STANDARD SEWER SPECIFICATIONS
AND DETAILS
FOR
WILLISTOWN TOWNSHIP

APRIL 2014

PREPARED FOR:

WILLISTOWN TOWNSHIP
40 LLOYD AVENUE
MALVERN PA 19355

PREPARED BY:

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STANDARD SPECIFICATIONS AND DETAILS
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SECTION 01010
GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work to be accomplished under these Standard Specifications and Detail Drawings consists of all labor, equipment, materials and other facilities necessary and proper to construct sanitary sewer extensions, sanitary sewer force mains and sewage pumping stations, including the associated appurtenances and restoration work. The Specifications in this document are written with the intention of, in whole or in part, to be included in the Agreement, Application, or Contract executed by and between Willistown Township (OWNER), Township customers, and developers (Developer), and associated contractors (CONTRACTOR). The Township will not accept the dedication of sanitary sewer facilities constructed by a Developer unless and until they conform to the requirements of the applicable portions of these Standard Specifications.

B. The Standard Specifications and Detail Drawings are intended to apply to a complete project with respect to sewer facilities, and it shall be thoroughly understood that failure of these Standard Specifications to mention specifically any work which would normally be required to complete the project shall not relieve the Developer and/or his CONTRACTOR of his responsibility to perform such work.

C. The Standard Detail Drawings at the end of this document represent the standards of construction of theTownship. Where reference is made herein to "Detail Drawings" or "Standard Details", it shall be understood to mean these drawings. They are to be adhered to by the Developer and/or his engineer in preparing plans for sewer extensions and laterals, sewage pumping stations, sewage force mains, and all appurtenant facilities.

1.02 DEFINITIONS

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

OWNER and Township: WILLISTOWN TOWNSHIP, acting directly or through any agent, officer or employee duly authorized to act for the said part in the execution of the legal functions of theTownship.

ENGINEER: The Township ENGINEER duly employed by Willistown Township as consultant and authorized to observe the results of the performance of the work under Contract by the CONTRACTOR, acting directly or through properly authorized agents, engineers, assistants, or other representatives acting severally within the scope of the particular duties entrusted to them. The word "ENGINEER" shall include the officers, agents, or employees of the ENGINEER.

Developer: Party of the First Part or First Party to the Contract; the corporation, partnership, or individual intending to develop for residential or other purposes a certain tract of land situate within the sewer franchise area of the Township, acting directly or through any authorized lawful agents, legal representatives or employees appointed to act for said party in the execution of the work of the Contract.

CONTRACTOR: Party of the Second Part or Second Party to the Contract, acting directly or through his authorized lawful agents, legal representatives, superintendents, or employees, appointed to act for said party in the performance of the work under contract. In the context of these Specifications, the term "CONTRACTOR" shall also be interpreted as the "Developer" in certain instances where specific responsibilities are not defined or can be performed by either party.

Contract: The written agreement executed by and between the Developer and the CONTRACTOR, covering the performance of the work and the furnishing of labor, materials and service in the construction of sewer facilities (including appurtenant facilities) within the sewer franchise area of theTownship.

Project: All the necessary performance, services and materials required for the satisfactory completion of the work under contract as described in the Specifications and shown on the Drawings.

Specifications: Collectively the Standard Specifications and Detail Drawings for sanitary sewer and sewage pump station facilities and all of the written technical descriptions of materials, equipment, construction systems, standards and workmanship pertaining to the construction of the project which are a part of the contract but not contained herein.

Drawings and Plans: Collectively, all of the drawings which show the character and scope of the work to be performed on the project and which have been prepared by an engineer and approved by theTownship; and also such supplementary drawings as may be issued from time to time in order to elucidate or clarify said Contract Drawings or show details which are not shown thereon.

1.03 REFERENCED STANDARDS AND SPECIFICATIONS

All work shall comply with the current issues of the following codes, regulations and requirements, any or all references to earlier dated editions notwithstanding.

1. Pennsylvania Department of Labor & Industry - Regulations for Trenches and Excavations.

2. Federal and State Air Pollution Regulations.

3. NFPA - National Fire Protection Association.

4. OSHA - Occupational Safety and Health Administration.

5. AISC - American Institute of Steel Construction, Manual of Steel Construction.

6. NEC - National Electric Code.

7. NACE - National Association of Corrosion Engineers.

8. ASTM - American Society of Testing and Materials.

9. AWWA - American Water Works Association.

10. ACI - American Concrete Institute.

11. BOCA - Building Officials and Code Administrators International, Inc. - National Plumbing Code.

12. PennDOT - Pennsylvania Department of Transportation:

    Publication 213 - Work Zone Traffic Control Guidelines
    Publication 408 - Specifications
    Publication 459 - Occupancy of Highways by Utilities
    Publication 19 - Field Test Manual (Pennsylvania Test Methods)

13. DEP - Pennsylvania Department of Environmental Protection:
    Erosion and Sediment Pollution Control Manual
    Domestic Wastewater Facilities Manual
    Sewerage Manual

14. ANSI - American National Standards Institute.

15. FS - Federal Specifications.

16. AASHTO - American Association of State Highway and Transportation Officials.

1.04 EQUAL OR APPROVED EQUAL

A. In the various detailed sections of the Specifications, where any item of material or equipment is specified by proprietary name, trade name, and/or name of one or more manufacturers, without the addition of such expressions as "or equal", it is to be understood that these items are so specified for reasons of standardization or for special requirements of the job. For items so specified, no substitute products will be acceptable.

B. In the various detailed sections of the Specifications, where any item of equipment is specified by proprietary name, trade name, and/or name of one or more manufacturers, with the additions of such expressions as "or equal", it is to be understood that equal quality equipment or products, of either a manufacturer named or of a manufacturer not named, which meet the detailed requirements of the specifications, are intended and are subject to the acceptance of the ENGINEER as to the equality thereof. It is distinctly understood that: (1) the ENGINEER is to use his own judgment in determining whether or not any item of equipment or product proposed is equal to that specified; (2) the decision of the ENGINEER on all such questions of equality shall be final; and (3) in the event of any adverse decision by the ENGINEER, no claim of any sort shall be made or allowed against the ENGINEER or theTownship.

C. In normally rare occurrences, if it becomes necessary (because of delays in delivery, strikes, discontinuance of the manufacture of items specified or the equal thereof, or any other similar reasons) for the CONTRACTOR to request the use of any item of equipment or product which is of a different type than the equipment or product specified, or the approved equal thereof, the ENGINEER at his discretion, may authorize the use of such different type equipment or product of the same, greater or less cost than that specified.

D. In such cases as described in Paragraphs B and C above, the CONTRACTOR shall submit to the ENGINEER in writing (1) his request for permission to make a substitution, and (2) a complete description of the proposed item, including dimensions, operational characteristics, changes (if any) that will be required to other related parts of the work, etc.

E. If any submitted equipment necessitates changing electrical, water, gas, vacuum, air or other utility services from the sizes, capacities, configurations and locations shown on the Drawings, it shall be the CONTRACTOR's responsibility to bear the construction cost of all changes. It shall also be the CONTRACTOR's responsibility to bear the cost of engineering fees to analyze, design, specify and formulate the construction changes necessitated by the proposed deviations from the specified equipment and/or the Drawings.

1.05 OBSERVANCE OF LAWS

The CONTRACTOR at all times shall observe and comply with all Federal and State laws and regulations, and local bylaws, ordinances and regulations in any manner affecting the conduct of the work or applying to employees on the Project, as well as all safety precautions and orders or decrees which have been promulgated or enacted, or which may be promulgated or enacted, by any legal bodies or tribunals having authority or jurisdiction over the work, materials, equipment, employees or the Contract; such observance and compliance shall be solely and without qualification the responsibility of the CONTRACTOR without reliance on superintendence or direction by the Township or ENGINEER. The duty of enforcement of all of said laws, ordinances, regulations, orders, or decrees lies with the body or agency promulgating them, not with Township or ENGINEER.

1.06 REGULATIONS OF THE DEPARTMENT OF LABOR AND INDUSTRY

Special attention is drawn to the regulations of the Pennsylvania Department of Labor and Industry relating to wage scales, trenches and excavations, tunnel construction, equipment, materials, labor, safety, sanitation, and other regulations on which the CONTRACTOR shall be fully informed and with which he shall fully comply. Observance of and compliance with said regulations shall be solely and without qualification the responsibility of the CONTRACTOR, without reliance on superintendence of or direction by the Township or ENGINEER. The duty of enforcing such laws and regulations lies with the said Department, not with the Township or ENGINEER.

1.07 PERMITS AND LICENSES

A. The CONTRACTOR or Developer shall, unless otherwise specified elsewhere herein, procure all necessary permits and licenses, pay all charges and fees thereof, and shall give all notices necessary and incident to the proper and lawful prosecution of the work.

B. In the event that the Pennsylvania Department of Transportation or any other underground utility requires any of their personnel to be present during the construction of the work, payment for such personnel shall be borne by the Developer or his CONTRACTOR.

1.08 NOTICE

The service of any notice by the Township or ENGINEER to the Developer or CONTRACTOR shall be considered accomplished upon completion of any one of the following procedures:

A. When delivered, in writing, to the person in charge of the office used by the addressee to conduct business;

B. When delivered, in writing, to the addressee or any of his authorized agents in person;

C. When delivered, in writing, to the addressee or any of his agents at the office used by the addressee to conduct business of the Contract at or near the Site of the work;

D. When deposited in the United States Mail, postpaid, or transmitted by fax machine, and addressed to the party intended for such service at his office used for conducting the business of the Contract at the Site of the work, or his last known place of business; or

E. When filed at any company operated office of the Western Union Telegraph Company and addressed to the party intended for such service at his last known place of business or for conducting the business of the Contract at the Site of the work.

1.09 ADVERTISING

No advertising will be permitted on any part of buildings, scaffolding, fences, materials, obstructions, barricades, or work.

1.10 CONTRACTOR'S INSURANCE REQUIREMENTS

A. The CONTRACTOR is required to maintain Bodily Injury Liability Insurance including Personal Injury and Property Damage Liability Insurance in Comprehensive form to include Operations, Explosion, Collapse and Underground Hazard, Products and Completed Operations Hazard, Contractual and Independent Contractors. Insurance Certificates shall name the Township and the ENGINEER as additional insured. The Township shall be named as the "Certificate Holder".

B. Vehicle Insurance shall be maintained on a Comprehensive form to include Owned, Hired and Non-owned.

C. CONTRACTOR shall maintain Workmen's Compensation Insurance including Employer's Liability for all operations as required by law.

D. The CONTRACTOR shall maintain limits of liability for the above mentioned insurance in an amount not less than four million dollars ($4,000,000.00).

E. Within seven (7) calendar days from the mailing of the notice of acceptance, the CONTRACTOR shall submit certificates of insurance for all coverages detailed above. The certification of insurance must clearly stipulate that the insurer will notify both the Township and the ENGINEER, in writing, thirty (30) days prior to the cancellation of the policy. The Township shall not issue the Notice to Proceed until all required insurance policies and certifications have been approved by the Authority and the ENGINEER.

F. The CONTRACTOR shall require all Subcontractors to maintain all required insurance coverages as required of the CONTRACTOR under the Specifications.

G. The CONTRACTOR shall indemnify and hold harmless the Township and the ENGINEER of all claims made by employees of either the CONTRACTOR or Subcontractor arising from the execution of work required under this Contract.

H. The Surety on all Bonds and Insurance shall be rated "A Minus" or better by A.M. Best Co. and shall be licensed to conduct business in the Commonwealth of Pennsylvania.

1.11 DRAWINGS AND SPECIFICATIONS

A. In general, the Drawings and Specifications are complementary; what is called for by one is as binding as if required by all. All items necessary or incidental to completely construct or erect the work denoted shall be furnished as required to provide a complete operating facility whether specifically detailed by the Drawings and/or Specifications.

B. Deviations from the Drawings or Specifications required by the exigencies of construction will be determined by the ENGINEER only, and authorized in writing.

C. Where dimensions or locations of existing facilities are of importance to the successful performance of any part of the work of the Contract, the CONTRACTOR shall verify the correctness of such dimension or location in the field before any other procedure, whether of manufacture of related equipment or construction of related structure, shall begin. Failure of the CONTRACTOR to follow the required verification procedure here specified shall cause him to waive all right to claim for additional cost by reason of the later discovery of inaccurate dimensions or locations of existing facilities as depicted on the Drawings and/or Specifications.

1.12 CONSTRUCTION STAKEOUT

Construction stakeout shall be performed by the CONTRACTOR. The CONTRACTOR shall be responsible for protecting and preserving all reference points for the duration of the Project.

1.13 ENGINEER'S DUTIES

A. The ENGINEER shall have free access to observe work at the site and be furnished by the CONTRACTOR with every reasonable facility for observing the work, to the extent of uncovering, testing or removing finished portions thereof. The CONTRACTOR shall provide all labor and equipment necessary for such observation. The ENGINEER may require the CONTRACTOR to uncover for observation, or to remove any work done or placed in violation or disregard of instructions issued to the CONTRACTOR by the ENGINEER or his representative.

B. The ENGINEER and his assistants are the representatives of the Township during the construction of the work. When so authorized by the Township, it shall be the duty of the ENGINEER to see that all materials and work are properly observed and that all such materials and work conform fully to the requirements of the Specifications. He shall perform such other duties as may be assigned him from time to time and shall have such additional authority as may be defined elsewhere in these General Requirements. He shall in no case act as foreman or perform other duties for the CONTRACTOR nor interfere with the management of the work by the CONTRACTOR.

C. All observations and tests shall be performed without unnecessarily delaying the work. All material and workmanship, if not otherwise designated by the Specifications, shall be subject to observation, examination, and test by the ENGINEER or his duly authorized representatives. The ENGINEER shall have the right to reject defective material or workmanship or require its correction. Rejected workmanship shall be satisfactorily replaced with proper material and the CONTRACTOR shall promptly segregate and remove rejected material from the premises. If the Specifications, the ENGINEER's instructions, laws, ordinances, or any public authority require the work to be specially tested or reviewed, the CONTRACTOR shall give the ENGINEER timely notice of its readiness for observation.

D. The ENGINEER shall, within a reasonable time after presentation to him, answer all questions in relation to the construction of the Project, and in all cases answer every question which may arise relative to the performance of the work covered by the Contract.

E. The ENGINEER shall have full authority to decide all questions which may arise under the Contract relative to the quality and acceptability of materials furnished and the manner, rate of progress, quality and acceptability of work performed, and the interpretation of any or all Plans and Specifications.

F. Any verbal opinion or suggestion, which the ENGINEER may give the CONTRACTOR, shall in no way be construed as binding the Township in any way.

G. In case of any dispute relative to the quality of materials or work, or the manner of performing the work, the ENGINEER shall have authority to reject materials or suspend the work. He shall not be authorized to revoke, alter, enlarge, relax, or release any requirements of the Specifications, nor to approve or accept any portion of the work or issue instructions contrary to the Specifications.

H. Whenever the ENGINEER is of the opinion that the CONTRACTOR is not complying with any of the provisions of the Specifications or Contract Drawings, the ENGINEER may direct the CONTRACTOR to discontinue that particular phase of the work.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment supplied for use on projects shall be new and purchased specifically for incorporation into the work included in the Drawings and Specifications, except as noted.

B. The ENGINEER and his assistants are the representatives of the Township during the construction of the work. When so authorized by the Township , it shall be the duty of the ENGINEER to see that all materials and work are properly observed and that all such materials and work conform fully to the requirements of the Specifications. He shall perform such other duties as may be assigned him from time to time and shall have such additional authority as may be defined elsewhere in these General Requirements. He shall in no case act as foreman or perform other duties for the CONTRACTOR nor interfere with the management of the work by the CONTRACTOR.

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PART 2 - PRODUCTS

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A. All materials and equipment supplied for use on projects shall be new and purchased specifically for incorporation into the work included in the Drawings and Specifications, except as noted.

B. The CONTRACTOR shall furnish the ENGINEER, promptly after the award or execution of the Contract Agreement, a complete statement of the origin, composition, and manufacture of all materials to be used in the construction of the Project. Only materials conforming to the requirements of these Specifications and approved by the ENGINEER shall be used in the work.

C. Representative preliminary samples of the materials, of the character and quality prescribed in the Contract shall be submitted when indicated or directed, for advance examination or test. Written approval of the quality of such samples shall be received by the CONTRACTOR prior to obtaining materials from the respective sources of supply.

D. Samples of all materials requiring laboratory tests shall be taken under the direction or supervision of, or in the manner prescribed by the ENGINEER. Such materials shall not be used until accepted as the result of such tests. Materials will be used only as long as the quality of the material remains equal to that of the accepted sample. The acceptance at any time of any material shall not be a bar to its future rejection, if it is subsequently found to be defective or inferior in quality to the material specified.

E. Required laboratory tests of materials shall be made by a testing laboratory or agency selected or approved by the ENGINEER and in accordance with the methods indicated herein. When standard specifications and serial numbers of technical societies and associations are stipulated, the reference shall be construed to be the latest edition of such specifications and serial numbers.

F. The CONTRACTOR shall furnish all labor, materials and equipment necessary for collecting, packaging and identifying representative samples of materials, and the shipping of such samples to the testing laboratory.

G. For tests or observations conducted by, and at the options of, the ENGINEER, at sites other than the testing laboratory and not under the jurisdiction thereof, the CONTRACTOR shall furnish or arrange with the producer to furnish all material, labor, tools, and equipment, and every facility for the verification of the accuracy of all scales, measures and testing equipment, necessary for such tests or inspections.

H. The CONTRACTOR shall permit or arrange with the producer to permit the ENGINEER or any agent of the testing laboratory to observe or test any and all material being used or to be used, at any time before, during or after its preparation, or while being used during the progress of the work or after the work has been completed.

I. Materials shall be stored so as to insure preservation of their specified quality and fitness for the work. When considered necessary they shall be placed on wooden platforms or other hard and clean surfaces, and not on the ground, and shall be placed under cover when directed. Stored materials shall be located so as to facilitate prompt observation. Private property shall not be used for storage purposes without permission of the owner or lessee of the property.

J. If any material intended for use in the construction of the Project has been observed and rejected after such material has been delivered to the Site, all such rejected material shall be immediately removed from the property by the CONTRACTOR.

2.02 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Proper and suitable tools, equipment, and appliances for the safe and convenient handling and placing of all materials and equipment shall be used.

B. During loading, unloading, and placing, care shall be taken in handling the equipment and materials so that no equipment or materials are damaged.

C. Any precautions necessary to protect items of equipment and materials from damage while stored on the construction site shall be exercised.

D. All mechanical and/or electrical equipment and paint delivered to the job site shall be stored under roof, protected on all sides and supported off the ground with pedestals. The resulting enclosure shall be weathertight in all respects.

E. The CONTRACTOR shall follow all written instructions and recommendations of the equipment manufacturer and all requirements of the ENGINEER regarding the oiling, exercising, maintenance and protection of the equipment during storage. It shall be the CONTRACTOR's complete responsibility to satisfactorily store and care for equipment and materials.

F. Equipment may be initially delivered to a warehouse, conveniently located in the vicinity of the site, with the approval of and under such conditions as may be further imposed by the ENGINEER.

2.03 PROTECTION AGAINST ELECTROLYSIS

Where dissimilar metals are used in conjunction with each other, suitable insulation shall be provided between adjoining surfaces so as to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, non-metallic separators, or washers, or other approved materials. When requested by the ENGINEER, the CONTRACTOR shall prove by acceptable test the effectiveness of the insulation.

PART 3 - EXECUTION

3.01 PRELIMINARY INSPECTION

The CONTRACTOR is required to carefully examine the site of the work, Drawings, Specifications, and all applicable State, County and local codes for the work contemplated; and it will be assumed that he has familiarized and satisfied himself as to the conditions and obstacles to be encountered, as to the character, quality, and quantities of work to be performed and materials to be furnished, and as to the requirements of the Drawings and Specifications.

3.02 PRECONSTRUCTION MEETING

A. A preconstruction meeting will be held after formal execution of Development Agreements.

B. The CONTRACTOR will be notified as to the date and time of this conference and will be expected to attend with the designated Project Superintendent.

C. The CONTRACTOR is required to submit a construction schedule showing the order in which the CONTRACTOR proposes to carry on the work, the dates on which he will start several of the more salient features and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale as to approximately indicate the percentage of work completed at any time.

3.03 PROGRESS MEETINGS

A. During the construction period, progress meetings shall be held with the ENGINEER at the job site to discuss recent developments and future work plans as they relate to the schedule. Progress meetings will be held weekly in general, but the interval between meetings may be increased or decreased by the ENGINEER to suit the current circumstances.

B. The ENGINEER, CONTRACTOR, and major Subcontractors shall be represented at every meeting by a responsible member of their respective organizations. All decisions and interpretations given by the ENGINEER at project meetings, shall be on behalf of the Authority and shall be conclusive on each CONTRACTOR or Subcontractor affected.

C. The proceedings of these meetings will be recorded by the ENGINEER, and each required representative at meetings will be furnished one copy. The ENGINEER's act of conducting meetings, recording and distributing meeting minutes on behalf of the Township shall not be construed as coordinating or scheduling CONTRACTOR's work.

D. If a change of meeting date/time is required due to causes beyond control of the Township or ENGINEER, the ENGINEER will advise each concerned party in advance of such change.

3.04 SHOP DRAWINGS, PRODUCT DATA, SAMPLES AND CERTIFICATIONS

A. Fabricated materials or equipment to be incorporated in the work shall be subject to review by the ENGINEER. The CONTRACTOR shall obtain and check prints of manufacturer's certified shop drawings and other pertinent data. When the CONTRACTOR has reviewed the shop drawings and is satisfied they are correct, he shall number each submittal (shop drawing, certificate, manual) and submit them to the ENGINEER for review. Submittal numbering system shall be the section number referenced by these Specifications followed by the submittal number (i.e., 11310-1, 15100-1 and 15100-2).

B. Shop drawings are intended to mean fabrication and installation drawings. These drawings and pertinent data shall be complete and in such detail as the ENGINEER may require for providing information regarding the design, installation, testing, and operation for products and/or equipment.

C. All costs necessary for compliance with the requirements of this section of the Specifications shall be included in the bid.

D. Detailed shop drawings, data, and literature for fabricated materials or equipment to be incorporated in the work shall be submitted to the ENGINEER for review at least two weeks before fabrication. The CONTRACTOR shall obtain and check manufacturer's shop drawings, certified prints, and other pertinent data for conformance with all requirements of the Drawings and Specifications in ample time to permit satisfactory progress of the work.

E. After completion of such checking and verification by the CONTRACTOR, the CONTRACTOR shall include a full completed copy of Attachment 1 as a cover sheet for the shop drawing. In addition, the submittal number shall be written or typed in the lower right hand corner of all copies of each shop drawing. The submittal numbering system should be the specification section number followed by the submittal number (i.e., 02610.1 - Ductile Iron Pipe, 02610.2 - PVC Pipe). Failure to include a cover sheet or not numbering submittals shall be grounds for rejection of the submittal by the ENGINEER. (See Attachment 1 at the end of this section).

F. All data, drawings, and correspondence from subcontractors, material men, or suppliers shall be routed through the CONTRACTOR. This procedure is required so that the CONTRACTOR's superintendent can familiarize himself with all information which the CONTRACTOR sends to the ENGINEER and also to prevent the ENGINEER from taking action upon something other than that which is desired by the CONTRACTOR. The ENGINEER shall consider for review only such data and details as are verified and transmitted to him directly by the CONTRACTOR.

G. All correspondence between the ENGINEER and the CONTRACTOR, all shop drawings, and all data for review of drawings or materials will be handled by the ENGINEER. All such data shall be delivered directly to him at the ENGINEER's office. The replies pertaining to these matters will be delivered to the CONTRACTOR or the CONTRACTOR's representative at the job site.

H. A sufficient number of shop drawings and review data shall be submitted to the ENGINEER, who will retain four (4) copies of each submittal. All additional copies, up to a maximum of four (4), received by ENGINEER will be returned to the CONTRACTOR or CONTRACTOR's representative at the job site. The ENGINEER's notations of the action which the ENGINEER has taken will be noted on all the returned copies. Sufficient time for the review of all shop drawing submittals shall be allowed in the CONTRACTOR's schedule. A minimum of two weeks shall be allotted for each shop drawing review.

I. Drawings of minor or incidental fabricated materials and/or equipment may not be required by the ENGINEER. The CONTRACTOR shall furnish the ENGINEER with tabulated lists of such fabrications, showing the names of the manufacturers and catalog numbers, together with samples of general data as may be required to permit intelligent determination as to their acceptability for incorporation in the work.

J. Upon successful review by the ENGINEER of the shop drawings, data sheets, samples, other data, the fabrications furnished shall be in conformity with the same. The acceptance of the shop drawings, data sheets, samples or other data shall in no way release the CONTRACTOR from CONTRACTOR's responsibility for the proper fulfillment, by any fabrication, of the requirements of the Agreement.

K. All reviews of shop drawings, data sheets or literature are subject to the products fulfilling the specific requirements of the Drawings and Specifications. Review of items that do not conform in detail to the specified product shall place upon the CONTRACTOR the responsibility for successful operation of the proposed product. Should the item subsequently prove to be defective or otherwise unsatisfactory for the service for which it was intended, the CONTRACTOR shall, without cost to the OWNER and without obligation on the part of the ENGINEER, replace the item with the material originally specified. The ENGINEER's review of shop drawings or layout for any material, apparatus, or device shall not relieve the CONTRACTOR from the responsibility of furnishing the same of proper dimension, size, quantity, quality, and all performance characteristics to efficiently perform the requirements and intent of the Contract Documents. Such review shall not relieve the CONTRACTOR from responsibility for errors of any sort on the shop drawings. If the shop drawings deviate from the Contract Documents, the CONTRACTOR shall advise the ENGINEER of the deviations, in writing accompanying the shop drawings, including the reasons for the deviations, and shall request a deviation from the Contract Documents as hereinafter described.

L. The shop drawings are intended to be utilized by the CONTRACTOR for additional fabrication, assembly, and erection data. The shop drawings do not change or supersede the Drawings and Specifications except in specific cases when the CONTRACTOR requests, in writing, a deviation from the Drawings and Specifications. The CONTRACTOR's request for a change shall give, in detail, the specific change requested and shall state the reason for the change. Changes requested by the CONTRACTOR and reviewed by the ENGINEER shall not be construed to include acceptance of any change except the changed details specifically requested and accepted.

M. It shall be the responsibility of the CONTRACTOR to make all the necessary changes in other items, which result from deviations or changes requested by the CONTRACTOR and reviewed by the ENGINEER, so that all items perform the requirements and intent of the Contract Documents.

N. The CONTRACTOR shall furnish the number of samples required by individual sections of the Specifications. Submit samples under separate transmittal letter with appropriate section and article number of the Specifications as identification. A separate transmittal letter is required for each sample submitted.

O. The CONTRACTOR shall furnish all certifications including Statements of Compliance, Installation Certificates, and certified test results as required by individual sections of the Specifications. Submit certificates under separate transmittal letter using the same numbering system as specified for shop drawings and product data. The number of certifications submitted shall be the same as used for shop drawing and review data submittals.

P. CONTRACTOR shall make resubmittals under procedures specified for initial submittals and shall identify changes made since previous submittals. ENGINEER will review the first submittal and the first resubmittal at no cost to the CONTRACTOR. Additional submittals will be reviewed by the ENGINEER and the costs for these reviews will be borne by the CONTRACTOR. These costs when incurred by the CONTRACTOR will be deducted from CONTRACTOR's progress payments. Each resubmittal shall contain the original submittal number with a suffix letter after the original number such as "A" for the first resubmittal, "B" for the second resubmittal, "C" for the third, and so forth.

ATTACHMENT 1

Project: _____

Title: _____
(Submittal Number - Name)

Checked By: _____
(CONTRACTOR's Name)

Signed By: _____
(Checker's Name)

Date: _____

This submittal has been reviewed and approved by the CONTRACTOR with respect to the means, methods, techniques, sequences and procedures of construction, and safety precautions and programs incidental thereto. The CONTRACTOR also warrants that this submittal complies with the Contract Documents and comprises no variation thereto.

Notes:

1. The CONTRACTOR is responsible for putting the submittal number in the lower right hand corner of all copies of each submittal.

2. The CONTRACTOR is responsible for binding or stapling all copies of each submittal individually.

3.05 OPERATION AND MAINTENANCE MANUALS

A. The CONTRACTOR shall furnish six (6) copies of a complete instruction manual for installation, operation, maintenance, and lubrication of each component of mechanical and electrical equipment. All copies shall be submitted to the ENGINEER. Each instruction manual furnished shall be fixed in hard back cover or file folder which is clearly labeled to designate the system or equipment for which it is intended with reference to the section and pages where the item is specified.

B. Each instruction manual shall include but not be limited to the following: detailed description of the function of each principal component of the system; installation instructions; procedure for starting; procedure for operating; shutdown instructions; maintenance and overhaul instructions which shall include detailed assembly drawings with part numbers, parts list, and complete instructions for ordering spare parts; lubrication instructions which shall list points to be greased or oiled, and recommend frequency of lubrication; safety precautions, diagrams and illustrations; test procedures; and performance data. It is intended that the manual shall be complete in all respects for all equipment, controls, accessories, and associated appurtenances.

C. Each instruction manual shall be transmitted to the ENGINEER according to the established schedule and prior to installation of the equipment and all equipment shall be serviced in accordance with the manufacturer's recommendations prior to operation. A service record shall be maintained on each item of equipment and shall be delivered to the ENGINEER prior to final acceptance of the project by the OWNER.

D. Operating instructions for use by operating personnel shall be provided for each principal equipment component. The instructions shall be placed adjacent to the applicable equipment and shall be protected against weathering with a laminated plastic covering. The instructions shall include but not be limited to the following: start-up, proper adjustment, operation, shutdown, safety precautions, procedure in event of equipment failure, and any other necessary items of instruction as recommended by the manufacturer of the unit.

3.06 CONDUCT OF WORK

A. All work shall be subject to the approval of the ENGINEER and the Township. In the performance of the work, the CONTRACTOR shall abide by all orders, directions and requirements of the ENGINEER and the Township, and shall perform all work in such manner and sequence as the Township may require. The ENGINEER and Township shall determine the amount, quality, acceptability and fitness of all parts of the work; shall interpret questions regarding the Drawings and Specifications; shall issue any extra work orders; and shall decide all other questions in connection with the work. The CONTRACTOR shall employ no plant, equipment, materials, or methods to which the ENGINEER or Township objects and shall remove no plant, materials, equipment or other facilities from the site of the work against the ENGINEER's or Township objection. Upon request, the ENGINEER or Township shall confirm in writing, any oral order, direction, requirement, or determination. If any person employed on the work by the CONTRACTOR shall appear to the ENGINEER or Township to be incompetent or to act in a disorderly or improper manner, such person shall be removed immediately upon request by the ENGINEER.

B. The CONTRACTOR agrees to use, at all times on the work, only such labor as will in no way disturb or affect labor employed by the Township and/or other contractors on the project. The CONTRACTOR and each and every subcontractor performing work at the site of the project shall comply with all "Labor Laws" of the Government, and of the State, County, Township, and Municipality in which the project is located.

3.07 TEMPORARY FACILITIES

A. The CONTRACTOR shall furnish and maintain all temporary telephone, gas, electric, water, and sewer utilities required for construction, start-up, and performance testing of the Project. All costs for providing temporary utilities shall be borne by the CONTRACTOR up to and including the date of acceptance. (The CONTRACTOR is not required to provide field facilities for the ENGINEER.)

B. The CONTRACTOR shall furnish and erect all necessary temporary fences required to provide adequate security for all materials, equipment, and structures throughout the project.

3.08 RECORD DRAWINGS

A. Before the work will be accepted by the Township, the Developer shall submit to the Township two (2) blue line record drawings (as-constructed) for review and approval by the ENGINEER. Corrections noted on the blue line record drawings shall be incorporated on the original drawings. The Developer shall then supply three (3) blue line copies of the approved record drawings, and one (1) set of reproducibles of all working drawings, modified as necessary to show as-constructed conditions. The Developer shall submit a certificate with the as-constructed reproducibles attesting to the correctness of all information shown on the Record Drawings. (The Township intends to use prints of the reproducibles to provide information to designers and contractors as required by the Commonwealth of Pennsylvania Act 287).

B. The following statement is also required on all record drawings:

These record plans have been completed and certified by _____, as reflecting as-built conditions. Responsibility for accuracy of the as-built plans rests with the above surveyor.

_____
Surveyor's Signature and Certification

Failure to comply shall cause the withholding of any required certifications.

C. As-constructed plans are to indicate stationing for all laterals as measured from the downstream manhole of each pipe run. This assures ease in location at a future date.

D. The CONTRACTOR is required to maintain one (1) set of up-to-date Record Drawings, approved shop drawings and specifications on the project site at all times. Up-to-date is defined as containing modifications for work performed within the past 30 days.

3.09 OPERATIONAL ACCEPTANCE TESTS

A. After installation, the CONTRACTOR shall adjust and balance all equipment and systems, and shall demonstrate that all equipment is operating in a satisfactory manner. All rotating equipment shall be lubricated according to recommendations of the manufacturers and shall be made to suit anticipated operating conditions. Each piece of machinery shall be tested to show that it operates quietly, without vibrations, overheating, or sign of distress at full specified capacity. Adjustments shall be made as necessary. All defective parts on machinery shall be replaced.

B. The CONTRACTOR shall make a request in writing at least ten (10) days in advance of starting each operational acceptance test. Such tests shall be conducted with qualified representatives of the equipment manufacturer present, and in accordance with the requirements of these Specifications. All pertinent Operation and Maintenance manuals must be in receipt of the ENGINEER prior to any operational acceptance test.

C. All parts and components of mechanical equipment shall be designed for satisfactory service under continuous duty without wear under the specified and indicated operating conditions for a period of not less than one (1) year. Any part of mechanical equipment that shows undue or excessive wear or that fails due to wear under normal operating conditions within the first year of operation under operational acceptance shall be considered as evidence of defective material or defective workmanship, and it shall be replaced with equipment or parts to meet the specified requirements.

3.10 DEFECTIVE WORK

A. When any material not conforming to the requirements of the Specifications and Drawings has been delivered to the Site of the Project or incorporated in the work, or when any work performed is of inferior quality, such material or work shall be considered as defective and shall be immediately removed and renewed or made satisfactory as directed by the ENGINEER. Failure or neglect on the part of the ENGINEER to condemn or reject any bad or inferior work or materials shall not be so construed as to imply an acceptance of such work or materials, if such bad or inferior material or work becomes evident at any time prior to the delivery of the completion certificate by the Township to the Developer.

B. The CONTRACTOR shall remove any work or material condemned, and shall rebuild and replace the same.

C. The CONTRACTOR shall promptly remove from the premises all materials condemned by the ENGINEER as failing to conform to the Specifications, whether incorporated in the work or not, and the CONTRACTOR shall promptly replace his own work in accordance with the Contract.

3.11 SAFETY REQUIREMENTS

A. The CONTRACTOR shall furnish, erect and maintain at closures, intersections and throughout the Project, all necessary approved barricades and fences, suitable and sufficient lights, reflectors, danger signals, warning, and closure signs, provide a sufficient number of watchmen and take all necessary and legal precautions for the protection of the work and safety of the public. All barricades, danger signals, warning signs and obstructions shall be illuminated at night and all

lights shall be kept illuminated from sunset until sunrise. All materials and safety devices (i.e., barricades, flashing warning lights, reflectors, signs) which the CONTRACTOR provides for the purpose of protecting the work and the safety of the public and for maintaining and protecting traffic must conform to the requirements specified in PennDOT Publications 408 and 213.

B. The safety provisions of applicable laws, and regulations of the Pennsylvania Department of Labor and Industry, and local building and construction codes shall be observed. Machinery, equipment, and other hazards shall be guarded in accordance with the safety provisions of the "Manual of Accident Prevention in Construction", published by the Associated General Contractors of America, to the extent that such provisions are not in contradiction of applicable State and local laws.

C. The provisions of the "OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970" of the U.S. Department of Labor and particularly Part 1926 - "Safety and Health Regulations for Construction" thereof, including all pertinent revisions of said provisions shall be complied with in the performance of all work. Observance of and compliance with the provisions of said act shall be solely and without qualification the responsibility of the CONTRACTOR, without reliance on superintendence of or direction by the Township or ENGINEER. The duty of enforcement of the provisions of the act lies with the U.S. Department of Labor, not with the Township or ENGINEER.

3.12 WORKING CONDITIONS

A. No night or Sunday work requiring the presence of the ENGINEER or his representative will be permitted except in cases of emergency.

B. No work shall be done when, in the opinion of the ENGINEER, the weather is unsuitable for good and careful work to be performed. Should the severity of the weather continue such that the work cannot be prosecuted successfully, the CONTRACTOR, under order of the ENGINEER, shall cease all such work until directed to resume the same.

C. The CONTRACTOR shall arrange for and be responsible for a sufficient amount of illumination at all times, subject to the approval of the ENGINEER, to carry on all phases of the work.

D. The CONTRACTOR shall specifically note and abide by work hour restrictions in State highways as delineated in highway occupancy permits or as required by PennDOT, the OWNER, the Township, the County, or the ENGINEER in consideration of safety or access conditions.

3.13 CLEANING UP

A. The CONTRACTOR is to continuously keep the work, the site and adjacent properties free from accumulations of waste materials, excess excavation, rubbish, and windblown debris resulting from construction operations. Periodically remove waste materials, excess excavation, debris and rubbish from the site and dispose of at legal disposal areas away from the project site.

B. Remove grease, mastics, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from site-exposed interior and exterior surfaces of structures. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds. Restore areas disturbed by construction.

Provide continuous dust control during construction.

C. At the completion of the work, or each major portion thereof, the CONTRACTOR shall remove surplus materials, tools, construction equipment and machinery, and leave the site clean and ready for occupancy by the Authority.

3.14 ONE YEAR'S RESPONSIBILITY

It shall be understood that the CONTRACTOR agrees to furnish such material and appliances, and to construct the whole work in such substantial and workmanlike manner that it shall be continuously stable and efficient, and the CONTRACTOR shall promptly make good, or replace, any or all parts of the materials or installation, including all details, which may be found to be unstable or defective in any particular, ordinary wear and tear excepted, for a period of guarantee of one (1) year after the whole installation has been entirely completed, tested and accepted by the Township.

3.15 ONE YEAR'S RESPONSIBILITY NOTWITHSTANDING ACCEPTANCE

The acceptance, after observation by the ENGINEER, or his representative, of any portion of the work or material shall be subject to its demonstrating freedom from the exhibition of any inherent or developed defect, or any failure to conform to these Specifications, between the time of its acceptance, and the expiration of the above named period of one (1) year.

3.16 ONE YEAR'S RESPONSIBILITY FOR DIMENSIONS

The acceptance by the ENGINEER of any of the dimensions proposed by the CONTRACTOR shall always be understood to be with the proviso, whether stated at the time of acceptance or not, that the said dimensions shall be demonstrated to be adequate and proper at all times until the expiration of the above named period of one (1) year.

END OF SECTION

SECTION 01015
SPECIAL REQUIREMENTS

PART 1 - GENERAL

1.01 SPECIAL REQUIREMENTS

A. Before any work is started, the Developer shall ascertain from the Township whether or not the latter intends to employ a consultant as ENGINEER for the Project. If the Township indicates that no ENGINEER will be employed, the word "Township" is substituted for the word "ENGINEER" throughout these Specifications, and the Developer and CONTRACTOR shall be guided accordingly.

B. The CONTRACTOR should plan his work so as to provide adequate protection during storms. Certain portions of the work may be affected during storms and floods. Provisions for preventing damage should be made available at all times. All work shall be protected at all times against damage from uplift due to high ground water levels.

C. Where sanitary sewers are to be constructed within State Highway rights-of-way, the Developer shall make necessary applications for permits to construct such sanitary sewers and shall pay all charges and fees required therefor. It shall be the responsibility of the CONTRACTOR to construct the project in strict conformance with the requirements of, any permits issued by the Pennsylvania Department of Transportation. The permitee for all permits shall be Willistown Township

D. Willistown Township requires that a "Highway Occupancy Permit" be obtained to perform any construction within the rights-of-way of Township streets. The Developer shall obtain all such Highway Occupancy Permits and shall pay all fees and charges required therefor.

E. Where sanitary sewers are to be constructed within the limits of paved streets, all removal and replacement of street paving shall be in strict conformance with the requirements of Horsham Township and of the Pennsylvania Department of Transportation, as applicable.

F. Streets shall not be unnecessarily obstructed. The CONTRACTOR shall take such measures as may be necessary to keep the street or road open and safe for traffic.

G. All driveways shall be restored to a condition equal to their original undisturbed condition using the same type and quality of materials as that of the particular driveway restored.

H. All curbs, gutters and sidewalks damaged or disturbed shall be replaced with the same type of materials, as the original curb, gutter or sidewalk. The replaced curbs, gutters, and sidewalks shall be of the same shape, thickness and surface finish as the original curb, gutter or sidewalk.

I. At the conclusion of work at the end of the work day, all streets shall be maintained in such condition whereby they can be readily opened and safely traveled in cases of emergency such as a fire, ambulance, rescue, etc.

J. The CONTRACTOR shall provide a competent and reliable person who is delegated to be readily available and have full authority to act in the behalf of the CONTRACTOR in case it is necessary to deal with any emergency situations which may arise in connection with the project during off working hours, evenings, weekends, and holidays.

K. The use of a "HYDRA-HAMMER" for compaction of backfill will not be permitted.

L. The use of calcium chloride additive in concrete is prohibited.

M. Drawings of the water distribution and the sanitary sewer systems which are to be submitted to the ENGINEER for approval in compliance with Section 01010.3.04 of these Specifications shall be drawn on sheets 24 by 36 inches (minimum size) to the following requirements:

1. Scales:

   Key Sheet - 1" = 400'

   Plan and Profile Sheets: Horizontal - 1" = 50'
   Vertical - 1" = 5'

2. Pipe sizes shall be shown on the Key Sheet or sheets together with the names of all streets.

   a. Include the number designation of each sanitary sewer manhole.

3. On the plan and profile sheets, the location of each existing or proposed building shall be shown on the Plan with the elevation of the existing or proposed first floor. The sanitary sewer main and appurtenances shall be referenced to roadway centerlines, easement centerlines, or designated construction baselines. Pipe sizes and materials shall be identified on the plan.

4. On the Profile, the pipe size, material shall be identified. In the case of gravity sewer mains, the distance between manholes and the slope shall be identified. Existing and proposed profile of the roadway ground surface shall be shown. Where other utilities cross the proposed sanitary sewer lines, the size, and invert elevations (top and bottom elevation in the case of duct lines) shall be given.

   For details of bedding, encasement, service connections, water system appurtenances, etc. reference need only be made to the appropriate "Detail Drawing" included in these Specifications.

N. Easements shall be provided for all sanitary sewer lines which are outside the public right-of-way. Easement widths shall be as follows:

Sewer Force Mains - 20' wide easement (minimum)
Gravity Sewer Lines less than 15 feet deep - 20' wide easement (minimum)
Gravity Sewer Lines greater than 15 feet deep - 30' wide easement (minimum)

Greater easement widths may be required as directed by the Township's ENGINEER. Sewer lines shall be installed no closer than 10 feet to the edge of easement that is 20 to 30 feet wide, and no closer than 15 feet to the edge of easements that are wider than 30 feet.

O. No permanent structures, fences, plantings or trees shall be placed within ten feet (10') of the permanent easement.

P. Boring and/or jacking of pipe crossings of State highways and roadways shall be in accordance with the requirements of PennDOT and the associated Highway Occupancy Permit.

Q. Before the work will be accepted by the Township, the Developer shall submit to the Township reproducibles of all working drawings, modified as necessary to show as-built conditions. The Developer shall submit a certificate with the as-built reproducibles attesting to the correctness of all information shown on the Drawings. (The Township intends to use the prints of the reproducibles to provide information to designers and CONTRACTORs as required by the Commonwealth of Pennsylvania Act 287).

R. The Specifications for the Sewage Pumping Station are for a typical submersible pumping station and lack sizes and capacities. There may be circumstances where a wetwell-drywell type pumping station is more appropriate. The Township should be consulted prior to initiating design regarding the type of pumping station, sizes, capacities and emergency power requirements for the project. The Developer shall submit to the ENGINEER prior to start of construction, specifications and drawings of the pumping facility giving complete dimensions, sizes, capacities, loads, electrical wiring, and description and quality of materials, etc.

S. Large projects or other projects of special concern as determined by the Township, shall provide a metering system to measure gravity sewer flows emanating from the project. The metering system shall be an ultrasonic open channel flowmeter consisting of a transducer continuously measuring the liquid level at the measuring point of a Parshall flume or Palmer-Bowles flume, and a microprocessor based flow transmitter providing linear flow rate conversions with totalization. The flowmeter shall be installed in an approved concrete vault. The Developer shall submit to the ENGINEER prior to construction, specifications and drawings of the metering facility.

1.02 SANITARY SYSTEM DESIGN STANDARDS

A. Basis for Design: Sanitary systems, which unless otherwise determined by the Authority, are to be dedicated to the Willistown Township shall be designed, constructed, inspected and tested at the Developer's expense. The Township ENGINEER will provide the Developer with a schematic layout of the proposed sanitary sewer system upon which the design of the sanitary sewer system will be based. The sanitary sewer system design shall be submitted to the Township ENGINEER for review and approval, and the Township ENGINEER shall inspect the construction and testing. The design shall be in accordance with the standards herein and the review comments of the Township ENGINEER. Undedicated sanitary sewer systems shall not be permitted to connect to the Township's collection system. All sanitary sewers shall be designed in accordance with the latest edition of the PA Department of Environmental Protection "Domestic Wastewater Facilities Manual."

B. Depth of Cover: The minimum depth of cover from the top of the sanitary sewer main to proposed grades shall be a minimum of 4 feet.

C. Controls: Sanitary sewer systems shall be constructed with construction stakes indicating the alignment and grade of sanitary sewer main. Stakes shall be provided at every manhole, and at all fittings and appurtenances.

D. Location of Mains: All mains must be located in public roadways or utility right-of-way, or a sanitary sewer easement dedicated to the Township.

E. Force Main Pipe Deflection: Deflection of the pipe at the joint may be permitted upon the approval of the ENGINEER. The deflection cannot exceed the pipe manufacturer's maximum allowable deflection, but in no case shall be greater than two degrees.

F. Each sewer customer shall have its own sanitary sewer lateral. See the Standard Details.

G. Sanitary sewer mains shall be designed to pass under water mains with a minimum clearance of 18", (OUT-TO-OUT) wherever possible.

H. Connections to Existing Manholes: Connections to existing manholes shall be made in such a manner as to provide a watertight installation. The CONTRACTOR shall take all necessary precautions to prevent cutting debris from entering the existing sewage flow. Sewer connections to existing manholes shall be made by carefully boring an opening no greater than two (2") inches around the new pipe. The existing bench and channel must be cut to invert to form a channel for the new pipe. A CMA Concrete Manhole Adaptor, as manufactured by Fernco, or approved equal, shall be installed, and the inside face of the gasket be filled with non-shrink hydraulic cement. The newly cut channels shall be finished with non-shrink grout and troweled to meet the existing channel.

END OF SECTION

SECTION 02100
CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION

The CONTRACTOR shall clear the entire work area including a sufficient area alongside of same to properly carry on the work, of all trees, down timber, snags, brush, rubbish, all other objectionable material, and other vegetation, except leaves, grass and weeds. All stumps and matted roots shall be grubbed.

1.02 QUALITY ASSURANCE

The CONTRACTOR shall remove all obstructions within the permanent and construction right-of-ways except those indicated on the Drawings or specified to be saved or restored. If the CONTRACTOR removes extra material than is required on the Project, then all suitable material removed shall be replaced by the CONTRACTOR at his own expense. If the CONTRACTOR exceeds the clearing limits specified, he shall, if directed, restore such areas to their original condition.

1.03 SUBMITTALS

Submit two (2) copies of agreements with each property OWNER releasing the OWNER from responsibility in connection with the disposal of debris.

1.04 JOB CONDITIONS

State and local code requirements shall control the disposal of all materials. Arrange for disposal of debris resulting from clearing and grubbing to locations outside the OWNER's right-of-way and obtain written agreements with the OWNERs of the property where the debris will be deposited. Site deposition or burning shall not be permitted.

PART 2 - PRODUCTS

This part not used.

PART 3 - EXECUTION

3.01 PREPARATION OF GROUND SURFACE

A. Construction shall not be started in any area until all clearing and grubbing has been completed. In areas where excavation is to be made, the ground shall be cleared of all living or dead trees, stumps, brush, or other objectionable material. All embedded stumps, root mats, etc. shall be removed to a depth not less than 2 feet below the subgrade or slope surfaces. All depressions made as the result of such removal shall be backfilled with suitable material and compacted.

B. In areas of fill or embankment where the depth of fill or embankment is to be 5 feet or more in depth, trees and stumps shall be cut off not more than 6 inches above existing grade. If the fill is to be less than 5 feet, all trees, stumps, roots, brush, root and debris shall be removed completely.

3.02 MATERIALS TO REMAIN

Before commencing the work, the ENGINEER shall clearly mark trees, shrubs, or any other objects or materials which are to remain within the areas to be cleared. The CONTRACTOR shall provide fencing or other suitable protection devices, as directed by the ENGINEER, to protect these objects from damage during the course of construction.

3.03 STRIPPING AND STOCKPILING TOPSOIL

Strip topsoil to whatever depth it may occur from areas to be excavated, filled or graded and stockpile at a location approved by the OWNER for use in finish grading. The topsoil is the property of the OWNER and shall not be used as backfill or removed from the site.

3.04 TREE REMOVAL

A. All individual trees, groups of trees or bushes shall be removed from all easements for the full width of the easement. All stumps and roots larger than three inches (3") in diameter shall be excavated and removed.

B. Trees required removal or trimming of roots and branches which interfere with construction or traffic shall not be removed without written permission of the ENGINEER.

C. In order to minimize damage to trees that are to be left standing, trees shall be felled toward the center of the area being cleared.

D. Transplanting of trees and pruning procedures shall conform to the latest standards of the American Association of Nurserymen.

3.05 DISPOSAL OF CLEARED AND GRUBBED MATERIAL

All timber, brush, stumps, roots and other refuse from the clearing and grubbing operations shall be disposed of according to the laws of the local municipality. Stumps and other material shall not be buried without the written permission of the ENGINEER.

3.06 RESTORATION

A. Remove protective fences, enclosures and guards upon the completion of the project.

B. Repair all injuries to bark, trunk, limbs, and roots of remaining plants by properly dressing, cutting, tracing and painting, using approved agricultural practices and materials. Replace trees, shrubs and plants designated to be saved which are permanently injured or die during the life of the Contract as a result of construction operations with like species acceptable to the OWNER.

C. Restore any obstructions removed to facilitate construction to the condition equal to that existing before construction operations.

END OF SECTION

SECTION 02125
STREAM CROSSING

PART 1 - GENERAL

1.01 SCOPE OF WORK

The CONTRACTOR shall furnish all materials, labor, and equipment necessary to install sanitary sewers across the stream.

1.02 DESCRIPTION

A. The work includes, but is not limited to:

1. Construction of diversion dams and piping, maintenance and pumping of the enclosed work area for construction in the dry of the pipeline to the line and grade shown on the drawings.

2. Prosecution of the work in a manner so as to avoid deposition of any material of any nature in the creek outside the diversion dams.

3. Flooding of the work area, and complete removal of the diversion dams and sedimentation dikes when work has been completed.

B. The work area shall include that area of creek bed between the diversion dams that is maintained in a dry condition while the installation of the sewer pipeline takes place.

1.03 SUBMITTALS

Should the CONTRACTOR propose to perform the stream crossing in a manner different than as specified, and as shown on the drawings, he shall submit to the ENGINEER a plan and narrative depicting his method for performing the stream crossing. All plans shall be signed and sealed by a Professional ENGINEER registered in the Commonwealth of Pennsylvania. Submission of plans shall be at least 30 days prior to the anticipated date of the stream crossing. Plan shall include method of crossing, erosion and sedimentation controls, soil borings, flood data information, HEC-2 analysis if stream is to be restricted as part of the plan, narrative, and schedule for the crossing.

1.04 SMALL STREAM CROSSINGS

A. Construct small stream crossings in accordance with the Drawings using a temporary diversion pipe and dams or other method approved by DEP Bureau of Dams and Waterway Management.

1.05 TESTING

The CONTRACTOR shall test the pipelines as soon as possible after the pipes have been installed, and before the stream crossing has been flooded.

PART 2 - PRODUCTS

This part not used.

PART 3 - EXECUTION

3.01 CONSTRUCTION OF CREEK DIVERSION

The CONTRACTOR shall construct and maintain the necessary diversion dams and pipes, as shown on the standard drawings. The stream crossing facilities shown on the standard drawings are the minimum required to perform the work. The CONTRACTOR shall provide any additional diversion dams, diversion pipes, and sedimentation control facilities as necessary to perform the work as specified and as shown on the drawings.

3.02 DEWATERING OF THE CREEK CROSSING

A. The CONTRACTOR shall furnish, install, operate and maintain all pumping and other equipment required to maintain the work area free of water while construction and testing of the sewer main takes place. Adequate standby powered pumping units shall be provided for this purpose including reserve equipment. The CONTRACTOR shall maintain all equipment in first class operating condition at all times.

B. Dewatering operations shall be carried out in such a manner as to prevent boiling and detrimental under-seepage at the bottom of the excavation.

C. The CONTRACTOR shall keep the excavation fee of water while excavating, preparing the subgrade, installing pipe, placing concrete and backfilling of the trench. The CONTRACTOR shall not be entitled to extra compensation by reason of the amount of water that may leak into the work area.

D. To help minimize siltation, all water pumped or drained from the work area shall be pumped to a sedimentation basin before being discharged back into the stream. At no time shall water be discharged directly into the stream, or to any sewer manhole or inlet. In the event that pumps fail for any reason, the CONTRACTOR shall be fully responsible for all damage resulting from such failure.

3.03 FLOODING OF THE CREEK CROSSING

A. After the sewer pipeline(s) have been installed, and the trench backfilled to the existing grade, the CONTRACTOR shall flood the work area before removing the diversion dams.

B. The CONTRACTOR shall notify the ENGINEER in writing that he desires inspection by the ENGINEER, and that all portions of the pipelines have been installed, cleaned, and tested, concrete placed, and that all surplus materials and construction equipment has been removed from the work area.

C. Upon receipt of written notification, the ENGINEER shall arrange for an inspection, and if the work is found to be complete he shall notify the CONTRACTOR that the work area may be flooded. If the inspection reveals that the work is not sufficiently complete to permit flooding, the CONTRACTOR shall take immediate steps to correct all deficiencies and request an additional inspection. The CONTRACTOR shall not flood the work area until he is directed to do so by the ENGINEER.

D. The diversion dams, pipes, sedimentation dikes, and any other temporary construction facilities installed by the CONTRACTOR shall be removed to the finished grades of the creek bed. All materials removed shall remain the property of the CONTRACTOR and shall be properly disposed of off site.

3.04 CROSSING DETAILS

A. All pipelines shall be ductile iron and encased in concrete as indicated on the Drawings. Do not backfill until concrete has achieved its initial set and concrete work is examined by the ENGINEER or Township's Representative.

B. Prior to the start of any construction, all Erosion and Sedimentation Controls must be placed as per the rules, regulations, and requirements of the Pennsylvania Department of Environmental Protection (DEP). The CONTRACTOR is advised that the DEP rules, regulations, and requirements also apply to all other work on this project outside the Stream Crossing locations.

C. Pipe trench subgrade shall be prepared a minimum of six (6) inches below the bottom of the pipe. Unsuitable subgrade material shall be removed and backfilled with 2A coarse aggregate.

After the trench subgrade has been prepared, the pipe shall be encased in Class C, 2,000 psi concrete; a minimum of six (6) inches thick around the outside diameter of the pipe as per the Detail Drawings. The pipe may be supported in the trench by the use of solid concrete block.

D. The CONTRACTOR may start the backfilling operation once the concrete has sufficiently set as determined by the ENGINEER. The backfilling shall be performed so as to avoid the formation of a permanent ridge in the streambed. After backfilling is complete, the CONTRACTOR shall remove all excess material and debris from the streambed.

E. Construction of the stream crossings shall be completed in one operation. The CONTRACTOR may not start another operation until the stream crossing is completed, the streambed restored, and the temporary crossing removed, unless otherwise approved by the ENGINEER.

F. The Developer or CONTRACTOR is responsible for all stream crossing permits. ENGINEER's approval of the stream crossing plan will not substitute for, and is not valid without, the required permits.

END OF SECTION

SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION

The CONTRACTOR shall excavate, sheet, shore, dewater, backfill, and compact all excavation, and shall make all fills that may be necessary for constructing the work under this project. The above shall also include all subsurface explorations and rough grading. The CONTRACTOR shall furnish all labor materials and equipment necessary for completion of the work. Excavation shall be unclassified.

1.02 QUALITY ASSURANCE

A. Employ, at CONTRACTOR's expense, soil testing laboratory to perform twenty (20) compaction tests plus one test for each 1000 linear feet of pipeline. Conduct compaction tests at locations directed by the ENGINEER during backfilling operations.

B. Determine compaction in state highways and shoulders by the testing procedure contained in Pennsylvania Test Method PTM 106 Method B or PTM 402. Determine compaction in areas other than State highways and shoulders by the testing procedure contained in ASTM D1556 or ASTM D2922.

1.03 SUBMITTALS

A. Before proceeding with work, submit name and credentials of retained soil testing laboratory for approval by the ENGINEER.

B. Submit a Statement of Compliance together with supporting data from the materials supplier attesting that the composition analysis of backfill materials meet specification requirements.

C. Submit certified compaction testing results from the soils testing laboratory.

1.04 JOB CONDITIONS

A. Barricade open excavations occurring as part of this work and post with warning lights. Operate warning lights as recommended by authorities having jurisdiction.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

C. CONTRACTOR to comply with O.S.H.A. requirements.

D. The CONTRACTOR shall cooperate with other contractors holding contracts for certain phases of the work so as to assure the proper incorporation of or provisions for all items which will be furnished and placed by others.

E. The CONTRACTOR shall be responsible for giving notice to the other contractors, utility companies, etc., so that their work may be placed in ample time to prevent any delay in this work.

1.05 EXCAVATION IN WETLANDS

The CONTRACTOR shall use mats or other suitable devices under all heavy equipment operating in wetland areas, including all construction roads and access ways. Mats shall be installed prior to commencing excavation in wetlands, and will remain in place until the trench has been properly backfilled and restored. Construction in wetlands shall comply with applicable permits.

1.06 EARTH EXCAVATION

Earth excavation includes removal and disposal of pavements and other obstructions visible on the ground surface, underground structures and utilities indicated to be demolished and removed, material of any classification indicated in data on subsurface conditions, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

1.07 UNAUTHORIZED EXCAVATION

Consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of ENGINEER. Unauthorized excavation, as well as remedial work directed by ENGINEER, shall be at the CONTRACTOR's expense.

PART 2 - PRODUCTS

2.01 PIPE BEDDING MATERIAL AND SUBBASE

Shall conform to Section 703.2 of PennDOT Publication 408. Pipe bedding material for ductile iron pipe and structural subbase shall be 2A stone. Pipe bedding material for polyvinyl chloride and polyethylene pipe shall be AASHTO No. 8 coarse aggregate. Pipe bedding materials shall be stone material. Slag based materials will not be permitted.

2.02 CRUSHED STONE BACKFILL

Shall conform to Sections 703.2 and 703.3 of the PennDOT Publication 408. Stone backfill, directed by the ENGINEER, in the areas other than State Highways, shall be 2A stone. Stone backfill in State Highways shall conform to 2RC select granular material and shall be 2A stone. Slag based materials will not be permitted.

2.03 SUITABLE BACKFILL MATERIAL

Shall be free from boulders, rocks larger than two (2) inches, frozen lumps, debris (bricks, masonry batts, plaster, etc.) vegetation or other organic or foreign material.

2.04 FILL MATERIAL

Shall be inorganic soil, free from frozen lumps, debris, or vegetation and shall have a liquid limit not exceeding 45, and a plasticity index not less than 6 nor greater than 15.

2.05 TIMBER SHEETING

Timber sheeting, bracing and shoring lumber shall be straight grained, free from cracks, shakes, and large loose knots with the minimum characteristics equal to E=1,600,000 and F_b=1650.

2.06 STEEL SHEETING

Shall be standard and generally accepted product of a recognized manufacturer and the AISC.

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION

A. Trenches shall be excavated to the depths and widths as approved. The sides of the trenches will be as nearly vertical as possible. The trenches shall be excavated true to line so that a clear space of six inches (6") is provided on each side of the pipe barrel for pipes up to 3" in diameter, and ten inches (10") for pipes up to 20" in diameter, and twelve inches (12") for pipes 20" in diameter and larger, to a height not less than the top of the pipe. The maximum allowable trench width shall be two feet (2') wider than the outside diameter of the pipe barrel. Where sheeting is used, the maximum width below top of pipe shall be measured between interior faces of sheeting as driven, but in no case shall stringers or whaling strips be so placed as to interfere with proper ramming of earth under and around pipe. If sheeting does not extend below a point six inches (6") above pipe as laid, the maximum width allowed shall be measured between faces of excavation below the bottom of the sheeting.

B. Where a section of trench has been excavated to a greater depth than specified, it shall be brought to proper grade, using crushed stone bedding material.

C. Where, in the opinion of the ENGINEER, the grade is suitable for the foundation of the work, the bottom of the trench shall be excavated flat to receive pipe, and the bottom of the trench under each joint or coupling hollowed out to allow for making joints. Trenches excavated below proper grade, excepting at joints, shall be filled to proper grade with suitable material thoroughly rammed to ensure adequate support and stability of pipe or other structures.

D. The ENGINEER shall have the right to limit the amount of trench opened in advance of the completed pipeline. Excavation shall be completed at any location, except for final grading and shaping of the pipe bed, which shall be completed a minimum of twenty feet (20') in advance of

pipe installation. The amount of pipe laid in advance of backfilling shall not exceed one hundred feet (100'). Trench excavation in wetlands shall be limited to a length which can be excavated, laid, backfilled, tamped and completed in one (1) working day.

E. The ENGINEER shall be empowered at any time to require backfilling of open trenches over completed pipelines even though to accomplish said backfilling, the CONTRACTOR may be compelled to temporarily stop excavation or other work. If work is stopped on any trench, for any reason except by order of the Township, and excavation is left open for an unreasonable length of time in advance of construction, the CONTRACTOR, shall if so directed, backfill such trench, and shall not again open said trench until he is ready to complete work therein. If the CONTRACTOR refuses or fails to backfill such trench completely within forty-eight (48) hours, the Township shall be authorized to do the work, and charge expense thereof to the CONTRACTOR.

F. Where the location of a trench must be changed from that proposed on the Drawings due to the presence of an obstruction or other causes, the CONTRACTOR shall be entitled to any additional compensation.

3.02 DISPOSITION OF EXCAVATED MATERIAL

A. The CONTRACTOR shall grub and clear surface and remove all surface materials, of whatever nature, over line of trench and site of other structures.

B. Excavated materials shall be classified, separated and stored in use in backfilling, repaving or replacing topsoil. Otherwise, replacement materials shall be furnished of equal quantity and quality, as directed, to replace the displaced material.

C. Excavated material shall be placed so as not to interfere with traffic on the streets and driveways in an unreasonable manner. All surplus excavated materials shall be removed from the site of the work, but none shall be deposited on private property unless written consent of the property owner has been obtained and a copy filed with the Township.

D. In case more material is excavated than can be used for backfill or stored at the site without causing conflict with traffic or drainage problems, the excess material shall be removed, stored and returned as required, for re-use as backfill.

E. The CONTRACTOR shall furnish approved equipment for transporting loose or wet material over streets or highways.

F. The CONTRACTOR shall be responsible for any loss or damage to curb, gutter, sidewalk and flagstones, and to paving material through their careless removal or neglectful or wasteful storage, disposal or use.

G. The CONTRACTOR shall perform all necessary work for the removal of trees or for excavation by hand or tunnel in the vicinity of trees that may be left standing. No trees shall be cut down or trimmed unless approved by the Township.

3.03 MATERIAL EXCAVATED NOT THE PROPERTY OF CONTRACTOR

If the work occurs in public right-of-way, the CONTRACTOR shall have no property right for any material taken from excavations, and shall not remove any excavated material from site of work, unless specified or directed by the Township.

3.04 ROCK EXCAVATION

A. Any material shall be considered rock, which in the opinion of the ENGINEER cannot be excavated, except by drilling, wedging, or blasting. The word "rock" where used in the specifications, shall mean boulders, solid ledge rock and pieces of concrete exceeding 1/2 cubic yards in volume, which in the opinion of the ENGINEER, requires for its removal by drilling, wedging, blasting, or breaking up with a power operated tool. Any material which can be removed by means other than those specified above, which by reason of economy the CONTRACTOR prefers to remove by drilling and blasting, will not be classified as rock. Any soft material or disintegrated rock which can be removed with a pick or which can be broken down with sledge hammers, boulders less than 1/2 cubic yards in volume, or broken stone in rock filling shall not be considered rock excavation.

B. Rock excavation shall be accomplished by drilling and wedging or blasting as permitted. Should blasting operations in any way shatter rock below the specified grade or specified width, so that, in the opinion of the Township, the area is unfit for foundation, such rock shall be removed and the area backfilled with approved material, to the proper grade.

C. All excavated rock material, which is unfit for backfilling shall be immediately removed from the site.

3.05 EXPLOSIVES AND BLASTING

A. The use of explosives shall comply with Title 25, Rules and Regulations - set forth by the Pennsylvania Department of Environmental Protection, Sub. Part d - Environmental Health and Safety, Article 4 - Occupational Health and Safety, Chapter 211 - Storage, Handling and Use of Explosives.

B. CONTRACTOR shall use heavy timbers, blasting mats, or other suitable devices to prevent damages from the flying rock.

C. The CONTRACTOR shall be solely responsible for injury to persons or property located within or beyond the area or scope of the project that may result from use of explosives.

D. Whenever any pipe, main or conduit is encountered in an excavation, the right is reserved to require that all rock within five feet of the same be removed by some method other than blasting.

E. All explosives shall be stored as directed in the DEP Regulations. The CONTRACTOR, prior to initiation of any drilling or blasting operations, shall thoroughly familiarize himself with all State, County, and Local Rules and Regulations pertaining to use and storage of explosives and methods of drilling. Under no conditions shall detonation devices, filing caps, priming cord, etc., be stored or transported in proximity to explosive materials.

F. All explosives shall be stored in a secure and safe manner. All such storage places shall be marked clearly "DANGEROUS EXPLOSIVES" and shall be in the care of competent watchman at all times. Explosives shall be kept on the site only in such quantity as may be needed for the work being done and only during such time as they are being used.

G. Blasting for excavation will be permitted only after securing the written permission of the Township, and after securing required blasting permits, insurance and bonds. The Township reserves the right to regulate the time of blasting and all protective measures required for safety. The type, strength of explosives used, and storage facilities shall also be approved by the ENGINEER.

H. Should any street paving adjoining any excavation be damaged in consequence of the CONTRACTOR's blasting operations, he shall immediately cease his blasting operations and repair the damaged street paving; also he shall not again proceed with any blasting until he has submitted to and obtained approval from the Township of the methods and means he proposed to use to perform all subsequent blasting.

I. Blasting in State owned highways shall not be permitted without prior authorization from PennDOT.

3.06 DEWATERING EXCAVATIONS

A. There shall be provided and maintained at all time during construction of work, ample means and devices, including all necessary equipment, power, and labor to pump, bail, or otherwise promptly remove and properly dispose of all water and/or sewage entering, or found in the excavations and other parts of work. Well points shall be utilized wherever necessary to maintain dry conditions throughout working areas.

B. All excavations shall be free of water during construction of structures and backfilling operations. Temporary flumes, channels or pipes shall be used to divert water from the excavation.

C. All water from any source shall be pumped or bailed to provide a dry trench, and shall be discharged in such manner as not to cause injury to work completed, damage to property, health hazards or impediment to traffic.

D. In no case shall water be permitted to rise into or flow through a completed pipeline unless permitted by the Township. In no case shall drainage through a completed pipeline be permitted until the Township has been satisfied that all precautions have been taken to prevent admission of sand or other material, and in no instance shall internal pressure be permitted at any point in lines. Adequate means shall be provided at all times and continually maintained to relieve any internal pressure that might otherwise be exerted. All methods used to accomplish dewatering must meet with the Township's approval.

3.07 SHEETING AND SHORING

A. All work performed and materials used for sheeting, bracing and shoring shall be in conformity with the current requirements of the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) requirements.

B. Trenches shall be properly and adequately shored at all times. The prevention of accidents and protection of surrounding ground and adjacent structures is the responsibility of the CONTRACTOR. When directed by the Township, tight wood sheeting (approved steel sheeting optional) shall be installed for the protection of the workmen, property and the work. Voids found behind sheeting shall be immediately filled with a granular material and compacted.

C. All timbering or underpinning shall be placed or driven by men skilled in such work and shall be so arranged that it may be withdrawn as backfilling proceeds without injury to structures built or adjacent structures or properties. If, in the opinion of the Township, the material furnished for timbering excavations is not of proper quality, size, or improperly placed, the CONTRACTOR shall repair or replace as required by the Township.

D. CONTRACTOR shall upon notice, procure and place timbering in a satisfactory manner. Upon his failure to do so, work may be ordered stopped until said notice shall have been complied with by the CONTRACTOR.

E. Timbering in excavations may be withdrawn as the backfilling is being done, except to such extent as the Township shall order that said timbering be left-in-place. The CONTRACTOR shall cut off any sheeting left-in-place, at least two (2) feet below finished grade where ordered by the Township, and shall remove cut-off material without compensation therefore.

F. When in quicksand or soft ground, or for protection of any structure or property, sheeting shall be driven to a depth below bottom of excavation as may be required by the ENGINEER or the Township.

3.08 RESPONSIBILITY FOR CONDITION OF EXCAVATION

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

B. Failure or refusal of the Township 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 of placing or driving sheeting, brace or shores, shall not relieve the CONTRACTOR of any responsibility concerning the condition of excavations or his obligations under the contract. Any delay 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 these obligations under the contract relating to injury of persons or property.

3.09 UNDERGROUND UTILITIES AND STRUCTURES

All utility services encountered, shall be supported by timber struts or by other suitable means. Utilities or other structures located transversely across the trench or parallel to the trench in the vicinity will be protected from damage or displacement.

3.10 PROTECTION OF PROPERTY AND STRUCTURES

The CONTRACTOR shall, at his own expense, sustain in their places and protect from direct or indirect injury, all pipes, conduits, poles, tracks, walls, buildings, and other structures or property in vicinity of his work, whether above or below ground. He shall replace any drain pipe, even if apparently not used and damaged, and shall at all times have a sufficient quantity of material available for sheeting his excavations, and for sustaining or supporting any structures that are uncovered, underdrained, endangered, threatened, or weakened.

3.11 ACCOMMODATION OF TRAFFIC

A. The CONTRACTOR shall, where required, maintain part of the road open for traffic with satisfactory barricades, warning signs, and lights. Where permission for detouring traffic is granted, the CONTRACTOR shall post detour signs in compliance with PennDOT Publication 213 to the satisfaction of the ENGINEER. The CONTRACTOR shall maintain such detour routes. All detour roadways shall be maintained for through emergency vehicle traffic. No State Highway shall be closed to traffic without State approval. During progress of the work, sidewalks and crossings shall be kept open for passage of pedestrians, unless otherwise authorized. The CONTRACTOR shall be responsible for creation of a detour plan, for approval by the Township's Representative, and for securing Township detour request letters, where applicable.

B. The CONTRACTOR shall construct and maintain adequate and approved bridges over excavations as may be necessary or directed by the State, County, or Township for purpose of accommodating pedestrians or vehicles.

C. All fire hydrants, water valves, fire alarm boxes, and letter boxes shall be left uncovered and readily accessible for use.

3.12 OBSTRUCTION SHOWN ON DRAWINGS

The Drawings show, in addition to structures to be built, certain information regarding location of tracks, pipes, conduits and other structures which exist along lines of work, both at and below surface of ground. The Township expressly disclaims any responsibility for the accuracy and completeness of information given on Drawings with regard to existing structures. Said structures are shown only for the convenience of the CONTRACTOR. The information does not relieve the CONTRACTOR of any of his obligation to protect said structures in every way as provided for in the Specifications.

3.13 OBSTRUCTIONS AND MAINTENANCE OF SERVICES

A. Any work on poles, pipes, conduits or other structures that, in the opinion of the Township requires removal, realignment or change because of work to be done under the Contract, will be done by the CONTRACTOR or by the owner of the structure. The CONTRACTOR shall uncover and support said structures within the limits of the trench.

B. There shall be maintained at all times a continuous flow in all existing gas, water, sewer, conduit, electric power, and telephone lines, or any other pipes or drainage structures encountered in prosecution of work under this project, whether above or below ground surface.

C. For prosecution of the work the CONTRACTOR shall arrange with all utility companies for any relocation, temporary removal and restoration of their facilities when required or directed by the Township.

3.14 MISCELLANEOUS EXCAVATION

A. The CONTRACTOR shall do such miscellaneous excavating work as may be necessary and directed by the Township. Such excavation shall be subject to the same conditions and requirement specified herein trench excavation.

B. Miscellaneous excavation shall include extra excavation for any special structure or outside trench, that may not be shown on the Drawings or described in the Specifications, where such excavation is done at the direction of the Township.

3.15 BACKFILLING AND COMPACTION - TRENCHES

A. Backfilling includes all refilling of excavations and the tamping and rolling required for satisfactory compaction. Backfilling shall be done as promptly as possible without damage to pipe or structure in place. Backfilling will be done following inspection and approval of the work by the ENGINEER, and only with permission of the ENGINEER.

B. No part of a pipeline or other structure that needs to be tested, located, or measured, shall be filled over or around until required tests and measurements have been made or witnessed by the Authority, and their permission so given to backfill. Any backfilling without authorization shall be uncovered by the CONTRACTOR at his own expense.

C. All pipes shall be laid on an even and uniform bedding surface. The bedding shall be installed from a depth of six inches (6") below the pipe barrel. Bell holes and depressions for joints of the pipes shall be dug after the bedding materials have been properly graded. The pipe shall then be laid to its true grade and alignment. The bedding materials shall then be shovel placed and hand tamped to fill all spaces under and adjacent to the pipe to hold the pipe in its true grade and alignment during the test. The lines, grades and joints of the pipes will be inspected before any further backfilling above the pipe is commenced. After the inspection is completed, the backfilling shall be continued in layers not exceeding ten inches (10") to a height six inches (6") above the top of the pipe. The materials shall be placed with hand shovels and shall be solidly rammed down.

D. From six inches (6") above the top of the pipe, suitable backfill material, conforming to the requirements of these specifications may be used. This material shall be carefully and manually deposited for an additional height of one foot (1'). The compaction shall be done for the full length of the pipe, and in such a manner as not to disturb or damage the pipe. Hand-operated mechanical tampers may be used for compaction. Such mechanical tampers shall have a rating of at least 300 foot/lb. of energy per blow.

E. From one foot six inch (1'-6") above the top of the pipe, machine backfilling and compaction may be used. Above this level, except for the last two (2) feet, small stones not larger than six inches (6") in their greatest dimension will be permitted, but this should not be in excess of 15% of the total volume of the backfill materials in the entire depth. Such stones shall be evenly distributed throughout the entire mass.

F. The excavated material removed from the trenches can be used for backfilling purposes provided it meets the material classifications. In the areas where the conditions require the removal of the excavated materials, all the backfilling shall be done using crushed stone backfill. The backfilling materials should compact readily by the usual methods of tamping and rolling. Unsuitable materials, such as clay that will crumble under light pressure by hand, frozen materials, ashes, cinders, tree stumps and other organic and unsuitable materials shall not be used for backfilling. Organic soil will not be permitted as backfill except for the top 18" of trenches located in wetlands.

G. The materials backfilled in trenches shall be deposited in layers not exceeding ten inches (10"). All backfill shall be properly moistened or dried to within 2% of the optimum moisture content as determined by ASTM D-1557. Each lift shall be compacted to 95% maximum density. The reference density will be determined in the laboratory by the soils engineer in conformance with ASTM D-1557. The degree of compaction shall be checked by the soils engineer, and each successive lift shall not be placed or compacted until the previous lift is inspected and approved by the soils engineer. The fill shall be compacted to elevations and limits indicated on the Drawings.

H. The compaction shall be continued to the desired elevations. The trenches shall be mounded to a height of one foot (1') after compaction with suitable materials. All the backfilling and compaction shall be continued without interruption to completion. The areas shall be properly cleaned and all the excess material shall be properly disposed of from the work area.

3.16 BACKFILLING OF TRENCHES UNDER STATE, COUNTY OR TOWNSHIP JURISDICTION

Backfill material used for all pipelines on State, County, and Township roads shall be as specified by these governmental agencies. Where 2A coarse aggregate or other special material is specified by the Agency having jurisdiction, the CONTRACTOR shall install such backfill. The excavated material from the trench shall be removed and disposed of at suitable locations designated by the ENGINEER. The trench shall then be backfilled with the material and procedure specified by these Agencies.

3.17 TEMPORARY REPAVING AND MAINTENANCE OF TRENCH SURFACES

A. When trenches in paved areas have been backfilled to the proper grade, the CONTRACTOR shall install temporary paving in conformance with Township, County or State requirements.

B. The CONTRACTOR shall maintain, at his own expense, all backfilled excavations in proper conditions as specified. All depressions appearing in backfilled excavations shall be promptly repaired and brought to proper grade by the CONTRACTOR. If the CONTRACTOR fails to make repairs within twenty-four (24) hours after receipt of written notice from the Township, the Township may backfill said depression wherever necessary without giving previous notice to the CONTRACTOR and the cost charged to the CONTRACTOR.

3.18 RESTORATION OF HIGHWAY SHOULDERS

Subsequent to the acceptable backfilling of trenches, the CONTRACTOR shall shape and roll the full width of the shoulder until it is stabilized and restored to a condition satisfactory to the Township. Any additional material required to restore the shoulder shall be furnished and placed by the CONTRACTOR.

3.19 RESTORATION OF TRENCHES

When the trenches are located within the roadway areas or the public right-of-way, the temporary restoration of roadways, walkways, shoulder, etc. shall commence within one (1) week of the completion of the backfilling of trenches. All the work pertaining to restoration shall be completed, as specified, without undue interruption. Final restoration and resurfacing shall be completed as specified by the appropriate State, County and Township agencies.

3.20 RESTORATION OF EASEMENTS

A. Where the excavations are located in public or private easements, the areas shall be restored to their proper conditions, as closely as practical. The restoration shall commence immediately after backfilling of trenches with proper conditions for paving or planting.

B. All the trees, stumps and debris shall be removed form the site in a satisfactory manner and disposed of at proper locations, as directed by the ENGINEER.

C. The CONTRACTOR shall restore the area to its original conditions, as closely as practical. The restoration shall include, but not be limited to, regrading the area, placing of topsoil, replanting the shrubbery, repair or replacement of sidewalks, driveways, landscaping, etc. and any damage during construction.

D. The CONTRACTOR shall take necessary precautions to protect the property, trees shrubs, etc. in the areas adjoining to right-of-way lines. Any damages caused during construction to such areas shall be repaired or replaced at the CONTRACTOR's expense.

E. As the restoration work is completed, all surplus earth and other materials shall be disposed of in a satisfactory manner.

F. If the CONTRACTOR fails or neglects to commence the restoration work as specified, he shall assume all responsibilities and expenses for all damages arising out of such non-compliance.

3.21 RESTORATION OF WETLANDS

A. Excavations located in wetlands shall be restored to their existing natural grade.

B. The top eighteen inches (18") of all trenches in wetlands shall be backfilled with topsoil previously stripped from the trench.

C. All excess excavated material, and any other miscellaneous material shall be removed from the wetlands.

END OF SECTION

SECTION 02270
EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

The CONTRACTOR shall provide labor, equipment, tools, materials, and services needed to accomplish work as described herein and as shown or called out on the Drawings.

PART 2 - PRODUCTS

2.01 MATERIALS

All materials shall be in accordance with the description herein and as shown or called out on the Drawings.

PART 3 - EXECUTION

3.01 PROCEDURES

A. All measures instituted to prevent erosion and control sedimentation shall be in accordance with the permit and approval obtained by the Developer from the Chester County Conservation District prior to the start of construction.

B. The CONTRACTOR shall schedule and conduct his operations to minimize erosion of soils and to prevent silting and muddying of wetlands, streams, rivers, irrigation systems and impoundments (lakes, reservoirs, etc.). Construction of drainage facilities and performance of the contract work which will contribute to the control of erosion and sedimentation shall be carried out in conjunction with earthwork operations, or as soon thereafter as practicable. The area of bare soil exposed at any one time by construction operations shall be kept to a minimum.

C. Prior to the suspension of construction operations for appreciable lengths of time, the CONTRACTOR shall shape the earthwork in a manner that will permit storm runoff with a minimum of erosion. Temporary erosion and sedimentation control measures such as berms, dikes, or slope drains, deemed necessary by the ENGINEER or Township's Representative shall be provided and maintained until permanent erosion control features are completed and operative. Temporary erosion control measures will be considered as a subsidiary obligation of the CONTRACTOR during the course of his work.

D. The CONTRACTOR shall also conform to the following practices and controls:

1. Waste or disposal areas and construction roads shall be located and constructed in a manner that will keep sediment from entering streams.

2. When work areas are located in or adjacent to drainage facilities, such areas shall be separated from the easement by a dike or other barrier to keep sediment from entering a drainage easement. Care shall be taken during the construction and removal of such barriers to minimize the siltation of adjacent drainage facilities or streams.

3. Pollutants such as fuels, lubricants, bitumens, raw sewage and other harmful materials shall not be discharged into or near rivers, streams, wetlands, and impoundments, or into natural or manmade channels leading thereto. Washwater or waste from concrete mixing operations shall not be allowed to enter live streams, or discharged in wetlands.

4. All applicable regulations of fish and wildlife agencies and statutes relating to the prevention and abatement of pollution shall be complied with in the performance of the contract.

5. All areas of disturbed earth, not originally paved, shall be temporarily or permanently seeded immediately upon completion of work, if the area is not to be redisturbed prior to final grading and seeding. Disturbed areas (outside wetlands) which are not at finished grade and which will be re-disturbed within one year shall be seeded with a quick growing temporary seeding mixture and mulched. Disturbances in wetlands and/or disturbed areas which are either at finished grade or will not be re-disturbed within one year shall be seeded with a permanent seed mixture and mulched. If construction takes place during the winter months, the disturbed area shall be mulched immediately upon completion of work, if the area is not to be redisturbed prior to final grading and seeding. Refer to Section 02920 for specifications on mulching material and temporary and permanent seed mixtures and the application thereof.

6. When drainage ways are crossed, they shall not be left blocked overnight if this blockage could cause siltation downstream, or flooding to adjacent property. All drainage ways shall be restored to existing conditions or improved as directed by the ENGINEER or Township's Representative.

7. Dumping of excavated or spoil material into adjacent streams, or on the banks of the stream where it may wash or slide into stream waters shall not be permitted. Dumping of excavated material, other than for stockpiling for backfilling of trenches, shall not be permitted in wetlands.

8. Pumping of silt laiden water from trenches into streams or wetlands shall not be allowed.

9. All construction equipment shall be operated in such a manner as to prevent pollution of any streams.

10. Temporary stream crossings will be used to convey equipment and materials from one stream bank to the other. Under no circumstances will construction equipment be permitted to cross natural stream channels.

11. Excavated material or new backfill shall not be stored between trenches and bodies of water, rather they shall be stored on the opposite side of the trench.

12. All restoration work shall proceed as the work progresses and not left until end of the project.

13. Any sediment cleaned from the erosion and sedimentation controls must be legally disposed off site.

E. When it becomes necessary, the ENGINEER or Township's Representative will inform the CONTRACTOR of unsatisfactory construction procedures and operations insofar as erosion control and water pollution are concerned. If the unsatisfactory construction procedures and operations are not corrected promptly, the ENGINEER or Township's Representative may suspend the performance of the construction until the unsatisfactory condition has been corrected.

END OF SECTION

SECTION 02310
BORING AND JACKING OPERATIONS FOR HIGHWAY CROSSINGS

PART 1 - GENERAL

1.01 DESCRIPTION

The CONTRACTOR shall furnish all labor, materials and equipment required to install a steel casing for the proposed highway crossing as shown on the Drawings. The work shall include casing installations by specified methods, design of jacking pit sheeting and shoring, excavation and backfill, maintaining the tunnel and pits free of water, furnishing and installation of the steel casing pipe, furnishing and installation of ductile iron carrier pipe, grout backfill (inside and outside), end seals, and restoration of all disturbed areas following the satisfactory completion of work and required testing.

1.02 QUALITY ASSURANCE

The CONTRACTOR or Subcontractor proposing to do the work shall demonstrate to the Township and the ENGINEER the successful completion of at least four (4) similar casing installations within the past five (5) years of comparable diameter and length.

1.03 SUBMITTALS

The methods and materials for the construction of each crossing must be approved by the ENGINEER prior to the start of construction of the crossing. CONTRACTOR shall submit his proposed construction procedures and other information as may be necessary for review by the ENGINEER. Such submittals shall include drawings of jacking pits and method of construction prepared and sealed by a Registered Professional Engineer and a detailed narrative of proposed construction procedures.

1.04 JOB CONDITIONS

A. The CONTRACTOR shall give written notice to PennDOT, with copies to the Township and ENGINEER not less than fourteen (14) days in advance of when he or his subcontractor will start work within the highway right-of-way in order that work can be properly coordinated. CONTRACTOR should note that if proposed work involves construction operations through the property owned or controlled by PennDOT, all work shall be performed in a manner satisfactory to their engineers or their authorized representatives and in accordance with the roadway occupancy permit. The road traffic shall be maintained at all times with safety and continuity and the CONTRACTOR shall conduct all of his operations on or under the highway right-of-way fully within the rules, regulations and requirements of PennDOT. The CONTRACTOR shall be responsible for acquainting himself with such requirements as PennDOT may demand. The CONTRACTOR shall be responsible for traffic safety. The CONTRACTOR shall be responsible for any injury to persons and damage to property.

B. The CONTRACTOR shall be fully responsible for the design, safety and adequacy of the jacking and/or tunneling and for the proper construction, handling, placing, maintaining, operating and removing of all equipment materials and related services.

PART 2 - PRODUCTS

2.01 CASING PIPE

Casing pipe shall be steel having a minimum yield strength of 35,000 psi. Pipe ends shall be beveled with a single V-groove for field welding. Pipe joints shall be butt welded by a certified welder with a full penetration weld on the outside circumference of the pipe. If required, fittings for outside grouting shall be as shown on the Drawings. The casing pipe shall be 6-8 inches larger than the outside diameter of the carrier pipe bells.

2.02 GROUT

Grout shall be a uniform mixture of 1:6 cement grout.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. The steel casing shall be installed by means of the Boring or Drilling Method. All equipment and methods shall be approved by the ENGINEER or Township's Representative and PennDOT. All supervisory and operating personnel engaged in the operation of boring or drilling equipment shall be fully qualified for such work and shall have had at least twelve (12) months experience in the operation of the equipment being used.

The casing pipe shall be installed true to line and grade as shown on the Drawings. Bored installations shall have a bored hole essentially the same as the outside diameter of the pipe. If voids should develop or if the bored hole diameter exceeds the outside diameter of the casing, grouting or other approved methods shall be employed to fill such voids at the CONTRACTOR's expense.

When augers or similar devices are used for casing pipe placement, the front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe and thereby assuring that there will be no unsupported excavation ahead of the pipe. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. The face of the cutting head shall be arranged to provide reasonable obstruction to the free flow of soft or poor material. Plans and descriptions of the auger stop arrangement to be used shall be submitted to the ENGINEER for approval, and no work shall proceed until such approval is obtained and the arrangement is inspected in the field by the ENGINEER or Township's Representative. Work started prior to this inspection will be halted and the installed casing abandoned in place.

B. Sheeted and shored pits shall be constructed for boring or jacking the casing. The CONTRACTOR shall submit the proposed design for supporting the pit walls to the ENGINEER for review and approval. The sheeting/shoring design shall be prepared by a Professional Engineer, licensed to practice in the Commonwealth of Pennsylvania. If a jacking machine is used with an auger as a vehicle removing the material, the machine must be able to jack independent of the auger. The use of water or other liquids to facilitate casing placement and spoil removal is prohibited. Installation of the steel pipe casing shall start at the low end.

C. The boring operation shall be continued without interruption, except to install new lengths of casing pipe. The lengths of the casing pipe shall be joined by bevel cut full penetration welds. The joints shall be welded completely around the circumference of the pipe so as to prevent water leakage from the casing throughout its length. After the joints are formed, the welds shall be coated with a bituminous coating at least two (2) mils in thickness.

D. If groundwater is encountered during the installation of the casing and the carrier pipe, the CONTRACTOR shall take all steps necessary to maintain dry conditions in the boring pit including channels, water collection wells, embankments, and pumping. Extreme care must be taken by the CONTRACTOR so that soil and/or soil fines are not removed by erosion during the dewatering operation. The discharge water shall be clear. If during the dewatering operation unstable soil conditions occur, the CONTRACTOR shall take all necessary steps to rectify the problem by stabilizing the soil. The CONTRACTOR shall provide sedimentation and erosion controls. No water pumped from excavations will be permitted to be pumped directly to sewers, inlets, or to a creek, but must first be filtered through a sedimentation trap or other approved sedimentation control device prior to discharge.

E. In the event that voids develop between the casing and the surrounding soil, or if the casing passes through rock, the outside of the casing shall be grouted by the CONTRACTOR with cement grout.

F. After the casting has been installed, the carrier pipe shall be installed as follows:

1. Unless otherwise approved by the ENGINEER, the carrier pipe shall be installed in accordance with the Standard Details. Spacers shall be installed on the carrier pipe and arranged in accordance with the manufacturer's recommended instructions to maintain the proper horizontal and vertical alignment of the carrier pipe inside the casing.

G. The ends of the casing shall be permanently sealed with brick masonry after inspection and after all tests have been completed and accepted by the ENGINEER.

H. If applicable, special requirements of PennDOT, or the railroad owning the right-of-way to be crossed shall apply.

I. The CONTRACTOR shall provide a bulkhead and sandbags on site. CONTRACTOR shall provide a stockpile of gravel sufficient to make emergency restoration of undermined areas. CONTRACTOR shall also provide lights for night work. Lights are to be aimed into the excavation and must not be directed toward roadway traffic, or buildings.

J. Where jacking is to pass through grouted soil, no jacking shall proceed until satisfactory test reports are received by the ENGINEER and the ENGINEER provides written authorization to commence jacking operations.

K. Objectionable debris shall be disposed of at approved locations, and the work areas left in a neat and slightly condition.

END OF SECTION

SECTION 02511
PAVING RESTORATION

PART 1 - GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall furnish all labor, materials and equipment required to restore all paving removed or damaged by construction operations and place new paving as required.

B. Repaving of Township roads shall be done in strict accord with regulations and requirements of Willistown Township.

C. Repaving of state roads shall be done in strict accordance with regulations and requirements of PennDOT.

D. All openings or holes cut through any paving for test holes, borings, well points, or for any reason shall be replaced in accordance with these Specifications at the CONTRACTOR's expense.

1.02 QUALITY ASSURANCE

A. Use only materials which are furnished by a bulk bituminous concrete producer regularly engaged in production of hot-mix, hot-laid bituminous concrete and is listed in PennDOT Bulletin 41, List of Commercial Producers of Bituminous Mixtures, or by a Redi-mix cement concrete producer as listed in Publication 42, List of Commercial Producers of Redi-mix concrete.

B. Referenced Standards:

Pennsylvania Department of Transportation (PennDOT):

Regulations Governing Occupancy of Highways by Utilities (67 PA Code, Chapter 459)
Publication 408 - Specifications, 1990 as Amended
Publication 27 - Specification for Bituminous Mixtures (Bulletin 27)
Publication 37 - Specification for Bituminous Materials (Bulletin 25)
Publication 213 - Work Zone Traffic Control Guidelines
Publication 30 - Portland Cement Concrete (Bulletin 5)
Publication 72 - Standards for Roadway Construction

1.03 SUBMITTALS

Submit a Statement of Compliance, together with supporting data, from bituminous and aggregate suppliers attesting that the materials conform to the State Specifications.

1.04 PROJECT/SITE CONDITIONS

A. Take measures to control traffic during repaving operations. Do not allow traffic on repaved areas until authorized by the ENGINEER or Township.

B. All paving damaged by the CONTRACTOR's operations beyond the limits of work shall be restored to its original condition at the expense of the CONTRACTOR.

PART 2 - PRODUCTS

2.01 CONCRETE

Refer to Section 03010.

2.02 BITUMINOUS PAVING MATERIALS AND AGGREGATES

Refer to PennDOT Publication 408 Specifications. All bituminous materials and aggregates used in paving and resurfacing are designated and shall conform to the applicable portions of the State Specifications.

PART 3 - EXECUTION

3.01 PAVEMENT RESTORATION IN TOWNSHIP ROADS

A. Temporary paving must be maintained until replaced by permanent paving. Temporary paving shall be performed as shown on the Standard Details.

B. All paving removed or damaged by construction operations, shall be replaced in kind and/or repaired as specified herein. All paving damaged beyond limits herein specified, shall be replaced with new paving at the CONTRACTOR's expense.

C. All work shall meet the requirements of the Pennsylvania Department of Transportation for replacing pavement over all excavated or disturbed areas of the improved surface of the right-of-way.

D. When temporary road patching has been in place for at least 90 days, temporary patching shall be removed and replaced with five inches (5") of Superpave asphalt mixture design, HMA base course, 3 to <10 million ESALS, 25.0 mm mix; two inches (2") of Superpave asphalt mixture design, HMA binder course, 3 to <10 million ESALS, 19.0 mm mix; and 1½ inches (1½ ") of Superpave asphalt mixture design, HMA wearing course, 0.0 to <0.3 million ESALS, 9.5 mm mix. The base course shall be flush with the surface of the existing base coarse pavement. The base coarse shall extend a minimum one foot (1 foot) (cutback 5" deep and 1' wide into the existing base coarse, and or subbase) on each side of the original excavation.

E. The placing of bituminous material for base and surface courses of permanent pavement replacement shall terminate between October 15 and October 31, and shall not be resumed prior to April 1 to April 15 as determined by the ENGINEER, depending upon weather conditions. Bituminous material for base and surface courses of permanent pavement replacement shall not be placed when the air temperature is 40 degrees F. or lower; nor when the temperature of the pavement, base or binder on which it is to be placed is 40 degrees F. or lower, as determined by the ENGINEER.

F. At joints between existing pavements and repaving work, the edges of existing pavements shall be cut back parallel with the trench at right angles, neatly trimmed, and approved by the ENGINEER. An application of Class AC-20 asphalt cement shall be provided at all locations where new bituminous pavement joins existing bituminous pavement; no separate or additional payment will be made for this work.

3.02 PAVEMENT RESTORATION IN STATE HIGHWAYS

A. All paving removed or damaged by construction operations shall be replaced as specified. All paving damaged beyond the limits specified shall be replaced with new paving at the CONTRACTOR's expense.

B. Prior to the installation of new pavement, the existing subbase adjacent to the trench, and trench backfill shall be compacted as specified in PennDOT Publication 408, Section 350.3(e).

C. Base course cement concrete shall conform to PennDOT Publication 72, Standards for Roadway Construction, RC-20, RC-26, and RC-27, and Publication 408, Section 301. The base course concrete pavement shall be doweled into the existing concrete pavement along the longitudinal joint and at each end of the new pavement. For trenches perpendicular to the roadway, the existing cement concrete pavement shall be cut back and the new base course concrete installed as specified in PennDOT Publication 72.

D. The bituminous concrete base course and wearing course shall not be installed until the cement concrete base course has developed a minimum compressive strength of 3000 PSI as determined by compressive tests made on cylinder specimens, in accordance with Pennsylvania Test Method No. 604. When the base course cement concrete has achieved the required compressive strength, the bituminous base course and wearing course shall be installed, extending one foot (cut back 12" wide into the existing bituminous pavement) on each side of the base course concrete. The existing bituminous pavement shall be squared so that patch boundaries are either parallel or perpendicular to the trench line. A tack coat of type E-1 bituminous material shall be applied to the concrete prior to the placement of the bituminous paving.

E. All work shall meet the requirements of PennDOT for replacing and patching pavement, over all excavated or disturbed areas of the improved surface, within the right-of-way.

3.03 REPLACEMENT OF DRIVEWAYS, CURBING AND SIDEWALKS

A. Curbing and sidewalks that have been damaged or removed during construction shall be replaced in kind as shown on the Drawings. All joints between existing curb and sidewalk and replacement work shall be saw cut at right angles and neatly trimmed. Provide 1/4" premolded expansion joint material between old and new joints.

B. For bituminous paved residential driveways, the replacement paving shall consist of a crushed stone base course and a bituminous concrete surface course. The base course shall not be less than eight inches (8") thick after compaction, and the top surface thereof shall not be less than four inch (4") below the surface of the adjacent existing paving. The bituminous concrete surface course shall consist of a four inch (4") thick wearing course of ID-2A bituminous concrete. The top surface shall be flush with the surface of the adjacent existing paving.

C. Cement concrete residential driveways shall be replaced by the CONTRACTOR using Class "A" concrete conforming to the requirements specified in PennDOT Publication 408, Section 704. The replaced driveway shall be of the same thickness, workmanship and surface finish as the original driveway unless otherwise required by the ENGINEER.

3.04 TESTING

A. Obtain a minimum of one 6" diameter core sample for each 500 linear feet of permanent paving, or fraction thereof, for test of depth of bituminous material courses.

B. Take core samples at locations as directed by the ENGINEER after final compaction rolling.

C. Bituminous or cement concrete courses deficient more than 1/4-inch from the specified depth in any one sample, or uniformly more than 1/8-inch in three or more samples, shall be removed and replaced to the correct depth.

D. Refill and compact test holes with material acceptable to, and under direction of, the ENGINEER.

END OF SECTION

SECTION 02605
MANHOLES, VAULTS AND COVERS

PART 1 - GENERAL

1.01 DESCRIPTION

The CONTRACTOR shall furnish and install precast reinforced concrete manholes as indicated on the Drawings. All precast structures shall be of the same manufacturer and shall be subject to the ENGINEER's approval.

1.02 SUBMITTALS

A. Submit certified dimensional shop drawings and manufacturer's product data on precast manhole sections and bases, frames and covers, steps, resilient pipe-to-manhole connection gasket and joint sealant compound.

B. Submit a Statement of Compliance together with supporting data from the materials supplier attesting that the materials meet or exceed specification requirements.

1.03 QUALITY ASSURANCE

A. Design loading shall include dead load, live load, impact, loads due to water table, handling stresses before and during installation, and any other loads indicated on the Drawings. Live loading shall be for A-16 per ASTM C890. A live load shall be considered as that load which produces the maximum shear and bending moments in the structure.

B. All manhole steps furnished for the project must be acquired from the same manufacturer, and the manufacturer must be approved by the Pennsylvania Department of Transportation and listed in PennDOT Publication No. 35, Bulletin 15.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Crushed stone subbase shall be 2A coarse aggregate in accordance with PennDOT Publication 408. Slag based subbase and backfill materials will not be permitted.

B. Concrete: Refer to Section 03010 - Concrete for Utility Construction.

C. Joint Sealant Compound: Provide a double ring of preformed sealing compound conforming to ASTM C990, so that the joint will remain watertight under all conditions of service, including movement due to expansion, contraction and normal settlement. Sealant compound shall be "Butyl-Lok" as manufactured by A-Lok Products, Inc., or approved equal, which shall contain a moisture insensitive epoxy resin, capable of bonding concrete and masonry surfaces down to 32°F.

2.02 MANHOLES

Precast concrete manholes, riser sections, and bases shall be manufactured in accordance with ASTM C478. Manholes shall have an internal diameter of four feet unless otherwise noted on the Drawings. The cone section shall be an eccentric type with a minimum 24" access opening.

2.03 APPURTENANCES

A. Manhole Frames and Covers: Grey cast iron conforming to ASTM A48 Class 30 or better. Contact surfaces shall be machined and matched, and the frames and covers shall conform to the details shown on the drawings. They shall be smooth, free from scale, lumps, blisters, cracks, holes, swells, and cold shuts and other imperfections. Frames and covers shall be coated with asphalt paint with a smooth finish. Covers shall fit the frame in any position. The letters shall be cast on the cover in two inch (2") high letters. Frame and cover shall be East Jordan Iron Works Catalog No. 1835Z1 and 1835A1, or approved equal. Watertight frame and cover shall be East Jordan Iron Works Catalog No. 1040APT and 1045ZPT, or approved equal. All manhole frames and covers shall be HS-20 load rated.

B. Manhole Inserts: Manhole inserts shall be provided for standard manhole frames located within roadways, and shall conform to the dimensional details shown in the drawings for standard manhole frames and covers. They shall be made from a "durable" High Density Polyethylene Copolymer material that meets ASTM Specification Designation D-1248 Class A, Category 5, Type III, as supplied by Parson Environmental Products, or approved equal. Manhole inserts shall incorporate two 3/16" holes 180-degrees apart, approximately 1" from the top of the insert to allow for ventilation. They shall have a corrosion resistant nylon strap installed for easy removal and re-installation into the manhole frame.

C. Manhole steps shall meet one of the following specifications:

1. Plastic coated steel: ASTM A615, Grade 60 deformed reinforcement bar, coated with copolymer polypropylene plastic conforming to the requirements of ASTM D2146, Type II, Grade 43758.

D. Resilient Pipe Connection Gasket: Conforming to ASTM C923 and integrally cast into manholes as indicated on the Drawings. The gasket shall be A-Lok as manufactured by A-Lok Products Corporation of Tullytown, PA; or equal.

2.04 PROTECTIVE COATINGS

All outside surfaces of manholes shall receive two (2) coats of Koppers, 300-M epoxy coating or approved equal, with a minimum dry film thickness of 8 mils each for a total dry film thickness of 16 mils. The concrete surfaces shall be cleaned and free from all loose concrete or soil particles before application of any coatings. The coating shall be placed on entire exterior surfaces from the top of bottom slab to bottom of the frame and cover. The protective coating may be applied in the shop.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The CONTRACTOR shall provide an excavation of sufficient size to accommodate the outside dimensions of the structure as shown on the Drawings. Prior to setting the unit, the CONTRACTOR shall prepare an 8" minimum base of compacted 2A stone suitable for receiving the structure. The base material shall be compacted and leveled to the elevations shown on the Drawings.

B. The CONTRACTOR shall provide sufficient labor and equipment to unload and place the units. Should rental of a crane be required for unloading and setting the unit, it shall be coordinated with the manufacturer's dispatch office in sufficient time to acquire the equipment.

C. The bases for manholes shall be precast. The inlet and outlet pipes shall be set to proper grade, with their ends flush with the inside of the manhole prior to placement of concrete.

D. All precast sections of manholes shall be lifted and moved by use of suitable lifting slings and lugs to prevent damage to the precast joint edge. If minor damage occurs to the precast sections, such damage will be repaired in the presence of, and to the satisfaction of the ENGINEER.

E. All manhole joints between sections shall receive a 1" equivalent diameter joint sealant. One layer of tape shall be applied to both inside and outside flanges of the manhole section groove before lowering the precast unit in place. This should be done is such a manner that when the modules are pressed together, a small amount of excess bonder is forced out of the joint area evenly. If no bonder is forced out of the joint area, immediately pull apart the top section and repress the units together.

F. Pipes entering precast sections shall be set securely in the opening provided, to the correct line and grade shown on the Drawings. Concrete shall be placed under the pipes for a minimum of three (3) feet from the manhole wall or within six (6) inches of the pipe joint.

G. Leveling the manhole sections by use of wedging or placing shims will not be permitted. Manholes shall not be backfilled without the permission of the Township or ENGINEER.

H. Manholes shall be constructed as promptly as practical to coincide with the adjacent sewer pipe construction. If the construction of the manholes is unnecessarily delayed, Willistown Township shall have the authority to stop trenching and pipe laying until manholes are constructed to complete sections of sewer.

I. The top of all precast manholes shall be brought to proper grade for receiving manhole frames, by adding concrete grade rings. The joints between these rings shall be constructed to be watertight, and shall meet the specifications for joints as specified above. A maximum of five (5) rings may be constructed above the cone.

J. Precast grade rings shall meet the requirements of ASTM C-478 with 4000 psi concrete. The grade rings shall be 8" wide x 2" thick, and shall be full or one piece circular sections. Holes shall be provided in the grade ring at suitable locations to receive anchor bolts. Grade rings shall be laid in a minimum 1/8" thick (1/8" thick after spreading) of Butyl-Lok sealant, or approved equal. Application shall be by hand or trowel.

K. Construct drop connections as indicated on the Drawings.

L. All manholes as indicated on the drawings shall be provided with a short piece of pipe, approved stopper and plug for future connections. Where future drop connections are to be made, complete vertical drop connections shall be installed. The plugs and stopper shall be set in 1:2 cement mortar. Proper support shall be provided for the piping outside the manhole. The opening inside and outside the manhole shall be filled with cement mortar to provide a neat watertight connection.

M. Doghouse manholes shall be constructed per the Drawings.

3.02 MANHOLE TESTING

A. The testing equipment shall be an NPC Manhole Vacuum Tester as supplied by NPC Systems, Inc., Milford, NH, or approved equal.

B. Manholes shall be vacuum tested using the following procedure:

1. All manholes shall be tested after manhole is brought to final grade and castings attached.

2. Plug all sewer openings, taking care to securely brace the plugs and the pipe.

3. Connect the vacuum pump to the outlet port with the valve open.

4. Draw a vacuum of 10" of mercury and close the valve. Start the test.

5. Determine the test duration for the manhole from the following Table:

VACUUM TEST TABLE

Manhole Depth (ft.)	Manhole Diameter and Test Period (Sec.)		
	48" dia.	60" dia.	72" dia.
0-10	60	90	120
10-20	90	120	150
20-30	120	150	180

6. Record the vacuum drop during the test period. If the vacuum drop is greater than 1.0" of mercury during the test period, repair and retest the manhole. If a vacuum drop of 1" of mercury does not occur during the test period, discontinue the test; the manhole will be accepted.

   a. If the manhole fails the initial test, the CONTRACTOR shall locate any leaks and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material.

END OF SECTION

SECTION 02700
SEWERAGE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Ductile iron and PVC gravity sewer piping
2. Ductile iron and PVC force main piping
3. PVC and HDPE low pressure force main piping
4. Sewer pipeline testing

1.02 SUBMITTALS

A. Submit a Statement of Compliance, together with supporting data, from each product supplier attesting that the pipe, pipe fittings, joints, joint gaskets and lubricants meet or exceed specification requirements.

B. Submit manufacturer's instructions for installation of adapters and for assembly of mechanical, push-on and compression type joints, including the manufacturer's maximum recommended deflection per joint. Submit tightening torque requirements for anchor studs, set screws, and bell bolts.

1.03 QUALITY ASSURANCE

A. Materials contaminated with gasoline, lubricating oil, liquid or gaseous fuels, aromatic compounds, paint solvent, paint thinner, or acid solder will be rejected.

B. Pipe strengths specified shall be provided unless otherwise indicated on the Contract Drawings. Pipe fittings shall be of the same strength rating as the piping on which they are installed.

1.04 PRODUCT HANDLING, DELIVERY AND STORAGE

A. A packing list shall accompany every delivery made to the site. Absence of such a list may cause refusal of shipment. The packing list shall contain complete information, including customer's order number, contract number, truck number, truck routing, kind and class of pipe, diameter, weight per pipe, length of pipe, and date or other plant identification of the particular lot of pipe contained in the shipment. A copy of the packing list shall be submitted to the ENGINEER or OWNER's representative as soon as practicable after the delivery of the pipe to the job site.

B. During loading and unloading, care shall be taken in handling all pipe and fittings so as not to damage in any way the exterior coating or the lining. Under no circumstances shall a pipe or fitting be dropped. In unloading, mechanical equipment should be used whenever possible.

C. The hook - sling method of lifting pipe, in which hooks or similar devices are inserted into each end of the pipe for lifting, will not be permitted. One acceptable method would be use of the single or double sling, which is placed around the barrel of the pipe. Pipe being unloaded on skids shall not be rolled or skidded against pipe already on the ground.

D. PVC pipe shall be protected from exposure to ultraviolet light.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE FOR SEWAGE FORCE MAINS

A. Pipe shall conform to ANSI A21.51/AWWA C151 Class 52. Furnish pipe with double thickness cement mortar lining and seal coat in accordance with ANSI A21.4/AWWA C104. All piping shall have gasketed push-on type or mechanical joints conforming to ANSI A21.11/AWWA C111.

B. Fittings shall be standard or compact size and of ductile iron in accordance with ANSI A21.10/AWWA C110 and ANSI A21.53/AWWA C153. Provide mechanical or push-on joints for sewage force main piping. Furnish fittings with double thickness cement mortar lining and seal coat consistent with pipe.

C. All ductile iron pipe and fittings located inside structures shall be flanged. Flanged ductile iron pipe shall conform to ANSI A21.15/AWWA C115 Class 53. Flanges shall be flat faced conforming to ANSI B16.1 Class 125. Raised face flanges will not be permitted. Gaskets shall be full faced rubber, 1/8" thick conforming to ANSI A21.10/C110. Nuts and bolts for flanged joints shall be low alloy steel conforming to the requirements of ANSI B16.1.

D. All pipe and fittings located inside structures shall be primed with an epoxy polyamide exterior coating minimum 4 mils DFT (TNEMEC Series 66, or equal).

2.02 DUCTILE IRON PIPE FOR GRAVITY SEWER MAINS

A. Pipe shall conform to ANSI A21.51/AWWA C151 minimum Class 50. Furnish pipe with double thickness cement mortar lining, and seal coat in accordance with ANSI A21.4. All piping shall have gasketed push-on type joints conforming to ANSI A21.11/AWWA C111.

B. Fittings shall be ductile iron or gray iron in accordance with ANSI A21.10/AWWA C110 and ANSI A21.11/AWWA C111 Standards. Furnish fittings with double thickness cement mortar lining and seal coat consistent with pipe.

2.03 POLYETHYLENE ENCASEMENT FOR DUCTILE IRON PIPE

In areas with corrosive soils, all pipe, fittings and appurtenances shall be installed with polyethylene encasement. In the event the Drawings do not indicate any encasement or the limits of the encasement, the decision of the ENGINEER or Township's Representative shall determine the location where the encasement shall be used. All costs related to soil sampling, analysis and inspection shall be borne by the CONTRACTOR. The polyethylene encasement shall be 8 mils thick and installed in accordance with Method A of ANSI A21.5/AWWA C105.

2.04 PVC PIPE FOR GRAVITY SEWER MAINS AND LATERALS

A. Pipe and fittings shall conform to ASTM D3034, SDR-35.

B. Elastomeric seal material shall comply with the requirements of ASTM F477. Joints shall be designed in accordance with ASTM D3212.

2.05 PVC PIPE FOR SEWAGE FORCE MAINS

A. Pipe and fittings shall conform to ASTM D2241, SDR 26, 160 psi pressure rating. Joints shall be designed in accordance with ASTM D3139.

B. Elastomeric seal material shall comply with the requirements of ASTM F477.

2.06 PVC PIPE FOR LOW PRESSURE SEWAGE FORCE MAINS

A. Pipe and fittings shall conform to ASTM D1784, D3915, and ASTM D2241 – SDR 21. All joints shall be push-on type using flexible elastomeric seals.

B. Elastomeric seal material shall comply with the requirements of ASTM F477. Joints shall be designed in accordance with ASTM D3212.

C. All fittings shall be Iron Pipe Size (IPS) manufactured in one piece of injection molded PVC compound meeting ASTM D1784. Fittings shall be Class 200 and conform to the requirements of SDR 21.

D. Lateral cleanout fittings shall be Schedule 40 PVC.

2.07 HDPE PIPE FOR LOW PRESSURE SEWAGE FORCE MAINS

A. High Density Polyethylene (HDPE) pipe and fittings shall conform to ASTM D3035 and ASTM F714 – DR 11. All joint connections shall be made using compression fittings conforming to ASTM D3035 or electrofusion fittings conforming to ASTM F1055.

B. All fittings shall be Iron Pipe Size (IPS) manufactured from polypropylene compound. Fittings shall have outside o-ring sealed compression ends as manufactured by Cepex, or approved equal. Buried solvent weld joints will not be permitted.

2.03 PUMP DISCHARGE VALVES AND PIPING

A. Provide a hydraulically sealed quick disconnect discharge flange and 90° elbow for each pump.

B. Provide flanged, double thickness cement-lined, ductile iron pipe and fittings from the pump discharge flange through the valve pit. All valves in the valve pit must have extensions for ease of operation. Flanged ductile iron pipe shall conform to ANSI A21.15/AWWA C115 with pipe barrel meeting ANSI A21.51/AWWA C151. Fittings shall conform to ANSI A21.10/AWWA C110 with ANSI B16.1 Class 125 flanges. Cement lining shall conform to ANSI A21.4/AWWA C104. The minimum thickness class shall be Class 53.

C. Provide each pump with an iron body, bronze mounted, horizontal swing type check valve with renewable bronze faced disc and adjustable lever and weight or outside lever and spring operator. Valve shall be in accordance with AWWA C508 and rated for 175 psi working pressure. Valve shall be Model A-2600-6-01 or A-2600-6-02, as manufactured by Mueller Company, or equal.

D. Provide each pump with an iron body, resilient seated, solid wedge type gate valve conforming to AWWA C509. Valve shall have a non-rising stem and flanged ends. Furnish valves with handwheel, which opens by turning in a counterclockwise direction. Gate valves shall be Kennedy resilient seated valves, or approved equal.

E. Provide a 4" bypass line connection on the combined pump discharge inside the valve pit. Bypass line shall be used for flushing and draining of force main. Furnish bypass line with resilient seated gate valve and threaded cap.

F. Provide a flanged pressure sensor and a 4-1/2 inch pressure gage or ball valve with gage in the common discharge downstream from the bypass pipe. Gage shall read 0-20 feet greater than the shut-off head of the pumps.

2.04 PRECAST CONCRETE STRUCTURES

A. The pump basin shall consist of precast reinforced manhole sections conforming to requirements of ASTM C478. Precast riser sections shall have dimensions and orientation of piping cutouts as shown on the Drawings. Precast flange-type base shall have hopper type bottom. Precast flat slab top section shall have cutouts for the access hatch frames. No ladder is permitted in the wet well. Provide a minimum of 2 feet freeboard between the pump intake and the wet well liquid low level. Provide junction box NEMA 4X, recessed in wet well cover slab, not within the wet well.

B. The valve pit shall consist of provide watertight precast reinforced rectangular concrete valve pit designed for ASTM C890 A-16 live loading and installation conditions, and manufactured to conform to ASTM C913. Honeycombed or retempered concrete will not be acceptable. Valve pit shall have flange-type base and flat slab top section with cutout for the access hatch and frame. Furnish with aluminum manhole steps or vertical aluminum ladder. Manhole steps shall be as indicated on the Drawings. Provide a valve pit drain line to the wet well with a flap cover at the end, entering with a higher invert than the inlet to the wet well. The valve pit floor shall slope toward the drain line. Provide ventilation/blower if the valve pit depth exceeds 5 feet.

H. The excavation into which the pipe is being laid shall be kept free from water, and no joints shall be made underwater. Water shall not be allowed to rise in the excavation until the joint is complete. Care shall be used to secure watertightness and to prevent damage to joints during backfilling. All pipe joints shall be watertight within allowances established by these Specifications.

I. No pipe shall be lain upon a foundation into which frost has penetrated, nor any time when the ENGINEER or Township's Representative shall deem that there is a danger of formation of ice or penetration of frost at the bottom of excavation. Where the foundation is unstable or consists of rock, a stone or gravel foundation shall be placed and tamped to form an acceptable bed for the pipe.

J. Where sanitary sewer pipe crosses under water or gas or storm sewer lines, eighteen inches (18") of vertical separation shall be maintained. Where eighteen inches (18") of vertical separation cannot be maintained, the sanitary sewer shall be concrete encased ten feet (10') either side of the crossing. Refer to the Drawings for concrete encasement requirements. Also, when crossing water or gas lines, sewer joints shall be equidistant and as far as possible from the water or gas joints.

K. If pipe must be cut to fit as closing pieces, such cuts shall be evenly and squarely made in a workmanlike manner with approved equipment. Injury to linings or coatings shall be satisfactorily repaired.

L. Where pipe is layed on a radius or curvature, each section of pipe shall be deflected at its joint equally with each adjacent pipe.

3.03 LAYING LATERALS AND FITTINGS

A. Connections to the sewer shall be by means of wye fittings, at the locations directed by the OWNER, or as shown on the Drawings. The lateral pipe shall be laid on a 1/4-inch per foot grade, to a point on the right-of-way line, or, as directed by the Township. The lateral pipe stub shall be capped with a watertight pressure type fitting capable of withstanding the sewer tests, and to remain until future connection to the house sewer. The end of all laterals shall be physically marked to show location and depth of pipe end.

B. The Lateral Pipe shall be installed in a trench providing a minimum horizontal separation of 10 feet from the water service. The pipe shall be of PVC to the point where it connects to the main sewer. Fittings shall be of the same material as the sewer main to which the lateral will connect.

C. Where conditions prevent the above vertical separation or when the water service must cross beneath a Lateral Pipe, the bottom of the Lateral Pipe shall be at least eighteen (18) inches above the top of the water service line, and the Lateral Pipe shall be of cast iron pressure pipe with push-on or mechanical joints, at least (10') feet on either side of the crossing.

D. When a Lateral Pipe is installed on filled or unstable ground, it shall be push-on or mechanical joint ductile iron pressure pipe.

3.04 LOW PRESSURE SANITARY LATERAL INSTALLATION

A. All laterals are to be 1-1/2" pipe unless otherwise noted. The pipe is to conform to Section 02610.2.05 of these Specifications.

B. Laterals shall be connected to the sewer main at a wye fitting as shown on the Drawings.

C. The CONTRACTOR is to construct all laterals to the property line and extend a minimum of one foot beyond the connection pit. The laterals must be laid on a bedding of a minimum thickness of 6". The pipe bedding material shall be in accordance with Section 02221 of these Specifications.

D. The free end of all laterals must be plugged with an approved push-on type plug or approved mechanical expansion plug. All plugs must be watertight.

E. All piping and valves are to be installed in the connection pit as shown on the Drawings prior to testing. Lateral piping is to be tested with sewer main piping against the farthest upstream valve in connection pit.

3.05 THRUST BLOCKS

Thrust blocks shall be provided by the CONTRACTOR for force mains where fittings are used to change the direction of pressure pipelines. Horizontal thrust blocks shall be in accordance with the Drawings. Vertical thrust blocks shall be in accordance with the Drawings. The thrust block must be formed against a solid trench wall which is excavated by hand so as not to damage the bearing surface. The thrust blocks must be constructed so the bearing surface is in direct line with the major force created by the pipe or fitting. The bearing surface for each fitting shall be in accordance with the Drawings. No coupling or joint shall be covered with concrete. Thrust blocks are not required for heat-fused PE3408 fittings.

3.06 PRESSURE MAIN TESTING

A. Test each newly laid force main, including any valved section thereof, hydrostatically at a minimum of 100 psi or 125% above the normal operating pressure (whichever is greater) based on the elevation of the lowest point in the pipeline corrected to the elevation of the test gauge. The maximum test pressure shall be 175 psi.

B. The pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Township or Township's Representative. Slowly fill the section to be tested with potable quality water, expelling air from the pipeline at the high points if necessary. After all air is expelled, raise the pressure to the specified test pressure.

C. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings and valves showing visible leakage. Retest.

D. After visible deficiencies are corrected, continue testing at the same pressure for an additional two hours to determine the leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as the quantity of water supplied to the pipeline necessary to maintain test pressure during the period of the test.

E. Compute the maximum allowable leakage by the following formula:

$$L = \frac{SD\,P^{1/2}}{133{,}200}$$

Where: L is the allowable leakage in gallons/hour
S is the length of the section tested in feet
D is the nominal diameter of the pipe in inches
P is the average test pressure in psig

If the line under test contains sections of various diameters, the allowable leakage shall be the sum of the computed leakage for each size.

F. If the test of the pipe indicates leakage greater than that allowed, locate the source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of the amount of leakage.

3.07 GRAVITY SEWER TESTING

A. During construction and at the completion of the work, the CONTRACTOR shall make tests as directed by the ENGINEER or Township's representative to ascertain if the pipe is properly aligned and the joints are tight. The ENGINEER or Township's Representative will witness all tests. The CONTRACTOR is responsible for providing a pressure gauge and a metering device (if required) for the test. The CONTRACTOR shall also furnish a suitable pump and all other apparatus required, and shall pay all costs connected therewith. Defective work shall be repaired or replaced immediately at the CONTRACTOR's expense.

B. Test for proper alignment of PVC pipe by passing a mandrel through all gravity sewer mains. Mandrel size shall be determined from the following table.

Nominal Pipe Size	Outside Diameter of Mandrel
4"	3.68"
6"	5.45"
8"	7.28"
10"	9.08"
12"	10.79"
15"	13.20"
18"	16.13"
21"	19.01"
24"	21.36"
27"	24.06"

C. Test each newly installed section of gravity sewer including laterals for leakage between manholes by the low pressure air method. All sewers shall be backfilled to a depth of not less than two feet above the sewer, and all openings carefully plugged before start of a test. The testing procedure shall be as follows:

1. The air compressors to be used for the tests must be equipped to control the air entry rate and prevent the pressure from exceeding 5 psig. The test shall be performed on pipe with a wet inside condition. All outlets in the section to be tested shall be fitted with air-tight plugs and braced to withstand the applied pressure.

2. After the pipe has been wetted, the air shall be slowly admitted to the test section until a constant pressure of approximately 4.0 psig is reached. If ground water is present, determine its elevation above the springline of the pipe by means of a piezometric tube. For every foot of ground water above the springline of the pipe, increase the starting test pressure reading by 0.43 psig. Do not increase pressure above 10 psig. Allow temperature to stabilize for at least five (5) minutes. During this time all plugs shall be checked for tightness with a soap solution. If leaks are found, the pressure will be released and the plugs tightened to stop the leakage. This procedure shall be repeated until all of the plugged openings are found to be tight. Adjust pressure to 3.5 psig and start test.

3. Determine the test duration for a sewer section with a single pipe size from Table 1 (Ductile Iron Piping) or Table 2 (PVC Piping), as appropriate.

TABLE 1

(Minimum Test Time for a 1 psig Pressure Drop for Ductile Iron Piping)

Nominal Pipe Size, inches	T(time), min/100 ft.	Nominal Pipe Size, inches	T(time), min/100 ft.
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0
15	2.1		
18	2.4		

4. Record the drop in pressure during the test period. If the air pressure has dropped more than 1.0 psig during the test period, the line is presumed to have failed. If the 1.0 psig air pressure drop has not occurred during the test period, the test shall be discontinued and the line will be accepted.

5. If the line fails, determine the source of the air leakage, make corrections and retest. The CONTRACTOR has the option to test the section in incremental stages until the leaks are isolated. After the leaks are repaired, retest the entire section between manholes. The Authority reserves the right to require TV inspection on any section of pipe. Any pipe found broken shall be dug up and replaced by new pipe.

6. For testing of long sections or sections of larger diameter PVC pipes, or both, a timed-pressure drop of 0.5 psig shall be used in lieu of a 1.0 psig timed-pressure drop. If a 0.5 psig pressure drop is used, the appropriate required test time is depicted in Table 3.

7. If lateral or service lines are included in the test, their length may be ignored for computing required test time if the test time requirements are met. If the test section fails, time shall be recomputed to include all the lateral lengths using the following formula:

$$T = 56.67 \left[\frac{\left(D_1^2 L_1 + D_2^2 L_2 + ... + D_n^2 L_n\right)}{\left(D_1 L_1 + D_2 L_2 + ... + D_n L_n\right)} \right] K$$

Where:

T = shortest time allowed for the air pressure to drop 1.0 psig, seconds,
$K = 0.000419 (D_1 L_1 + D_2 L_2 + ...D_n L_n)$, but not less than 1.0,
$D_1 D_2$, etc. = nominal diameter of different size pipe being tested, and
L_1, L_2, etc. = respective lengths of different size pipes being tested.

TABLE 2

(Minimum Specified Time Required for a 1.0 psig Pressure Drop for Size and Length of PVC Pipe Indicated)

Pipe Diameter, In.	Minimum Time, Min:s	Length For Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	--
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	--
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	--
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13.51	15:49	--
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	--
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19.50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

TABLE 3

(Minimum Specified Time Required for a 0.5 psig Pressure Drop for Size and Length of PVC Pipe Indicated)

Pipe Diameter, In.	Minimum Time, Min:s	Length For Minimum Time, ft	Time for Longer Length, s	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	0.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	--
6	2:50	398	0.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	--
8	3:47	298	0.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	--
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	--
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	--
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9.55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57
36	17:00	66	15.384 L	25:39	38:28	51:17	64.06	76:55	89:44	102:34	115:23

NOTE: Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 in. in diameter.

3.08 DEFLECTION TESTING OF PLASTIC SEWER PIPE

A. Perform vertical ring deflection testing on all portions of PVC sewer piping after backfilling has been in place for at least 30 days, but not longer than 12 months.

B. Limit the maximum allowable deflection for installed plastic sewer pipe to 5% of the original vertical internal diameter.

C. Perform deflection testing with a properly sized mandrel.

D. Locate, excavate, replace, and retest pipe exceeding the maximum allowable deflection at the CONTRACTOR's expense.

3.09 TELEVISION INSPECTION OF GRAVITY SEWERS

A. CONTRACTOR shall furnish all equipment, labor, materials and incidentals necessary for documenting the post-construction conditions of newly installed sanitary sewers by the use of closed circuit television. All video inspection shall be conducted in the presence of the ENGINEER. All recordings and reports submitted shall become the property of the OWNER.

B. CONTRACTOR shall employ only competent personnel skilled in this type of work. CONTRACTOR shall have not less than two years experience with closed circuit television inspection and videotaping of sewer lines. ENGINEER may require evidence in the form of records from previous sewer inspections to substantiate any claims concerning the ability of the CONTRACTOR and his equipment to perform as required.

C. Any recorded coverage not acceptable to the ENGINEER shall be refilmed.

D. One complete set of project DVD or CD recordings and reports shall be submitted to the ENGINEER for approval.

E. Each DVD or CD shall have an audio description of the location, size and type of material of the sewer being inspected along with all laterals, defects, cracks, leaks, or cross connections identified. Manhole descriptions and conditions shall also be recorded. The DVD or CD shall in no way relieve the CONTRACTOR from preparing and submitting the written report.

F. A written report of the closed circuit television inspection shall be submitted, in duplicate, outlining the locations and the conditions found which are indicative of leaks, breaks, growths or incrustations, debris, serious misalignment or other adverse conditions. The report shall include, but not be limited to, the following:

1. Location of beginning and terminal structure (station and offset shown on the Drawings).
2. Pipeline material and size.
3. Length of run and stations.
4. Locations of all laterals, pipe breaks, cracks, infiltration, debris, etc. by station.

G. The television camera used shall be one specifically designed and constructed for pipeline inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be operative in 100 percent humidity conditions, the camera shall have a minimum of 600 line resolutions. Picture quality and definition shall be to the complete satisfaction of the ENGINEER.

H. A self-propelled transport shall be employed when a skid mounted television camera cannot be used or winched through the sewer line. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Radios, or other suitable means of communications, as required, shall be set up between the two manholes of the section being inspected.

I. The cable or rod shall have a footage meter so that the location of the television camera and point of observation will be known at all times. The footage readings shall be automatically displayed on the video monitor in the television studio and shall be recorded on the permanent DVD or CD log.

J. To preclude the possibility of tampering or editing in any manner, all DVD or CD recordings must, by electronic means, display continuously and simultaneously generated transparent digital information to include the name of the project, month, day, year, hour, minute and seconds of the day. This transparent alpha-numeric information will appear on the extreme upper-left hand third of the screen.

K. The locations of each manhole, identification of street in which each sewer is located and direction which televising is being done shall be provided.

L. The CONTRACTOR shall furnish professional grade DVD or CD recording equipment and a sufficient quantity of DVD's or CD's to record the work. The DVD or CD recorder shall have sound dubbing facilities that will permit an audio track to be added to the recordings.

M. Prior to televising, CONTRACTOR shall clean the sewer line to permit passage of the camera. Any debris resulting from cleaning operations shall not be permitted to pass through the sewer system, but shall be flushed down to and removed from the downstream manhole of the sewer line.

N. CONTRACTOR shall immediately repair or replace any defective work. Any pipe found broken or crushed shall be replaced by new pipe. Repaired or replaced pipe shall be retested as required by ENGINEER. All sewer lines shall be retelevised after any repairs.

END OF SECTION

SECTION 02730
SUBMERSIBLE SEWAGE PUMPING STATION

PART 1 - GENERAL

1.01 SUMMARY

A. Any applicant requesting permission to construct a pump station and force main, shall conform to this section and all other provisions of these construction specifications. It shall be a condition of approval that the completed system, along with the necessary land and right-of-ways, be dedicated to the Township. Pumping stations are to consist of a duplex sewage pumping station consisting of two (2) submersible pumps and motors, hydraulically sealed discharge flanges, discharge piping, discharge valves, precast concrete pump basin and valve pit, access hatches, lift-out rail system, trash basket, portable hoist assembly, liquid level controls, pump control panel, and all necessary wiring and appurtenances complete in place as indicated on the Drawings.

B. Related Sections

1. Section 02605 - Manholes and Vaults; precast concrete structures.

1.02 SUBMITTALS

A. Complete design calculations computing discharge capacity, system head curve, wet well volumes, float and transducer elevations, and antiflotation requirements.

B. Complete shop drawings including dimensional drawings, descriptive literature, and wiring diagrams by the equipment manufacturer(s) for all equipment items as specified under Section 01010. Include pump characteristic curves.

C. Complete operation and maintenance instructions including a detailed description of operation of each principal component, procedures for operation, instructions for overhaul and maintenance, lubrication schedule, safety precautions, test procedures, parts list and list of local service centers in accordance with Section 01010.

D. Three (3) copies of certified pump performance curves for actual pumps to be supplied shall be submitted prior to delivery for each pump specified in this Section. Curves shall show head versus capacity, horsepower versus capacity, efficiency versus capacity, and NPSH, where applicable. Drawings and curves shall be complete and shall show all information needed to demonstrate that the pumps to be furnished are in accordance with the conditions specified.

E. Maintenance material (spare parts). Provide one complete set of the manufacturer's recommended spare parts for each pump. Provide 100% spare fuses, 100% spare pilot light and alarm light lamps, one (1) spare motor starter coil, and one (1) spare control transformer for control panel. Package each part individually or in sets in moisture proof containers or wrappings clearly labeled with part name and manufacturer's part/stock number. Provide any special tools required for equipment maintenance.

F. Provide separate control diagram with each line numbered and relay contacts indicated and written description of control sequence.

1.03 QUALITY ASSURANCE

A. It is the intent of this Specification that the pumps and wet well, valve chamber and valves, guide rails, trash basket, internal piping, and controls shall be supplied by the pump manufacturer as part of an integrated all in one pump station unit.

B. The CONTRACTOR may supply an equal pump station unit, or may assemble a concrete wet well and pump station in the field, upon approval by the ENGINEER. If any review is required for an equal or field assembled pump station, the cost of said review shall be borne by the CONTRACTOR.

C. The following design and performance criteria must be specified or shown on the Project Drawings:

System Curve Description (3 data points plus design point)
Static Head
Minimum Pumping Efficiency
Motor Speed
Motor Horsepower
Power Requirements
Pump Discharge Size and Solids Handling Size

D. Pumps shall be as manufactured by Barnes Pumps, Inc., or approved equal.

1.04 FIELD SERVICES

Provide the services of a manufacturer's representative experienced in the installation and operation of the pumping station supplied under this specification for not less than one 8-hour workday on-site for installation inspection, start-up and performance testing, and instructing OWNER's operating personnel.

1.05 PUMP STATION LAYOUT

A. Provide access to the pump station site by providing ownership or easement of the property containing frontage on a roadway.

B. Provide a 12" wide paved driveway with a turn-around area for machinery/vehicles.

C. Provide a chain link fence around the pump station to a minimum height of 8 feet, allowing for 3 foot clearance from all interior appurtenances.

D. Provide 6" stone cover over filter fabric on unpaved areas within the enclosure.

E. Provide two accesses in the fencing, one vehicular and one pedestrian.

F. Provide vehicular access individually to the wet well and valve pit without interrupting continuous access in either unit.

G. Provide sufficient distance, as approved by the OWNER's representative, between the control panel and wet well and valve pit to reduce potential for accidents.

H. Provide a site plan indicating all components of the pump station and their layout. Provide a pump station plan (plan and profile), detail sheets, single line diagram for electrical, utilities, and landscaping sheet for review.

I. Provide "same" key locks on all gates, equipment, etc. at the pump station.

PART 2 - PRODUCTS

2.01 SEWAGE PUMPS

A. Sewage pumps shall be heavy duty submersible sewage pumps, field serviceable, with cast iron pump case and motor housing, integral stainless steel motor and pump shaft and stainless steel fasteners.

B. Impellers shall be cast iron with back pressure vanes, statically and dynamically balanced. Impeller size at design point shall not exceed 90% of non-overloading full size impeller over the full range of performance curve operation.

C. Tandem carbon/ceramic mechanical shaft seals with oil chamber between seals shall be provided. Mount an electrode between seals to detect water leaking into seal chamber and actuate a light on the control panel.

D. The rotor shall be supported by upper and lower ball bearings with the lower bronze sleeve or ball bearing to take radial loads from impeller. Minimum ball bearing B-10 life of 30,000 hours.

E. Provide all pumps with a stainless steel data plate, suitably attached to the pump, containing the manufacturer's name, pump size and type, serial number, speed, impeller diameter, capacity and head rating, and other pertinent data.

2.02 PUMP MOTORS

A. Pump motors shall be NEMA Design B, Class F insulated, squirrel cage induction type, sealed submersible motor with open windings operating in dielectric oil and minimum 1.15 service factor. The motor shall be non-overloading between the pump shut-off head and static head with a 1.0 service factor. Motor leads shall be potted in epoxy compound to form leak-proof seal.

B. Protect motor with a heat sensor thermostat to stop motor if overloaded. Thermostat to reset automatically when temperature drops to a safe level.

2.03 PUMP DISCHARGE VALVES AND PIPING

A. Provide a hydraulically sealed quick disconnect discharge flange and 90° elbow for each pump.

B. Provide flanged, double thickness cement-lined, ductile iron pipe and fittings from the pump discharge flange through the valve pit. All valves in the valve pit must have extensions for ease of operation. Flanged ductile iron pipe shall conform to ANSI A21.15/AWWA C115 with pipe barrel meeting ANSI A21.51/AWWA C151. Fittings shall conform to ANSI A21.10/AWWA C110 with ANSI B16.1 Class 125 flanges. Cement lining shall conform to ANSI A21.4/AWWA C104. The minimum thickness class shall be Class 53.

C. Provide each pump with an iron body, bronze mounted, horizontal swing type check valve with renewable bronze faced disc and adjustable lever and weight or outside lever and spring operator. Valve shall be in accordance with AWWA C508 and rated for 175 psi working pressure. Valve shall be Model A-2600-6-01 or A-2600-6-02, as manufactured by Mueller Company, or equal.

D. Provide each pump with an iron body, resilient seated, solid wedge type gate valve conforming to AWWA C509. Valve shall have a non-rising stem and flanged ends. Furnish valves with handwheel, which opens by turning in a counterclockwise direction. Gate valves shall be Kennedy resilient seated valves, or approved equal.

E. Provide a 4" bypass line connection on the combined pump discharge inside the valve pit. Bypass line shall be used for flushing and draining of force main. Furnish bypass line with resilient seated gate valve and threaded cap.

F. Provide a flanged pressure sensor and a 4-1/2 inch pressure gage or ball valve with gage in the common discharge downstream from the bypass pipe. Gage shall read 0-20 feet greater than the shut-off head of the pumps.

2.04 PRECAST CONCRETE STRUCTURES

A. The pump basin shall consist of precast reinforced manhole sections conforming to requirements of ASTM C478. Precast riser sections shall have dimensions and orientation of piping cutouts as shown on the Drawings. Precast flange-type base shall have hopper type bottom. Precast flat slab top section shall have cutouts for the access hatch frames. No ladder is permitted in the wet well. Provide a minimum of 2 feet freeboard between the pump intake and the wet well liquid low level. Provide junction box NEMA 4X, recessed in wet well cover slab, not within the wet well.

B. The valve pit shall consist of provide watertight precast reinforced rectangular concrete valve pit designed for ASTM C890 A-16 live loading and installation conditions, and manufactured to conform to ASTM C913. Honeycombed or retempered concrete will not be acceptable. Valve pit shall have flange-type base and flat slab top section with cutout for the access hatch and frame. Furnish with aluminum manhole steps or vertical aluminum ladder. Manhole steps shall be as indicated on the Drawings. Provide a valve pit drain line to the wet well with a flap cover at the end, entering with a higher invert than the inlet to the wet well. The valve pit floor shall slope toward the drain line. Provide ventilation/blower if the valve pit depth exceeds 5 feet.

2.05 ACCESS HATCHES

A. Access hatches shall consist of aluminum, flush frame type. Provide a double leaf and single leaf hatch for the pump station as recommended by the pump station manufacturer for pump and trash basket removal. Pump station access hatch shall open so as not to interfere with the operation of the portable hoist assembly during pump or trash basket lift-out. Provide a double leaf hatch for the valve pit sized to give clearance above the discharge valves and bypass line. Access hatches shall be of watertight construction.

B. Valve pit hatch shall have 1" channel frame with anchoring flange. Provide 1-1/2" channel drain piping to floor. Channel drain piping shall be black steel with malleable iron fittings. Pump station hatches shall have 1/4" extruded aluminum frame.

C. Provide each hatch with minimum 1/4" thick diamond checkered aluminum plate cover designed for minimum 300 lbs./sq. ft. loading. Furnish hatch with heavy bronze hinges, stainless steel hinge pins, spring-operated lifting mechanism, automatic hold-open arm with release handle, stainless steel inside snap lock, and removable key-wrench lifting handle. Hatches shall be Bilco type J or JD, Halliday W1S or W2S, or other approved equal.

2.06 APPURTENANCES

A. Pump Guide Rails: Non-sparking stainless steel.

B. Pump Mounting Plates and Guide Rail Braces: Stainless steel.

C. Guide Rail Supports: Stainless steel.

D. Pump Lifting Cable: Stainless steel.

E. Fasteners and Hardware: Stainless steel.

F. Pump/Control Cable: Cable shall be supplied by the manufacturer for the entire circuit, starting at the pumps and terminating in the pump control panel. Provide junction boxes as required.

G. Lights: Furnish valve pit with two (2) 100 watt explosion proof lights, which turn on when access hatch is opened. Provide explosion-proof switch with push rod and hardware.

H. Trash Basket: Provide a removable stainless steel trash basket and lift-out rail system as indicated on the Drawings. Attach a 1/4" diameter stainless steel lifting chain to the basket so that the end is within easy reach of the access hatch.

I. Vent Pipe: Provide 4" ductile iron vent with return bend and No. 8 bronze mesh insect screen between two flanges.

2.07 PORTABLE HOIST

Provide a stainless steel portable, adjustable boom (12" to 60" reach), hoist assembly with drop-in socket(s) cast in the top of the wet well and valve pit and show the location(s) on the Drawings. Hoist shall be capable of lifting each pump and rotating each pump so that it can be lowered onto the back of a pick-up truck. Hoist shall also be capable of lifting the trash basket. Furnish with self-locking winch to hold pump in position when crank is released. Furnish hoist with a shackle clamp to attach to pump lifting cable allowing continuous lifting beyond end of hoist cable. Minimum capacity shall be double the pump weight. Provide a drain hole and cap for the mounting socket.

2.08 LIQUID LEVEL CONTROLS

A. Provide a digitally settable dual channel, dual set point controller with high and low alarms. Each channel shall provide separate, adjustable turn-on and turn-off points and shall have Form C (SPDT) type relays to drive motor starters. Alarm set points shall also be adjustable and shall have Form A (SPST) relays. Controller shall accept a 4-20 milliamps signal from a pressure transducer in the wet well. Provide a feature for testing controls and alarms in place. Controller shall also incorporate a channel 1/channel 2 alternator with indicator lamps to display which relay is controlling and an override to set lead channel. Display shall be a 40 segment liquid crystal bargraph display with blinking average indicator.

B. Controller shall be powered by 115 volts rms AC at 60 hertz. Provide a metal oxide varistor (MOV) voltage protection and 2500 volt of isolation in the transformer.

C. Upon power interruption, provide a 10 second time delay for pump 2 start and alarm output relay closure.

D. Provide a float switch input for emergency. Float switch closure shall energize both channels and alarms.

E. Controller shall be Digital Control Corporation, Model No. 11421, or approved equal. Controller shall be mounted in a control panel along with other items as specified in 02730.2.09.

F. Provide a pressure sensor for detecting the wet well level. Sensor shall be suitable for continuous submerged operation in raw sewage and shall be constructed of a 316 SS body with 300 series SS bolts. Sensor shall generate a 4-20 mA signal directly proportional to the measured liquid level for input to the controller. Sensor shall be Sigma Controls, Inc., series 6100 Submersible Level Sensor, or approved equal. Sensor shall be suspended in the wet well with a 20 gauge direct burial polyethylene jacket shielded cable (unspliced) within a 6" diameter PVC pipe rigidly fixed to the wet well wall. Pipe shall extend one foot below the lowest liquid level.

G. Provide a high level back up float, Anchor Scientific, Inc., Type S, or approved equal, for emergency back up, independent of the digital control. Provide a separate time delay relay for back up float circuit.

2.09 OPERATION OF LIQUID LEVEL CONTROLS

A. On rise of liquid level, the pump stop switch energizes first. As liquid level increases, the lead pump switch starts the lead pump. With lead pump running, basin liquid level decreases to the pump stop setting.

B. When lead pump stops, an alternating relay indexes so that the lag pump will start on the next rise in liquid level.

C. If the liquid level continues to rise while the lead pump is running, the lag pump start switch starts the lag pump. Both lead and lag pumps operate together until the pump stop switch stops both pumps.

D. If the liquid level continues to rise with both pumps in operation, the high level alarm switch energizes the alarm signal.

E. Provide a minimum of 2 feet between the low level alarm and the pump intake.

2.10 CONTROL PANEL

A. Provide a concrete slab and concrete block for the control panel housing.

B. Controls shall be kept in a NEMA 3R enclosure with dead front. The control panel shall have an industrial grade enamel finish to match motor control center and shall be furnished with piano hinged type door(s) with a hasp and all bronze padlock keyed to the OWNER's master keying system. All fasteners shall be stainless steel, ASTM Type 304 or 316.

C. The control panel shall house the following:

1. Liquid level controller (see 02730.2.07) incorporating alternator, alternator selector switch and power interruption delay timer for lag pump.

2. H/O/A Selector Switch for each pump.

3. Run Indication Light (green lens) for each pump.

4. Seal Leak Alarm Light (red lens) for each pump.

5. Motor High Temperature Alarm Light (amber lens) for each pump with manual dry contact reset.

6. High Level Alarm Light (red lens).

7. Control Relays.

8. Fuses as required with 100% spare.

9. Dry alarm contacts for high liquid level, motor high temperature, seal failure, motor starting failure, main power failure and relay for remote alarm monitoring.

10. Flasher for exterior red light to energize during an alarm condition.

11. Phase monitor.

12. Elapsed time meters (3); one (1) meter for each pump and one (1) meter for simultaneous operation of both pumps.

13. Strip heater and thermostat.

14. Automatic dialing alarm (Butler National ADAS IX for standardization purposes).

15. Provide dry contacts to energize a local alarm light and an alarm at the OWNER's office.

16. Provide off timer for emergency cycle.

D. All alarms shall be tied into a common alarm relay which when energized shall flash a red light mounted on the exterior of the panel. Red light shall flash only during an alarm condition. Provide reset switch and testing pushbutton for alarm circuit. Provide a test button for alarm light.

E. Provide terminal strips in the control panel for all alarm circuits, controls, lighting and power wiring.

F. Provide an outdoor duplex convenience outlet (120V).

G. Provide an outdoor emergency generator receptacle, type as approved by the OWNER's Representative.

H. Phase monitor shall monitor incoming power and shut down the pumps when required to protect the motors from damage caused by phase reversal, phase loss, voltage unbalance greater than 5% or voltage less than 83% of nominal. A time delay shall be provided to minimize nuisance trips. The motors shall automatically restart when power conditions return to normal.

2.11 ELECTRICAL REQUIREMENTS

A. Design electrical supply and control circuits to meet the requirements of the National Electric Code and Willistown Township, 230 volt, 3 phase.

B. Protect the motor control panel by conduit seals or other appropriate sealing methods meeting the requirements of the National Electric Code for Class I, Division 1, Group D locations.

2.12 PROTECTIVE COATINGS

A. All ferrous metal surfaces excluding stainless steel and galvanized components shall be shop coated with a minimum 2.0 mils DFT of epoxy polyamide primer followed by two (2) coats of minimum 4.0 mils DFT each of epoxy polyamide paint. Provide pumps with manufacturer's standard baked-on epoxy coating. Vent pipe color shall be green.

B. Shop coat the interior of the pump basin with two (2) 8.0 mil DFT coats of white polyamine epoxy paint. MAB (Pennsbury) 52 Series, or equal.

PART 3 - EXECUTION

3.01 GENERAL SITE WORK

A. Construct a 12' wide paved access road with a turnaround and indicate on the Drawings in accordance with Section 02511 for bituminous driveways.

B. Provide a chain link fence surrounding the pump station area in accordance with Section 02830. The fence shall be a minimum height of 8 feet and be provided with separate vehicular and pedestrian gates. All non-paved areas within the fencing shall be covered with 6" of 2A coarse aggregate over filter fabric.

C. Provide trees and shrubs surrounding the fence. Provide a plan indicating the type, size, spacing and distance from the fence on the Drawings for approval by the OWNER's Representative.

3.02 EQUIPMENT INSTALLATION

A. Install the pumping equipment where indicated on the Drawings in accordance with the manufacturer's instructions and the approved shop drawings. Use resilient pipe connections gaskets to seal all pipe penetrations through precast concrete structures.

B. Provide and connect accessories, power and control conduit and wiring as required to ensure a complete operable system as intended.

3.03 PUMP START-UP AND PERFORMANCE TESTING

A. Make the following checks before operating pumps:

Assure that piping and basin are clear of debris, which might clog pump.
Check level switch settings.
Check for proper motor rotation.

B. Operate the pump station using clear water at the design point through two complete pumping cycles under the supervision of the manufacturer's representative and in the presence of the ENGINEER or OWNER's Representative. Check pump and motor for excessive vibration and high bearing temperatures. Demonstrate correct sequence of pump operation. Check for motor overload by taking ampere readings.

C. Verify pump performance by timing how long it takes to drawdown a specific volume of liquid and measuring the pump discharge head with a pressure gauge.

D. Demonstrate provision for pump removal and replacement.

3.04 EQUIPMENT ACCEPTANCE

Adjust, repair, modify or replace any components which fail to perform as specified and rerun the tests. Make final adjustments under the direction of the manufacturer's representative and to the satisfaction of the ENGINEER or OWNER's Representative.

END OF SECTION

SECTION 02735
SANITARY SEWAGE SPECIALTIES

PART 1 - GENERAL

1.01 DESCRIPTION

Furnish and install all valves, valve chambers, and other piping specialties as specified herein and indicated on the Drawings to provide complete piping systems as intended.

1.02 SUBMITTALS

A. Submit certified dimensional shop drawings and manufacturer's product data on valves and valve operators including assembled weight, construction details, materials of components, and installation instructions.

B. Submit manufacturer's maintenance instructions and complete parts lists.

1.03 QUALITY ASSURANCE

Products shall be new and the latest standard of reputable manufacturers with replacement parts available. Products contaminated with gasoline, lubricating oil, liquid or gaseous fuels will be rejected.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver valves and accessories to the job site in the manufacturer's boxes or crates. Mark each valve as to size, type, and installation location. Seal valve ends to prevent entry of foreign matter into valve body.

B. Store valves and accessories in areas protected from weather, moisture, and possible damage. Do not store materials directly on ground.

C. Handle valves and accessories to prevent damage to interior and exterior surfaces.

PART 2 - PRODUCTS

2.01 RESILIENT SEATED GATE VALVES

A. Provide iron body, resilient seated, solid wedge type gate valves conforming to AWWA C509. Burred valves shall have a non-rising stems with a 2" square operating nuts which open by turning in a counterclockwise direction. Buried gate valves shall be Kennedy resilient seat valves, or approved equal, with mechanical joint ends. Interior valves shall be Kennedy resilient seat valves, or approved equal, with flanged ends and handwheel operators.

B. Provide 5-1/4" diameter three piece, cast iron, adjustable valve boxes for all buried gate valves. Valve boxes shall be of sufficient length to reach the surface of the ground, but not extend above the ground surface. The word "SEWER" shall be cast in the top of the cover. Valve boxes shall be as manufactured by Tyler Company, or approved equal, slide on style.

C. Refer to the Drawings for typical installation of buried gate valves and valve boxes and for typical installation of force main cleanout chamber.

2.02 SEWAGE AIR RELEASE VALVE

A. Sewage air release valve shall be designed to release small amounts of accumulated air during operation of a sewage force main. Valve shall close drop-tight. All internal metal parts shall be stainless steel. The linkage/lever mechanism shall be removable from the valve without disassembly of the mechanism. Body and cover shall be cast iron conforming to ASTM A126, Class B. Provide backwash attachments and valves. Air release valve shall be 2-inch size with a 1/4-inch orifice for a working pressure of 150 psi. Sewage air release valves shall be manufactured by APCO Valve and Primer Corporation, or equal.

B. Provide 2-inch gate valve for sewage air release valve. Gate valve shall be iron body with a minimum working pressure of 200 psi, double face solid wedge of bronze, bronze spindle and renewable bronze seat rings, and screw ends. Valve shall be Jenkins, or other approved valve. Refer to the Standard Details for installation details.

2.03 SEWAGE COMBINATION AIR VALVES

A. Provide single body, double orifice sewage combination air valves to allow large volumes of air to escape or enter through the large diameter air and vacuum orifice when filling or draining a pipeline. Sewage combination air valves shall have a small diameter air release orifice to allow small pockets of air to escape when the pipeline is filled and pressurized. Valves shall be manufactured by APCO Valve and Primer Corporation, or equal.

B. Materials of construction shall be ASTM A126, Class B cast iron body and cover; ASTM A240 stainless steel float and stem; Buna-N needle and seat; ASTM B124 bronze plug; ASTM D1233 Delrin or cast iron leverage frame. Furnish each valve with inlet and outlet valves, quick disconnect coupling, and 5' of hose for flushing.

Inlet Size: 2" NPT
Outlet Size: 1" NPT

Provide for lower durometer setting for operating pressures less than 20 PSI, or as recommended by the manufacturer.

2.04 PVC FLAPPER CHECK VALVES

Provide PVC swing check valves with plain ends for redundant backflow protection at the right-of-way. Rated for 150 psi working pressure.

2.05 PVC BALL VALVES

Provide true union, double entry ball valves with Viton O-ring seals, self-lubricating Teflon seats, and 2" square operating nut. Rated for 150 psi working pressure. Ball valves shall only be used in vertical position.

2.06 CLEANOUT AND AIR VALVE CHAMBERS

Provide precast concrete manholes with flat slab tops and cast iron manhole frames and covers, as specified in Section 02605 and shown on the Drawings.

2.07 HOSE END GATE VALVE

A. The gate valve to be installed in the Cleanout Chamber shall be a bronze hose end gate valve, with single wedge disc, non-rising stem, female inlet having American Standard taper pipe threads, and outlet having National (American) thread for Fire Hose Couplings and Fittings (ANSI B26) and provided complete with bronze cap and chain. Hose end gate valve shall be Figure 2153 Hose Gate Valve with cap and chain as manufactured by the Lunkenheimer Co., Cincinnati, Ohio, or similar hose end gate valve and cap and chain as manufactured by Walworth or Crane Co., or equal.

B. The valve shall be designed for a minimum water working pressure of 150 psi and shall be factory tested at a pressure of 300 psi; shall have clean waterway opening of the full nominal diameter of the valve; and shall be opened by turning to the left. The valve shall be handwheel operated and the operating wheel shall have cast thereon an arrow indicating the direction of the opening. The valve shall have the maker's initials, pressure rating, and year of manufacture cast on the body.

2.08 PRESSURE SEWER LATERAL CONNECTION PIT

A. Pipe and fittings inside connection pit shall be Schedule 40 PVC conforming to ASTM D1784 and D1785. Threaded hose connection and cap shall be made from aluminum conforming to ASTM B62.

B. Connection pits shall be made of 36" diameter rigid corrugated PVC piping designed in accordance with ASTM D1784.

C. Connection pit covers shall be a locking type Model MC-36-MB as manufactured by the Ford Meter Box Company, Inc. or approved equal. The cover shall be provided with an inner lid and be supplied with the words "SEWER" cast into the top of each cover.

2.09 STAINLESS STEEL PIPE

A. Steel Pipe: ASTM 789, Schedule 40; stainless steel.

B. Threaded Fittings: All joints shall be NPT threaded, all fittings and couplings shall be Schedule 40, stainless steel in accordance with ASTM A815.

PART 3 - EXECUTION

3.01 INSTALLATION

Inspect joint surfaces for structural soundness and thoroughly clean before installation. Install valves and accessories in accordance with manufacturer's instructions. Check and adjust valves and accessories for smooth operation.

END OF SECTION

SECTION 02830
CHAIN LINK FENCE

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work shall consist of furnishing and erecting the chain link fence complete, in accordance with the Specifications and within the limits shown on the Drawings, or as directed. This work includes the disposal of surplus excavated material. Fence shall be installed by a specialist experienced in fence construction.

B. The CONTRACTOR shall furnish all labor, materials and equipment necessary for completion of the work.

1.02 SYSTEM DESCRIPTION

Fence Height: 8'-0". Extension arms together with the attached barbed wire shall not be considered as part of the required height of 8'-0" but as an addition to the height of the fence.

1.03 SUBMITTALS

A. Certificates shall be furnished, signed by the CONTRACTOR and the chain link fencing manufacturer, stating that proposed chain link fencing meets specified material requirements.

B. Product data and Manufacturers installation instructions shall be submitted to the ENGINEER for approval in accordance with the General Requirements.

1. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

2. Manufacturer's installation instructions: Indicate installation requirements, plan layout, spacing of components, post foundation dimensions, and hardware anchorage.

C. Project record documents: Accurately record actual locations of perimeter posts relative to property lines and easements.

1.04 QUALITY ASSURANCE

A. All dimensions and gauges of material are subject to accepted industry tolerance standards. Job site shall be cleared of excess spillage of concrete, cut wires, etc. and post hole excavation scattered uniformly away from posts.

B. Upon request of the ENGINEER, samples of each component shall be submitted for approval prior to fabrication and shipment of fencing for this project. Mill certificates shall confirm compliance with these specifications and fabrication from domestic produced steel.

C. Any material found not to be in compliance with the herein described specifications shall be removed and replaced at CONTRACTOR's expense.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All ferrous metal elements of the fence, except the fence fabric shall receive a hot dip zinc coating of not less than 1.2 ounce per square foot of surface.

B. Provide all hardware, expansion sleeves, caps, fittings, and braces required for a complete installation.

2.02 FABRIC

A. The fabric shall consist of No. 9-gauge wire woven into a 2-inch mesh. Fabric shall be aluminum coated conforming to ASTM A491, minimum of 0.40 ounce per square foot of wire surface. The coated wire picket from which the fabric is made shall have a minimum breaking load of 1290 pounds. Unless otherwise indicated on the Drawings or specified, both salvages of the fabric shall have a twisted and barbed finish and barbing shall be done by cutting the wires on the bias. The size of the mesh shall be determined by measuring from inside to inside of the wires of the mesh at approximately right angles to them. Fabric shall be stretched so that there will be no slack edges or warped sections.

B. The fabric width shall the nominal fabric height shown on the Drawings measured from the ends of the barbs or knuckles with an allowable tolerance of $\pm$ 1-inch.

2.03 FASTENERS

Fasteners for attaching the fabric to line posts shall be No. 6-gauge aluminum wire or No. 9-gauge galvanized preformed clips. Fasteners for attaching the fabric to tension wires shall be either No. 10-gauge galvanized steel wire or aluminum hog rings of comparable gauge.

2.04 END, CORNER AND FULL POSTS

End, corner and pull posts shall be 3-inch square or 2.875 inches O.D. tubular steel posts ASTM Designation A501 weighing 5.79 pounds per linear foot. Provide bracing (2 at corners, 1 at ends and gates) consisting of a single piece horizontal member, 1-5/8-inch O.D. steel pipe weighing 2.27 pounds per foot and a 3/8-inch diameter steel rod with drop forged turnbuckle for use as a diagonal tension member.

2.05 LINE POSTS

Line posts shall be 2-1/2 inch diameter steel posts.

2.06 TOP RAIL

Top rail shall be 1-5/8 inch O.D. steel pipe Schedule 40. Top rail lengths shall be coupled with a 6-inch long, self-centering, outside type sleeve coupling at intervals of approximately 20 feet.

2.07 BARBED WIRE

Barbed wire shall consist of three lines of aluminum coated steel wire with a minimum coating of 0.30 ounce per square foot of wire surface. The bonded wire shall consist of two 12-1/2 ga. stranded line wires, with 14 ga. aluminum barbs in a 4 point pattern on 5" centers.

2.08 CONCRETE

The concrete for posts bases shall be Class "A" and conform to the requirements of Section 03010 - Concrete For Utility Construction.

2.09 GATES

Swing gate frames shall be hot-dip galvanized, 1.90-inch minimum O.D. standard Schedule 40 steel pipe, 2.72 pounds per foot. Fabric shall be the same as that for the fence. Each gate shall be complete with malleable iron head and socket hinges, catches, and stops and shall be arranged to permit the gate to swing back against the fence 180 degrees. Each gate shall be of adequate design and strength to provide satisfactory operation of the gate.

PART 3 - EXECUTION

3.01 INSTALLATION

A. All fence posts and gates shall be set to line and grade, and shall be erected in accordance with standard fence erecting practice, by trained installation crews and previous experience in fence installation. Finished fence shall be tight and without sags. Expansion sleeves shall be installed in a manner to provide a rigid connection and to allow for expansion.

B. The bottom of the fence fabric, after erection, shall conform to the contour of the ground surface along the line of the fence, and at no point shall the bottom of the fabric be more than 2 inches above the ground surface.

C. The CONTRACTOR shall perform the necessary clearing, excavation and filling required to provide clear "line of fence" runs. All site grading shall be complete prior to fence installation.

3.02 POST HOLES

A. Post holes shall be of sufficient depth to allow for approximately 36 inches of posts to be set into concrete footings.

B. Post holes shall be 10 inches in diameter for line posts, and 12 inches in diameter for terminal posts.

C. All post footings shall be constructed by Class "A" concrete and shall be domed 1-1/2 inches above grade.

3.03 LINE POST SPACING

Line post to spaced at 10-foot centers except where guard rail beam is mounted on fence.

3.04 TENSION WIRE

No. 7 gauge galvanized coil spring wire shall be stretched along the bottom of the chain link fabric approximately 6 inches above grade. The chain link fabric shall be attached to this wire with the attachments spaced 24 inches apart.

3.05 HORIZONTAL BRACES

All end, corner, gate and pull posts for 6 foot and higher fence shall be braced in accordance with standard fence erecting practice. Horizontal braces shall be spaced midway between the top rail and the ground and shall extend to the first line post. These braces shall be of the same size and weight as the top rail and shall be securely fastened to the posts by means of malleable iron or pressed steel connections. The braces shall then be trussed from the line post back diagonally to the end, corner, gate or pull post with a 3/8-inch diameter rod having a turnbuckle attachment for tension adjustment.

3.06 FABRIC BANDS

Fabric bands, spaced at approximately 14 inches on centers, shall be used to fasten the fabric to the posts. Galvanized steel wire, spaced at approximately 24 inches on centers, shall be used to fasten fabric to the top rail.

3.07 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch

B. Maximum offset from True Position: 1 inch

C. Components shall not infringe adjacent property lines.

END OF SECTION

SECTION 02920
FINISH GRADING AND SEEDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work of this Section includes, but is not limited to:

Placing topsoil
Soil conditioning
Finish grading
Seeding
Sodding
Maintenance

B. The Seeding Tables at the end of this Section lists specific seeding requirements for temporary and permanent cover.

1.02 QUALITY ASSURANCE

A. All areas to be seeded shall be inspected by the CONTRACTOR before starting the work. Any defects such as incorrect grading, etc., shall be reported to the ENGINEER prior to beginning the work. The commencement of work by the CONTRACTOR shall indicate his acceptance of the areas to be seeded, and he shall then assume full responsibility for the work of this Section.

B. Soil and soil supplement testing shall be performed by a Soils Testing Laboratory engaged and paid for by the CONTRACTOR and approved by the ENGINEER. Collect soil samples under the direction of the ENGINEER.

1.03 SUBMITTALS

A. Prior to use or placement of material, submit a Statement of Compliance from the materials suppliers, together with supporting data, attesting that the composition of the following products meet specification requirements.

Topsoil analysis
Fertilizer
Lime
Seed mixture(s)

B. If soil tests are performed to justify decreased liming and fertilizer rates, submit certified soil sample analyses, including laboratory recommended soil supplement formulation.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver seed fully tagged and in separate packages according to species or seed mix. Seed, which has become wet, moldy, or otherwise, damaged in transit or storage will not be accepted.

1.05 PROJECT/SITE CONDITIONS

A. Any soil or similar material which has been brought onto paved areas by hauling operations or otherwise shall be removed promptly, keeping these areas clean at all times.

B. Upon completion of work under this Section, all excess stones, debris and soil resulting from work under this section which have not previously been cleaned up shall be cleaned up and removed from the site.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Having a pH of between 6.0 and 7.5 containing not less than 2% nor more than 10% organic matter as determined by AASHTO T194.

B. Fertile friable loam, sand loam, or clay loam which will hold a ball when squeezed with the hand, but which will crumble shortly after being released.

C. Free of clods, grass, roots, or other debris harmful to plant growth. Free of pests, pest larvae, and matter toxic to plants.

D. Grading analysis shall be as follows:

Sieve	Minimum %
2"	100
#4	90
#10	80

sand, silt, and clay shall be as defined by AASHTO designation M-146, and shall be present within the following ranges:

	Minimum %	Maximum %
Sand	20	75
Silt	10	60
Clay	5	30

2.02 FERTILIZER

Commercial fertilizer shall conform to all applicable state laws. It shall be uniform in composition, dry and delivered to the site in original unopened containers each bearing the manufacturer's guaranteed analysis.

2.03 LIME

Raw ground limestone conforming to Section 804.2(a) PennDOT Publication 408 Specifications.

2.04 SEED AND SOD

A. Fresh, clean, dated material from the last available crop and within the date period specified, with a date of test not more than 9 months prior to the date of sowing. Percentage of pure seed present shall represent freedom from inert matter and from other seeds distinguishable by their appearance. All seeds will be subject to analysis and testing.

TABLE 1 - GRASS AND AGRICULTURAL SEEDS

Species	Minimum Guaranteed Purity (Percent)	Minimum Guaranteed Germination (Percent)
Kentucky Bluegrass (Domestic origin)	98	80
Pennfine Perennial Ryegrass	98	90
Kentucky 31 Tall Fescue	98	85
Penngift Crownvetch	99	90
Empire Birdsfoot Trefoil	99	90
Pennlawn Red Fescue (Turf Type)	98	85
Hounddog Tall Fescue (Turf Type	98	85
Falcon Tall Fescue (Turf Type)	98	85
Mustang Tall Fescue (Turf Type)	98	85
Jamestown Fine Fescue (Turf Type)	98	85
Annual Ryegrass	98	90
Timothy	98	95
Spring Oats	90	85
Fylking Kentucky Bluegrass	98	85
Winter Rye	90	85
Winter Wheat	60	80
Red Top	92	90
Bent Grass	90	75

B. Sod shall be dense and well rooted, composed of 100% Bluegrass mix, Pennsylvania Certified. Sod shall be approximately two inches (2") high, grown in the general locality where it is to be used. Sod shall be cut in uniform stripe approximately 12" or 18" x 36", but no longer than is convenient for handling.

2.05 SEED MIXTURES

See Temporary and Permanent Seeding Tables at the end of this Section.

2.06 INOCULANT

A. Inoculate leguminous seed before seeding with nitrogen fixing bacteria culture prepared specifically for the species. Do not use inoculant later than the date indicated by the manufacturer. Use inoculant in accordance with the manufacturer's specifications. Use four times the amount of inoculant when hydroseeding a leguminous seed.

B. Protect inoculated seed from prolonged exposure to sunlight prior to sowing. Reinoculate seed not sown within 24 hours following initial inoculation.

2.07 EROSION CONTROL NETTING

Biodegradable netting and paper soil stabilization material.

2.08 MULCHING MATERIALS

Mulches for seeded areas shall be one, or a combination of, the following:

1. Hay and Straw:

   Cured to less than 20% moisture content by weight. Containing no stems of tobacco, soybeans, or other coarse or woody material. Hay mulching material shall consist of timothy hay, mixed clover and timothy hay, or other approved native or forage grasses. Salt hay or other saline grasses are not acceptable. Straw mulching material shall be either wheat or oat straw.

2. Wood Cellulose:

   Containing no growth or germination-inhibiting substances. Green-dyed and air-dried. Packages not exceeding 100 pounds.

Moisture Content:	12% $\pm$ 3%
Organic Matter (Dry oven basis):	98.6% $\pm$ 0.2%
Ash Content:	1.4% $\pm$ 0.2%
Minimum Water-Holding Capacity:	1,000%

PART 3 - EXECUTION

3.01 TIME OF OPERATIONS

Seeding operations shall be conducted under favorable weather conditions during one of the preferred seeding seasons listed in the Seeding Tables. At the option of, and on the full responsibility of the CONTRACTOR, seeding operations may be conducted under unseasonable conditions, except as noted herein.

3.02 PREPARATION OF SUBGRADE

A. "Hard pan" or heavy shale:

Plow to a minimum depth of 6". Loosen and grade by harrowing, discing, or dragging. Handrake subgrade. Remove stones over 2" in diameter and other debris.

B. Loose loam, sandy loam, or light clay:

Loosen and grade by harrowing, discing, or dragging. Handrake subgrade. Remove stones over 2" in diameter and other debris.

3.03 FINISH GRADING

A. Finish grading work shall not be started until the installation of all underground utilities, sewers, clearing of site, etc., has been completed. The CONTRACTOR shall be responsible for giving notice to the other CONTRACTORs whose work is affected regarding the installation of his work in order that such work may be in place in ample time to prevent any delay in the completion of the work on this contract.

B. Finish grading shall not be started until rough grading has been approved by the ENGINEER or Township, site has been cleared of rubbish and debris, and trucking operations over the area are finished.

C. The handling, moving or working of topsoil shall be performed only when, in the opinion of the ENGINEER or Township, it is in a normally friable condition, suitable for such operations, moist but not wet. Under no circumstances shall topsoil be worked when wet enough to "ball up" when worked.

D. Replace topsoil and spread over the prepared subgrade to obtain the required depth and grade elevation. Handrake topsoil and remove all materials unsuitable or harmful to plant growth.

E. Final thickness of topsoil shall be not less than 6" thick after rolling with a handroller. Finished grades shall be within the following tolerance limits:

1. 3/4" deviation within a distance of 10'.
2. 1-1/2" maximum deviation.

F. In achieving the finish grades, control points shall be set up and maintained at all times, and whenever this requirement is not met in a particular area, corrections shall be made immediately and before proceeding further with the work.

3.04 TILLAGE

A. After seed bed areas have been brought to proper compacted elevation, thoroughly loosen to a minimum depth of 5" by discing, harrowing, or other approved methods. Do not work topsoiled areas when frozen or excessively wet.

B. Distribute limestone uniformly at the rate indicated on the Seeding Tables. Thoroughly incorporate into the topsoil to a minimum depth of 4" as a part of the tillage operation.

C. Distribute fertilizer uniformly at the rate indicated on the Seeding Tables. Incorporate into soil to depth of 4" by approved methods as part of tillage operation.

D. Liming and fertilizer rates may be decreased if lesser rates are indicated by soil tests provided by the CONTRACTOR.

3.05 SEEDING

A. All areas of disturbed earth, not originally paved, shall be temporarily or permanently seeded immediately upon completion of work, if the area is not to be redisturbed prior to final grading and seeding. Disturbed areas (outside wetlands) which are not at finished grade and which will be re-disturbed within one year shall be seeded with a quick growing temporary seeding mixture and mulched. Disturbances in wetlands and/or disturbed areas which are either at finished grade or will not be re-disturbed within one year shall be seeded with a permanent seed mixture and mulched. If construction takes place during the winter months, the disturbed area shall be mulched immediately upon completion of work, if the area is not to be redisturbed prior to final grading and seeding.

B. Uniformly sow specified seed mix by use of approved hydraulic seeder, power-operated seeder, or hand-operated seeder. Do not seed when winds are over 15 mph.

C. Upon completion of sowing, cover seed to an average depth of 1/4" by handraking or approved mechanical methods.

D. Upon completion of seed covering, roll the area with a roller, exerting a maximum force of 100 pounds per foot width of roller.

3.06 MULCHING

A. In general, straw mulching may be used on less critical slopes for soil erosion. On slopes greater than 3:1, jute matting, woven fiber erosion control blanket, land lass, or approved equal shall be used instead of straw mulch.

B. Mulching shall be performed in conjunction with seeding at the conclusion of finish grading operations. Straw shall be placed uniformly in a continuous blanket at a minimum rate of three tons per acre. A mechanical blower may be used to apply mulch material, provided the machine has been specifically designed and approved for this purpose. Machines, which cut mulch into short pieces, will not be permitted.

C. Straw shall be anchored by the use of twine stakes, wire staples, paper or plastic nets, emulsified asphalt provided it is applied uniformly to the mulch at a rate of not less than 31 gallons per 1000 square yards), or by other approved methods. Mulch over topsoiled areas shall be incorporated into the soil by approved equipment.

D. When mulching by the asphalt mix method, apply the mulch by blowing. Spray the asphalt binder material into the mulch as it leaves the blower. Apply the binder to the mulch in the proportion of 1.5 to 2.0 gallons per 45 pounds of mulch. Protect structures, pavements, curbs, and walls to prevent asphalt staining. Erect warning signs and barricades at intervals of 50 feet or less along the perimeter of the mulched area. Do not spray asphalt and chemical mulch binders onto any area within 100 feet of a stream or other body of water.

E. Apply wood cellulose fiber hydraulically at a rate of 320 pounds per 1000 square yards. Incorporate as an integral part of the hydroseed slurry after seed and soil supplements have been thoroughly mixed.

F. Thoroughly water mulch and seed bed immediately after completion of mulching. Soil shall be moistened to a depth of not less than 4".

3.07 JUTE AND PAPER MATTING

A. In general, jute or paper matting shall be used on the more critical slopes or as required by the ENGINEER to prevent seed washout and soil erosion. Shape and grade the slope to be protected as required by the Drawings and Specifications. Remove rocks, clods over 1-1/2 in. in diameter, sticks and other material that will prevent contact of the matting with the soil surface.

B. Lime, fertilize and seed in accordance with the applicable seeding standard except that for jute matting, one-half of the seed may be applied prior to laying the matting, and the remaining seed applied after laying the matting.

C. Start laying the matting from the top of the channel or slope and unroll downgrade so that one edge of the strip coincides with the channel center. Lay a second strip parallel to the first on the other side of the channel and allow at least a two-(2) inch overlap for jute matting. If one roll of matting does not extend the length of the channel, continue downhill with additional rolls.

D. Secure the matting by burying the top end of jute strips in a trench four (4) inches or more deep. Tamp the trench full of soil. Reinforce with a row of staples driven through the jute about four-(4) inches downhill from the trench. These staples should be about ten (10) inches apart. Then staple the overlap in the channel center. These staples should be three (3) or four (4) feet apart. The outside edges may be stapled similarly at any time after the center has been stapled. Closer stapling along the sides is required where concentrated water may flow into the channel.

E. Succeeding strips of matting, further down the channel or slope, are secured in a similar manner. Strips of matting on the swale should be laid and secured as above to a height of three (3) feet above base of swale.

F. Where one roll of jute matting ends and another roll begins, the end of the top strip shall overlap the trench where the upper end of the lower strip is buried. Make the overlap at least four (4) inches and staple securely.

G. Erosion Stops: At any point, jute matting may be folded for burying in slit trenches and secured as were the upper ends. This checks water flow and erosion that may begin under the matting. It also gives improved tie-down. The procedure is recommended on the steeper slopes of sandy soil and gentler slopes subject to seepage. Spacings vary from 25 to 100 feet as required by the ENGINEER or Township.

H. Diversions: Where diversions outlet into a waterway, the outlet should be protected with matting used in the same matter as in the main channel. The matting for the outlet is laid first so that matting in the main channel will overlap the outlet strip.

I. Matting Soil Contact: Get contact between matting and soil by rolling after laying, stapling, and seeding are complete. Perfect contact is vital to keep water flow over (not under) the matting.

J. Inspection: After job completion, confirm that matting is in contact with the soil at all places and that critical areas are securely stapled down.

3.08 SODDING

A. Sodding shall be required if the grades exceed two to one slope.

B. Sod shall be planted only when the soil is moist and favorable to growth. The area to be sodded and shaped and finished to the lines and grades indicated on the Plans, and the surface loosened prior to placing the sod. The grade shall be kept moist by sprinkling, if necessary, until the sod is placed. The sod shall be placed on the prepared surface with the edges in close contact and, as far as possible, in a position to break joints. Each piece of sod laid shall be fitted and rolled or tamped into place with hand tampers or rollers not less than one hundred (100) square inches in area.

C. Sod strips in waterways shall be laid perpendicular to the direction of flow. Butt ends of strips tightly.

D. After rolling or tamping, sod shall be pegged or stapled to resist washout during the establishment period. Jute or other netting may be pegged over the sod for extra protection in critical areas.

E. A sufficient quantity of water shall be applied to all sod after laying, to insure immediate growth.

3.09 MAINTENANCE, GUARANTEE, AND CERTIFICATION OF ACCEPTABILITY

A. Maintenance shall begin immediately after each portion of lawn is planted, and shall continue in accordance with the following requirements:

1. The CONTRACTOR shall be held responsible for maintenance of lawns, including watering, weeding, sowing, cutting, and replanting as necessary for at least sixty (60) days after sowing and as much longer as is necessary to establish a uniform stand of the specified grasses and until certification of acceptability. No bare spots will be allowed. After the grass has started, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded repeatedly until all areas are covered with a satisfactory growth of grass. At time of cutting, keep mower blades not less than two and one-half (2-1/2) inches high. The maintenance period shall continue after seeding and until the lawns are certified acceptable by the ENGINEER, which date of certification shall not be earlier than the date of substantial completion of the entire work.

2. Damage resulting from erosion, gullies, washouts or other causes shall be repaired by filling with topsoil, tamping, re-fertilizing, reseeding or sodding and mulching by the CONTRACTOR at his expense if such damage occurs prior to certificate of acceptability by the ENGINEER.

3. The CONTRACTOR's responsibility for maintenance shall cease at the time of certification of acceptability by the ENGINEER. During the guarantee period, the CONTRACTOR shall be held responsible for making replacements, but no maintenance will be required.

4. At the end of the guarantee period, inspection will be made by the ENGINEER upon written notice requesting such inspection submitted by the CONTRACTOR at least ten (10) days before the anticipated date.

B. Lawns shall be guaranteed for one (1) year after certification of acceptability by the ENGINEER, and shall be in satisfactory condition at the end of the guarantee period, except for damage resulting from causes beyond the responsibility of the CONTRACTOR.

C. Certification of Acceptability:

1. Inspection of the work of lawns to determine completion of the work under this Section will be made at the conclusion of the maintenance period and upon written notice requesting such inspection submitted by the CONTRACTOR at lease five (5) days prior to the anticipated date. The condition of lawns will be noted and determination made by the ENGINEER, whether maintenance shall continue in any part.

2. After inspection by the ENGINEER, the CONTRACTOR will be notified in writing by the ENGINEER of acceptability of all work of this Section, or if there are any deficiencies of the requirements for completion of the work. Lawn maintenance remaining to be done shall be subject to re-inspection before being certified acceptable.

3. At the beginning of the next planting season after that in which the permanent grass crop is sown, the seeded areas will be inspected. Any section not showing dense, vigorous growth at that time shall be promptly reseeded by the CONTRACTOR at his own expense. The lawns shall be watered, weeded, cut, and otherwise maintained until the end of that planting season, when they will be accepted.

4. All requirements for preparation stated in the Specifications shall be repeated for reseeding.

5. Lawns shall be cut at least once a week and watered at least once a week if there hasn't been any rain.

6. CONTRACTOR shall submit a schedule for this maintenance, which shall include soil control and conditioning with chemicals, based upon soil tests every two (2) months until lawn is fully developed and approved.

TEMPORARY SEEDING TABLE

Condition	Topsoil	Lime	Fertilizer	Seed Mix & Sowing Rate (% By Weight)
Temporary Cover Mar. thru June	N/A	N/A	N/A	35% Spring Oats 35% Annual Ryegrass 30% Kentucky 31 Fescue Sow 85# per acre
Temporary Cover July thru Aug.	N/A	N/A	N/A	15% Fylking KY Bluegrass 40% Kentucky 31 Tall Fescue 45% Annual Ryegrass Sow 65 # per acre
Temporary Cover After Aug. 30th	N/A	N/A	N/A	75% Winter Rye or Winter Wheat 12% Annual Ryegrass 10% Kentucky 31 Tall Fescue 3% Red Top Sow 154 # per acre (Winter Wheat or Winter Rye in the mix = 116 lbs. or 2 bushels)

PERMANENT SEEDING TABLE

Condition	Topsoil	Lime *	Fertilizer **	Seed Mix and Sowing Rate (% By Weight)
Roadside, Non-Mowed	Yes	100# Per 1,000 Sq.Feet	10-6-4 or 20-8-8	80% KY 31 Tall Fescue 20% Pennlawn Red Fescue Sow 100 Lbs/Acre March to May/August to September
Roadside, Mowed	Yes	100# Per 1,000 Sq.Feet	10-6-4 or 20-8-8	50% KY Bluegrass 30% Pennlawn Red Fescue 20% Pennfine Perennial Ryegrass Sow 100 Lbs/Acre March to May/August to September
Bank Areas, Non-Mowed	Yes	100# Per 1,000 Sq.Feet	10-6-4 or	45% Crownvetch or Birdsfoot Trefoil 55% Annual Ryegrass Sow 45 Lbs/Acre Anytime except September to October
Lawns	Yes	100# Per 1,000 Sq.Feet	10-6-4 or 20-8-8	80% Turf Type Fescue *** 20% Pennfine Perennial Ryegrass Sow 250 Lbs/Acre March to May/August to September
Fields and Pasture, Non-Cultivated	No	No	10-6-4 or 20-8-8	100% Timothy Sow 45 Lbs/Acre March to May/August to September
Fields, Cultivated	No	No	10-6-4 or 20-8-8	100% Annual Ryegrass Sow 45 Lbs/Acre March to May/August to September
Woods, Sparse	No	No	10-6-4 or 20-8-8	100% Pennlawn Red Fescue Sow 175 Lbs/Acre March to May/August to September

PERMANENT SEEDING TABLE (Continued)

Condition	Topsoil	Lime *	Fertilizer **	Seed Mix and Sowing Rate (% By Weight)
Wetlands	Yes	No	No	10% Red Top 30% KY 31 Tall Fescue 30% Annual Ryegrass 30% Bent Grass 85 Lbs/Acre March to May/August to September

* Unless lesser rate indicated by soils tests.

** Fertilizer shall be minimum 50% organic nitrogen, apply at a rate in accordance with the manufacturers specifications for new lawns.

*** Turf Type Fescue shall be supplied in two equal parts or different species (See Table 1).

END OF SECTION

SECTION 03010
CONCRETE FOR UTILITY CONSTRUCTION

PART 1 - GENERAL

1.01 DESCRIPTION

A. The work shall consist of the cast-in-place cement concrete construction associated with curbs, sidewalks, pads, and encasements.

B. The CONTRACTOR shall supply all necessary labor, materials, and equipment necessary for the completion of this work.

1.02 SUBMITTALS

A. Submit a Statement of Compliance from the concrete producer, together with supporting data, attesting that the cement concrete conforms to the State Specifications for the class of concrete being used.

B. Submit detailed shop drawings of reinforcing steel.

PART 2 - PRODUCTS

2.01 CEMENT CONCRETE

A. Ready-mixed, conforming to Section 704, Publication 408 Specifications.

Requirements for State approved batch plants design computations and plant inspection shall not apply. The acceptability of concrete will be based on conformance with the Cement Concrete Criteria specified below and the results of the specified tests.

B. Cement Concrete Criteria:

Class A:

28-day compressive strength: 3300 psi
Slump: 1 to 3 inches

Class C:

28-day compressive strength: 2000 psi
Slump: 2 to 6 inches

High Early Strength:

3-day compressive strength: 3000 psi
Slump: 1 to 3 inches

Cement Factor and Maximum Water-Cement Ratio conforming to Table A, Section 704.1(b), Publication 408 Specifications.

2.02 CONCRETE ACCESSORIES

A. Reinforcement Bars:

New billet-steel conforming to Section 709.1, PennDOT Publication 408 Specifications and ASTM A615, Grade 60.

B. Steel Wire Fabric:

Conforming to Section 709.3, Publication 408 Specifications.

C. Premolded expansion joint filler:

Conforming to ASTM D1752.

2.03 DURABILITY

Concrete which will be subject to potentially destructive exposure (other than wear or loading) such as freezing and thawing, severe weathering or chemicals shall contain entrained air as indicated in Table I.

Table 1

Nominal Maximum Size of Coarse Aggregate (inches)	Total Air Content, Percent By Volume
3/8	6 to 10
1/2	5 to 9
3/4	4 to 8
1	3.5 to 6.5
1-1/2	3 to 6
2	2.5 to 5.5

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with Section 1001 PennDOT Publication 408 Specifications for construction requirements including formwork, curing, protection and finishing of cement concrete.

B. Excavate and shape trench bottoms and sides to accommodate thrust block forms, encasement, manhole bases, inlets and vaults.

C. Support pipe at the required elevation with brick or concrete block. Do not use earth, rock, wood, or organic material as supports.

D. If concrete work is to take place in cold weather where for 3 consecutive days the average daily air temperature is less than 40 degrees fahrenheit, and the air temperature is not greater than 50 degrees fahrenheit for more than one-half of any 24 hour period, then the CONTRACTOR shall conform to ACI 306R-88, Cold Weather Concreting, and ACI 306.1-90, Standard Specifications for Cold Weather Concreting.

3.02 CONSTRUCTION

A. Construct cast-in-place manhole bases, curbs, sidewalks and miscellaneous reinforced structures of Class A concrete. Class A concrete shall be central-plant-mixed.

B. Construct reaction and support blocking, cradles, encasements, and miscellaneous mass concrete of Class C concrete. Class C concrete may be from a mobile cement concrete plant or truck mixed.

C. Provide spacers, chairs, bolsters, ties and other devices for properly placing, spacing, supporting and fastening reinforcement in place.

D. Place concrete utilizing all possible care to prevent displacement of pipe or fittings. Return displaced pipe or fittings to line and grade immediately.

E. Ensure tie rods, nuts, bolts and flanges are free and clear of concrete.

F. Do not backfill structures until concrete has achieved its initial set, forms are removed, and concrete work is inspected by the ENGINEER.

G. Perform backfilling and compaction as specified in Section 02200.

END OF SECTION