remove any loose matter.
- 3.3.8 Notify Engineer of unexpected subsurface conditions and immediately discontinue the affected work until notified to resume work.
- 3.3.9 Stockpile excavated material in area designated on site and remove excess material not being reused, from site. Remove excavated materials from site.

3.4 TRENCHING

Side walls or trenches shall be kept as nearly vertical as possible and shall be properly sheathed and braced, as necessary. The bottom of trenches shall be excavated true to line so that a clear space not more than eight (8) inches in width is provided on each side of the barrel of the pipe. Where damage is liable to result from withdrawing sheathing, the sheathing shall be left in place. Care shall be taken not to excavate below the depth specified. Contractor shall correct unauthorized excavation and over-excavation at no extra cost.

3.5 EXCAVATION NEAR EXISTING STRUCTURES

- 3.5.1 All other utility lines shall be located on the ground with pipe locating equipment well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement at least fifty (50) feet in advance of all trench excavation.
- 3.5.2 As the excavation approaches pipes, conduits, or other underground structures, digging by conventional trenching machine methods shall be done with extreme care.
- 3.5.3 Excavation near structures will not be allowed closer to the structure than the depth of the excavation below the bottom of the foundation without shoring the excavation with sheathing.

3.6 PROTECTION OF EXISTING STRUCTURES

- 3.6.1 Prior to any excavation work, in compliance with Act 172, Contractor shall utilize the Pennsylvania One Call System (1-800-242-1776) to notify all utilities of the pending construction.
- 3.6.2 All existing pipes, poles, wires, fences, curbing, property-line markers, and other structures which must be

preserved in place without being temporarily or permanently relocated shall be carefully supported and protected from injury by the Contractor. In case of injury, the Contractor shall notify the appropriate party so that proper steps may be taken to repair any and all damage done.

3.6.3 All utility services shall be supported by suitable means so that the services shall not fail when tamping and settling occurs.

3.6.4 Whenever the Contractor uncovers service pipes or lines which, because of age or injury, are in poor condition, he shall immediately notify the proper authority so that steps may be taken for replacement or repair. To prevent dispute with property owners as to cause of damages, the Contractor shall notify his foreman to carefully note and properly report such damage.

3.7 MAINTENANCE OF SERVICES

The Contractor shall at all times maintain a continuous service in all existing gas, water, sewer, conduit, electric power, telephone lines, or any other pipes or structures encountered in the prosecution of work, whether above or below ground surfaces.

3.8 TUNNELING

Prior to undertaking any tunneling, Contractor shall have a professional engineer, licensed to practice in Pennsylvania, prepare a design and outline the proposed tunneling methods and procedures to be followed. The engineer shall also provide a certification signed and sealed by him that the design for tunneling conforms to applicable requirements of the Construction Safety Code of the Occupational Health and Safety Act.

3.9 SHEATHING AND SHORING

3.9.1 Where sheathing, shoring, bracing or trench boxes are used, they shall be designed by a professional engineer licensed to practice in Pennsylvania. The design engineer shall provide the Contractor with a certification signed and sealed by him stating that the design of the sheeting and bracing conforms to all applicable requirements of the Construction Safety Code and the Occupational Health and Safety Act. An informational copy of these data shall be furnished to the Engineer before installing any sheathing, shoring, bracing, or trench boxes.

3.9.2 Trenches shall be properly and adequately sheathed and braced to prevent accidents, caving of the sides of the trench, breaking of the ground outside of the lines of the trenches proper, damage to buildings or other structures of all types shall be protected by the Contractor, who shall use all necessary shoring, bracing, or other appliances for the protection of same. Care must be taken not to injure water mains, water service pipes, drain pipes, sanitary or stormwater sewers, gas mains, oil mains, electric conduits or other structures encountered on the lines of the work.

3.9.3 In case of accident to any structures, the Owner of the structures shall be notified immediately so that the proper steps may be taken to repair any and all damage done. Any damage done to such structures shall be repaired by the Contractor.

3.9.4 No shoring shall be left in place unless so authorized by the Engineer.

3.10 DEWATERING

3.10.1 All ground water which may be found in the trenches and any water which may get into them from any cause whatsoever shall be pumped or bailed out so that the trench shall be dry during pipe laying period. No water

shall be permitted to reach concrete until it has set sufficiently. All water pumped from the trenches shall be disposed of in compliance with the applicable local regulations of the appropriate governing body. The Contractor shall provide at least two pumps for each trench opened in wet ground.

- 3.10.2 The Contractor shall provide and place all necessary flumes or other channels of adequate size to temporarily carry all streams, brooks, stormwater or other water which may flow along or across the lines of the pipe line. All flumes or channels thus utilized shall be tight so as to prevent leakage into the trenches. Water pumped from trenches shall be led to a natural watercourse.

3.11 RESPONSIBILITY FOR CONDITION OF EXCAVATION

- 3.11.1 The Contractor shall be solely responsible for condition of all his excavations, and any slides or cave-ins shall be removed.

- 3.11.2 Failure or refusal of the Engineers to order the use of bracing or sheeting; to order better quality or larger sizes of timber; to order sheeting, bracing or shoring left-in-place; to give orders or directions on methods or placing or driving sheeting, braces or shores, shall not relieve the Contractor of any responsibility concerning the condition of excavations or his obligations. Any delay (whether caused by the Contractor, Owner, Township, or their agents or employees), that requires keeping an excavation open longer than would otherwise have been necessary, shall not relieve the Contractor from his obligation to properly and adequately protect the excavation from cave-ins or slipping or any of his obligations under the contract relating to injury of persons or property.

3.12 UNSTABLE SUPPORTING SOILS

- 3.12.1 When the material encountered at subgrade is unstable and, in the opinion of the Engineer, does not provide a sufficiently firm foundation, the trench shall be excavated to such increased depth as may be necessary to reach a stable upgrade.

3.13 FIELD QUALITY CONTROL

Provide for visual inspection of bearing surfaces, unless otherwise required by the work. When field conditions are noted by the Engineer that may not be considered acceptable for foundations or backfill, the Contractor shall engage at its expense an Authority approved soils firm to provide an independent evaluation and written report

3.14 PROTECTION

- 3.14.1 Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- 3.14.2 Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

3.15 CARE AND RESTORATION OF PROPERTY

- 3.15.1 Excavating machinery and cranes shall be operated with care to prevent damage to existing structures and/or wires.
- 3.15.2 On paved surfaces, the Contractor shall not use or operate tractors, bulldozers, or other power-operated

equipment with treads or wheels so shaped as to cut or otherwise damage such surfaces. Backhoes will use wood under the treads or outriggers to prevent scarring of the existing paving.

- 3.15.3 All surfaces which have been damaged by the Contractor's operation shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations. Suitable materials and methods shall be used for such restoration as approved and directed by the Engineer.
- 3.15.4 The entire area in the vicinity of the structures where excavation, filling, and backfilling is to be performed shall be raked clean of all trash, wood forms, and other debris after completion of the work specified and all spoil piles shall be leveled and excess material disposed of as specified herein.

** END OF SECTION **

SECTION 02230

BACKFILLING

PART 1 GENERAL

1.1 DESCRIPTION

This section includes:

- o Excavation and trench filling and backfilling
- o Consolidation and compaction
- o Backfilling which includes: support of utilities, additional fill, disposal of excess or unsuitable fill, grading, and all incidental work required for a complete installation

1.2 RELATED SECTIONS

1.2.1 Section 02220, EXCAVATION

1.2.2 Section 02270, EROSION AND SEDIMENT CONTROL

1.2.3 Section 02550, MANHOLES

1.2.4 Section 02560, SANITARY SEWERS AND APPURTENANCES

1.2.5 Section 02570, SEWERS IN RELATION TO WATERWAYS

1.2.6 Section 03300, CONCRETE

1.3 REFERENCES

1.3.1 ANSI/ASTM C 136 - Method for Sieve Analysis of Fine and Coarse Aggregates.

1.3.2 ANSI/ASTM D 698 - Test Methods for Moisture-Density Relations of soils and Soil-Aggregate Mixtures, using 5.5 Rammer and 12-inch (304.8 mm) Drop.

1.3.3 ANSI/ASTM D 1556 - Test Method for Density of Soil in Place by the sand-Cone Method.

1.3.4 ANSI/ASTM D 1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, using 10 lb Rammer and 18-inch Drop.

1.4 SUBMITTALS

1.4.1 Submit shall be in accordance to Section 01300.

1.4.2 Samples: Submit a minimum 10 lb sample for each type of fill to be tested to the laboratory, in air-tight containers.

PART 2 PRODUCTS

2.1 COMPACTION

Backfill in paved areas and shoulder areas shall normally be compacted to not less than 95% of the maximum density as determined by ASTM D 1557.

2.2 SUITABLE EXCAVATED MATERIALS

Materials excavated from the trench which are free from large clods, roots, top soil or stones larger than 8 inches maybe reused if proper compaction can be obtained.

2.3 CRUSHED STONE

All crushed stone shall conform to the requirements of PaDOT Form 408, Specification Section 703.2 for Coarse Aggregates Type C or better, No. 2A, No. 2B or No. OGS. Under no circumstances will stones over 3/4 inches in diameter be permitted.

2.4 SELECT BACKFILL

Select backfill shall conform to the requirements of PaDOT Form 408, Specifications Section 703.3.

2.5 CONCRETE

All concrete that is used for cradles, encasements or thrust blocks shall have a compressive strength of 3,500 psi and meet the requirements of Section 3300, CONCRETE.

2.6 VAPOR RETARDANT

A polyethylene liner of a minimum 10 mil thick shall be provided.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Determine that all work to be buried has been inspected and approved by the Engineer.

3.1.2 Determine fill materials to be reused are acceptable.

3.2 PREPARATION

3.2.1 Generally, compact subgrade to density requirements for subsequent backfill materials.

3.2.2 Cut out soft areas of subgrade not capable of in situ compaction. Backfill with Type B, C fill and compact to density equal to or greater than requirements for subsequent backfill material.

3.2.3 Prior to placement of aggregate base course material at gravel paved areas, compact subsoil to 95 percent of its maximum dry density in accordance with ANSI/ASTM D698.

3.3 BACKFILLING

- 3.3.1 Backfill areas to contours and elevations with unfrozen materials.
- 3.3.2 Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- 3.3.3 Granular Fill: Place and compact materials in continuous layers not exceeding 6 to 8 inches compacted depth.
- 3.3.4 Soil Fill: Place and compact materials in continuous layers not exceeding 12 inches compacted depth.
- 3.3.5 Employ a placement method that does not disturb or damage foundation perimeter drainage, foundation dampproofing, foundation waterproofing, and protective cover utilities in trenches.
- 3.3.6 Maintain optimum moisture content of backfill materials to attain required compaction density.
- 3.3.7 Remove surplus backfill materials from site to an approved location.
- 3.3.8 Leave fill material stockpile areas completely free of excess fill materials.
- 3.3.9 Contractor shall backfill all excavations as rapidly as practicable, following inspection and approval of work by the Engineer.
- 3.3.10 No part of a pipeline or other structure that needs to be located or measured shall be filled over or around until required measurements have been made by the Engineer and their permission so given to backfill.
- 3.3.11 Any backfilling which is done without authorization shall be uncovered by the Contractor at his own expense. Leakage and pressure tests shall be performed after backfill has been placed over pipelines.
- 3.3.12 Contractor shall be required to compact all backfill materials to a minimum as specified in Section 1.2.

3.4 PIPE BEDDING

- 3.4.1 Pipe bedding for ductile iron shall consist of a minimum of six (6) inches of 2B (No. 57) below the invert of the pipe. The bedding shall be placed in the trench for its full width to uniformly support the pipe at the required line and grade. Suitable recesses shall be provided in the bedding to permit adequate clearance for bells, couplings, or similar projections. The bedding shall extend twenty-four (24) inches above the top of the pipe barrel to form a positive cradle fitting the pipe and providing a uniform support along the length of the pipe section. See FIGURE 1 for typical detail.
- 3.4.2 Pipe bedding for PVC pipe shall consist of a minimum of six (6) inches of 2B (No. 57) below the invert of the pipe. The bedding shall be furnished and placed in the trench for its full width to uniformly support the pipe at the required line and grade. Suitable recesses shall be provided in the bedding to permit adequate clearance for bells, couplings, or similar projections. The bedding shall extend twenty-four (24) inches over the pipe barrel. Bedding material shall be spread in six-inch layers, and each layer shall be compacted with twenty pound hand tampers until the required total depth of bedding has been built up. See FIGURE 1 for typical detail.
- 3.4.3 When the material encountered at subgrade is unstable and, in the opinion of the Engineer, does not provide a sufficiently firm foundation:
 - o The trench shall be excavated to such increased depth as may be necessary to reach a stable subgrade. The trench shall then be backfilled with 2A aggregate to the required grade and compacted to the satisfaction of the Engineer. A test hole may be utilized to determine the feasibility of this approach. OR

o The pipe shall be supported on Concrete Cradle. Concrete Cradles shall be installed where no suitable supporting solid or rock stratum exists at the bottom of the trench. The foundation shall be furnished and installed equal to the "Concrete Encasement", except that only that portion of the encasement at and below the horizontal diameter of the pipe shall be poured, forming a true cradle under the bottom half of the pipe. See FIGURE 2 for typical detail.

3.4.4 An earthen dam, constructed from clean earth backfill material, shall be placed from subgrade to two foot height over the top of the pipe including laterals when required by the Engineer. The earth material shall be hand compacted with designed tamping tools.

3.5 CONCRETE ENCASEMENT

3.5.1 Where required, the pipe shall be supported by concrete encasement.

3.5.2 The trench shall be excavated to a minimum depth of six inches below the bottom of the pipe or as shown on approved Plans. The excavated space shall then be completely filled with, and the entire pipe encased in concrete such that the concrete encasement at any point around the outside barrel of the pipe measures a minimum six inches thick.

3.5.3 The total minimum width of the concrete encasement shall equal the width of trench excavation. Unless otherwise shown on the Plans or specified herein, concrete shall have a 3,500 psi strength. Freshly poured concrete's exposed surfaces shall be maintained free from ground water for at least the first 4 hours. No backfilling of the trench shall begin until a minimum time period of 24 hours has elapsed after the encasement has been poured. Proper safety precautions shall be maintained by the Contractor during this period. See FIGURE 2 for typical detail.

3.5.4 The encasement shall always be extended to a pipe joint.

3.6 TRENCH BACKFILLING IN AREAS TO BE PAVED

3.6.1 Between two (2) feet over the top of pipe and the grade or subgrade of paving, the excavation shall be mechanically filled with PaDOT or Township approved fill and compacted by tamping or rolling. The backfill material shall be evenly spread in layers not normally exceeding six (6) inches with tamping or power rolling and maybe up to two (2) feet with suitable vibratory equipment, subject to approval of the Engineer. Backfill material shall not exceed more than twenty (20) percent by volume of rock.

3.6.2 Backfill in State Highways shall be in accordance with current PADOT 408 requirements. A permit shall be obtained by the Developer in the name of the Township for all state roadway work.

3.7 TRENCH BACKFILLING IN UNPAVED AREAS

3.7.1 Between two (2) feet over the top of pipe and the grade or subgrade, the excavation shall be mechanically filled with select fill that based upon a certification of a soils engineer may be previously excavated material from the trench and compacted by tamping or rolling. Where unsuitable material is found in the judgement of the Engineer, the Engineer shall specify the required material. The backfill material shall be evenly spread in layers not normally exceeding twelve (12) inches with tamping or power rolling and maybe up to three (3) feet with suitable vibratory equipment, subject to approval of the Engineer. Backfill material shall not exceed more than twenty (20) percent by volume of rock, and no rock shall exceed eight inches in any dimension.

3.7.2 Backfilling in State Highways shall be in accordance with PADOT 408 requirements. A permit shall be obtained by the Developer in the name of the Township for all state roadway work.

3.8 TOLERANCES

Top Surface of Backfilling under Paved Areas: Plus or minus one inch from required elevations.

3.9 FIELD QUALITY CONTROL

3.9.1 Tests and analysis of fill material shall be performed in accordance with ANSI/ASTM D698, D1557.

3.9.2 Compaction testing shall be performed in accordance with ANSI/ASTM D1556, ANSI/ASTM D1557, ANSI/ASTM D698.

3.9.3 If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost.

3.9.4 Proof roll compacted fill surfaces under slabs-on-grade, pavers, paving.

3.10 PROTECTION OF FINISHED WORK

3.10.1 Protect finished work from damage due to weather, traffic, vandalism, etc.

3.10.2 Compact fills areas subject to vehicular traffic.

3.11 DISPOSAL OF MATERIAL

3.11.1 After completion of backfill, all material not used therein, shall be removed and disposed of by the Contractor in such a manner and at such point or points he may select, subject to the approval of the Engineer. All roads, sidewalks, and other places on line of work shall be left free, clean and in good order.

3.11.2 All removal and clean-up shall be done by the Contractor, and, if he fails to do such work within a reasonable time, after receipt of notice, the work will be performed by the Owner, and the cost deducted out of monies due or to become due to the Contractor.

3.12 MAINTENANCE

3.12.1 The Contractor shall maintain all backfilled excavations in proper conditions as specified. All depressions appearing in backfilled excavation shall be promptly repaired by the Contractor.

3.12.2 If the Contractor fails to make repairs within forty-eight (48) hours after receipt of written notice from the Engineer, the Authority may backfill said depression and the cost deducted from any monies due or to become due the Contractor.

3.12.3 In an emergency, the Engineer may backfill or protect any dangerous depression wherever necessary without giving previous notice to the Contractor and the cost deducted from any monies due or to become due to the Contractor.

3.13 SAMPLES AND TESTING

3.13.1 During or after backfill operations, the Engineer may require soil compaction tests in conformance with ASTM standards. Testing laboratory and method of testing shall be as determined by the Engineer.

3.13.2 If determined by the Engineer that any lift does not meet 95 percent of the maximum density, the Contractor shall be required to dig test holes, as directed by the Engineer, at various levels throughout the backfill, at the Contractor's expense, so that additional tests may be taken. If the additional tests indicate unsatisfactory compaction, the Contractor shall remove all unsatisfactory backfill and recompact same to the required standards at his expense.

3.14 CARE AND RESTORATION OF PROPERTY

3.14.1 Excavating machinery and cranes shall be operated with care to prevent damage to existing structures and/or wires.

3.14.2 On paved surfaces, the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels so shaped as to cut or otherwise damage such surfaces. Backhoes shall use wood under the treads to prevent scarring of the existing paving.

3.14.3 All surfaces which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations. Suitable materials and methods shall be used for such restoration.

3.14.4 The entire area in the vicinity of the structures where excavation, filling, and backfilling is to be performed shall be raked clean of all trash, wood forms, and other debris after completion of the work specified and all spoil piles shall be leveled and excess material disposed of as specified herein.

** END OF SECTION **

SECTION 02270

EROSION AND SEDIMENT CONTROL PLAN

PART 1 GENERAL

1.1 DESCRIPTION

This section provides general requirements for erosion and control measures for construction of sanitary sewers and conveyance systems and shall only apply for projects where no erosion control approval of a development is necessary.

This section includes:

- o Preparation and implementation of a plan and obtainment of a permit for the prevention of accelerated soil erosion during construction
- o General sedimentation preventative measures for streams and waterways adjacent to construction site
- o Removal of erosion and sediment control measures upon completion of all site construction

1.2 REGULATORY REQUIREMENTS

Department of Environmental Protection of the Commonwealth of Pennsylvania (PaDEP), Title 24, Chapter 102, as amended, federal measures as required under Environmental Protection Agency permitting and Montgomery County Conservation District.

1.3 DELIVERY, STORAGE, AND HANDLING

- 1.3.1 All materials scheduled for use in Contractor's approved erosion and sedimentation control plan shall be delivered, stored, and handled to prevent exposure to weather and soil contamination prior to installation and use.
- 1.3.2 All materials and equipment shall be delivered on site with original manufacturer's product labels.

PART 2 PRODUCTS

2.1 MATERIALS

- 2.1.1 All materials and equipment shall meet the requirements of applicable federal, state, and local regulatory agencies.
- 2.1.2 All materials shall be new and clean, unless otherwise approved.

2.2 SEDIMENT TRAPS

- 2.2.1 Sediment traps are small temporary basins formed by excavation and/or embankment to intercept sediment-laden runoff and to trap and retain sediment.

PART 3 EXECUTION

3.1 EXAMINATION

- 3.1.1 Contractor shall examine the construction site requiring erosion and sedimentation control prior to preparation and submission of proposed plan.
- 3.1.2 Contractor shall field verify dimensions and elevations of the construction site prior to preparation and submission of proposed plan.

3.2 INSTALLATION - SEDIMENT TRAPS

- 3.2.1 All excavation operations shall be carried out in such a manner that erosion and water pollution shall be minimal. Any excavated portion of sediment traps shall have 2:1 or flatter slopes.
- 3.2.2 Three (3) types of outlets for sediment traps: earth, pipe and stone as permitted. An earth outlet trap consists of a basin formed by excavation and/or an embankment. The trap has a discharge point over or cut into natural ground. If an embankment is used, the outlet crest shall be at least one (1) foot below the top of the embankment. A pipe outlet sediment trap consists of a basin formed by an embankment and excavation. The outlet for the trap is through a perforated riser and a pipe through the embankment. The pipes shall be made of corrugated metal and the sizes shall be as indicated on the Plans. The top of the embankment shall be at least one and one-half (1-1/2) feet above the crest of the riser. At least the top two-thirds of the riser shall be perforated with 1/2 inch holes spaced eight (8) inches vertically and 10 to 12 inches horizontally. All pipe connections shall be watertight. A stone outlet sediment trap consists of a basin formed by embankment or a combination of embankment and excavation. The outlet for the trap is over a level stone section. The stone outlet provides an intentional pounding area by utilizing a relatively impervious core such as straw bales or timber placed in the stone. The crest of the stone outlet shall be a minimum of one (1) foot below the top of the embankment. Stone shall be similar to PADOT Type 2B.
- 3.2.3 Embankments and other areas disturbed by construction of sediment traps shall be seeded with temporary approved mixture at the rate of two (2) pound per 1,000 square feet.
- 3.2.4 Sediment shall be removed when the sediment has accumulated to one-half of the design depth of the trap. Sediment removed from the trap shall be deposited in a suitable area in such a manner that it will not erode.
- 3.2.5 After disturbed areas have established permanent vegetation the sediment traps shall be removed.

3.3 INSTALLATION - DIVERSION DIKES

- 3.3.1 Diversion dikes are temporary structures constructed of compacted fill and used to divert runoff to sediment traps and basins.
- 3.3.2 The diversion dikes shall be machine compacted and have a minimum top width of two (2) feet, side slopes of 2:1 or flatter, and shall be a minimum of eighteen (18) inches high.
- 3.3.3 Where the slope of the formed channel flow area exceeds five (5) percent, it shall be stabilized with crushed stone.
- 3.3.4 Temporary seeding is required on all diversion dikes and they shall be removed when areas contributing have established permanent vegetation.

3.4 TRAFFIC CONTROL

Minimization of the areas of disturbance also involves traffic control. Corridors for equipment travel shall be established to protect those areas that will not be denuded. Instructions shall be issued that routes for convenience shall not be allowed and that the established equipment travel corridors must be used.

3.5 DIVERSIONS

- 3.5.1 In cases where runoff from higher land will cross an unprotected area, diversion channels or interceptor dikes shall be installed to protect the stripped ground.
- 3.5.2 All channels of conveyance on grades of five (5) percent or more shall be stabilized with rip rap or other suitable materials.
- 3.5.3 Rock dams, straw bales, filter dikes, and sediment traps are other tools which can be helpful in preventing sediment from reaching the streams.
- 3.5.4 On-site personnel shall evaluate each section of construction and install any structures necessary to adequately prevent sediment pollution.

3.6 STOCKPILES

- 3.6.1 Stockpile areas shall also be selected and maintained by on-site personnel. Site selections and stockpile design shall incorporate sediment erosion control considerations to prevent the potential direct production and delivery of sediment to waterways, damage to vegetation that is part of the total sediment and erosion control plan, and the unnecessary destruction of trees that are selected for preservation.
- 3.6.2 Temporary or interim stabilization of soil stockpiles shall be promptly instituted. Critical slopes on stockpiles shall be avoided. Stockpiling shall not be allowed adjacent to channels or waterways.
- 3.6.3 Structural practices shall be installed on large stockpiles. Their design and implementation shall be accomplished by competent on-site personnel.
- 3.6.4 If a stockpile is to remain for over sixty (60) days, it shall be stabilized by soil stabilizing chemicals, temporary vegetation, interim structures, or other special practices.
- 3.6.5 Temporary vegetative measures planned for implementation on stockpile areas shall be established immediately after the stockpile operation is completed. Proper mulching and soil stabilization in conjunction with these seeding operations shall also be carried out.

3.7 EXCAVATION AND BACKFILL

- 3.7.1 Excavation shall be closely controlled. The material removed from the excavation shall be selectively stockpiled in areas where a minimum of sediment will be generated and where other damage will not result from the piled earth.
- 3.7.2 Drainageways shall be protected at all times and the piling of soil in waterways shall not be allowed.
- 3.7.3 In paved areas, temporary repaving shall be placed promptly after backfill operations are completed.

3.8 STREAM PROTECTION

- 3.8.1 Where construction is close to existing streams and other waterways, construction shall be performed in a manner which will not contribute to stream pollution. Construction practices shall include the following:
- A. Construction debris, excavated materials, brush, rocks, refuse and topsoil shall be kept as distant from the stream as possible.
 - B. Stream crossings and machinery operation in the stream shall be prohibited unless no other feasible construction alternative exists in which case the Contractor shall provide a written request to the Engineer for approval to temporarily encroach upon the waterway. Under no circumstances will a stream bed be permitted to become a highway for machinery traffic.
 - C. Temporary cofferdams used for stream crossing construction shall be completely removed and the stream bed restored to its original condition after the construction is completed.
- 3.8.2 The Contractor shall file a plan for approval by the proper agencies with the Engineer for each stream crossing or where required by the Engineer or public agency.
- 3.9 EXCAVATION PUMPED WATER
- 3.9.1 Pump water management shall be practiced by the Contractor to reduce the production of sediment. Pumped water shall be discharged onto stabilized surfaces and then allowed to be filtered by the existing vegetation.
- 3.9.2 If ditches are required to remove pumped water from construction excavations, they shall be given the same consideration as any other man-made waterway and they shall be stabilized if they are not to degrade and produce sediment.
- 3.10 FILTER BERMS
- 3.10.1 When construction operations take place within existing curbed roadways and backfilling will not immediately take place, crushed stone filter berms may be required by the Engineer.
- 3.10.2 The filter berms shall be six (6) inches high, placed perpendicular to the curb, and be shaped with side slopes which will facilitate vehicular traffic.
- 3.11 FILTER INLETS
- 3.11.1 Temporary filter inlets shall be used at existing stormwater inlets where required by the Engineer and are built by first setting concrete blocks in a circle around the inlet and then piling crushed stone against the blocks. The stone filters sediment from runoff and the blocks prevent the stone from being washed into the storm sewer system. After all disturbed areas draining to the inlet have been stabilized, the filtering materials can be removed.
- 3.11.2 After the construction phase is complete, permanent vegetation on the areas that have been disturbed shall be reestablished as rapidly as possible. If the completion of the construction activities does not coincide with a season in which permanent vegetation can be started, an interim or temporary program is required. This shall include soil stabilization, mulching, or the establishment of filter strips or the use of scarification. In any case, sediment and erosion controls shall be installed promptly and their maintenance assured.
- 3.12 MAINTENANCE
- 3.12.1 Sediment and erosion control practices will not function properly throughout their designed life span if they

are not maintained. Periodic inspection shall be made at sufficiently frequent intervals to detect any impairment in the ability of the erosion control facilities installed as part of this plan to continue to function effectively. Responsibility for maintenance shall be assigned to an individual who has access to equipment, material, and funds required to sustain the maintenance schedule.

- 3.12.2 Most control structures require work to restore them after each storm. This maintenance shall be performed to allow the structure to continue to perform the function for which it was designed.
- 3.12.3 Vegetative practices require maintenance. Frequently, a stand of vegetative cover established in the sediment and erosion control program is allowed to deteriorate and become ineffective. A fertilization and reseeded program shall be established and carried out as the construction proceeds. Areas where failures have been experienced in the establishment of vegetative protection shall be promptly treated. The reestablishment of permanent vegetative cover shall be initiated as soon as possible in an effort to keep the area requiring maintenance work to a minimum.
- 3.12.4 Information shall be distributed to all persons on the construction site describing and stressing the importance of the proper installation and maintenance of the erosion and sediment control procedures included in this plan. The actions and language of supervisors on the project shall continually emphasize the seriousness and importance of sound erosion and sediment control procedures.
- 3.12.5 This approved erosion and sediment control plan and the Standard Conditions Relating to Erosion Control issued as part of the PaDEP Water Quality Management Permit shall be available at the immediate site of construction activity at all times.

** END OF SECTION **

SECTION 02550

MANHOLES

PART I GENERAL

1.1 DESCRIPTION

This section includes:

- o Installation of manhole foundations, manhole bases, and manhole riser sections
- o Installation of manhole steps and manhole frames and covers
- o Installation of gravity piping, inside drop piping and outside drop piping
- o Installation of manhole flow channels and benches
- o Exterior and interior manhole coating
- o Leakage testing of manholes
- o Flow preventer inserts

1.2 REFERENCES

- 1.2.1 ASTM C478 - Precast Reinforced Concrete Manhole Sections
- 1.2.2 ASTM C923 - Rubber gasket specification (piping)
- 1.2.3 ASTM C443/C361 - Rubber joint
- 1.2.4 ASTM D1056 - Neoprene joint
- 1.2.5 ASTM A185 - Reinforcing
- 1.2.6 Federal Specification SS-S-210-A-Butyl rubber gasket.
- 1.2.7 Section 01300, SUBMITTALS
- 1.2.8 Section 02220, EXCAVATION
- 1.2.9 Section 03300, CONCRETE

1.3 SUBMITTALS

Submit shop drawings or manufacturer's cuts of all manhole items such as covers and frames, steps, pipe penetrations, manhole walls and bases, manhole joint materials, etc. in accordance to Section 01300, SUBMITTALS.

PART 2 PRODUCTS

2.1 MANHOLE BASES

- 2.1.1 The bases shall be constructed of cast in place, reinforced concrete, and consist of the manhole bottom including the shaped invert and a wall which shall extend a minimum of six (6) inches above the top of the highest inflowing sewer, or
- 2.1.2 Precast manhole bases, including bottoms, inverts and walls shall be formed in standard metal forms designed specifically for this use. Product shall be Atlantic A-Lok Precast Invert System or Engineer-approved equal.
- 2.1.3 The minimum depth of flow channel shall be equal to three-fourths the diameter of the largest sewer in the manhole. The channel shall be graded to give a smooth, uninterrupted flow through the manhole.
- 2.1.4 The bench shall be pitched a minimum of one inch per foot from manhole wall to the edge of the flow channel.
- 2.1.5 Changes in grade shall be made gradually and evenly. Changes in the direction of the sewer and entering branch or branches shall have a curve of as large a radius as the size of the manhole will permit. Changes in pipe sizes 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. At no time should the elevation of the top of the incoming pipe be lower than that of the outgoing pipe. See FIGURE 3 for typical detail.

2.2 RISERS AND TOP SECTIONS

- 2.2.1 Manhole riser and top sections shall be designed, manufactured, tested, finished and marked in accordance with this specification and "Specifications for Precast Reinforced Concrete Manhole Sections" (ASTM C478).
- 2.2.2 The manholes shall be constructed of precast reinforced concrete manhole sections, which shall be a minimum of four feet in diameter for pipe sizes up to, but not including, 24 inches internal diameter. Product shall be by Atlantic Concrete Products or Engineer-approved equal.
- 2.2.3 Manhole barrels shall consist of riser and top sections with a minimum wall thickness of five (5) inches or as required by the manhole depth. The top section shall be an eccentric conical section with thickened upper walls with the smallest inside diameter equal to 24 inches, to receive the manhole frame and cover. No more than two (2) lift holes shall be cast in each barrel or top section. See FIGURE 3 for typical details.

2.3 SEALS

- 2.3.1 A flexible connection sleeve shall be cast into place in the riser sections for all gravity pipes and shall be ASTM C-923, "Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes". Product shall be Fernco, Atlantic A-Lok or Engineer-approved equal.
- 2.3.2 The entire exterior surface shall be coated with three (3) coats, producing a dry film thickness of 32 mils per coat of Bitumastic Super Service black, as manufactured by Kop-Coat or Engineer's-approved equal. The coating shall be placed on the entire exterior surface of the manhole from the bottom of the frame and cover to a line at the base approximately level with the invert of the channel.
- 2.3.3 Joints between riser sections shall be sealed by two strips of pre-formed butyl sealant tape per joint (one on

inner and one on outer flat) with materials to meet ASTM D 297 requirements. Product shall be Atlantic FS-series, K. T. Snyder Company or Engineer-approved equal.

- 2.3.4 Manholes shall be fitted with EPDM manhole entry sleeves imbedded in the top of the eccentric cone section and lining the grade rings and frame. Product shall be Atlantic Water-Lok or Engineer-approved equal. See FIGURE 3 for typical details.

2.4 MANHOLE STEPS

- 2.4.1 Manhole steps shall be of extruded 6061-T6 aluminum or reinforced plastic unless otherwise approved. Portions of manhole steps which are to be embedded in 3,500 psi concrete shall be protected by coating those portions with a mastic or other suitable protective coating, which will prevent corrosion due to galvanic action. The steps shall have a minimum resistance to pullout of 1,500 lbs. A direct contact between the aluminum alloy step and reinforcing bars or other dissimilar metal shall not be permitted. See FIGURE 4 for typical details.

- 2.4.2 Manhole steps shall be cast into the walls of risers and conical top sections, and shall be aligned vertically and spaced so as to be on equal centers in the assembled manhole at a nominal distance apart of 12 inches. Steps shall not normally be within six (6) inches from the ends of riser and top sections.

2.5 MANHOLE FRAMES AND COVERS

- 2.5.1 Shall conform to details on Plates and be Woodward Castings, Phoenixville, PA; Campbell Foundry Co., Harrison, NJ; Neenah Foundry Co., Neenah, WI (No. R-1642 with Type C lid for standard and No. R-1916-F1 for watertight); or equal. Two (2) pick holes, cored one-half the depth of the cover and not to extend through the cover, shall be located diametrically opposite. Frame base shall have four (4) one-inch diameter holes to receive the anchor bolts. All covers shall have the words "Sanitary Sewer" cast in the cover. See FIGURE 5 for typical details.

- 2.5.2 Frames and covers shall be suitable for purpose intended. In traffic bearing areas, they shall be capable of supporting traffic loads, as specified by PADOT and shall at a minimum be designed to support an AASHTO Highway Loading Class HS-20. Covers in areas subject to flooding shall have bolt down-type with butyl rubber or neoprene gaskets or shall have internal bolt down covers with gaskets.

- 2.5.3 Castings shall be gray iron, free from cracks, holes, swells and cold shuts and shall conform to ASTM A 48, Class 30 requirements. All manhole castings shall be made accurately to the pattern and dimensions shown on Plates and shall be planed where marked, or where otherwise necessary to secure perfectly flat and true surfaces. Lids which "rock" and do not lie solid after construction is finished will be rejected and must be replaced by perfect lids.

- 2.5.4 No plugging, burning in, or filling will be allowed. Covers must fit the frames in any position. All castings shall be carefully coated, both inside and out, with coal-tar pitch varnish.

2.6 ANCHOR BOLTS

- 2.6.1 In unpaved areas, anchor bolts for bolting manhole frame to the precast manholes shall be 3/4 in. diameter galvanized all-thread steel rods with five (5) inch hook for embedment in the manhole top and a minimum two (2) inch projection through the rim of the frame.

- 2.6.2 Anchor bolts shall not be used in paved areas.

2.7 MANHOLE INSERTS

Manhole inflow preventer dishes shall be provided for all locations where watertight covers are not required. The units shall be Parsons Dishes or approved equals.

PART 3 EXECUTION

- 3.1 INSTALLATION (see FIGURES 3, 4, 5, 6 and 7 in Section 04000, CONSTRUCTION DETAILS for typical manhole details)
- 3.1.1 Manholes shall be constructed promptly as the sections of the sewer between them are completed.
- 3.1.2 All ground water shall be kept away from newly placed concrete bases. Manholes which admit ground water after completion, must be repaired to the satisfaction of the Engineer.
- 3.1.3 In all junction manholes, where the grade line of one sewer is more than 24 inches above the other, the connection shall be made by means of an outside "drop connections" (See Figure 6 for typical details). The drop pipe shall be external to manhole for new manholes.
- 3.1.4 All damage to precast sections shall be thoroughly repaired in the presence of the Engineer. Repair and patching of minor breaks shall be done by chipping the defective area before application of the grout. Clean area per grout manufacturer's instructions. Sufficient time shall be allowed for curing before the precast sections are put together. Concrete cast in place bases shall be specially formed and keyed to accommodate the bottom precast section.
- 3.1.5 Precast manhole bases shall be placed on a level six-inch base of crushed stone.
- 3.1.6 To secure a proper level, manhole sections shall not be set by wedging or shims.
- 3.1.7 In constructing "Drop Manholes", the Contractor shall encase and support the drop pipe and incoming pipe with concrete down to undisturbed earth as shown on FIGURE 6.
- 3.1.8 The top of all manholes may be brought to proper grade for receiving manhole frames by using not more than one precast concrete ring which shall not exceed six (6) inches in depth. All work shall be laid plumb, straight, level, square and true. All joints shall be full and not more than one-half inch in thickness. The Contractor shall set in place and bond in the masonry all necessary manhole steps and miscellaneous items. Masonry walls shall not normally be used and shall have the prior approval of the Engineer. The masonry walls shall be parged on the inside and outside with a one-half inch coat of Portland Cement mortar, and coated with Dry-Con or Thoro-Seal for waterproofing.
- 3.1.9 Mortar (maybe used in brickwork when previously approved by the Engineer), setting manhole frames, and parging, shall be prepared by thoroughly mixing: One (1) volume of Type II Portland Cement with three (3) volumes of sand and sufficient clean water to produce a rich mass of approved consistency. Mixing mortar on the ground or any paved surface shall not be permitted. Sand to be used in making mortar shall be clean, well graded, and shall pass a standard No. 4 sieve.
- 3.1.10 Masonry shall not be constructed during cold weather (air temperature below 40 Degrees F.) unless necessary precautions are observed as directed by the Engineer.
- 3.1.11 Manhole frames and covers shall be brought to proper grade as previously noted, set in 1/4-inch bed of mastic, and anchored in place (as required) with the four (4) 3/4-inch diameter anchor bolts which shall be securely embedded in the top of the manhole. Where mortar is used, its thickness shall not be less than 3/8-inch nor more than 3/4-inch.

For manhole frames located above or at-grade in non-road areas, the exterior of the frame shall be concrete encased.

- 3.1.12 All seals shall be installed, and the concrete prepared, in accordance with the seal manufacturer's instructions.
- 3.1.13 The final elevation of manholes in rights-of-way shall normally be at least (12) twelve-inches above grade, unless other requirements are imposed by the Authority. The exterior surface shall be cement coated and waterproofed.

3.2 PIPING CONNECTIONS TO EXISTING MANHOLES

- 3.2.1 In joining new PVC pipe to an existing manhole, a hole shall be cut into the manhole and a sand coated PVC rubber ring-type coupling grouted into place to receive the new pipe. This must result in a flexible joint at the point of juncture with the manhole.
- 3.2.2 In joining Ductile Iron pipe to an existing manhole, the method described above may be used, or the new pipe may be grouted directly into the existing wall. See FIGURE 7 for typical detail.
- 3.2.3 Where a smaller diameter pipe connects to a larger diameter sewer, the flow lines shall be adjusted.
- 3.2.4 The manhole channel shall be re-shaped to provide a new uniform channel(s).
- 3.2.5 All holes cut into manholes must be performed by coring.

3.3 TESTING/INSPECTION

- 3.3.1 Normally 4-foot diameter manholes shall be vacuum tested to 10 inches of mercury. The pressure drop shall be maintained for twenty (20) seconds without leakage or any indication of pressure rise on the pressure gauge.
- 3.3.2 Backfilling of manholes shall not be permitted without the permission of the Engineer.
- 3.3.3 Testing shall be performed, unless previously approved by the Engineer, after the final paving is completed for the development.

** END OF SECTION **

SECTION 02560

SANITARY SEWERS AND APPURTENANCES

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The section includes:

- o Installation of sanitary sewer gravity and pressure pipe.
- o Installation of lateral connections to sanitary sewer gravity pipe.
- o Testing of sanitary sewer gravity and pressure pipe.
- o Site Protection and Restoration

1.2 RELATED SECTIONS

1.2.1 Section 01300, SUBMITTALS

1.2.2 Section 02220, EXCAVATIONS

1.2.3 Section 02230, BACKFILLING

1.2.4 Section 02580, SEWERS IN RELATION TO WATERWAYS

1.3 DESIGN AND INSTALLATION

1.3.1 Products and installation methods shall conform to applicable sections of the Pennsylvania Department of Environmental Protection sewerage manual and to the "Related Sections" listed in 1.2 above.

1.3.2 All 8-inch sanitary gravity sewer lines shall be designed and run at a minimum 0.5 percent grade and initial runs for all gravity sewer lines shall be designed for 1.0 percent grades. Only one type and class of material shall be permitted in any continuous run of sewer between structures.

1.3.3 No sanitary sewer line shall normally be installed in cartways with less than 6-foot of cover to the top of the pipe.

1.3.4 Vertical lateral risers shall not be permitted.

1.3.5 Laterals shall not normally terminate into a manhole.

1.3.6 The material of construction of all force mains shall be ductile iron.

1.3.7 The plans should clearly note what level of service is being provided -- first floor or basement and the location of the lateral shall be shown on the plans.

1.3.8 The inspection and testing of the sewer lines by the Engineer as described in Part 3.

PART 2 PRODUCTS

2.1 DUCTILE-IRON PIPE WITH RUBBER GASKET

2.1.1 General

A. Pipe shall be as manufactured by U.S. Pipe, American Cast Iron Pipe Co., or approved equal.

B. Ductile-iron pipe shall be bell and spigot type, centrifugally cast and conforming to standard specifications of American National Standards Institute, ANSI A 21.50 and ANSI A 21.51. Ductile-iron thickness shall be minimum Class 52. Inside contour of bell shall provide a seat for the gasket, and an internal bead in the socket shall fit into the groove in the gasket. Plain end of the pipe shall be slightly tapered to ease its sliding fit with the gasket when joint is being made. Standard bituminous coating shall be provided on all pipe and fittings.

2.1.2 Fittings for Ductile-Iron Pipe

All fittings, where in main or lateral lines, for Ductile-Iron Pipe may be either gray or ductile-iron conforming to latest issue of ANSIA21.10 for short body Gray and Ductile-Iron Fittings, for 250 psi water pressure, plus water hammer where appropriate, and shall be made with mechanical joint ends conforming to ASI A21.11.

2.1.3 Lining

All pipe and fittings, except for lateral sewer lines, shall be single cement-mortar lined for sewer pipe and double cement-mortar lined for force mains and seal coated in accordance with AWWA C151.

2.1.4 Sleeves

Sleeves shall be AWWA C110 mechanical joint ductile iron split-sleeve type. The pipe and space shall not exceed one-third of the sleeve laying length.

2.1.5 Couplings

A. Couplings shall be middle ring and compression gland type. The middle ring shall be without pipe stop. Standard middle ring length shall be provided for pipe and space of one inch or less. Long middle ring length shall be provided when pipe and space exceeds one inch. Include spacer ring to reduce end space to not more than one-quarter inch. Middle rings and followers shall be ductile or cast iron for iron couplings and steel for steel couplings.

B. Steel couplings shall be Smith-Blair Type 411, Rockwell International Corporation; Dresser Style 38, Dresser Industries, Inc.; or approved equal.

C. Iron couplings shall be Smith-Blair Type 431, Rockwell International Corp.; Dresser Style 53, Dresser Industries, Inc.; Ford Meter Box Company, Inc.; or approved equal.

D. Couplings for joining direct buried, exposed exterior, vault or pit installations of ductile iron pipe, shall be iron. Couplings for exposed interior ductile iron pipe may be steel or iron.

E. Bolts shall be ductile iron or stainless steel for iron couplings and high-strength, low-alloy steel for steel couplings.

F. Middle ring and end follower glands shall be completely coated with two-part epoxy or nylon fuse-coated to a minimum ten mils thickness. Line interior of all steel coupling intended for exposed-interior installations. Coat exterior with normal shop coating.

G. Anchored couplings shall be furnished where joint restraint is required to offset internal pipeline forces and hydrostatic test pressure. Harnesses shall consist of lugs or clamps securely fastened to opposite joint elements with tie bolts between opposing lugs. Mechanical joint retainer glands shall not be used where joint restraint is required.

2.2 POLYVINYL CHLORIDE PIPE

2.2.1 General

A. Pipe shall be manufactured by Harrington Corporation, Extrusion Technologies, Inc. or approved equal. The Engineer shall be furnished with a manufacturer's certificate of conformance for the pipe to be used on the project.

B. Gravity pipe and fittings, 4 inches through 15 inches, shall be made of polyvinylchloride plastic, conforming to ASTM-3034, Type PSM Poly (PVC) Sewer Pipe and Fittings, SDR-35, with integral bell gasketed joints. Pipe installed deeper than 15 feet below grade shall be SDR 26 PVC pipe, unless ductile iron is required by the Engineer. All pipe under six feet in depth in cartways, over twenty feet in depth or on slopes exceeding ten percent shall be ductile iron.

2.2.2 Joint and Gaskets

Joints shall conform to ASTM 3212 and gaskets shall conform to ASTM F477 and D3139.

2.3 AIR RELIEF/VACUUM RELIEF VALVES

An automatic air relief and/or vacuum relief valve(s) shall be located at high points in the force main to prevent air pockets from developing and siphoning from occurring.

2.4 TERMINATION

Force mains should enter the gravity sewer system at a point not more than two feet above the flow line of receiving manhole. A concrete channel shall be provided along with a method to reduce the energy of the water to prevent erosion.

2.5 FORCE MAIN DESIGN PRESSURE

The force main and all fittings, including restraints, shall be designed to withstand normal working pressure including water hammer plus 75 psi. The plans shall clearly indicate the maximum water pressure of the system and then show the addition of the 75 psi.

2.6 SPECIAL CONSTRUCTION

Sanitary gravity pipes and force main construction near streams shall meet applicable requirements of Section 02580, SEWERS IN RELATION TO WATERWAYS.

PART 3 EXECUTIONS

3.1 SEPARATION FROM WATER MAINS AND OTHER UTILITIES

- 3.1.1 There shall be at least a ten-foot horizontal separation between water mains and all sanitary sewer piping. Additionally, sanitary sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the force main and the outside of the water main. This shall be the case where the water main is either above or below the force main. At crossings, if possible, one full length of water pipe shall be located so both joints will be as far from the force main as possible. Special structural support for the water main and force main may be required.
- 3.1.2 A minimum of two (2) feet clearance shall be provided to all other utilities. Where this clearance can not be provided, at a minimum, concrete encasement shall be provided. The Engineer may require other steps to be taken including change in type of pipe material.

3.2 STOPPERS

Plugs, stoppers, etc. shall be securely installed in the open end of each wye fitting, lateral and manhole stub. The stopper shall make a watertight closure of the pipe bell end of the pipe.

3.3 PROTECTING AND KEEPING PIPE CLEAN

During construction, the mouth of the completed pipe shall always be kept properly closed with a suitable plug to prevent the entrance therein of any water, earth, stones or other debris. The Contractor shall also take any and all measures to keep the pipe clean and free from deposits and protect the pipe from damage.

3.4 ASSEMBLY OF PIPE

- 3.4.1 Pipe laying shall be accomplished only in the presence of the Engineer or his authorized representative.
- 3.4.2 Except where necessary in making connections with other lines, pipe shall be laid with the bells facing in the direction of laying. For lines on an appreciable slope, bells shall face upgrade.
- 3.4.3 All cutting of pipe shall be done by means of mechanical cutters of an approved type or types. Wheel cutters shall be used wherever practicable.
- 3.4.4 No deflections from the straight line or grade shall be allowed for gravity sewers. For force mains deflections from a straight line or grade, made necessary by vertical curves or horizontal curves or offsets, may not exceed that approved by the pipe manufacturer. Where alignment requires deflections in excess of those permitted, the Contractor shall either provide bends or shorter lengths of pipe to provide for the necessary angular deflections.
- 3.4.5 Each pipe shall be well bedded and no pipe shall be brought into position until the preceding length has been thoroughly secured in place. Coupling or bell holes shall be dug sufficiently large to insure the making of a proper joint. Special care shall be used to secure water tightness and to prevent damage to joints during backfilling. All joints shall provide the necessary watertightness established by these specifications. All joints shall be made in strict conformance with the manufacturer's instructions.
- 3.4.6 All excavations shall be kept free from water and no joints shall be made under water.
- 3.4.7 No pipe shall be laid upon earth to which frost has penetrated, nor at any time when there is a danger of formation of ice or penetration of frost at the bottom of excavation.

3.4.8 Joint Restraint

A. Contractor shall have the option of restraining elbows, tees, and plugs by using poured-in-place concrete thrust blocks or providing restraining joints for ductile iron pipe. Restrained joint pipe must be used when unsuitable trench conditions or soil conditions are found and/or when interference with, or the close proximity to buried structures, pipelines or utility lines is found.

B. If the Contractor elects to use poured-in-place concrete thrust blocks, they shall be placed at all points of potential thrust. Thrust blocks shall be of concrete or concrete and steel, as required, and shall be placed so that joints or mains will be accessible for repair. Concrete thrust blocks shall be poured against undisturbed earth and shall be of sufficient size to resist the thrust resulting from the specified hydrostatic test pressure.

C. If the Contractor elects to use restrained joint ductile iron pipe, then restrained joints shall be placed at all points of potential thrust. The number of joints to be restrained on each side of a fitting shall be determined by the pipe manufacturer. The length of restrained pipe shall be sufficient to resist the specified hydrostatic test pressures and shall also take into account such factors as the burial depth, soil types, and backfill material.

3.4.9 Pipe connections shall be made in accordance with pipe manufacturer's instructions. Any discrepancies between instructions and this specification shall be brought to the attention of the Engineer for resolution during the design review stage.

3.5 SADDLES

Where approved by the Engineer, saddles shall only be used to connect new building connections to an existing sewer pipe. After selecting the location, the hole in the sewer main shall be cut with an approved type of tapping machine. No hand cutting will be allowed. See FIGURE 8 for typical detail. The Engineer will normally require a new wye to be installed in the existing sewer line.

3.6 HOUSE CONNECTIONS

3.6.1 The Contractor shall install a Y-branch of identical material to the main sewer with a 6-inch diameter. In general, service connections or laterals shall be 6-inch diameter Ductile Iron (Cast Iron Soil Pipe) or PVC SDR-35 pipe and fittings (unless larger size is specified by Engineer or Township) and laid at a grade of not less than 1/4-inch per foot. Where the lateral begins at a depth greater than 15 feet, or where a vertical lateral is necessary or where the depth of the lateral is less than 6 feet, cast iron pipe shall be employed.

3.6.2 Laterals are to be installed terminating as a bell outside the limits of the cartway, sidewalk, etc. and as near as practicable beyond the right-of-way line or curb line as determined by the Engineer. Normally a full length of lateral shall be installed. See FIGURES 9 and 10 for typical lateral details.

3.6.3 In connecting laterals to the Y-Branch in the main sewer, an approved bend shall be used. Where it is necessary to install a lateral in an existing line, and no Y-branch has been furnished, the connections shall normally require the installation of a new wye fitting.

3.6.4 Location Records of Laterals and House Connections

It is the responsibility of the Contractor to furnish to the Authority, the exact final location of the end of each and every lateral on the project. The horizontal location shall be given as the distance from the end of lateral to the centerline of the sanitary sewer. The vertical location shall be given as the distance from the center of the

end of lateral to the ground surface.

3.7 TESTING

3.7.1 Force Mains

A. The force main shall be backfilled a minimum of thirty (30) days before being hydraulically tested. The entire line shall be filled with water by the Contractor. There shall be no air or air pockets in the line. The line shall remain full and untouched by the Contractor for a period of 24 hours.

B. After the end of the first 24-hour period, the normal hydrostatic pressure shall be increased by a minimum of 50 pounds per square inch or to a pressure specified by the Engineer, on certified gauges on the discharge side of the raw sewage pumps and maintained, untouched by the Contractor, for a second 24-hour period.

C. Leakage in excess of 50 gallons per inch diameter per mile per 24-hour period, while the force main is under pressure test, will be unacceptable.

D. The Contractor shall provide all equipment apparatus, gauges, etc., required for testing

3.7.2 Gravity Pipe

A. After the gravity sewers have been laid and backfill placed to two (2) feet above the pipe, a laser light will be shone between manholes, or, if the manhole has not yet been constructed, between the location of manholes, to determine whether the alignment of the main is true and whether any pipe has been displaced subsequent to laying. If alignment is correct and no other defects are disclosed, backfilling may be continued. If the test shows poor alignment of the main, misplaced pipes or other defects, such defects shall be remedied by the Contractor before the work of backfilling proceeds.

B. No section of gravity sewer lines shall be tested for leakage before backfilling of that section has been completed and a minimum of thirty (30) days have passed. Any debris or silt in the line shall be flushed prior to testing. If this condition has been fulfilled, the sewer lines shall be tested for leakage between manholes. Leaky or poor joints shall be repaired, or removed at once by the Contractor to the satisfaction of the Engineer. The Engineer shall determine the testing method to be used.

C. Air shall be used for leakage tests of all accepted pipe material mains. The test procedure and accepted resulting pressure drops shall be in general accordance with the Ramseier procedure described in the publication of the National Clay Pipe Institute. Unless otherwise approved by the Engineer, each sewer line shall be air tested for five (5) minutes at five (5) psi pressure with no pressure drop. As indicated in the procedure, the air test may be dangerous if, because of carelessness, a line is improperly prepared. It is important that the necessary safety precautions described in the test procedure be followed.

D. The tests shall be witnessed by the Engineer.

E. All gravity sewer lines shall be televised and a video tape provided prior to final acceptance at the end of the maintenance period.

Additionally, during or immediately after construction, where there appears to be deficient construction work by the Contractor, either in alignment or in testing, the Engineer may order a televised survey of that portion of the lines to determine the extent of the deficiency of the corrective action necessary. The cost of such survey or surveys shall be paid by the Contractor, including the Engineer's time.

F. The entire system shall be flushed at the time of acceptance.

3.8 RECORD DRAWINGS

The Contractor shall furnish the Authority with one (1) mylar reproducible and two (2) sets of prints of as-built conditions, sealed by a registered surveyor. In addition to the above sentence, the Contractor shall provide, when the Authority elects, as-built plans in a CADD format acceptable to the Engineer. The plans shall show manhole and pipe locations, pipe slopes, manhole rim and invert elevations, location of laterals, and any other pertinent information.

3.9 SITE PROTECTION AND RESTORATION

Where a project extends off the Developer's site for any reason, a full video recording of the area(s) shall be performed by the Contractor prior to the start of any work on the entire project. The original video shall be given to the Engineer.

** END OF SECTION **

SECTION 02570

PUMPING STATIONS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The section provides the general design requirements for conventional sewage pumping stations including wet well/dry well type and submersible pump stations.

1.2 RELATED SECTIONS

1.2.1 Section 01300, SUBMITTALS

1.2.2 Section 02560, SANITARY SEWERS AND APPURTENANCES

1.2.3 Section 02600, RESTORATION

1.2.4 Section 03300, CONCRETE

PART 2 PRODUCTS

2.1 GENERAL

2.1.1 All pump stations shall comply with applicable sections of the latest edition of PaDEP's Sewerage Manual in addition to the requirements of this section.

The developer shall be required to submit an application to PADEP to obtain a permit(s) for each pumping station in the name of the Authority.

2.1.2 The pumping station structure(s) and its electrical and mechanical equipment shall be protected from damage by water from 100-year flood-levels. Sewage pumping stations should remain fully operational and accessible during this flood-level.

2.1.3 A grinding system to eliminate rags, large materials, etc. shall normally be required to be installed prior to pumping.

2.1.4 When an existing pump station is to be modified, the Authority will normally design the necessary modifications for Contractor installation or payment.

2.1.5 Each pumping station shall be supplied with a complete set of operational instructions, including emergency procedures, maintenance schedules, special tools and such spare parts as may be necessary. Additionally, a minimum of eight (8) hours of training shall be provided for each major equipment piece.

2.2 WET WELL/DRY WELL PUMPING STATIONS

2.2.1 Structures

A. Equipment Maintenance

Hoists or other Engineer's approved means shall be provisions to facilitate removing pumps, motors, and other mechanical equipment requiring inspection and maintenance for either the wet and/or dry pit compartments of the stations.

B. Access

Both dry and wet pits shall have suitable means of access provided.

C. Construction Materials

Due consideration shall be given to the selection of materials because of the presence of hydrogen sulfide and other corrosive constituents frequently present in sewage. Normally, all structures shall be of concrete materials.

2.2.2 Pumps

A. A minimum of two identical pumps shall be provided. For certain applications, such as grinder pumps, abnormal potential wear, etc. and based upon the Engineer's opinion, an un-installed spare pump/motor shall be provided.

B. Pumps shall be capable of passing solids of at least 2-1/2 inches in diameter and pump suction and discharge piping shall be at least four inches in diameter.

C. Priming

The pump will be permitted to operate under a positive suction head.

D. Electrical Equipment

Electrical systems and components in enclosed or partially enclosed spaces shall comply with the National Electric Code requirements for Class 1, Division 1, Group D Locations. In addition, equipment located in the wet well shall be suitable for use under corrosive conditions.

E. Each pump should have an individual intake. Intake piping should be as straight and short as possible.

F. Dry Well Compartment

When a dry pit is provided, a sump pump equipped with dual check valves shall be provided to remove leakage or drainage with its discharge being to the wet well. Floor and walkway surfaces should have an adequate slope to the sump.

2.2.3 Comminutors

Comminutors shall be Muffin Monster or approved equal.

2.2.4 Controls

A. Type

Control systems shall be of a bubbler or encapsulated float type.

B. The controls shall stop all pumps on low level, start each pump at a set level and alarm on high water level. Provisions shall be made to automatically alternate all pumps.

C. Location

The control system shall be located away from the turbulence of incoming flow and pump suction. Float tubes in dry wells shall extend high enough to prevent overflow.

2.2.5 Valves

A. Suitable shut-off plug valves shall be placed on the suction line of each pump except on submersible facilities. Valves shall be located in the dry well or on a separate valve chamber.

B. Suitable check valves shall be placed on the discharge line of each pump. Valves shall be capable of withstanding normal pressure and water hammer.

2.2.6 Wet Wells

A. Floor Slope

The wet well floor shall have a minimum slope of 1 to 1 to the hopper bottom.

B. Materials

The structure shall be of concrete, with stainless steel access steps, cover and ventilation materials. All other materials shall be either be PVC or PVC coated.

2.2.7 Ventilation

Mechanical ventilation that meets PaDEP guidelines and OSHA requirements shall be provided for all pump stations where the pump facility is located below the surface of the ground. Separate wet well and dry well ventilation systems shall be required.

A. Wet Wells/Ventilation

Ventilation may be either continuous or intermittent. Ventilation, if continuous, shall at a minimum provide at least 12 complete air changes per hour; if intermittent, at least 30 complete air changes per hour.

B. Dry Wells

Ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least

6 complete air changes per hour; intermittent, at least 30 complete air changes per hour.

2.2.8 Flow Measurement

Flow meters shall be required for all pumping stations. Meters shall be permanently installed with suitable recording devices. Meters shall be normally be mag meters. All meters and flow recording devices shall be approved by the Engineer.

2.2.9 Water Supply

A public water supply shall be furnished to all stations. A backflow preventer shall prevent the physical connection between any potable water supply and a sewage pumping station.

Where public water is available, a freezeless yard hydrant shall be provided.

2.3 SUCTION LIFT PUMPS

Suction lift pumps are not acceptable.

2.4 SUBMERSIBLE PUMP STATIONS

Submersible pump stations shall meet the general applicable requirements set forth under Section 2.2.

2.4.1 Construction

Submersible pumps shall be designed specifically for submerged use and raw sewage. Normally cast iron materials of construction shall be provided.

2.4.2 Pump Removal

Submersible pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well. Slide rails, stainless steel lifting cable or chain and hoist, and quick base-disconnect couplings shall be provided.

2.4.3 Electrical

A. Electrical supply and control circuits shall be designed to allow disconnection at a junction box located or accessible from outside the wet well.

B. The motor control center shall be protected by a conduit seal or other appropriate sealing method meeting the requirements of the NEC for Class 1, Division 2, location.

C. Submersible pump motors which remain totally submerged during the entire pumping cycle are not required to be explosion proof.

D. Submersible pump power cables shall have their disconnect located near the access hatch and outside the wet well for ease of disconnection and removal.

E. All pumping stations shall be provided with emergency power generators and an automatic transfer switch. Where public gas is not available in the opinion of the Engineer, sufficient fuel shall be provided to allow for a minimum 168 hours operation, and the containment for natural gas shall meet all federal and state

regulations for above ground storage. The generator shall be housed in a weatherproof enclosure and equipped with appropriate filters and silencers.

2.4.4 Submersible Valve Pit

When valves are located in a separate valve pit, its shall be constructed of concrete with an aluminum access cover. Any accumulated water shall be drained back to the wet well and the drain shall be equipped with a flap valve to preventing fumes from entering this pit. The valve shall prevent sewage from entering the pit during surcharged wet well conditions.

2.4.5 Operation

Submersible pumps shall be capable of unsubmerged operation without damage or reduction of service capability, or position provisions shall be made to assure submergence.

2.5 ALARM SYSTEMS

Alarm systems shall be provided for pumping stations. The alarm shall be activated in cases of power failure, generator starting, pump failure, use of the lag pump, low and high water levels, or any cause of pump station malfunction. Pumping station alarms should be telemetered, including identification of the alarm condition, via an autodialer system. A complete alarm schedule shall be furnished for every station. The autodialer shall be a standard model used by the Authority for its installations.

2.6 EQUIPMENT REQUIREMENTS

The following general requirements shall apply to all internal combustion engines used to drive electrical generating equipment.

2.6.1 Engine Protection

The engine must be protected from operating conditions that would result in damage to equipment. Protective equipment shall monitor for conditions of low oil pressure and over heating or freezing.

2.6.2 Size

The engine shall be sized to adequately handle the rated power to start and continuously operate all connected loads which includes two pumps running.

2.6.3 Engine Ventilation

The engine shall be located above grade with adequate ventilation of fuel vapors and exhaust gases. Where the generator is housed in the dry well side of a pump station or motor control center, adequate ventilation shall be provided to prevent excess building temperature

PART 3 EXECUTION

3.1 All equipment shall be installed in accordance with manufacturer's instructions.

- 3.2 Contractor shall test all pumps and other equipment to ensure satisfactory installation and operation.
- 3.3 Equipment manufacturer's service representative shall provide assistance for installation, testing, and start-up for all equipment.

** END OF SECTION **

SECTION 02580

SEWERS IN RELATION TO WATERWAYS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The section includes requirements for constructing sewers adjacent to or crossing streams.

1.2 RELATED SECTIONS

1.2.1 Section 02560, SANITARY SEWERS & APPURTENANCES

1.2.2 Section 02600, RESTORATION

PART 2 PRODUCTS:

Not Used

PART 3 EXECUTION

- 3.1 The top of all sewer piping, that either enters or crosses a waterway, shall be placed at a depth below the natural bottom of the stream bed to protect the pipe from erosion. In rock, a minimum of one foot of cover above the encasement should be provided and in other materials (soils), at least three feet of cover above the concrete encasement shall be provided.

All sanitary sewers located along streams shall be located outside of the stream bed area to provide for the possibility of future stream movement or widening. Further, no sewer lines shall be constructed in wetlands except for the necessary crossing of same.

- 3.2 All sewers which enter or cross streams shall be constructed of ductile iron pipe with mechanical joints so that they will remain watertight. Sewer shall be encased in concrete, minimum six-inch thickness and shall be extended to a pipe joint that is a minimum of ten feet on either side of the stream. Pipes crossings shall be designed to cross the stream as nearly perpendicular to the stream flow as possible. The construction methods that will minimize siltation shall be employed. The stream shall be returned as near as possible to its original condition. The stream banks shall be seeded, planted or other erosion prevention methods as required by the soil erosion control plan and permit.

3.3 Inverted Siphons

Inverted siphons shall normally not be approved. When determined necessary by the Engineer, it shall be designed to meet the requirements of PaDEP and other requirements of the Authority.

** END OF SECTION **

SECTION 02600

RESTORATION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The section covers Contractor restoration of all disturbed areas to their original condition. Restoration includes but is not limited to, wetlands, streets, driveways, curbs, sidewalks, street signs, lawns, mailboxes, retaining walls, shrubs, bushes, and plantings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

1.2.1 Section 02822, SEEDING OF DISTURBED AREAS

1.2.2 Section 02610, REPAVING

PART 2 PRODUCTS

Products shall be as described in Part 3 and the appropriate sections listed in 1.2, above.

PART 3 EXECUTION

3.1 CONCRETE CURBING

The Contractor shall replace any damaged portion of such curbing with new curbing in accordance to requirements of the Township. Generally 3,500 psi air-entrained concrete which is finished to match the existing curbing is required.

3.2 CONCRETE SIDEWALK

The Contractor shall replace damaged sidewalk with new segments constructed of 3,500 psi air-entrained concrete finished to match the existing sidewalk.

3.3 DRIVEWAY

Wherever trenches cross or underlie paved/concrete driveways, the Contractor shall replace the paving in-kind or with a minimum six inches of 2B crushed stone topped with two inches of ID-2 binder course and 1-1/2 inches of ID-Wearing Course. Joints shall be sealed. Concrete driveways shall be replaced in-kind or with a minimum four inches crushed stone base and six inches of 3,500 psi air-entrained concrete with 6x6 temperature steel which shall be finished to match the existing driveway.

3.4 WETLANDS

No wetlands shall be disturbed during construction unless approved by a joint permit issued through the PaDEP and Corps of Engineers. Any wetlands disturbed during construction shall be completely restored to the satisfaction of the PaDEP and the Corps of Engineers.

** END OF SECTION **

SECTION 02610

REPAVING

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The section covers the general requirements for all temporary and permanent paving in Township Roadways and outlines the PADOT requirements to which the Developer must make application.

1.2 RELATED WORK SPECIFIED ELSEWHERE

1.2.1 Section 02822, SEEDING OF DISTURBED AREAS

1.2.2 Section 02600, RESTORATION

1.2.3 Commonwealth of Pennsylvania, Dept. of Transportation Specification, Publication 408, latest issue.

1.2.4 Commonwealth of Pennsylvania "Work Zone Traffic Control" Publication 203 (67 PA Code, Chapter 203) latest revision.

1.3 NOTIFICATIONS

The Contractor shall notify all companies, utilities and authorities that have existing utilities within the project area sufficiently in advance of any construction in order for their facilities to be adjusted, relocated, or reconstructed where required.

1.4 APPROVALS

The Developer shall obtain all necessary approvals and permits from PaDOT and the Township for work that occurs within their rights-of-way. The Developer shall pay all fees and costs associated with the permit(s) and shall provide the Authority at acceptance with documents satisfactory to the Authority of the acceptance of PaDOT and/or the Township.

The specific written requirements of PaDOT or the Township as it relates to backfilling two (2) feet above the top of the pipe, restoration, temporary repaving and permanent repaving shall supersede these specifications.

PART 2 PRODUCTS

2.1 BITUMINOUS PAVING COURSES

2.1.1 Bituminous concrete base course (BCBC) shall conform to Commonwealth of Pennsylvania, Department of Transportation Specifications, Publication 408, Section 305.

2.1.2 Bituminous binder course shall conform to Commonwealth of Pennsylvania, Department of Transportation Specifications, Publication 408, Section 421.

2.1.3 Bituminous wearing course shall conform to Commonwealth of Pennsylvania, Department of Transportation Specifications, Publication 408, Section 420.

2.1.4 Temporary paving material shall be PA RSP cold patch or bituminous binder course as defined in Section 2.1.2 above.

PART 3 EXECUTION

3.1 TEMPORARY PAVING

- 3.1.1 Following completion of approved backfill and compaction of select material, the Contractor shall apply temporary paving in accordance with Specification 02612, 2.1.4.
- 3.1.2 Temporary paving shall remain in place and maintained for a minimum of sixty (60) calendar days following completion of backfill and compaction of select material for entire trench excavation.
- 3.1.3 With the approval of the Engineer and after a minimum of sixty calendar days following completion of temporary paving, the Contractor shall remove temporary paving material and excess backfill material and proceed with installation of permanent paving.

3.2 PERMANENT PAVINGS

- 3.2.1 Prior to the placement of the base course, the edges of the existing base and surface shall be saw cut twelve (12) inches beyond limit of trench excavation as indicated on plan unless a lesser cutback distance is approved by the Engineer based upon field conditions.
- 3.2.2 Remove all material within the trench and the "cut back" area to subgrade ready for the base course.
- 3.2.3 The subgrade for all repaved areas shall be thoroughly compacted to the proper distance below and parallel with the prescribed level of the base course. The subgrade shall be completely tamped in an approved manner prior to placing the base course. Compaction shall conform to the Density Requirements in Section 210, SUBGRADE, Commonwealth of Pennsylvania, Department of Highways Specifications.
- 3.2.4 The Contractor shall provide a proper roadway paved crown in accordance with Township requirements.
- 3.2.5 All paving damaged and/or undermined during construction shall be replaced by contractor. Paving which extends beyond the trench excavation limits plus cut-back shall be replaced at Contractor's expense. All paving shall be replaced/restored in accordance with specifications and Township requirements.

3.3 CONSTRUCTION REQUIREMENTS

- 3.3.1 Thicknesses of all base courses and wearing courses shall be as specified by the Township and/or PADOT.
- 3.3.2 All paving and preparation of subgrade shall be constructed as shown on drawings and specified herein.

** END OF SECTION **

SECTION 02822

SEEDING OF DISTURBED AREAS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The section covers restoration of areas disturbed by Contractor's operations that includes topsoil, fertilizer, lime, seed, etc.

1.2 RELATED WORK

1.2.1 Section 01300, SUBMITTALS

PART 2 PRODUCTS

2.1 TOPSOIL

2.1.1 Topsoil shall be a natural, fertile, friable soil, typical of productive soils in the vicinity, obtained from naturally well drained areas, with pH values 6.0 to 7.0 and containing no substances harmful to grass growth.

2.1.2 Topsoil shall not be delivered to the site in frozen or muddy conditions.

2.2 FERTILIZERS

Fertilizer shall be a composite as recommended by the County Agricultural Agent.

2.3 SEED

2.3.1 The seed shall be of the composition as recommended by the County Agricultural Agent.

2.3.2 Seed shall be of an approved mixture, new crop, clean, high in germinating value and low in weed seed. Seed shall be obtained from a reliable seed company and shall be accompanied by certificates relative to mixture purity and germinating value.

2.4 LIME

Lime shall be ground agricultural type limestone.

2.5 JUTE NETTING

2.5.1 Jute mat shall be cloth of a uniform plain weave of undyed and unbleached single jute yarn, 48 inches in width plus or minus one (1) inch and weighing an average of 1.2 pounds per linear yard of cloth with a tolerance of plus or minus five (5) percent, with approximately 80 warp ends per width of cloth and 40 weft ends per linear yard of cloth. The yarn shall be of a loosely twisted construction having an average twist of not less than 1.5 turns per inch and shall not vary in thickness by more than one half (1/2) of its normal diameter.

2.5.2 Staples for anchoring soil stabilization matting shall be made of 12 to 20 inch lengths of No. 8 plain iron wire.

PART 3 EXECUTION

3.1 GENERAL

All existing seeded and planted areas disturbed by construction and areas indicated on the approved Plans shall be sodded.

3.2 TOPSOIL

3.2.1 After approval of rough grading, the Contractor shall place topsoil on all areas affected by grading. Topsoil shall be at least six (6) inches deep and no rock of any size shall be present.

3.2.2 All topsoil from stripping which is not used at the job site shall be removed from the site and disposed of as directed by the Owner.

3.3 LIME AND FERTILIZER

Lime, in the form of raw ground limestone, shall be applied at a rate of one hundred (100) pounds per 1,000 square feet of area. At least one (1) full week after lime has been spread, fertilizer shall be spread uniformly at a rate of twenty (20) pounds per 1,000 square feet. Peat moss shall then be added one-fourth (1/4) inch deep (approximately 643 square feet per large bale). Area shall then be gone over with a spike drag or Rototiller. The topsoil shall then be raked until the surface is finely pulverized and smooth and shall be compacted with rollers, weighing not more than 100 lbs. per linear foot of tread, to an even surface.

3.4 SEEDING

3.4.1 Seeding shall be done when weather conditions are approved as suitable, in the periods between April 1 and May 30, or August 15 to October 1, unless otherwise approved.

3.4.2 If there is a delay in seeding, during which weeds grow or soil is washed out, the Contractor shall remove the weeds, or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is begun, the soil shall be lightly raked.

3.4.3 Seed shall be sown at the rate recommended by the seed company, on a calm day and preferably by machine, but if by hand, by experienced workmen. Water seeding will not be permitted.

3.4.4 One half of the seed shall be sown in one direction and the other half at right angles. Seed shall be raked lightly into the solid to depth of 1/4 inch and rolled with a roller weighing not more than one hundred (100) pounds per linear foot of tread.

3.4.5 The surface shall be kept moist by a fine spray until the grass shows uniform germination over the entire area. Wherever poor germination occurs in areas larger than three (3) square feet, the Contractor shall reseed, roll, and water as necessary to obtain proper germination.

3.4.6 The contractor shall water, weed, cut, regrade, and otherwise maintain and protect seeded areas as necessary to produce a dense, healthy growth of perennial lawn grass.

3.5 INSPECTION AND ACCEPTANCE

At the beginning of the next planting season after that in which the sod is placed, the sodded areas will be inspected. Any section not showing dense, vigorous growth at that time shall be promptly resodded by the

Contractor at his sole expense.

**** END OF SECTION ****

SECTION 03300

CONCRETE

PART I GENERAL

1.1 DESCRIPTION OF WORK

This section provides the general information for cast-in-place concrete requirements.

1.2 RELATED WORK

1.2.1 Section 01300, SUBMITTALS

1.2.2 Section 02550, MANHOLES

1.2.3 Section 02560, SANITARY SEWERS AND APPURTENANCES

1.2.4 Section 02570, PUMPING STATIONS

1.2.5 Section 02580, SEWERS IN RELATION TO WATERWAYS

1.3 STATE ROADWAYS

For PaDOT work, it shall be noted that all concrete work shall comply with Publication 408, Section 704, Class A concrete, unless otherwise required. For Township work, all concrete work shall use 3,500 psi material with air-entrained required for all exposed surfaces.

PART 2 PRODUCTS

2.1 GENERAL

2.1.1 The Contractor shall comply with the requirements, standards and practices of the following American Concrete Institute specifications: ACI-214, ACI-304, ACI-305, ACI-306 and ACI-613.

2.1.2 The Contractor shall comply with the following ASTM standards: A-615, C-33 and C-150.

2.2 MATERIALS

2.2.1 The cement shall meet the requirements of ASTM C-150, Type I unless high-strength early concrete is required and Type III may be used. Portland Cement or brand named substitute shall be acceptable.

2.2.2 Only potable water shall be used.

2.2.3 All fine aggregates shall conform to ASTM C-33.

2.2.4 All coarse aggregates shall conform to ASTM C-33. Unless otherwise approved by the Engineer, coarse aggregates shall not exceed one inch in diameter.

2.2.5 All reinforcing bars shall conform to ASTM A-615, grade 60 material. Wire fabrication shall conform to ASTM A-82 requirements.

2.3 PROPORTIONING

- 2.3.1 Concrete mixes shall have a consistency to be able to be worked into corners, around reinforcing rods and not segregate.
- 2.3.2 All concrete shall be air-entrained with a five (5) percent content (+/- 1%).
- 2.3.3 Concrete shall be designed to provide the following 28 day compressive strength - 3,500 psi (Class B) for Authority work. PaDOT concrete shall meet Section 703 of PaDOT Publication 408 requirements.
- 2.3.4 All Class B concrete shall have no more than 6 gallons of water per sack of cement and shall have a slump not to exceed 4 inches.

2.4 GROUT

- 2.4.1 General grout shall be Type 2, Portland Cement Grout, sand and maximum 3/8-inch stone plus water. Mixes shall be designed to have a 28 day compressive strength - 4,000 psi with a maximum slump of 4 inches.
- 2.4.2 Non-shrink grouts shall be manufactured by Sika Corporation or approved equal.

PART 3 EXECUTION

3.1 DELIVERY OF MATERIALS

A delivery ticket shall be provided and is required with each batch of concrete delivered to a site. The ticket shall indicate the total amounts of water, quantities of sand, stone and cement, design strength and time the truck left the plant. The ticket shall be marked at the jobsite by the contractor as to arrival time, placement time and place of placement. A maximum of one hour is allowed between leaving the plant and placement at the jobsite.

3.2 PLACEMENT OF MATERIALS

3.2.1 Concrete

The placement of concrete shall be in accordance with ASI/ASTM requirements.

Concrete shall have a temperature between 50 and 90 degrees when it is placed. When air temperature is below 40 degrees or above 90 degrees, the placement and curing of the concrete shall be performed in accordance to ACI-306 and ACI-305.

3.2.2 Grout

Grout shall be placed in accordance to ACI-302.

**** END OF SECTION ****

SECTION 04000

CONSTRUCTION DETAILS

INDEX FOR FIGURES

FIGURE 1	TYPICAL PIPE BEDDING
FIGURE 2	TYPICAL CONCRETE ENCASEMENT AND CRADLES
FIGURE 3	TYPICAL STANDARD MANHOLE
FIGURE 4	TYPICAL MANHOLE STEPS
FIGURE 5	TYPICAL MANHOLE FRAME AND COVER
FIGURE 6	TYPICAL DROP MANHOLE
FIGURE 7	TYPICAL CONNECTION TO EXISTING MANHOLE
FIGURE 8	TYPICAL SADDLE CONNECTION ⁽¹⁾
FIGURE 9	TYPICAL LATERAL CONNECTION
FIGURE 10	TYPICAL DEEP SEWER LATERAL CONNECTION

(1) The use of a saddle will normally not be approved unless flow or other conditions warrant its use in the judgement of the Authority. A full wye will be the normal installation method for connection to an existing line.