

**STANDARD CONSTRUCTION
AND MATERIAL SPECIFICATIONS**

FOR

WASHINGTON TOWNSHIP MUNICIPAL AUTHORITY

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Phone Number 717-762-3108
FRANKLIN COUNTY, PENNSYLVANIA

**WASTEWATER COLLECTION
SYSTEM**

Revised June 2015

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STANDARD MATERIAL AND CONSTRUCTION SPECIFICATIONS FOR THE WASHINGTON TOWNSHIP MUNICIPAL AUTHORITY'S WASTEWATER COLLECTION SYSTEM

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SECTION 1

GENERAL INSTRUCTIONS

1.01 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:

- A. Authority: The **WASHINGTON TOWNSHIP MUNICIPAL AUTHORITY (WTMA)** including any agent, officer or employee duly authorized to act for the said party in the execution of the work required by the Contract.
- B. Completion Certificate: The certificate of the Engineer or Authority Representative indicating the completion and acceptance of all work specified and performed under the Contract.
- C. Contract: The written agreement executed by and between the Authority and the Developer or Contractor, or the Developer and the Contractor, covering the performance of the work and the furnishing of labor, materials and service in the construction of sewer extensions or sewer replacement to WTMA Wastewater Collection System.
- D. Contractor: Any corporation, partnership, or an individual hired by the DEVELOPER to construct a sanitary sewer system or a party hired by the WTMA to construct a sanitary sewer system, 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.
- E. Developer: For new Subdivisions or Land Developments, the corporation, partnership, or individual intending to develop for residential or other purposes a certain tract of land situated within the sewer franchise area of the Authority, 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.
- F. Drawings or Plans: Collectively, all of the drawings or plans (or reproductions of them) pertaining to the construction of the project and attached to the Contract or otherwise made a part thereof; and also such supplementary drawings as may be issued from time to time in order to elucidate or clarify said Contract Drawings, or for showing details which are not shown thereon.
- G. Engineer: The person or organization duly employed by the Authority as consultant and authorized to review plans, drawings and specifications and to inspect the results of the performance of the work under Contract by the Contractor, acting directly or through properly authorized agents, engineers, assistants, inspectors, or other representatives acting severally within the scope of the particular duties entrusted to them. The word "Engineer" shall include the officers, agents and employees of the Engineer. In cases where the Authority does not employ a consultant, the word "Authority" is substituted for "Engineer" throughout these Specifications.

- H. Inspection: The examination of work performed by the Contractor, to ascertain its conformity with these Specifications. Inspection may also be referred to as Construction Observation.
- I. Maintenance Bond: The approved form of security, executed by the Developer and his security that guarantees the replacement and repair of any unsatisfactory work or materials for 18 months following the issuance of the certificate of final acceptance of the constructed sewer extension. The security shall be for 18 months and in the amount of 15 percent of the approved contract cost.
- J. Performance Bond: The approved form of security, executed by the Developer and his surety, guaranteeing execution of all construction per the Contract. The security shall be for one year and in the amount of 110 percent of the approved Contract cost.
- K. Project: All of the necessary performance, services and materials required for the satisfactory completion of the work under Contract as described in the Specifications and indicated on the Drawings.
- L. Sewer: Any collecting sewer forming part of the sewer system.
- M. Specifications: Collectively, all of the definitions, descriptions, directions, provisions, requirements, terms and stipulations contained in these Standard Specifications; and all written supplements thereto, made or to be made, pertaining to the Contract, and the materials and workmanship to be furnished under the Contract.
- N. Subcontractor: A person, firm or corporation having a direct contact with the Contractor to perform part of the latter's contract; such as one who installs or furnishes and installs equipment forming a permanent part of the Contract work, or who furnishes labor for work required by the Contract in accordance with the Plans and Specifications. This term does not include individual workmen furnishing labor only, nor one who merely furnished material not worked to a special design.
- O. Warranty Period: An 18 month time beginning with the Authority's issuance of certificate of final acceptance.
- P. WTMA: The **WASHINGTON TOWNSHIP MUNICIPAL AUTHORITY** and its duly authorized agent(s).
- Q. AASHTO: American Association of State Highway and Transportation Officials.
- R. ACI: American Concrete Institute.
- S. AISC: American Institute of Steel Construction.
- T. ANSI: American National Standards Institute.
- U. ASTM: American Society of Testing Materials.
- W. Fed. Spec: Federal Specifications, United States Government.

- X. “Approved”, etc. The words “approved”, “acceptable”, “satisfactory”, or words of like import, shall mean approved by, or acceptable, or satisfactory, to the Engineer, unless another meaning is plainly intended or otherwise specifically stated.

1.02 DRAWINGS AND SPECIFICATIONS

- A. The Drawings and Specifications are complimentary, and the requirements of any one shall be considered as the requirements of all.
- B. The Specifications in this document are written as if they were included in the Contract Documents executed by and between the Developer and the Contractor and/or Authority and Contractor. Whether they are so used is at the discretion of the Developer; however, the Authority will not accept the sanitary sewer extensions provided by the Developer unless and until they conform to the requirements of these Standard Specifications.
- C. All drawings or plans pertaining to the Project (the Contract Drawings) are to be submitted by the Developer to the Authority for review at the time of the Preliminary Planning Phase of the development. After review of these Contract Drawings by the Authority, the Developer shall make any corrections required, and submit corrected copies thereof to the Authority. The Authority’s approval of the Contract Drawings shall not relieve the Developer from responsibility for errors or discrepancies in such drawings. All Contract Drawings shall be prepared and submitted in conformance with the requirements set forth in Section 2.07. CONTRACT DRAWINGS – DEVELOPER SUBMISSION
- D. **Deviations from the Drawings or Specifications required by the exigencies of construction will be determined by the Engineer only, and authorized in writing.**
- E. At all times the Contractor shall keep on the Project, available to the Engineer and his representatives, one (1) copy of the Drawings, and Specifications.

1.03 PRELIMINARY INSPECTION

Unless the requirement is waived by the Authority prior to the start of actual construction operations, the Contractor, or his authorized representative, shall go over the Project accompanied by the Engineer, or his designated representative, and shall observe for himself/herself, with the approved Drawings before him/her, all pertinent conditions relative to the Contract, including the status of rights-of-way and structures, obstructions, or other objects to be removed, altered and changed.

1.04 WORKING CONDITIONS

- A. No night, weekend, or legal holiday work, requiring the presence of the Engineer or Authority or a representative of either, will be permitted, except in cases of emergency, and then only with the written consent of the Engineer or Authority and to such an extent as he may judge necessary.
- B. Any request for inspectors other than normal working hours must be put in writing 48 hours prior to time needed; the availability of an Inspector is not guaranteed!
1. Normal working hours are considered to be between 7AM and 3:30 PM, Monday through Friday, inclusive.
 2. Work beyond the specified normal working hours will be charged to the developer at a rate of 1 ½ times the normal billing rate.

1.05 MATERIALS

- A. The Contractor shall furnish the Engineer, promptly after the award or execution of the Contract, with 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.
- B. 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.
- C. 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 so 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.
- D. 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 of such Specifications and serial numbers.
- E. 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.
- F. For tests or inspections 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.
- G. The Contractor shall permit or arrange with the producer to permit the Engineer or any agent of the testing laboratory to inspect 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 its preparation, or while being used during the progress of the work or after the work has been completed.
- H. Materials shall be stored 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 to facilitate prompt inspection. Private property shall not be used for storage purposes without permission of the owner or lessee of the property, unless written permission is received from Owner and a copy provided Township.
- I. When any material intended for use in the construction of the Project has been inspected and rejected after such material has been delivered to the Site, the Contractor shall immediately remove all such rejected material from the property.

1.06 ADVERTISING

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

1.07 PERMITS AND LICENSES

- A. With the exception of the Penn DOT Highway Occupancy Permit, if applicable, and the Water Quality Management Permit, if applicable, which will be obtained with the assistance of the Authority, the Contractor or Developer shall, unless otherwise specified, procure all necessary permits and licenses, pay all charges and fees, and shall give all notices necessary and incident to the proper and lawful prosecution of the work. The Developer or Contractor shall pay any fees and charges associated with the Highway Occupancy and the Water Quality Management Permit.
- B. The Penn DOT Highway Occupancy and Water Quality Management Permit applications shall be prepared by the Developer in the name of the Authority and submitted to the Authority along with the application fees. After review of the applications by the Authority, the Developer shall make any corrections, if required, and submit corrected copies to the Authority. The Authority will forward the applications and fees to the Pennsylvania Department of Transportation and the Department of Environmental Protection.
- C. Payment for personnel from State or Local Agencies, as required to be on hand during the construction of work on Highways under their jurisdiction, shall be borne by the Contractor or Developer.
- D. Where work is to be done by the Contractor, in placing any pipe or other construction under railroad tracks, within the right-of-way of any railroad company, the Contractor shall be governed by the requirements of the railroad company involved, and shall consult with the officials thereof relative to the installation. If the railroad company requires any of their personnel to be on hand during the construction of the work, payment for such personnel shall be borne by the Contractor or Developer. The Developer or Contractor shall pay any fees and charges associated with acquiring an occupancy permit in a railroad company right of way.

1.08 CARE OF PUBLIC AND PRIVATE PROPERTY

- A. The Contractor shall take all necessary precaution to prevent damage to all overhead and underground structures and to protect and preserve property within or adjacent to the Project and shall be responsible for damage thereto. Special care must be used by the Contractor in the prosecution of the work in order to avoid interference or damage to any operating utilities or plants; however, where there is any possibility of such interference or damage, the Contractor shall make satisfactory arrangements with responsible officers or with the owners of the utilities or plants, covering the necessary precautions to be used as safeguards during the performance of the work by the Contractor. Such arrangement shall be made before the work is started and shall be subject to the approval of the Engineer, which approval will not be considered as releasing the Contractor from any responsibility for the acts of himself or his employees or representatives. The Contractor shall protect all land monuments and property markers that will be affected by the construction until they have been correctly referenced. Contractor when directed shall, satisfactorily reset monuments and markers that are disturbed by the Contractor during the construction of the Project or otherwise.

- B. If the sewer lines cross telephone, telegraph, electric, television cables, gas, oil or water lines, no excavation or pipe laying shall be done at those crossings without an approved right of way agreement and the presence of an authorized representative from the office of the authority having jurisdiction. Attention is directed to the provisions of Act No. 287 (1974), and its amendments thereto of the Commonwealth of Pennsylvania, and full compliance therewith is required.

1.09 SAFETY REQUIREMENTS

- A. The Contractor is responsible for all site safety.
- B. If, and when the use of explosives is necessary for the prosecution of the work, the Contractor shall store and use in strict conformity to all State and local laws and regulations. No explosives shall be used without first securing an applicable blasting permit.
- C. Observance of, and compliance with, said regulations shall be solely and without qualification, the responsibility of the Contractor, without any responsibility whatsoever on the part of the Authority or Engineer. The duty of enforcing such laws and regulations lies with the said Department, not with the Authority or Engineer.

1.10 REQUIREMENTS OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION

The Contractor and the Developer are advised that they will be required to design and conduct their work in compliance with the rules, regulations and requirements of the Pennsylvania Department of Environmental Protection.

1.11 OBSERVANCE OF LAWS AND REGULATIONS

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 reliance on superintendence or direction by the Authority or Engineer.

1.12 ENGINEER'S DUTIES, EXAMINATION AND INSPECTION

- A. The work shall at all times be subject to the examination and inspection of the Engineer, Authority or its authorized employees, who shall have free access to the work, and be furnished by the Contractor with every reasonable facility for examination of the work, to the extent of uncovering, testing or removing finished portions thereof. The Contractor shall provide all labor and equipment necessary for such examinations. The Engineer may require the Contractor to uncover for examination, 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 its assistants are the representatives of the Authority during the construction of the work. When so authorized by the Authority, it shall be the duty of the Engineer to see that all materials and work are properly inspected and that all such materials and work conform fully to the requirements of the Specifications. The Engineer shall perform such other duties as may be defined assigned him from time to time and shall have such additional authority as may

be defined elsewhere in these General Instructions. The Engineer 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 inspections 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 inspection, 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 approved, the Contractor shall give the Engineer timely notice of its readiness for inspection.
- D. The Engineer shall, within a reasonable time after presentation to it, determine all questions in relation to the construction of the Project, and in all cases decide every question that may arise relative to the performance of the work covered by the Contract.
- E. The Engineer shall have full authority to decide all questions that 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 that the Engineer may give the Contractor shall in no way be construed as binding the Authority in any way.
- G. In case of any dispute relative to the quality of materials or work, the Engineer shall have authority to reject materials and to advise the Authority to 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.

1.13 DEFECTIVE WORK

- A. When any material not conforming to the requirements of the Specifications and Drawings, has been delivered upon 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 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 Authority to the Developer or termination of the Maintenance Bond, as may apply.
- B. The Contractor shall remove any work or material condemned, and shall rebuild and replace the same.
- C. The Contractor shall promptly move from the premises all materials condemned by the Engineer as failing to conform to the Specifications, whether incorporated in the structure or not, and the Contractor shall promptly replace its own work in accordance with the Contract.

1.14 NOTICE

The service of any notice, by the Authority or Engineer to the Developer or Contractor, shall be considered accomplished upon completion or 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 its authorized agents in person;
- C. When delivered, in writing, to the addressee or any of its agents at the office used by the addressee to conduct the business of the Contractor at or near the Site of the work;
- D. When deposited in the United States Mail, postpaid, and addressed to the party intended for such service at its office used for conducting the business of the Contract at the Site of the work, or its last known place of business.

1.15 ENGINEERING STAKES

The Contractor shall furnish, set and maintain suitable stakes, grade boards, temporary structures, templates, and other materials for establishing and maintaining points, marks, and lines. The Contractor shall be held responsible for the preservation of all stakes and marks.

1.16 ITEMS REQUIRED PRIOR TO BEGINNING CONSTRUCTION

- A. Sewer Extension Agreement
- B. County Conservation District approved Erosion and Sediment Control Plan
- C. Blasting permit if needed
- D. Penn DOT Highway Occupancy Permit if needed
- E. Local Street Cut Permits if needed
- F. 10 day notice letter indicating Contractor intends to start work
- G. Pre-Construction meeting
- H. Evidence that the final subdivision plan has been filed by the Municipality at the county courthouse, Recorder of Deeds office, if applicable
- I. Performance and Payment Bonds or other financial security to assure completion of the sewer extension
- J. Receipt of a letter from the Developer stating the name of the Contractor who will be installing the sanitary sewer extension, when applicable
- K. Receipt from the Authority of a copy of the Water Quality Management Permit (WQM) issued by DEP, when applicable; or DEP Planning Module approval letter if WQM is not required
- L. A list of suppliers for the materials to be used in the sanitary sewer construction
- M. Shop drawings of manhole bases, manhole risers, manhole frames and covers, pipe and other necessary construction materials approved by the Authority
- N. Certification from the pipe manufacturer that the pipe meets or exceeds the requirements of the Authority to proceed with construction
- O. Written approval by the Authority to proceed with construction

- P. Notice to One Call for marking all utilities in the work area.
- Q. Application for sewer service will be made prior to the installation of a new sewer service. Applications may be picked up at the Authority's office. Following approval of the permit application and payment of fees a permit shall be issued authorizing construction on the Authority's sewer system.

SECTION 2

GENERAL REQUIREMENTS

2.01 SITE LOCATION

Project locations are in the service area of the Washington Township Municipal Authority, Franklin County, Pennsylvania. Any project ultimately connecting to the Authority's sewerage system is included in these General Requirements.

2.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. Without intending to limit or restrict the extent of Work required under these Specifications, the Work generally comprises construction of extensions to the existing wastewater collection system in accordance with these Specifications, Sewer Detail Drawings bound herein and the latest Building Sewer Specifications.
- B. Drawings: The Sewer Detail Drawings represent the standards of construction of the Authority and are bound in the back of the Specifications.
- C. On the Sewer Detail Drawings the words "Project Manual" is to be defined as "these" Standard Specifications.

2.03 PRELIMINARY REQUIREMENTS

- A. Before any work is started, the Developer shall ascertain from the Authority if the Authority intends to employ a consultant as Engineer for the Project. If the Authority indicates that no Engineer will be employed, the word "Authority" is substituted for the word "Engineer" throughout these Specifications, and the Developer and Contractor shall be guided accordingly.
- B. Where sewers are to be installed within the limits of existing streets, all removal and protection of street paving, backfilling of trenches, temporary and permanent replacement of street paving, restoration of shoulders and the maintenance and protection of traffic will be performed in strict conformance with the requirements of the Washington Township Municipal Authority, the Washington Township Supervisors or the Commonwealth of Pennsylvania Department of Transportation, as applicable. The cost of all inspection by personnel of the Commonwealth of Pennsylvania Department of Transportation or the local municipality shall be paid by the Developer. Work performed within the right-of-way of State Highways shall be in accordance with the requirements of the latest edition of the Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, Transportation, Department of Transportation, Chapter 459, and Occupancy of Highways by Utilities. The Regulations are made a part of these Specifications.

- C. When service connections are required as work of this project, construct them from the cleanout/test tee to the building using materials required by the latest version of the Building Sewer Specifications.
- D. Where feasible, and to the maximum extent possible, locate new sewers in easements outside streets and paved areas to facilitate access for maintenance purposes.
- E. Do not connect storm water or groundwater drainage to any sewer extension of the Authority's system. No rain water leaders, roof drainage, area or yard drainage, basement, surface or water from fire hydrants, ground water or water from underground drainage fields shall be permitted to drain into or be admitted into the sanitary sewer system, nor shall any of these be admitted to the sanitary sewer system by the use of pumps of any type. The sanitary sewer system, and all extensions, is intended to convey sanitary sewage only. The sanitary sewer trench shall not be used for water drainage purposes.
- F. Interfacing Existing Construction:
 - 1. Do not permit ground or surface water to enter the existing sanitary sewer facilities through the new sewer piping connection.
 - 2. Do not flush, drain or deposit water or debris from the new sewer piping or related construction into the existing sanitary sewer facilities.
 - 3. Install a watertight plug in new sewer piping entering a new manhole. Maintain the plug until all debris and accumulated water has been removed from the new sewer facilities and the new sewer facilities have passed all specified acceptance tests.

2.04 SUBMISSIONS REQUIRED FOR AUTHORITY CONTRACTS

Contract Drawings for the Authority's Contract work shall be submitted by the Engineer.

2.05 SUBMISSIONS REQUIRED FOR NEW SUBDIVISIONS

Make all submissions to the office of the Authority unless directed otherwise.

- A. The descriptions under the SUBMITTALS Article in each Specification's Section indicate the type of submission required. Submit copies of the Developer's plans and a construction progress schedule to the Authority.
- B. Definition: The term shop drawing used throughout this Section includes manufacturer's product data in the forms of descriptive literature, specifications with published detail drawings, Contractor prepared drawings, certified test records or reports and such other certificates required by the Specifications.
- C. The terms Preliminary and Final **Subdivision** Approval are requirements of the Washington Township Supervisors and the Commonwealth of Pennsylvania. The WTMA does not provide Preliminary or Final **Subdivision** Approval. The WTMA provides sewer capacity and approves extensions to its sewage system in accordance with these specifications, engineering review comments, and applicable State and Federal Regulations. **It is the Developer's responsibility to communicate, plan and submit sewer extension requirements to the WTMA in a timely manner for the Developer to comply with the Washington Township's Preliminary and Final Subdivision Approval time**

requirements. To aid in this process the WTMA will review and submit comments back to the design engineer within 30 days of receipt of drawings and appropriate review fees. Subsequent reviews of the revised plans will also be completed within 30 days of receipt.

2.06 GENERAL OUTLINE OF STEPS FOR DEVELOPER SEWER EXTENSIONS

- A. All land development plans regardless of size shall be required to submit 4 sets of drawings to the Authority for review and comment.
- B. Planning Phase
 1. Upon notice to the Authority of the intent to propose an extension, Authority staff will provide a preliminary planning conference to provide information about Authority extension approval procedures and to receive general information from the Developer about the proposed extension.
 2. Submit an application and agreement for sewerage treatment capacity reservation. The Authority Engineer will determine if capacity exists and will so advise the Authority. **All Reservation Applications and Agreements must be acted on by the Authority Board.**
 3. After approval of a Reservation Agreement, the Authority will process its portion of a PADEP Planning Module if requested.
 4. Developer must obtain a copy of the Authority's "Standard Construction and Material Specifications for Wastewater Collection System".
 5. The Developer shall submit a "Proposed Wastewater System Extension Feasibility Study" (hereinafter "Study") prepared by a registered professional engineer. The Study shall contain any analysis and information needed to support an included certification by the author of the Study that the:
 - Proposed extension will adequately serve the wastewater needs of the new development,
 - Existing wastewater collection and/or conveyance system to which the extension is planned to discharge are capable, or have capacity, to receive the additional flows generated by the development without adverse impacts according to standards applied by the Authority Engineer, and
 - Extension can be successfully designed in conformance with the "Standard Construction and Material Specifications" for the Wastewater Collection System. The Study shall include a general layout of the extension on a plan, if not a finished design, showing the proposed system connection point(s), pipe sizes and locations, manhole locations, locations of any proposed pump stations, and other features or proposed improvements deemed important to determine the feasibility of the extension.
 6. The Authority shall act on the Study based on the written recommendation of the Authority's Engineer. If approved, such approval shall not be deemed as a requirement for the approval of an extension plan, or an acceptance of dedication of any facility to be constructed according to the Study. The meaning of the approval of the Study shall be limited to an affirmation that the requirement for the submission of a Study has been met,

and that, as of the time of the submission of the Study, it appears that the completion of the extension is feasible based on the information and certification contained therein. A sewer capacity reservation agreement is recommended, as sewer capacity is not reserved until an application to connect is submitted and approved for each lot or a sewer capacity reservation agreement is approved.

C. Design Phase

1. The Developer should submit 4 sets of drawings as referenced in 2.06A for each submission to the Authority for review and comment. The initial submission shall be done during the preliminary planning stages.
 - When the drawings are delivered to the Authority a check for the plan review fees and initial deposits for engineering and inspection cost shall be submitted to the Authority in accordance with the Authority's fee schedule. No plans will be reviewed without receipt of this payment.
 - As the design review progresses and the Authority's costs are greater than the deposit, the Authority may request additional escrow deposits from the Developer or invoice for any fees in excess of escrowed funds.
 - The plan review fees and initial deposit amounts are set by separate Resolution and are part of these specifications.
2. The Developer should submit documentation to Authority indicating permission from neighboring property owners when a right-of-way is required from a property not owned by the Developer, or when Developer intends to use an easement not explicitly stated to be used by Township or Authority. These may include gas, electric, water or phone easements.
3. Developer shall submit all legal descriptions for any easements to be dedicated to the Authority, prior to approval of design drawings. At completion of work, these shall be used in the dedication process.
4. If a Highway Occupancy Permit is needed for installation of the sewer, the Developer should prepare the permit in the name of the Authority. The Developer should then deliver the application to the Authority for signature and subsequent delivery to Penn DOT.
5. The preliminary subdivision plans shall be reviewed by the Engineer. Any or all comments must be addressed to the satisfaction of the Engineer and the changes made prior to receiving preliminary approval by the Authority.
6. Upon preliminary approval of the drawings, the Developer will be provided a listing of requirements prior to issuance of a Notice to Proceed. See E.1 below.
 - **Note: The approved preliminary plans are also the approved construction drawings for subdivisions and site development plans. The preliminary plan approval letter, when issued, will note the last revision date on the plans. No changes will be permitted after that date, unless the plans are resubmitted to the Authority identifying the requested changes and the changes are approved in writing.**

D. Agreement Phase

1. Upon approval of the design drawings, a **Sewer Extension Agreement (SEA)** shall be entered into between the Developer and the Authority. Sewer extension agreements apply to both private and public sewer extensions.
2. If bonding is required, The Developer shall submit to the Authority a construction cost estimate for review by the Authority's Engineer. The construction cost estimate will be used for financial security calculations. The construction cost estimate will be multiplied by 1.10 for a ten percent contingency and the approved construction cost estimate is the amount of required financial security. A Construction Cost Estimate for Financial Security is not required for private extensions not in a public right of way unless the extension is intended for use by more than one property. The Developer shall then select the desired form of financial security. The most common forms are Performance Bonds and Letters of Credit. The Authority has standard forms for each of these. The Developer is responsible for selecting and submitting the security to the Authority's standards.
3. A Developer may construct with approved preliminary subdivision plans, before final subdivision approval is requested. When this occurs financial security is required for all sewer extension work in a public right of way or utility easement and on private property not owned by the Developer. The purpose of this security is to assure that the Authority does not become liable for partial work or damage on properties not owned by the Developer.
4. Upon receipt of the above information, the Authority will develop three (3) original copies of the SEA and attach the Developer's financial security. (If required)
 - a. If additional escrow is required, the SEA will also indicate that additional money shall be deposited with the Authority for costs to be incurred by the Authority.
 - b. The Authority will determine the amount of escrow required.
 - c. The Authority will then forward the SEAs to the Developer for execution.
5. The following items must also be submitted to the Authority prior to issuance of a Notice to Proceed:
 - a. Developer to submit a minimum five (5) copies of Shop Drawings to the Authority for review and comment.
 - b. Developer's Engineer shall submit to the Authority in a digital format a complete set of the approved construction plans.
 - c. Developer to have executed SEA
 - d. Developer to have established the escrow account to the dollar amount specified in the SEA. If additional escrow money is needed during construction, the Authority will duly notify the Developer that an additional escrow deposit is required.

E. Construction Phase

1. The Developer is issued a Notice to Proceed after all the above items are addressed.
2. The Developer is responsible for issuing a ten (10) day notice to the Authority indicating the intent to start construction. At this time, a Pre-construction Meeting will be scheduled. Attendees at the Pre-construction meeting include at a minimum the

Contractor, Developer, Authority, Construction Inspector, and Authority's Engineer. A representative of the Washington Township Supervisors and of the County Soils and Erosion Control are recommended to be scheduled for this meeting.

- **The Developer shall submit five (5) sets of the approved drawings to the Authority for construction purposes. These drawings will be stamped approved for construction by the Engineer. During the Pre-construction Meeting, these drawings will be distributed to Developer, Contractor, Authority, Construction Inspector, and Authority's Engineer. Note: the plan requirements do not address plan requirements of other regulatory agencies**
3. Developer's Contractor shall install the sewers in accordance with Authority's Standard Construction Specifications.
 - The Contractor is responsible for record keeping of lateral locations, final elevations of manholes and final location of all piping.
 - The Contractor is responsible for survey and layout of sewer.
 4. The Authority's Construction Inspector shall observe installation of the sewer extension and the sewer extension testing.
 5. The Authority's Construction Inspector shall prepare a list of punch list items.
 6. The Developer's Contractor shall complete all punch list items.

F. Post Construction

1. Record Drawings as outlined later in Section 2.07 must be submitted to the Authority at the close of construction. All cost associated with the development of these drawings shall be the responsibility of the Developer.
2. Developer shall submit revised legal descriptions for dedication of the sewer extension and the sewer easements, both on and off the Developer's property, as necessary. The requirements of the plats and legal descriptions are as outlined later in Section 2.07.
3. Prior to the Authority accepting the dedication of the sewer extension the Developer shall submit to the Authority a Guarantee Phase Financial Security (Maintenance Bond).
 - a. The security shall be in the amount of 15% of the approved construction cost estimate.
 - b. The security shall be in effect for 18-months from the date of executed Deed of Dedication.
 - Ninety (90) days prior to expiration of the Financial Security, the Authority or the Authority's Engineer may perform an inspection of the sewer extension. Any deficiencies shall be corrected at the Contractor's expense. If Contractor refuses to correct deficiencies, the Financial Security will be used by the Authority to correct them.
4. All unpaid fees are due at this time.
5. Upon approval of the above information and receipt of unpaid fees, the Authority will then permit issuance of individual connection permits in accordance with the SEA. No permits

to connect to the sewer system will be issued until the aforementioned criteria have been met to the Authority's satisfaction.

2.07 CONTRACT DRAWINGS – DEVELOPER SUBMISSION

A. General:

1. Submit four (4) sets of drawings for review. After review of these drawings, make any corrections required and resubmit four (4) corrected sets. If the plans are for final approval five (5) sets of drawings are required as identified later in this section.
2. If a WQM (Water Quality Management) or Part II permit is required from DEP, submit seven (7) sets.
3. Sheet Size: 24 x 36 inches
4. Base all elevations on USGS datum, State Plane Coordinate System and refer to Authority record drawing elevations of the existing sewers and indicate the difference between USGS and Authority datum.
5. Include the following note on each drawing, "All materials used and construction methods employed shall be in accordance with the latest standards of the "WASHINGTON TOWNSHIP MUNICIPAL AUTHORITY STANDARD CONSTRUCTION AND MATERIALS SPECIFICATIONS".
6. Include the following note on each drawing, "for sewer detail drawings, reference the "Washington Township Municipal Authority Standard Construction and Material Specification drawings".
7. Include the following note on each drawing, "Contractor shall test pit all utility crossings prior to installing any sanitary sewer pipe to verify existing horizontal and vertical elevations to assure no conflict with new sewer."
8. Show details of manholes, bedding, encasement, service connections, etc., in drawings.
9. Bind drawings in sets and number them consecutively.
10. Include a copy of the attached design checklist indicating that all items meet the Authority's Standards with the initial submission.

B. Indicate on the design drawings the following general items:

1. Name of the Design Engineer/Surveyor Note: pumping station designs require an engineer's seal.
2. Seal of the Design Engineer/Surveyor (on Approved Drawings)
3. Signature of the Design Engineer/Surveyor (on Approved Drawings)
4. Name of the development and the owners
5. Original Date and all subsequent revision dates.
6. Indicate by note on the Index Map(s) or Plan and Profile sheet(s) the Water Quality Management Permit Number, or DEP File Code No. if no WQM permit was required.
7. Act 287 list of utilities, PA One Call Serial Number and Logo (and all subsequent amendments thereto)

C. Include the following information on drawings:

1. Location Plan: Showing approximate area of the municipality in which the project is located. No particular scale is required.
2. Plan and Profile Drawings: Plan View drawn to a scale of 1" = 50' and Profile View drawn to a horizontal scale of 1" = 50' and a vertical scale of 1" = 10' (or other scale, if approved by the WTMA) and having the following items included thereon:
 - a. Table 1, which is attached, is a checklist of minimum design criteria for sewer extensions.
 - b. The location of each existing or proposed building with elevation of the existing or proposed basement (Plan View). If proposed basement elevations are not known, the drawings must include a note stating which lots are not intended to be provided with gravity basement drainage.
 - c. Sewer ties to existing permanent and semi-permanent features (Plan View).
 - d. Top elevations of manholes (Profile View)
 - e. Invert elevations of manholes (Profile View)
 - f. Manhole numbers corresponding to those on Index Map (Plan and Profile Views). Contact the Authority for manhole numbering sequence.
 - g. Distance between manholes (Profile View); maximum 400 lineal feet
 - h. Grade of proposed sewer (Profile View); minimum 0.50 percent on 8-inch main and 1.00 percent for terminal manhole runs.
 - i. Minimum depth of gravity sewer shall be seven (7) feet from top of pipe unless the Engineer approves a shallower depth.
 - j. Sewers installed at a depth greater than 12 feet shall be made of Class 52 cement lined ductile iron pipe.
 - k. For sewers installed in fill areas, a note shall be placed on the drawings indicating that the "fill shall be compacted to a minimum of 95% of ASTM D698 Standard Proctor." The Authority requires testing data to verify that at the invert elevation of the sewer main that the compaction requirements have been met.
 - l. Size of proposed sewer (Profile View); 8-inch main with 6 and 4-inch Service laterals
 - m. Location, size and elevation of all existing and proposed underground utilities (Plan View and Profile View); minimum ten feet horizontal clearance to water mains and five feet to all other utilities.
 - n. Service Lateral Installation Location:
 - 1) The measurement to locate tee or wye branch is the horizontal distance measured along the centerline of the main sewer from the centerline of downstream manhole to the centerline of tee branch.
 - 2) The ties and measurements necessary to locate the upper free end of the service connections are:

- The horizontal distance from the centerline of the main sewer to the end of the service connection
 - The horizontal distance measured to the closet tenth of a foot from the downstream and upstream property markers, house corners, to the end of the service connection when available.
- 3) Connections at manholes are not permissible under normal conditions
 - 4) Laterals shall be installed at right angles to the main.
 - 5) A note should be included indicating that no laterals shall be placed in driveways, sidewalks, or within 10 feet of a water service or from any street or property tree planting.
- a. Invert elevations of manholes having greater than 24 inches difference between influent and effluent shall require construction of an inside drop connection within a minimum 5-foot diameter manhole.
 - 1) Manholes having less than 24 inches of fall shall have smooth flow transitions (channel) from influent to effluent pipes.
 - 2) Manholes requiring drop connections shall be a minimum of five (5) feet in diameter and shall be of the inside variety.

B. Final Acceptance Submissions:

1. Record Drawings:

- a. Before Sewer Connection Permits are issued and the work accepted by the Authority, submit a digital copy in a format acceptable to the WTMA, and two (2) 'hard' copies of all working Drawings, modified as necessary to show the facilities as constructed. Submit a certificate with the record reproducible attesting to the correctness of all information shown on the Drawings
- b. The Authority intends to use prints of the reproducible to provide information to designers and contractors as required by the Commonwealth of Pennsylvania Act 287 and its amendments thereto.
- c. Record drawings shall indicate:
 - 1) Sheet size 24" x 36"
 - 2) Lot lines and lot number adjacent to sewer easement or roadway
 - 3) All information as identified in Section 2.07 C on page 22 concerning Plan and Profile Drawings.
 - 4) Name of Design Engineer/Surveyor including seal and signature
 - 5) Name of Developer including address
 - 6) Name of Owner if different than Developer
 - 7) All manhole numbers as provided by the Authority.

2. Straight Line Diagrams: Contractor shall prepare and submit one copy of the lateral locations to the Authority and one copy to the Owner/Developer. Forms are included in

these Specifications as Table 2. Sewers including manhole numbers shall be indicated.

3. Final Acceptance Tests, as specified under the various Sections, completed and successful
4. Final Acceptance Affidavits: An affidavit and such other satisfactory evidence as is required that all labor, material, rentals, contractors and subcontractors, and indebtedness arising out of performance of the sewer contract work have been paid; and that all other claims against the Owner/Developer, Contractor, or Subcontractors arising out of performance of the sewer contract work either have been paid or that the Owner/Developer, Contractor or Subcontractor has and will maintain in force such Public Liability and Property Damage Insurance as will fully protect them and the Authority from any such claims as may be pending or that may thereafter arise, to include any work performed during or at the end of the Contractor's Guarantee period of 18 months. Such guarantee work as may be required because of the Authority's Guarantee Re-inspection which will take place before the end of the 18 month Guarantee time period.
5. Deed of dedication/Bill of Sale of all sewer mains and manholes to the Authority. All laterals, grinder pumps, private pressure pipe systems and off-street sewers not covered by a right-of-way shall remain with the property owner, Developer or by a homeowners association where required by Township regulations.

2.08 RIGHT-OF-WAY DRAWINGS

- A. Provide 5 copies of all required descriptions for rights-of-way. Proposed generic form for Deed of Easement is available from the Authority. The Authority shall record rights-of-way in the courthouse.
- B. Provide a deed of conveyance/Bill of Sale transferring ownership of the sanitary sewer extension to the Authority.

2.09 CONSTRUCTION PROGRESS SCHEDULE – CONTRACTOR SUBMISSION

- A. Contractor shall submit a letter to the Authority indicating its intent to start construction at least 10 days prior to the desired start date.
- B. At least seven days before work is commenced, submit three copies of a practical and feasible progress schedule showing the order in which the Work is to be carried on, the dates on which salient features will start (including procurement of materials and equipment), and the contemplated dates for completing same.
- C. Prepare the schedule in chart form and of a suitable scale to indicate the percentage of Work completed at any time.
- D. At the end of each month, update the Construction Progress Schedule by entering the actual progress of the Work on the schedule. Deliver three copies of the updated Construction Progress Schedule immediately after its completion.

2.10 SHOP DRAWINGS – CONTRACTOR SUBMISSION

- A. Submit a minimum five copies of each shop drawing with such promptness as to avoid delay in the work.

- B. Each submission of shop drawings must be accompanied by a letter of transmittal listing the items in the submission. Each shop drawing must be marked with the name of the Project and the name of the Contractor and be numbered consecutively.
- C. When making a submission for approval, the Contractor shall do so with the understanding that he is considered to have checked the items in the shop drawing before submitting them and that he is satisfied that, in their present state, they not only meet the requirements of the Specifications, but will present no difficulties in erection and completing his Contract, and shall clearly note his approval on all shop drawings prior to their submission to the Engineer. Failure of the Contractor to note his approval will be reason for the Engineer to return such submission to the Contractor unchecked.
1. If it appears that shop drawings submitted by the Contractor to the Engineer have not been properly checked, even though the Contractor's approval has been noted thereon, it will also be considered reason for the Engineer to return such submission to the Contractor unchecked.
 2. Markings, written or otherwise, made by the Contractor or by his suppliers or manufacturers must be made on the Submittal in a color other than red. RED is reserved for the exclusive use of the Engineer in marking Submittals.
- D. If shop drawings show variations from the Specifications requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in his letter of submission in order that (if accepted) suitable action may be taken for proper adjustment in the Contract; otherwise the Contractor will not be relieved of the responsibility for executing the Work in accordance with the Specifications even though the shop drawings have been approved.
- E. The approval of shop drawings will be general and shall not relieve the Contractor from the responsibility for proper fitting and construction of the Work nor from furnishing materials and work required by the Specifications which may not be indicated on the shop drawings when approved.
- F. After review by the Engineer, shop drawings will be returned marked as follows: Approved, Approved as Noted, Revise and Resubmit or Not Approved.
1. **Approved:** When shop drawings are returned "Approved", that means the shop drawings have been found to be in conformance with the Specifications. The Engineer's approval of the shop drawings does not relieve the Contractor from responsibility for errors or discrepancies in such shop drawings.
 2. **Approved as Noted:** When shop drawings are returned "Approved as Noted" that means the shop drawings have been found to be in conformance with the Specifications, provided the changes noted by the Engineer are incorporated in the shop drawings. Shop drawings returned "Approved as Noted" will not require resubmission.
 3. **Revise and Resubmit:** When shop drawings are returned noted "Revise and Resubmit" that means the Contractor shall make the required corrections and resubmit five copies of corrected shop drawings to the Engineer.
 4. **Not Approved:** When shop drawings are returned "Not Approved" that means the Contractor shall make completely new shop drawings and submit five copies to the Engineer for review.

SECTION 3

TEMPORARY FACILITIES AND CONTROLS

3.01 TEMPORARY SERVICES

A. General: Provide temporary services at the site of the Work throughout the entire period of construction and until the Work of the Contract is completed and the new facilities are placed in operation of the Authority's personnel.

B. Temporary Water Control:

1. At all times during the construction of work of this Contract maintain the flow of storm water, naturally occurring water and wastewater in existing facilities and channels affected by the Work.
2. Particular attention is directed to above requirement in regard to the maintenance of flow in existing sewer service connections during removal and replacement of the sewer main.
3. Contractor assumes risk from floods or other causes, and any damages done to the work in progress or to work completed under Contract. Make repairs and replacements to the satisfaction of the Engineer.
4. Contractor assumes responsibility for damages to property caused by flooding or back flooding of property due to blocking or restriction of storm water passages, natural waterways and wastewater facilities capacity during normal or excessive periods of water flow.
5. At any time do not permit wastewater flow from existing sewers to flow into nearby waterways or to flow on surface areas. Furthermore, should an accidental discharge occur, notify Department of Environmental Protection immediately.
6. The means and methods the Contractor employs to meet above requirements are at his discretion but will be subject to the Engineer's approval.

SECTION 4

REMOVAL OF TEMPORARY FACILITIES AND CONTROLS

4.01 REMOVAL

Contractor shall dismantle and remove such temporary facilities and controls as required during construction of the project.

SECTION 5

TRAFFIC REGULATION

5.01 DESCRIPTION

Purpose: The purpose of this Section is to provide the Contractor with general guidelines for the control of traffic while the work of the Project within street right-of-way is being performed. The goal is to help ensure safe and efficient traffic movement through work areas and provide safety for the Contractor's work force.

5.02 QUALITY ASSURANCE

Requirements of Regulatory Agencies:

- A. Furnish, erect and maintain at closures, intersections, and throughout the Project, the necessary approved barricades, suitable and sufficient lights, approved reflectors, danger signals, and warning, detour and closure signs. Provide a sufficient number of watchmen and take the necessary and legal precautions for protection of work and safety of the public. Barricades, danger signals, signs and obstructions shall be illuminated from sunset until sunrise. Materials and safety devices (i.e., barricades, flashing warning lights, torches, reflectors and signs) shall conform to the State Department of Transportation Specifications.
- B. Traffic regulation on Authority service area streets shall conform in all respects to the requirements for traffic control on State Highways.
 - Provide a traffic control plan (modeled after a state Highway plan) to the Authority prior to start of work and keep a copy of the plan at the site of the work at all times.
- C. State Highways: The Contractor is advised that he is required to provide traffic control in complete compliance with the rules and regulations of the Pennsylvania Department of Transportation (PDT), including but not necessarily limited to the following:
 - PA Code Title 67, Transportation: Chapter 203 – Work Zone Traffic Control.
 - PA Code Title 67, Transportation: Chapter 441 – Access to and Occupancy of Highways by Driveways and Local Roads.
 - PA Code Title 67, Transportation: Chapter 459 – Occupancy of Highways by Utilities.
 - Section 901 “Maintenance and Protection of Traffic during Construction” of the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408, as supplemented, and such other sections therein which complement this Section.
- D. Fines and related costs resulting from the Contractor's failure to provide adequate traffic control shall be borne solely by the Contractor.

SECTION 6

TRAFFIC CONTROL MATERIALS

6.01 MATERIALS

- A. Materials and safety devices such as barricades, flashing warning lights, reflectors and signs, provided 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 Section 901 of the current edition of the Commonwealth of Pennsylvania Department of Transportation Specifications Publication 408 (as supplemented) and to requirements specified in the current edition of PA Code Title 67, Transportation: Chapter 203 – Work Zone Traffic Control which complements Section 901

- B. Provide danger signals and warning signs in the approved color.

SECTION 7

SUBSURFACE EXPLORATION

7.01 DIGGING TEST PITS:

- A. In locations where new sewers are to be connected to existing sewers, the Contractor will not be permitted to proceed with new construction until he has dug test pits and determined the exact location and elevation of any existing facilities. Dig such test pits only at the locations agreed to by the Engineer.

- B. All appropriate approvals (i.e. street cut permits) must be obtained by the contractor from the governing municipality prior to any subsurface exploration.

SECTION 8

ROCK REMOVAL

8.01 QUALITY ASSURANCE

- A. Contractor: Contractor shall have five years documented experience with the use of explosives for disintegration of subsurface rock.
- B. Blaster shall be licensed in accordance with all applicable Federal, State and/or local laws, ordinances and regulations.

8.02 REGULATORY REQUIREMENTS

- A. Conform to applicable Federal, State and/or local laws, ordinances and regulations for explosive disintegration of rock.
- B. Obtain and display permits on site from authorities having jurisdiction before explosives are brought to site or drilling is started.

8.03 REFERENCES

- A. NFPA-495-Code for the Manufacturer, Transportation, Storage, and Use of Explosive Materials
- B. PA Code- Chapter 211 – Storage, Handling and Use of Explosives

8.04 MATERIALS

- A. Rock Definition: Solid mineral material with a volume in excess of 1/3 cu. yd., that cannot be machine excavated as determined by the Engineer.
- B. Explosives: Type recommended by explosives firm and required by authorities having jurisdiction.
- C. Delay Devices: Type recommended by explosives firm.
- D. Blasting Mat Materials: Type recommended by explosives firm

8.05 INSPECTION

- A. Verify site conditions and note irregularities affecting work of this Section.
- B. Beginning work of this Section means acceptance of existing condition.

8.06 ROCK REMOVAL - MECHANICAL METHOD

- A. Excavate for and remove rock by the mechanical method.
- B. Cut away rock at excavation bottom to form level bearing.
- C. Remove shale layers to provide sound and unshattered base for footings, slabs and embankments.

- D. In utility trenches, excavate to 8 inches below invert elevation of pipe and 24 inches wider than pipe diameter.
- E. Remove excess or unsuitable materials from site.
- F. Correct unauthorized rock removal in accordance with backfilling and compaction requirements of Section 9 TRENCHING.

8.07 ROCK REMOVAL - EXPLOSIVES METHOD

- A. If rock is uncovered requiring the explosives method for rock disintegration, notify the Engineer and execute as follows:
- B. Advise owners of adjacent building or structures in writing and conduct pre-blast survey of wells and structures on adjacent properties, as applicable.
- C. Provide seismographic monitoring during progress of blasting operations or limit charges as prescribed in regulations of the Pennsylvania Department of Environmental Protection.
- D. Disintegrate rock and remove from excavation.
 - 1. Conduct blasting operations to avoid injury to persons and property.
 - 2. Use explosive quantity and strength required to break rock approximately to intended lines and grades and yet leave rock in unshattered condition.
 - 3. Cover rock with logs or mats, or both where required.
 - 4. Issue sufficient warning to all persons prior to detonating a charge
 - 5. Store caps and exploders separately from explosives
 - 6. Remove all explosives from site at completion of blasting operations.
- E. Provide the Engineer with copies of daily blasting Records as prescribed in Chapter 211 "**Storage, Handling and Use of Explosives**", Section 211.46 of the Pennsylvania Department of Environmental Protection regulations.
- F. Repair any damage to structures, walls, paving, etc. resulting from blasting activities to satisfaction of property owners.
- G. The Owner reserves the right to prohibit blasting and the right to require that rock be removed by drilling and/or drilling and wedging.

8.08 FIELD QUALITY CONTROL

Provide a safe means for visual inspection of bearing surfaces and cavities formed by removed rock.

SECTION 9 TRENCHING

9.01 REFERENCES

Pennsylvania Department of Transportation Publication 408

9.02 PERMITS

- A. Township Highway Occupancy Permit and/or Street-cut Permit
- B. State Highway Occupancy Permit in Authority's name
- C. Blasting Permits
- D. Stream Crossing Permit
- E. Wetland Encroachment Permit
- F. Soil and Erosion Control Permit

9.03 PROTECTION

- A. Notify all utilities prior to work so that they may locate all affected facilities.
- B. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.
- C. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- D. Notify Engineer of unexpected subsurface conditions and discontinue work in affected area until notification to resume work.
- E. Protect bottom of excavations and soil adjacent to and beneath foundation from frost.
- F. **Use rubber tired or treated equipment on pavement unless otherwise authorized in writing by agency having jurisdiction.**
- G. Grade excavation top perimeter to prevent surface water run-off into excavation
- H. Contractor, at all times, shall keep the gutters open so that storm or other waters shall not have their flow obstructed. If, in any case, the material excavated from the trenches must temporarily extend over the gutters, it shall be duty of the Contractor to plank or bridge over the gutters without extra compensation so that the flow of water is not prevented.
- I. **The Contractor shall be responsible for maintaining a safe job site, including the safety of his employees. This includes safe trench access for the Authority's inspectors.**
- J. Temporary Protective Construction:
 - 1. Temporary Fence Barricade: Erect and maintain substantial temporary fences that surround the excavation to prevent unauthorized persons entering such areas.

2. Temporary Fence: Where necessary, to keep one side of streets or roadway free from obstruction or to keep material piled along side of the trench from falling on private property outside the right-of-way, erect and maintain a safe and substantial fence.
3. Barricades: Furnish and erect substantial barricades at crossings of trenches, or along trenches, to protect the traveling public.
4. Excavation Covers: Cover open excavation when work therein is suspended or left unattended, such as at the end of a workday. For such covers, use materials of sufficient strength and weight to prevent their removal by unauthorized persons.
5. Remove temporary protective construction at the completion of work on the Project.

9.04 WORK IN PRIVATE RIGHT OF WAY

- A. Right of way, if required to be secured by owner, Protect from injury all property including land, ornamental shrubs and trees, fences, and other improvements there to what may exist and replace in kind all those damaged.
- B. Pay all claims for property damage, trespass occupation for damage outside the right-of-way.
- C. It shall be the Contractor's responsibility to obtain all other rights-of-way for access to the Construction site. Written authorization from all effected property Owners shall be provided to Engineer before beginning work in the affected area.

9.05 SELECT MATERIALS IN ACCORDANCE PENNDOT'S PUBLICATION 408

- A. Coarse Aggregate AASHTO No. 8 (Penn Dot 1B Stone)
- B. Coarse Aggregate AASHTO No. 57 (Penn Dot 2B Stone)
- C. Coarse Aggregate PA No. 2A
- D. Coarse Aggregate PA No. R-3
- E. Bituminous Concrete Base Course
- F. SRL – E Wearing Course.
- G. HMA Superpave
- H. Class E – 1 Emulsified Asphalt Tack Coat.
- I. AC – 20 Asphalt Cement

9.06 INSPECTION

- A. Verify stockpiled fill to be reused is approved.
- B. Verify areas to be backfilled are free of debris, snow, ice, or water, and surfaces are not frozen.
- C. Verify materials delivered to site are as specified.

9.07 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. When necessary, compact sub grade surfaces to density requirements for backfill material.

9.08 EXCAVATION

- A. All excavation shall be unclassified; remove as required for piping installation shown on the drawings. Excavate subsoil required for piping as shown on the Drawings.
- B. Removal of Pavement & Storage of Materials
 - 1. Grub and clean surface of all materials of whatever nature over the line of trench
 - 2. Classify material removed and preserve such material as may be required for use in backfilling.
 - 3. Store removed material and preserve such material as may be required for use in backfilling.
 - 4. Cut paving to neat lines equidistant from the centerline of the trench. Width of paving removed initially shall be no greater than the trench width.
 - 5. In business streets, important thoroughfares, narrow streets, or other limited areas; Proceed as follows:
 - a. Material subsequently excavated shall be used to backfill the trench where required by the Detail Drawings.
 - b. Material not required for backfilling or which cannot be stored on streets or right-of-ways shall be removed. Contractor shall bring back as much of the required material removed as maybe required to properly backfill the trench or if so required furnish other material as may be necessary.
- C. Hand trim excavation and leave free of loose matter. Hand trim for bell and spigot pipe joints.
- D. Remove lumped subsoil, boulders, and rock up to 1/3 cu yard, measured by volume. Remove larger material under the requirements of Sections 8 and 9 of these specifications.
- E. Excavation shall not interfere with normal 45 degree bearing splay of foundations.
- F. Correct unauthorized excavation at no cost to Owner.
- G. Fill over-excavated areas under pipe bearing surfaces in accordance with direction by Engineer.
- H. Stockpile excavated material in area designated on site and remove excess subsoil from site.
- I. Excavated material shall be placed to minimize the inconvenience to occupants traveling in streets and driveways of adjoining properties.
- J. Excavated material shall not be deposited on private property without written consent of the property Owner thereof has been filed with the WTMA.
- K. In case more material is excavated from an excavation or trench than can be backfilled over the completed work, or can be stored within the limits of the right-of-way, or in the event working space is limited or space cannot be provided for traffic and drainage, the excess material shall be removed to some convenient place provided by the Contractor. The Contractor shall bring back as much material so removed as may be required to backfill the work; if of the proper kind; or, if so required furnish other material as may be necessary.

9.09 BACKFILLING

- A. Support pipe during placement and compaction of bedding fill. The bedding shall be graded by hand to provide a uniform and continuous bearing support for its entire length - bell holes shall be provided at ends of pipe lengths, but size of holes shall be kept to a minimum. The bell holes shall be backfilled with bedding material which shall be compacted and brought up to the height of the adjacent material. After pipe is placed bedding material shall be hand placed and carefully compacted to the dimension shown on the Drawings.
- B. Backfill trenches to contours and elevations. Backfill systematically (as early as possible) to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy sub grade surfaces.
- C. Compact all backfill material as shown on detailed Drawings or as directed by Engineer, or the governmental agency.
- D. Maintain optimum moisture content of backfill materials to attain required compaction density.
- E. Remove surplus backfill material from site.
- F. Backfill in accordance with the details shown on the Drawings, or as required by the local governmental agency.
- G. Materials shall be placed to 95% of the maximum dry density as determined by ASTM D698 or as directed by the Engineer.
- H. At the end of each work day the excavated area shall be completely backfilled and/or steel plates shall be placed over the excavation to accommodate traffic, unless other arrangements are specifically approved by the WTMA.
- I. Backfill shall be free of topsoil, vegetation, lumber, metal, refuse; and free of rock or similar hard objects larger than six inches in any direction.

9.10 UNSUITABLE MATERIAL

Remove and dispose of unsuitable material encountered during trench excavation work and replace with R-3 Coarse Aggregate material as specified herein.

9.11 TOLERANCES

Top Surfaces of Backfilling: Plus or minus one-eighth (1/8) inch

9.12 SEEDING

- A. General Requirements: The Seeding work shall consist of surface restoration work in lawn areas and also in right-of-ways. Minimum materials requirements are as follows:
 - 1. Topsoil: Use productive topsoil as available on site as excavated. Add topsoil as required using topsoil from Contractor's source. Provide topsoil that is free of subsoil, clay, stones and materials toxic or otherwise harmful to lawn and grass growth.
 - 2. Lime and Fertilizers: Provide lime and Fertilizer which conforms to the applicable State regulations and which is specifically formulated for lawn and grass growth.
 - 3. Lawn Mulch and Mulch Binder: Provide mulch material free of noxious weeds, seed bearing stalks, and roots harmful to lawn growth. Provide non-asphalt emulsion binders of water-soluble sticking aids, gums and polymers.

B. Grass Seed: New crop seed, furnished in sealed packages with proof of correct mixture evidenced, age of seed indicated and compliance with applicable state regulations evidenced if required.

1. Mixture Type A (Lawns):

	Mix Percent	Min Percent		Max Percent
<u>Species in Mix</u>	<u>By Weight</u>	<u>Purity Germination</u>		<u>Weed Seed</u>
Kentucky 31, Tall Fescue	20	90	90	0.50
Kentucky Bluegrass	60	85	80	0.40
Perennial	20	90	90	0.50

2. Mixture Type B (Right-of-Way):

	Mix Percent	Min Percent		Max Percent
<u>Species in Mix</u>	<u>By Weight</u>	<u>Purity Germination</u>		<u>Weed Seed</u>
Kentucky Bluegrass	30	85	80	0.40
Perennial Rye Grass	70	90	90	0.15

C. Performance: Place topsoil over the restored areas to an approximate depth of four inches, grade the surface to meet adjoining grades and the surface is to be free of objectionable material larger than one inch.

1. Incorporate lime and fertilizer into the topsoil layer in a tillage operation. Apply lime and fertilizer at the rates recommended on the packages of the individual products.
2. Sow the seed mixtures at the minimum rate of FIVE pounds per 1,000 sq. ft. area and not more than five days after soil supplements have been applied.
 - a. Cover seeds by imbedding them into the topsoil ¼-inch using equipment designed for the specific purpose.
 - b. Compact the seeded areas using a lawn roller weighing 60 to 90 pounds per linear foot of roller.
 - c. Immediately following seeding, apply mulch to a total coverage depth of not less than 1½ inch. Apply mulch binder in the number of passes as needed to secure the mulch but not to exceed three passes with the maximum applied binder not exceeding 10.0 gallons per 1,000 sq. ft.

SECTION 10

EROSION AND SEDIMENT POLLUTION CONTROL

10.01 DEVELOPER SEWER EXTENSIONS

The Developer and the Developer's Engineer and the Contractor assume all responsibility for design and implementation of the Erosion and Sedimentation Control Plan.

10.02 REQUIREMENTS OF REGULATORY AGENCIES

A. Erosion and Sediment and Pollution Control Plan:

1. Conduct soil erosion and sediment pollution control work in accordance with rules, regulations and requirements adopted by the Pennsylvania Department of Environmental Protection (DEP).
2. Detail requirements for the control plan are described in an Erosion and Sediment Pollution Control Program Manual that may be obtained from the Bureau of Soil and Water Conservation, Division of Soil Resources and Erosion Control, Harrisburg, Pennsylvania.
3. Shall be included as part of the preconstruction requirements.

B. Fines and related costs resulting from failure to provide adequate protection against soil erosion and sediment pollution control are the obligation of the Contractor.

C. Erosion and sediment pollution control measures employed will be subject to approval and inspection by the Pennsylvania Department of Environmental Protection and/or the County Conservation District.

SECTION 11 TUNNELING, BORING AND JACKING

11.01 RELATED WORK

A. Rock Removal: Section 8

B. Trenching: Section 9

C. Piped Utilities-Sanitary Sewers: Section 13

D. Service Lateral and Building Sewer Installation: Section 14, Sewer Construction and Material Specifications for Service Laterals and Building Sewers

11.02 QUALITY ASSURANCE

A. Workmen Qualifications:

1. Employ in the work only personnel thoroughly trained and experienced in the required skills.

2. Have welds made only by welders, tackers and welding operators who have been previously qualified by tests as prescribed in the Structural Welding Code AWS D1.1 of the American Welding Society to perform the type of work required.

B. Design Criteria:

Provide encasing conduit under highways of sufficient strength to support all superimposed loads, including an American Association of State Highway and Transportation Officials H-20 Loading with 50 percent added for impact.

C. Requirements of Regulatory Agencies:

1. Work of this Section within State Highway right-of-way will be subject to inspection by representatives of the Commonwealth of Pennsylvania Department of Transportation and the work must be performed in accordance with the requirements of the latest edition of the Commonwealth of Pennsylvania, Pennsylvania Code, Title 67, the Transportation, Department of Transportation, Chapter 459, Occupancy of Highways by Utilities.
2. Inspection, insurance or other charges demanded by the Commonwealth of Pennsylvania Department of Transportation, or other authority having jurisdiction shall be paid for by the Developer.

D. Source Quality Control:

1. Shop Tests: In accordance with Section 2.10, concerning shop drawings, each pipe manufacturer must have facilities to perform listed test. The Engineer reserves the right to require the manufacturer to perform such additional number of tests as the Engineer may deem necessary to establish the quality of the material offered for use.

<u>MATERIAL</u>	<u>TEST METHOD</u>	<u>NUMBER OF TESTS</u>
Steel Pipe	ASTM A 139 or ASTM A 53	As specified in ASTM A 139 or ASTM A 53 As applicable

2. Laboratory Tests: The Engineer reserves the right to require that Laboratory tests also are conducted on materials that are shop tested. Furnish labor, materials, and equipment necessary for collecting, packaging, and identifying representative samples of materials to be tested and the shipping of such samples to the Testing Laboratory.

11.03 REFERENCES

- A. American Association of State Highway and Transportation Officials (H-20): (AASHTO) Loading for Conduits Installed Under Streets, Road, or Highways

B. American Society for Testing and Materials:

1. ASTM A 53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
2. ASTM A 123, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A 139, Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 in. and Over)
4. ASTM A 307, Specification for Carbon Steel Externally Threaded Standard Fasteners
5. ASTM A 569, Specification for Steel, Carbon (0.15 Maximum Percent, Hot-Rolled Sheet and Strip, Commercial Quality
6. ASTM A 615, Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
7. ASTM C 32, Specification for Sewer and Manhole Brick (Made from Clay or Shale)
8. ASTM C 33, Specification for Concrete Aggregates
9. ASTM C 150, Specification for Portland Cement
10. ASTM C 270, Specification for Mortar for Unit Masonry

C. American Welding Society: AWS D1.1 Structural Welding Code

D. Commonwealth of Pennsylvania Department of Transportation (PDT), Specifications Publication 408/87, as supplemented. PDT Section 703.2 Coarse Aggregate

11.04 SUBMITTALS

- A. Shop Drawings and Products Data: Furnish completely dimensioned shop drawings, cuts or other data as required providing a complete description of Products to be installed.
- B. Certificates: Certified records or reports of results of shop tests, such records or reports to contain a sworn statement that shop tests have been made as specified.
- C. Furnish Penn DOT for approval, detail drawings, accompanied by design calculations, for the tunneling shield, tunneling pits, including sheeting and bracing therefore, tunnel liner plate and tunneling procedure and grouting method and all such drawings and computations shall bear the seal of a Registered Professional Engineer.
- D. Furnish Penn DOT for approval, detail drawings, accompanied by design calculations, for boring or jacking pits including (sheeting and bracing), steel pipe, boring or jacking procedure and grouting method. All such drawings and computations shall bear the seal of a Registered Professional Engineer.

11.05 PRODUCT DELIVERY, STORAGE AND HANDLING

Transport, handle and store materials and Products specified herein in a manner recommended by the respective manufacturers of such to prevent damage and defects.

11.06 SITE CONDITIONS

A. Scheduling:

Perform tunneling, boring or jacking operations continuously on a 24-hour basis if required by Penn DOT or Railroad Company.

B. Protection: As specified in Section 9.03 and such added requirements included herein:

1. Adequately support and protect utilities and facilities that are encountered in, or may be affected by, the work.
2. Accommodation of Traffic: As specified in Section 5.
3. Explosives and Blasting: Not permitted in performance of work of this Section.
4. Excavation Conditions: As specified in Section 9.
5. Excess Materials: As specified in Section 9.
6. Borrow Material: As specified in Section 9.

11.07 MATERIALS (tunneling, boring & jacking)

A. Encasing Conduit

1. Steel Tunnel Liner Plate: Cold formed, steel, four flanged liner plates.
 - a. Minimum Inside Neutral Axis Diameter: As shown on the Drawings or as indicated by the Engineer.
 - b. Minimum Thickness: U.S. Standard Gauge 8, marked on each liner plate by manufacturer.
 - c. Steel: Structural quality hot rolled carbon steel; ASTM A 569.
 - d. Provide tapped grout holes and plugs (minimum 1 ½ inch diameter) in every third plate.
 - e. Hot Dipped Galvanized: ASTM A 123
 - f. Nuts and Bolts: Minimum ½ inch diameter, coarse thread, conforming to ASTM A 307, Grade A
 - g. Coating: Factory coat inside and outside with asphaltic material to a minimum thickness of 0.05 inch.
 - h. Acceptable Manufacturers:
 - Armco Drainage and Metal Products, Inc
 - Republic Steel Corp.
 - Commercial Shearing and Stamping Company
 - Or Equal.
2. Steel Pipe: ASTM A 139, Grade B or ASTM A 53, Grade B
 - a. Minimum Diameter: As shown on the Drawings.
 - b. Minimum Wall Thickness: As required by design criteria.

3. Sewer Pipe and Fittings

Ductile Iron Pipe (DIP): As specified in Section 13.

B. Casing Spacers

1. Spacers shall be made of Stainless Steel and UHMW polymer plastic runners.
2. Shall be supplied by Advance Products & Systems, Inc., PO Box 53096, Lafayette, LA 70505-3096. 1-318-233-6116.

C. End Seals

1. 1/8" thick synthetic rubber with S.S. Bands
2. Model AC Pull on End Seal by Advance Products & Systems, Inc.

D. Aggregate Backfill: AASHTO No. 8 (Penn Dot 1B stone) coarse aggregate conforming to PDT Section 703.2

E. Sand: ASTM C 33, fine aggregate

F. Hold down Rod: Reinforcement bar, ASTM A 615, Grade 60, deformed.

Field coat with Bitumastic No. 300-M as manufactured by Koppers Company, Inc., or equal

G. Contractor Options in Products

The Contractor may install a larger diameter encasing conduit than is shown on the Drawings, provided that the Contractor has secured the prior written approval of the applicable agencies having jurisdiction. If the Contractor elects to install a larger diameter encasing conduit than is shown on the Drawing, all necessary clearances under the roadways, pipe lines or other structures shall be maintained.

11.08 EXECUTION

A. Inspection

1. Inspect Materials and Products before installing for conformance with the inspection requirements of the appropriate referenced standard.
2. Remove rejected Materials and Products from the Project.

B. Preparation

As specified in Sections 8 and 9.

C. Performance

1. Excavation:

As specified in Sections 8 and 9 and with such added requirements included herein. Should the Contractor in constructing any tunneling, boring or jacking pit excavate below the sub grade for the sewer pipe, he will be required to backfill the area excavated below the sub grade with Aggregate Backfill or with concrete as required by the Engineer.

2. Tunneling shall conform to the applicable requirements of Section 9 and all applicable requirements of Penn DOT.

- a. Install the tunnel liner plate to the limits indicated on the Drawings or required by the Engineer or Penn DOT.

- b. Tunneling pits shall be as shown on the Sewer Detail Drawing entitled "Tunnel Work Pit and Tunnel Liner Plate".
- c. Exercise care in trimming the surface of the excavated section in order that the steel liner plates fit snugly against undisturbed material.
- d. Do not advance excavation ahead of the previous installed liner plates any more than is necessary for the installation of the succeeding liner plate.
- e. Support vertical face of the excavation as necessary to prevent
 - . Completely bulkhead the heading at any interruption of the tunneling operation.
- f. Paint field bolt heads and nuts.

3. Grouting:

- a. Place a uniform mixture of grout under pressure behind the liner plate and the undisturbed material.
- b. Provide grout holes tapped for no smaller than 1 ½ inch pipe, spaced at approximately 3 feet around the circumference of the tunnel liner plates in every third ring.
- c. Start grouting at the lowest hole in each grout panel and proceed upwards simultaneously on both sides of the tunnel.
- d. Install a threaded plug in each grout hole as the grouting is completed at that hole.
- e. Proceed with grouting as required by the Engineer, but in no event shall more than six linear feet of tunnel be progressed beyond the grouting.

4. Boring shall conform to the applicable requirements of the regulatory agency and additional requirements specified herein.

- a. Install the encasing conduit by the boring method to the limits indicated on the Drawings or such additional limits required by the Engineer or regulatory agency.
- b. Excavate and sheet boring pit.
- c. Provide devices at the front of the pipe to prevent auger and cutting heads from leading the encasing conduit. Unsupported excavation ahead of pipe is prohibited.
- d. Over-cut by cutting head not to exceed the outside diameter of the encasing conduit by more than one-half inch
- e. The use of water or other liquids to facilitate casing placement and spoil removal is prohibited.
- f. If voids develop or if bored hole diameter is more than 1 inch greater than the outside diameter of the encasing conduit, place Grout to fill voids.
- g. Check conduit alignment in a manner and at times required by Engineer. Check alignment and grade at least once per shift as the work progresses.
- h. Completely bulkhead heading at interruptions in boring operation
- i. Completely weld joints around the circumference between sections of steel pipe encasing.

5. Jacking: Jacking shall conform to all applicable requirements of the regulatory agencies and additional requirements specified herein: This operation shall be conducted without hand mining ahead of the pipe and without the use of any type of boring, auguring, or drilling equipment.
 - a. Install the encasing conduit by the jacking method to the limits indicated on the Drawings or such additional limits required by the Engineer or the regulatory agencies.
 - b. Preliminary work shall consist of excavating and sheeting an acceptable shaft on the downstream side of the crossing and the installation of a backstop and guide timbers.
 - c. Design: Bracing and backstops shall be so designed and jacks of sufficient rating used so that the jacking can be progressed without stoppage except for adding lengths of pipe.
 - d. Accurately place guide timbers on line and grade.
 - e. Support: The vertical face of the excavation shall be supported as necessary to prevent sloughing.
 - f. Use poling boards and bulkheads as required if sub grade conditions in the heading are unstable.
 - g. Jacking and excavation within the pipe shall proceed simultaneously with the ground being cut no more than 2 inches outside the pipe at the top and sides and not less than 2 inches above sub grade at the bottom.
 - h. The use of water or other liquids to facilitate casing placement and spoil removal is prohibited.
 - i. If voids develop or if the jacked hole diameter is more than 1 inch greater than the outside diameter of the encasing conduit place grout to fill voids in manner approved by the regulatory agencies.
 - j. Check conduit alignment in a manner and at times required by Engineer. Check alignment and grade at least once per shift as the work progresses.
 - k. Completely bulkhead heading at interruptions in jacking operation
 - l. Completely weld joints around the circumference between sections of steel pipe encasing.
6. Laying and Testing Pipe: Lay and test pipe in encasing conduit as specified in Section 13 and such added requirements included herein.
 - a. Support and maintain the alignment and grade of sewer piping until the concrete cradle is installed and concrete has cured.
 - b. Provide concrete cradle as indicated on Detail Drawings.
 - c. Paint exposed portion of hold down rod if used.
7. Encasing Conduit: Filling and Closing: After the pipe sewer has been installed in the encasing conduit and has been tested, fill the encasing conduit with sand or AASHTO No. 8 (1 B) stone. Concrete is not considered acceptable fill material.

- Close one end of encasing conduit with rubber boot before filling encasing conduit. Close other end of encasing conduit with rubber boot after filling encasing conduit or as operation dictates.
8. Cleanup: As specified in Section 9
 9. Field Quality Control Testing: After laying pipe in encasing conduit and before filling conduit conduct line acceptance testing as specified in Section 13

SECTION 12

MANHOLES

12.01 RELATED DOCUMENTS

- A. Drawings and general provision of Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.
- B. Section 13 - Piped Utilities – Sanitary Sewers.

12.02 QUALITY ASSURANCE (manhole acceptance tests):

A. General:

1. After the manhole has been completely constructed, the frame bolted thereon, and the trench backfilled, a vacuum test shall be performed. A manhole acceptance test shall be conducted after backfilling and bituminous concrete base course or binder course has been completed unless otherwise directed by the Inspector. This test will be done from the rim of the manhole frame.
2. Any damage caused to properties due to sewage handling and/or sewage backup while vacuum testing shall be the responsibility of the DEVELOPER/CONTRACTOR.

B. Vacuum Testing Equipment: Furnish testing equipment as specified in the manufacturer's written instructions. Pressure gauge, for this procedure, MUST read in inches of mercury, not in PSI.

C. Vacuum Test Procedures:

1. Perform vacuum testing in accordance with the testing equipment manufacturer's written instructions.
2. Draw a vacuum of ten inches of mercury and close the valves.
3. Manhole will be acceptable when vacuum does not drop below nine inches of mercury for the following manhole sizes and times:
 - a. Four foot diameter - 60 seconds.
 - b. Five foot diameter - 75 seconds.
 - c. Six foot diameter - 90 seconds.
4. Repair or replace defective manholes and retest.

12.03 SUBMITTALS

- A. Submit shop drawings or catalogue cuts, as appropriate, for materials listed under Article 12.05 of this Section. Submit only those materials that are actually to be used in the work. These will usually be as follows:
 - 1. Precast Concrete Manholes
 - 2. Manhole Grade Rings
 - 3. Manhole Steps
 - 4. Manhole Castings
 - 5. Gaskets, Adapters, and Other Appurtenances
 - 6. Drop Bowl
- B. Submit manufacturer's Certification of Compliance in accordance with Section 1.05.
- C. Make submittals prior to start of construction. Make submittals to ENGINEER.

12.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle manholes, manhole frames and covers and appurtenances in accordance with the manufacturer's recommendations, and in such manner as to protect the materials from damage.
- B. Manholes and related materials shall be loaded and unloaded by lifting with hoists to avoid damage. Under no circumstances shall such material be dropped or skidded against material already on the ground.
- C. Manholes and related materials shall at all times be handled with care to avoid damage. The interior shall be kept free from dirt and foreign matter. All manholes, manhole frames and covers and appurtenances shall be carefully lowered or raised into place with suitable equipment in a manner that will prevent damage to the material. Under no circumstances shall manholes or accessories be dropped or dumped.
- D. Manholes, and all related materials, shall be thoroughly inspected for defects prior to their being installed. Any defective, damaged, or unsound material shall be repaired or replaced as directed.

12.05 MANHOLE SPECIFICATIONS

- A. Precast Concrete Manhole Base, Top and Riser Sections. Precast Concrete manholes shall be of the design and dimensions shown on the sewer Detail Drawings. Precast concrete bases shall be manufactured in accordance with the requirements of ASTM C478 except as follows:
- B. Portland Cement: Composition and compressive strength conforming to ASTM C478 except use ASTM C150, Type I or Type III with Xypex Concentrate Admix C-2000 (for sulphate resistance), or ASTM C150 Type II cement in manhole components and increase compressive strength to 4500 psi (at 28 days) in precast bases.
 - 1. Openings in precast concrete manholes to accommodate the connection of piping shall be custom preformed for each manhole at the time of manufacture. Openings for connection of the piping shall be of the size and shape required for the particular type of pipe seal provided.
 - 2. All precast concrete manholes shall be designed to accommodate AASHTO highway load class HS-20.

3. The tops of the precast concrete bases shall be accurately formed to receive the tongue of the bottom precast concrete manhole section of the wall.
 4. Precast top sections shall have hold down bolt inserts factory cast in the top section. Each top shall have four (4) three quarter (3/4) inch threaded inserts or slotted inserts to accommodate manhole frame hold down bolts. Insert types designed for an ultimate load in tension of 12,500 pounds. Coordinate insert locations in the top section to match the bolt hole locations on the manhole frame. All inserts shall be factory plugged before shipping.
- C. Monolithic Poured-In-Place Concrete Manhole Bases (Written approval must be obtained from the Authority to use this type of base.)
1. Monolithic poured-in-place concrete bases are permitted for use on a case-by-case basis, with prior written approval of the Authority.
 2. Portland cement: Composition and compressive strength conforming to ASTM C478 except use ASTM C150, Type I or Type III with Xypex Concentrate Admix C-2000 (for sulphate resistance), or ASTM C150 Type II cement in manhole components and increase compressive strength to 4500 psi (at 28 days) in precast bases.
 3. Concrete used for poured-in-place manhole bases shall be of a 4,000 psi mix design.
 4. Consistency: The concrete shall be of uniform consistency. The maximum allowable slump shall be 2-inches.
 - This strength requirement shall be verified by tests. At least one test shall be made per day or one test per structure. A test shall consist of at least two cylinders whose 28-day compressive strengths shall be determined by an approved laboratory.
- D. Concrete used for channels inside precast manhole bases shall be of a 3500 psi Mix Design with a 5/8" diameter maximum allowable aggregate size.
1. Consistency: The mixed concrete shall be of uniform consistency. The maximum allowable slump shall be 1-inch.
 2. Portland cement: Composition and compressive strength conforming to ASTM C478 except use ASTM C150, Type I or Type III with Xypex Concentrate Admix C-2000 (for sulphate resistance), or ASTM C150 Type II cement in manhole components and increase compressive strength to 4500 psi (at 28 days) in precast bases.
- E. Precast Reinforced Concrete Manhole Riser and Top Sections: As previously specified
- F. Steel Reinforcement: Steel reinforcement used in the manufacture of precast concrete manhole bases and precast concrete riser and top sections shall conform to the requirements specified in Section 6 of ASTM C478.
- G. Gasket for Sealing Precast Concrete Manhole Joints: Manhole section joint gasket materials specified herein shall be used in accordance with the Detail Drawings. Only one method of joint sealing and gasketing will be permitted for all manholes.
1. Preformed Plastic Gaskets for Manhole Joints:
 - a Flexible plastic gasket-type sealant for manhole joints shall be butyl rubber (plastic) sealant shall meet the requirements of Federal Specification SS-S-210A (3.4 Adhesion &

Hydrostatic Pressure) and shall conform with the applicable requirements specified in Section 5.7 of ASTM C361.

- b The sealing compound shall not leak at the joints (while being tested at 10 psi) for a period of 24 hours. Requirements for sag and flow resistance (vertical and overhead 1"-wide joints) shall be such that no sagging is detected (while being tested at 135 degrees F) for a period of 5 days. Requirements for chemical resistance shall be such that no visible deterioration of the sealing compound occurs (when immersed separately in a solution of acid, alkali or saturated hydrogen sulfide) for a period of 30 days.
 - c The sealing compound shall be supplied in extruded rope form of suitable cross-section. The size of the sealing compound shall be in accordance with the manufacturer's recommendations and sufficient to obtain squeeze-out of the material around the entire interior and exterior circumference when the joint is completed. The sealing compound shall be protected by a suitable removable two-piece wrapper. The two-piece wrapper shall be so designed that one-half may be removed longitudinally without disturbing the other half to facilitate application of the sealing compound. The sealing compound contained within the joint shall be the sole element utilized in sealing the joint from internal and external hydrostatic pressure. Joint surfaces shall be primed, sealing compound applied, and joint made in strict conformance with the written specifications of the sealing compound manufacturer.
2. Rubber O-Ring Gaskets for Manhole Joints: For joints sealed with rubber gaskets, the joint design and rubber gaskets shall conform to the applicable requirements specified in ASTM C443 and in Section 5.7 and Section 4.10 respectively of ASTM C361. A rectangular groove shall be provided in the tongue end of each manhole section to receive the rubber gasket and to contain the deformed gasket on all four sides when the joint is completed.)
 3. In the event a manhole fails pressure or vacuum testing because of a faulty gasket, the gasket shall be replaced. Parging the joint is not an acceptable repair.

H. Pipe Openings and Seals:

1. Openings shall be preformed during manufacturing in each base and riser section requiring a pipe opening. Each opening shall accommodate the type of pipe and pipe seal required.
2. Pipe opening seals shall meet the requirements specified in ASTM C923.
3. Pipe opening seals integrally cast with holes for pipe in precast concrete manhole walls shall be all-rubber composition, flexible, pliable, and provide up to 15 degrees lateral, diagonal or vertical pipe deflection. Gaskets shall be leak-proof tested to 20 psi and shall meet or exceed rubber quality standards of ASTM C-443.
4. Pipe opening seals not cast with holes for pipe shall be pliable and permit deflection. A strong rubber coated steel center compression ring and a long rubber sleeve with a deep groove secured stainless steel clamp shall be used to create a positive seal.
5. Rubber adapter ring for use on PVC pipe in poured-in-place manhole bases shall be recommended by the manufacturer.
6. Manhole adapters shall be provided for all PVC pipe in cut-in pipe opening and shall be as recommended by the pipe manufacturer.

I. Frame hold down bolts, nuts and washers shall be stainless steel in accordance with

ASTM A307 and ASTM A276.

J. Manhole Steps:

1. Aluminum Step: Aluminum alloys 6061-T6, tensile 38,000 psi, yield 35,000 psi. Manhole steps shall be installed in the reinforced concrete walls of the riser and eccentric top sections. Coat the portion of aluminum step being embedded in concrete with bituminous paint.
2. Reinforced Plastic Step: Composed of a 3/8-inch Grade 60 ASTM A615 deformed steel reinforcing bar completely encapsulated in Grade 49108, ASTM D4104 polypropylene copolymer compound Type II.
 - a. MA Industries, Inc.: Type PS-2-B or Type PS 4
 - b. Or equal

K. Field installation of manhole steps shall not be permitted.

L. Steps shall be aligned vertically and spaced to be on equal centers in the assembled manhole, a maximum distance of 16 inches apart. Steps shall be located the minimum distance from the ends of riser and top sections as shown on the Detail Drawing. Each step shall be embedded in the riser section at least three and one-half (3 1/2) inches but not more than four (4) inches.

M. Manhole Castings:

1. Castings for manhole frames and covers shall be heavy-duty cast iron.
2. Ferrous Castings shall be of uniform quality, free of blowholes, shrinkage distortion, or other defects.
3. Metal shall conform to ASTM A-48 Class 30 for gray iron designed for AASHTO highway loading class HS-20.
4. All castings shall be manufactured true to pattern; component parts shall fit together in a satisfactory manner. Frames and covers shall have continuously machined bearing surfaces to prevent rocking.
5. As-cast dimensions may vary one half the maximum shrinkage characteristic of the metal or $\pm 1/16$ inch.
6. Manhole Casting Schedule
 - a. Standard frame and cover
 - Total weight, 255 pounds minimum
 - The frame shall have a 24" ID and accommodate a 25.5" OD cover.
 - All parts of the casting shall be thoroughly coated at the factory with one (1) coat of black asphaltum.
 - Provide two (2) stainless steel recessed lifting eyes. Lifting eyes extending through the cover will not be permitted.
 - The words "SEWER" and "WTMA" shall be cast appropriately in the center of the cover. Lettering of shall be a minimum of 2-inches high.
 - Two concealed pick holes shall be provided.

- Provide machined dovetail groove centered in lip seat of cover for ¼-inch diameter continuous loop polyisoprene or neoprene rubber gasket (40 durometer).
- Drill four 7/8-inch diameter holes in frame flange equally spaced.

b. Watertight frame and cover

- Total weight 600 pounds minimum
- The words “SEWER” and “WTMA” shall be cast appropriately in the center of the cover; lettering shall be a minimum of 2-inch high.
- Two concealed pick holes shall be provided.
- The inner lid shall be provided with a machined dovetail groove for a self-sealing 1/4-inch diameter continuous loop polyisoprene gasket (40 durometer).
- Drill four 7/8-inch diameter holes in frame flange

7. Manhole frames and covers shall be as shown on the Detail Drawings.

8. Manufacturer

East Jordan Iron Works, Inc., Middletown, DE (Model 1040 for standard manhole frame and cover and Model 1045ZPT for watertight manholes) or approved equal.

N. Grade Rings:

1. Grade adjustment for a manhole shall not exceed six (6) inches.
2. Precast Concrete Grade Rings for leveling units shall be manufactured in compliance with the requirements of the Specifications for Precast Reinforced Concrete Manhole Sections, ASTM Designation C478; and shall be as thick as necessary to provide the required grade adjustment, but not less than 1 ½ inches in thickness. Split grade rings are unacceptable. Broken or cracked concrete grade rings will not be acceptable.
3. Rubber grade rings shall only be used in paved areas.
4. Tapered rubber grade rings shall be used to accommodate sloped paved surfaces.

5. Rubber Grade Rings (rubber adjustment riser) for leveling units shall comply with the following:

PHYSICAL PROPERTIES	TEST RESULTS	TEST METHOD
Density	$\pm 1.098 \text{ g/cm}^3$	ASTM C 642 - 90
Durometer Hardness		Based on ASTM D
- Molded surface	75A \pm 10 points	2240
- Interior surface	73A \pm 10 points	
PHYSICAL PROPERTIES	TEST RESULTS	TEST METHOD
Tensile Strength	1.6 MPa (232 psi) (not less than 1 MPa)	ASTM D 412 - 87
Compression	under 1 MPa	Based on ASTM D
Deformation	(145 psi)	575
- Initial deformation	6 \pm 4%	
- Final deformation	6 \pm 4%	
Compression Set	0.4% (no more than 4%) under 1 MPa (145 psi)	Based on ASTM D 395
Freeze and Thaw When exposed to Deicing Chemicals	no loss after 50 cycles	ASTM C 672 - 91
Coefficient of Thermal Expansion	$1.08 \times 10^{-4} \text{ mm/mm/}^\circ\text{C}$ ($6 \times 10^{-5} \text{ in/in/}^\circ\text{F}$)	ASTM C 531 - 85
Weathering (70 hours at 70° C)		ASTM D 573 - 88
- Hardness retained	100% \pm 5%	
- Compressive strength retained	100% \pm 5%	
- Tensile strength retained	100% \pm 5%	
- Elongation retained	100% \pm 5%	

O. Cement Grout:

1. Cement grout shall be non-shrink non-metallic.
2. Use Type I cement where grout is not in contact with sewage.
3. Use Type II (Sulfate Resistant) where grout is in contact with sewage.

P. Waterproofing Mortar:

1. Material composition meeting the requirements of ASTM C270, Type M with waterproofing admixture included.
2. Apply in accordance with manufacturer's instructions.
3. Acceptable Manufacturers
 - a. Medusa Waterproofing Paste or Powder; Medusa Cement Company
 - b. Hydralite, Grace Construction Material
 - c. Hydrolox, Chem Master Corporation

Q. Epoxy Bonding Compound Provide a high-modulus, low viscosity, moisture insensitive epoxy adhesive having the following characteristics:

- 1 Mix Ratio: 100 percent solids, two components; mixed one part by volume component B to two parts by volume component A.
- 2 Ultimate Compressive Strength: 13,000 psi after cure at 73°F and 50 percent relative humidity determined in accordance with ASTM D695.
- 3 Acceptable Manufacturers:
 - a Sikadur Hi-Mod; Sika Corporation
 - b Epoxite Binder; A. C. Horn, Inc.
 - c 452 Epoxy Systems; Euclid Chemical Company

R. Manhole Lining System (force main discharges)

1. General Design/Installation Characteristics
 - a. Lining of the manhole shall result in a monolithic structure conforming to the shape and contour of the existing manhole.
 - b. The liner shall be designed with independent structural hoop strength for full height hydrostatic pressure as if the liner were a secondary vessel inside the existing manhole. The manufacturer shall design adequate liner thickness into the system with or without additional fiberglass layers.
 - c. The liner shall be completely watertight, free of any joints or openings other than influent and effluent pipes and cover frame opening.
 - d. The liner shall protect the existing manhole surfaces from hydrogen sulfide corrosion.
2. Structural Properties: the liner shall have as a minimum the structural Compressive Strength of 8,699 psi in accordance with ASTM D-695.

3. Liner Materials shall consist of multiple layers of non-woven and woven materials capable of carrying resin and withstanding installation pressures and curing temperatures. The liner shall be compatible with the resin system used. The liner shall be able to stretch to fit irregularities in the existing manhole. The liner shall be fabricated to a size that, when installed, will tightly fit the internal shape and contour of the existing manhole.
4. Resin
 - a. Resin that is compatible with the liner materials and installation process shall be used.
 - b. The resin shall have proven resistance to municipal wastewater, sulfuric acid corrosion, and hydrogen sulfide gas.
5. Acceptable Manufacturers:
 - a. Poly-Triplex® Technologies, Inc., Panama City Beach, FL
 - b. Terre Hill Composites, Terre Hill, PA
 - c. OWNER/ENGINEER approved equal.

(Note: To be considered an approved equal, liner products must be demonstrated to the OWNER/ENGINEER to meet the design/installation specifications and acceptance vacuum testing criteria described in this Section.)

S. Manhole Inserts (Material and Design)

1. The insert shall be manufactured from corrosion proof material suitable for atmospheres and conditions commonly found in wastewater collection systems. The insert shall be made from High Density Polyethylene Copolymer material that meets ASTM Specification Designation D-1248 Class A, Category 5, Type 111. This material shall have superior stress crack resistance, combined with a high impact strength and rigidity. The insert shall have a minimum impact brittleness temperature of 105° F in accordance with ASTM D746-70. Softening temperature shall be 254° F, meeting all requirements of ASTM D 1525-70. The insert will have a tensile strength of 3700 psi, and an elongation factor 800%, meeting all requirements of ASTM D 638-71A. The thickness of the insert shall be a uniform 1/8". The insert shall be manufactured to a dimension of approximately 24" diameter to be field verified by the Contractor prior to ordering.
2. The insert shall have a corrosion resistant nylon strap installed for easy removal and reinstallation into the manhole frame.
3. The insert shall be manufactured specifically for use in collection system manholes, and shall be supplied by Parson Environmental Products, Reading, Pennsylvania, 1-800-356-9023 or approval equal.
4. Inserts are not required with manhole covers containing o-rings.

12.06 MANHOLE CONSTRUCTION

A. General

1. Manholes shall consist of precast reinforced concrete round riser sections and eccentric or

flat slab top sections on concrete bases, complete with cast iron frames and covers and aluminum steps.

2. Contractor shall provide precast reinforced concrete bases for manholes. Manholes with drop connections shall be provided with poured-in-place concrete bases or approved alternate.
3. Manholes shall conform to the design and dimensions shown on the Detail Drawings and to the requirements specified herein.
4. Manhole tops installed within streets and ground surfaces of residential areas shall be set to match existing grade and slope.
5. Where the Drawings show manhole tops to be above existing ground in undeveloped areas and in open country, manhole shall be set at the top elevations called for on the plans, unless otherwise directed by Engineer.
6. Manholes installed in undeveloped areas shall be marked with a reflector provided by developer/contractor.

B. Manhole Bases (precast concrete and monolithically poured concrete): All manhole bases shall be installed on a 6-inch layer of coarse aggregate as indicated on the Detail Drawings.

C. Concrete Channels.

1. Channel configurations shall be as indicated on the Detail Drawings.
2. In manholes with more than one influent line the channels shall be properly formed as to direct the flow into the main channel and downstream.
3. Channels shall be finished smooth in a neat and workmanlike manner with steel trowels. All channels shall be molded in the concrete base and shall be of proper size, cross section, and to the required grade; all bends in channels shall be built with the maximum possible radius.

D. Precast Concrete Riser and Top Sections:

1. All precast reinforced concrete risers and top sections necessary to build a completed manhole shall be furnished, and the different sections shall fit together readily to permit effective jointing. Jointing shall be in accordance with the Detail Drawings.
2. Rubber gasket joints between adjacent sections shall be carefully made in accordance with the written instructions of the manufacturer of the precast concrete manhole sections. After the joints have been made, the annular spaces which remain on the inside and outside of the joints shall be completely filled with non-shrink grout.
3. Preformed plastic sealing compound joints between adjacent sections shall be carefully made in accordance with the written instructions of the manufacturer. After the joints have been made, the preformed plastic sealing compound shall be cut or towed smooth across the joint on the inside of the manhole wall. Where required on the Detail Drawings, joints shall also be sealed with non-shrink grout.
4. Lifting holes shall be sealed with properly designed tapered rubber plugs. The plugs shall be driven into the lifting holes to make the holes completely water and airtight. Sealing of lifting holes with non-shrink grout will also be permitted.

5. Adjoining riser and conical top sections shall be fitted together to assure true vertical alignment of manhole steps.
- E. Manhole Steps: the manhole steps shall be as shown on the Detail Drawings and shall be set in a straight line on the side of the manhole and spaced as set forth on the Detail Drawings.
- F. Manhole Frames and Covers:
1. Where required, final adjustment of frame to elevation shall be made using precast concrete grade rings or rubber adjustment riser. **Grade elevation adjustments shall not be permitted to exceed six (6) inches.**
 2. Joints between precast concrete grade rings for leveling units shall be made with preformed plastic sealing compound, and shall be 1/2 inch thick and trowelled or trimmed smooth on the inside of the manhole. In addition, **the leveling units shall be sealed on the outside surface using non-shrink grout.**
 3. Joints between rubber grade rings for leveling units shall be made with Sikaflex compound.
 4. The joint between the bottom of the frame and the top of grade ring leveling units, or the top manhole section as applicable, shall be made with preformed plastic sealing compound and shall be sealed on the outside surface using non-shrink grout.
 5. Frames for all manholes shall be bolted to the manhole as shown on the Detail Drawings. Studs, nuts, and washers shall be of stainless steel. Bolts shall have a sufficient number of proper sized threads for proper connection.
 6. Bolt frames to top manhole section. **Secure covers to frame as shown on the Detail Drawings.**

SECTION 13

PIPED UTILITIES-SANITARY SEWERS

13.01 RELATED DOCUMENTS: drawings and general provision of contract, including general and supplementary conditions and other division 1-specification sections, apply to this section.

13.02 WORK includes the installation of Sanitary Sewers, Manholes, Specials, etc.

13-03 QUALITY ASSURANCE

- A. Piping and specials specified herein shall be essentially the standard products of manufacturers who have been regularly engaged in the successful production of high quality materials of this type for at least ten years, have supplied such materials for at least five years of the ten year period, and have at least five installations in successful operation for at least five years.
- B. Repair or replace defective piping or specials.
- C. Sewer Line Acceptance Tests:
 1. General:
 - a. All sewers and plugged laterals shall be air tested. Sewer lines will be tested for leakage between manholes as the work progresses. The allowable leakage rates shall

apply to each reach of sewer line, manhole-to-manhole, and manholes shall be included.

- b. PVC sewers installed shall be tested for deflection.
- c. All sewers, including manholes, shall be inspected prior to air testing, and all visible or detectable leaks shall be repaired before testing begins. The line acceptance tests shall be made after backfilling has been completed.
- d. The Contractor shall repair all visible or detectable leaks or defects of any nature.
- e. Any damage caused to properties due to sewage handling and/or sewage backup while air testing shall be the responsibility of the DEVELOPER/CONTRACTOR.

2. Testing equipment (Provided by Contractor):

- a. Air Testing: shall be performed utilizing testing equipment consisting of an air-compressor and storage tank of adequate capacity; an air control panel equipped with all necessary piping, valves and pressure gauges to control the rate at which the air flows to the test section and to monitor the air pressure inside the test section; and all required plugs. In order to prevent overloading the test section with the full pressure of the compressor, the test equipment must be provided with an approved pressure relief device set to blow out at 10 psi. An extra pressure gauge of known accuracy shall also be provided so that the gauges of the test equipment can be frequently checked. All gauges shall be oil filled and shall read to the half (1/2) P.S.I. increment.
- b. Deflection Testing:
 - 1) Deflection testing shall be performed using a rigid "Go-No-Go" (9 sided mandrel) device. A hydro-cleaner or blower/parachute device, complete with string lines, shall be provided for attaching pull lines.
- c. Mirror test:

Upon completion of a sanitary sewer main the Authority may conduct a mirror test on all sewers for leakage, alignment and grade. The mirror test shall consist of reflecting light by mirrors through the completed section of piping, which in order to be accepted, shall be sufficiently true and straight in alignment to allow for the passage of reflected light with an image of a full moon. All lines not showing a full moon shall require a ring deflection test for horizontal deflection. Vertical deflections shall be corrected by pipe replacement.
- d. Main line and lateral video:

The use of sewer line televising may be required by the Owner at the Engineer's discretion to resolve any problems identified in the pressure, deflection and mirror testing mentioned above.
- e. Hydrostatic testing shall be required for all pressure force mains. All necessary water, plugs, valves and other necessary equipment shall be provided by the contractor.

3. Cleaning

- a. No debris, silt or other material shall be allowed in the lateral. If required, the pipe shall be cleaned by hydro-flushing with water or by passing through the pipe a full gauge squeegee in a manner approved by the Authority.
- b. Cleanup
 - 1) Removal of debris, which may have been stored within the public rights-of-way, including the road, cart way or sidewalk, shall be removed within 24 hours of completion of the building sewer work.
 - 2) Any concrete sidewalk or curb removed for making a sewer connection must be temporarily restored within 48 hours and permanent replacement must be completed within 30 days from the time installation has been approved.
- c. No debris, silt, or other material shall enter existing sewers. It shall be the responsibility of Contractor to have the pipe clean at the time of air testing and deflection testing. If required, the pipe shall be cleaned by hydro flushing with water or by passing through the pipe a full gauge squeegee.
- d. All cleaning must be done in a manner that prevents debris from passing down stream of the construction area.

4. Air Testing Procedure:

- a. All wyes, tees, or end of side sewer stubs placed for future connections shall be plugged with flexible-joint caps, or acceptable alternate, securely fastened to withstand the internal test pressure. Plugs or caps shall be readily removable.
- b. Testing of any sewer may not be conducted until backfill and compaction are completed. Each pipe section shall be tested with low pressure air at 5.0 psi for a minimum of five (5) minutes. The maximum allowable drop in pressure over the five minute period is one (1) psi.
- c. Repair and retest sections of sewer not meeting test requirements.

5. Deflection Testing Procedure:

- a. Use **Go-No-Go** device in accordance with pipe manufacturer's requirements.
- b. Repair and retest sections of sewer not meeting test requirements. (Repair: Remove and replace any section that does not meet test requirements.)

6. Hydrostatic Testing Procedure:

- a. After pipe has been installed, test line and drain. Use clean water to perform test.
- b. Force main shall be tested to 150 psi or 1.5 times the design pressure of pipe, whichever is greater. Design pressure shall be the rated total dynamic head of lift station pump. The test shall be for a minimum of two hours, unless otherwise directed by the WTMA, with no pressure drop during testing.

D. Minimum Testing Requirements

1. Securely fasten and brace all line plugs in the pipe section being tested so that none of the plugs are suddenly released when the compressed air is applied to the pipe section
2. All gauges, air piping manifolds and valves of the air testing equipment shall be located above ground at the top of the trench.
3. No one shall be allowed in the manhole during testing.
4. Special care shall be exercised during removal of plugs; and the pressure in the piping of the test section shall be completely relieved before any plug shall be removed.

13.04 SUBMITTALS

- A. Submit shop drawings or catalogue cuts, as appropriate, for materials listed under Section 2 of these specifications. Submit only those materials that are actually to be used in the work. These will usually be as follows:
 1. Pipe and Fittings
 2. Stone Certification
 3. Gaskets, Adapters, Cleanout Covers and Accessories and Other Appurtenances
 4. Detection Tape
- B. Submit manufacturer's Certification of Compliance in accordance with Section 2.
- C. Make submittals prior to start of construction. Make submittals to ENGINEER.

13.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle the piping, manholes, manhole frames and covers and appurtenances in accordance with the manufacturer's recommendations, and in such manner as to protect the materials from damage.
- B. Pipe and related materials shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage. Under no circumstances shall such material be dropped or skidded against pipe already on the ground.
- C. Pipe and related materials shall at all times be handled with care to avoid damage. The interior shall be kept free from dirt and foreign matter. All pipe, manholes, manhole frames and covers and appurtenances shall be carefully lowered or raised into place with suitable equipment in a manner that will prevent damage to the material. Under no circumstances shall pipe or accessories be dropped or dumped.
- D. Manholes, and all related materials, shall be thoroughly inspected for defects prior to their being installed. Any defective, damaged, or unsound material shall be repaired or replaced as directed.
- E. All lumps, blisters, and excess coating shall be removed from the ends of each pipe. The joints shall be wire brushed and wiped clean, dry and free from oil and grease before the pipe is installed.

13.06 MATERIALS

- A. Ductile Iron Pipe (Gravity Sewer and Force Mains)

1. Pipe

- a. Ductile iron pipe shall be centrifugally cast, annealed ductile iron manufactured in accordance with ANSI A21.51.
- b. Pipe joints shall be push-on or mechanical joint and shall conform to ANSI specification A21.11. Furnish joints with all required accessories. Number of joints to be restrained shall be determined by the pipe manufacturer for the conditions encountered (minimum of four (4) joints on each side of the fitting and/or bend shall be restrained). Restrained joint pipe shall be as manufactured by U. S. Pipe, Clow, American or approved equal. The use of mechanical joint pipe with retainer glands may also be used.
- c. Gaskets for restrained joints shall be Field Lok 350 gaskets as manufactured by U. S. Pipe or approved equal.

2. Fittings

- a. Furnish fittings in accordance with ANSI 21.10 250 psi rating or ANSI 21.53, 350 psi rating.
- b. Joints shall be mechanical joint in accordance with ANSI A21.11. Furnish joints with required accessories.

3. Cement and Mortar Lining

- a. Cement and Mortar line all pipe and fittings in accordance with ANSI A21.4.
- b. Paint seal coat in accordance with ANSI A21.4.

4. Tar Coat exterior of ductile iron pipe and fittings.

5. Furnish gaskets in accordance with ANSI A21.11.

6. All pipe shall be Class 52 unless otherwise specified

B. PVC Pipe (Gravity Sewers at **depths less than 12 feet** only)

1. 4" - 15" Diameter Pipe.

- a. Unplasticized polyvinyl chloride (PVC) gravity sewer pipe and fittings with integral wall bell and spigot joints meeting ASTM D-3034 specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, Standard Dimension Ratio (SDR) 35, or ASTM F789.
- b. The pipe shall be joined with an integral bell, bell-and-spigot type rubber gasketed joint. Rubber gasket shall conform to ASTM F 477. The rubber gasket shall be compressed radially on the pipe spigot to form a watertight seal in accordance with ASTM D 3212.
- c. Fittings shall be made of PVC having a cell classification of 12454B or 12454C or as defined in ASTM D 1784. Fabricated fittings with solvent cemented components shall be made in accordance with ASTM D 2855 and taking cognizance of ASTM F 402.
- d. Pipe stiffness at 5% deflection shall be 46 PSI for all pipe diameters when tested in accordance with ASTM D 2412.

- e. Air testing and deflection testing to be performed in accordance with the requirements of this section.

2. 18” - 27” Diameter Pipe

- a. Unplasticized polyvinyl chloride (PVC) gravity sewer pipe and fittings with integral wall bell and spigot joints meeting ASTM F 679 specification for “Poly Vinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings”, or ASTM 794 specification for Poly Vinyl Chloride (PVC) Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled inside Diameter.
- b. The pipe shall be joined with an integral bell, bell-and-spigot type rubber gasket joint. Rubber gasket shall conform to ASTM F477. The rubber gasket shall be compressed radically on the pipe spigot to form a watertight seal in accordance with ASTM D 3212.
- c. Fittings shall be made of PVC having a cell classification of 12454B or 12454C (only) as defined in ASTM D 1784. Fabricated fittings with solvent cemented components shall be made in accordance with ASTM D 2855 and taking cognizance of ASTM F402.
- d. Pipe stiffness at 5% deflection shall be 46 PSI for all pipe diameters when tested in accordance with ASTM D 2412.
- e. Air testing and deflection testing to be performed in accordance with the requirements of this section.

C. PVC Pipe, Low Pressure Main (for low pressure sewer and grinder pump station service laterals only).

- 1. PVC Pipe for low pressure sewer mains must meet the requirements as set forth in ASTM D2241, SDR-21, 200 psi, as a minimum for all low pressure mains. Pipe shall have push-on type joints with integral wall bell. Schedule 80 pvc pipe may be used in accordance with the “purple” glue for inspection.
- 2. Fittings shall be manufactured of one piece of injection molded PVC meeting ASTM D-1784, class 200. Bell shall be gasketed joint conforming to ASTM D_3139 with gaskets conforming to ASTM F-477.
- 3. Service material shall be the same as specified above for the low pressure main.

D. High Density Polyethylene Pipe (HDPE) Force Mains less than 4-inch diameter.

- 1. HDPE pipe may only be used for Force Mains less than 4-inches in diameter.
- 2. High Density Polyethylene (HDPE) pressure pipe, tubing and fittings for force main piping shall be SDR 11. Manufacturers shall verify the suitability of pipe for the intended applications. See Section 20 for low pressure sewer piping.
- 3. All pipe sizes are to be minimum inside diameters for HDPE pipe. (Example: 4-inch HDPE is 4-inch inside diameter).

Materials used for the manufacturer of polyethylene pipe and fittings shall be high density, black PE 3408 meeting the following physical property requirements.

<u>Property</u>	<u>Test Method</u> (1)	<u>Nominal Value</u>
Material Designation	PPI/ASTM	PE 3408
Material Classification	D3350	345444C
Density	D1505	0.957
Flow Rate	D1238 (190/21.6)	8.5
Flexural Modulus	D790	136,000
Tensile strength @ yield	D638	3,500
ESCR	D1693	F ₀ >10,000
ESCR, compressed ring F1248	F ₀ >10,000	
UV stabilizer (C)	D1603	2.5
Elastic modulus	D638	125,000
Brittleness temperature	D746	<-180
Melting Point	D789	261
Vicat softening temperature	D1525	255
Hardness	D2240	64
Thermal expansion	D696	1.1 x 10 ⁻⁴
Volume resistivity	D991	2.6 x 10 ¹⁶
HDB @ 73.4°F	D2837	1600
HDB @ 140°F	D2837	800
Molecular weight category		extra high
Molecular weight	GPC	330,000

- Test procedures are ASTM unless otherwise specified. (PPI = Plastics Pipe Institute, and GPC = Gel Permeation Chromatography.)

5. Pipe and fittings shall be manufactured from identical material meeting the requirements listed and shall be designed for a 100-psi working pressure. The manufacturer shall certify that samples of the manufacturer's production pipe have been tested in-house, in accordance with ASTM D-2837, and validated in accordance with the latest revisions of PPI TR-3. Under these procedures, the minimum hydrostatic design basis shall be certified by the manufacturer to the 1600-psi at 73.4°F and 800 psi at 140°F. The pipe and fitting manufacturer shall have an independent PPI Material Listing in accordance with PPI TR-3 and TR-4. Field pressure test pressures for force mains shall be established on a case-by-case base.

6. Pipe and fittings shall be produced by the same manufacturer.

7. Pipe shall be manufactured in accordance with ASTM F-714. Dimensions and tolerances for pipe outside diameter and minimum wall thickness shall be in accordance with ASTM F-714.
8. Fittings shall be manufactured to the requirements of ASTM D-3261 and as follows:
 - a. Fabricated fittings shall be manufactured from pipe of at least one SDR heavier pipe than the system piping, and shall be pressure rated to match the system piping.
 - b. The butt fusion outlets of fabricated fittings shall be machined to the same SDR as the system piping to which they are to be fused.
 - c. The manufacturer shall subject samples from each molded fittings production lot to x-ray inspection for voids. Voids shall not be permitted, and if found in the samples, the entire production lot shall be x-ray inspected. If additional voids are found, the production lot shall be rejected.
9. Air Release Valve fittings will be Electorfusion Corp Saddles. Outlets shall be 2-inch NPT. Saddles will be as manufactured by Central Plastics Company.

D. Pipe Couplings and Adapters:

1. All couplings and adapters shall be solid sleeve.
2. Constructed of materials which will pass the strength and chemical requirements of ASTM C954.
3. Approved manufacturers:
 - Mission, Corona, CA
 - Calder, Gardner, CA
 - Dresser, Bradford, PA

E. Flexible Pipe Coupling with Anti-Shear Stainless Steel Collar

1. Provide flexible pipe couplings with anti-shear stainless steel collar designed for differing pipe material connection: and for transition/reducing conditions of differing pipe material connections.
2. Coupling will be PVC material which meets the performance requirements of Commercial Standard Specification CS 226-59. Couplings designed for pipe outside diameter coupling shall incorporate recesses to contain the stainless steel bands. Couplings provided with pre-assembled type 305 stainless steel bands.
3. Use flexible pipe couplings only where directed by the Engineer.
4. Approved manufacturer: FERNCO Inc., Distributed by the General Engineering Company

F. Wye Connections

1. PVC material to be ASTM D 3034, SDR-35
2. All wyes shall bear the manufacturer's identifying mark and size.

G. Sweeping Tee

1. PVC material to be ASTM D 3034, SDR-35

2. All sweeping tees shall bear the manufacturer's identifying mark and size.
3. Sweeping Tees will be as manufactured by:
 - a. Plastic Trends, MI
 - b. Specified Fittings, WA

H. Cleanouts.

1. Construction shall be in accordance with the International Plumbing Code (2000).
2. Cleanouts shall be placed at the edge of the right-of-way for each individual property served (or to be served) by sewer service.
3. On new lateral construction and/or lateral replacement, sweeping tees (test tee) shall be installed as indicated on the Detail Drawings.
4. All service lateral cleanout piping (vertical stack piping), shall be a minimum of six (6) inches in diameter. Cleanouts shall have a threaded cap. Glued caps or plugs are not acceptable.
5. Cleanouts located in paved areas or in areas where vehicular traffic may occur require a cleanout cover to be installed. Acceptable manufacturers:
 - a. General Engineering Company, Frederick, MD.
 - b. Or approved equal.
6. A sewer main not beginning with a manhole may be allowed to begin with a lamphole, with the express, sole prior approval of the WTMA.

I. Detection Tape

1. Detection tape shall be a metal detectable reinforced underground utility marking tape with a 50 gauge (0.0005") solid aluminum foil core with permanent printing under a Mylar layer.
2. The detection tape shall consist of a minimum 9.0 mil (0.0009") overall thickness, coated and colored cross-woven polyethylene, with no less than 2,500 lbs. of tensile break strength per 12" width and color coded suitable for direct burial.
3. Detection tape shall be 2-inch width minimum.
4. The detection tape shall be installed a minimum of 6" on top of the pipe stone bedding material, but no more than 24" above the pipe (see Trench Detail).

13.07 LAYING PIPE

A. General.

1. **All new gravity sewers are to have a minimum depth of 7 feet, from top of pipe and all new force main sewers shall have a minimum depth of 4 feet from the top of the pipe, unless approval is granted by the Authority.**
2. Following trench excavation, pipe laying shall proceed upgrade with pipe laid carefully, hubs upgrade, spigot ends fully centered into adjacent hubs, and true to lines and grades given.

3. **Only 1B fine aggregate shall be used for backfilling under and along side the pipe, and to a height of one foot (1') over the top of the pipe.**
4. Each section of pipe shall rest upon 6" of approved stone pipe bedding for the full length of its barrel, with recesses excavated to accommodate bells and joints. Each pipe shall be firmly held in position so that the invert forms a continuous grade with the invert of the pipe previously placed.
 - Utilize portable laser to establish grades of sewers, laser shall be used in accordance with manufacturer's written instructions.
 - Grade shown on Drawings is that of Sewer invert. (Tolerance $\pm \frac{1}{4}$ inch).
5. Under no conditions shall pipe be laid in water, on sub grade containing frost, and/or when trench conditions are unsuitable for such work. In all cases, water shall be kept out of the trench until concrete cradles, supports, encasement, or saddles, where used, and materials in the joints have hardened.
6. Any pipe that has its grade or joint disturbed after laying shall be taken up and re-laid. Any section of pipe already laid and found to be defective shall be taken up and replaced with new pipe.
7. Working on top of the completed pipeline, except as may be necessary in backfilling or tamping, shall be kept to a minimum.
8. Maintain pipelines free and clear of debris during the progress of the work.
9. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug.
10. Diversion of Sewage during Construction
 - a. Prior to beginning work:
 - 1) Contractor shall have on hand all required materials necessary to accomplish the work.
 - 2) Contractor shall have an Engineer approved construction plan for the bypass and the project work to be accomplished during the bypass.
 - b. Sewage flowing in existing sewer shall be temporarily plugged or diverted around or through the construction by means of by-pass pumping, fluming, or any other means acceptable to Engineer.
 - If by-pass pumping is required, provide stand-by pump equivalent to the largest by-pass pump in service.
 - c. At completion of each workday tie sewage back into existing sewer unless specific permission otherwise has been granted by the WTMA in advance. Tie-in shall be covered so there is no visible sewage.
 - d. Contractor shall be responsible for any property damage caused by sewage handling.
11. Contractor shall maintain a log of service connection locations and lateral pipe lengths and sizes. The locations shall be based upon sewer line stationing and shall indicate if the lateral is in service or plugged.

B. PVC Pipe

1. Inspect pipe and fittings for defects or damage prior to lowering into the trench.
2. Install PVC pipe and fittings in accordance with manufacturer's written instructions.
3. Do not kick or throw PVC pipe and fittings into the trench.
4. PVC piping shall not be laid at depths greater than 12 feet unless the bedding and compaction is designed by the Owner/Developer and approved by the Engineer.
5. Use of hydro hammer for compaction will not be permitted within four (4) feet of the top of the pipe.

13.08 RESERVED

13.09 CONCRETE FOUNDATIONS

- A. Where required by ENGINEER, or where shown on the Drawings, pipe shall be placed on a formed concrete cradle, or unformed concrete shall be placed around pipes for bedding and encasement.
- B. Concrete cradles shall consist of structures requiring forms and be composed of concrete, built-in trenches to support pipes, and to the dimensions shown on the Detail Drawings.
- C. Concrete bedding and encasement shall be composed of concrete placed in trenches, without forms as pipe bedding, or encased around pipes, to the dimensions and in the locations indicated on the Detail Drawings.
- D. When construction disturbs an existing pipe's bedding, a concrete cradle shall be required to support the disturbed piping. The concrete cradle shall extend 2 feet beyond the trench walls on both sides.

13.10 AUTHORITY

- A. The Authority reserves the right to retest at the Developer's expense, any piping throughout the duration of the Construction Period.
- B. Make repairs to piping found defective by such Authority conducted tests.
- C. The Authority will make a final inspection of the installed sewer system upon completion of the street construction, including paving. This inspection will be made to verify final grade of manholes frames and covers and that the interior of the manholes are clean and free from leaks.
- D. The warranty period will begin with all conditions being satisfactory to the Authority in its final inspection and Dedication.
- E. Before completion of the eighteen (18) months warranty period and approval of developer's installed sewer extension, the Authority shall re-inspect all facilities dedicated to the Authority and verify that the manholes and sewer mains continue to be free of leaks and defects and that all other facilities are functioning as approved or as addressed during the final inspection. Defects found shall be repaired as if under the terms of the original contract.

SECTION 14

SERVICE LATERAL AND BUILDING SEWER INSTALLATION

14.01 WORK INCLUDES Installation of sanitary sewer service laterals and building sewers

14.02 DEFINITIONS

- A. Service Lateral – That part of the sewer pipe extending from the sewer main to a point near the end of right-of-way. Laterals shall be six (6) inches in diameter or greater for all residential, commercial, and industrial connections.
- B. Building Sewer – That part of the sewer pipe that extends from the building to the property line. WTMA requires this pipe to be at least four (4) inches in diameter.
- C. The service connection - is the point between the service lateral and the building sewer pipes. This connection is typically at the right-of-way line and a cleanout separates the sewer lateral and the building sewer. Older service connections may not have a cleanout at the property right of way line; when the property owner performs work on the service connection near the property line the owner shall be required to install a right of way clean out at the owner's cost.

14.03 QUALITY ASSURANCE

- A. Piping and specials specified herein shall be essentially the standard products of manufacturers who have been regularly engaged in the successful production of high quality materials of this type for at least 10 years, have supplied such materials for at least 5 years of the 10-year period, and have at least 5 installations in successful operation for at least 5 years.
- B. Repair or replace defective piping or specials.
- C. Pipe Acceptance Tests
 - 1. General:
 - a. Laterals shall be tested for leakage between test tees after lateral installation has been completed. The allowable leakage rate shall be zero.
 - b. All laterals shall be inspected prior to air testing. All visible or detectable leaks shall be repaired before air testing begins. The line acceptance tests shall be made after backfilling has been completed.
 - c. The Contractor shall repair all visible and detectable leaks or defects of any nature.
 - d. Cleaning (Performed by Contractor) - No debris, silt or other material shall enter the lateral. It shall be the responsibility of the Contractor to have the pipe cleaned at the time of testing. If required, the pipe shall be cleaned by hydro flushing with water or by passing through the pipe a full gauge squeegee in a manner approved by the Authority.

2. Air Testing Procedure

- a. All wyes, tees, sweeping tees or end of lateral and/or building sewer placed for future connection shall be plugged with flexible caps, or acceptable alternate, securely fastened to withstand the internal test pressure. Plugs or caps shall be readily removable.
- b. Testing of any sewer may not be conducted until the entire line has been completed. Each building sewer shall be low pressure tested at 5.0 psi for a minimum of five (5) minutes. The maximum allowable leakage is one (1) psi during the test.
- c. Repair and retest sections of lateral not meeting test requirements.
- d. Air testing shall be performed utilizing test equipment consisting of an air compressor and storage tank of adequate capacity; an air control panel equipped with all necessary piping, valves and pressure gauges to control the rate at which the air flows to the test section and to monitor the air pressure inside the test section; and all required plugs. The pressure gauge for measuring internal pipe pressure shall be an oil-filled gauge measuring from zero to 20 psi, in one-pound increments. To prevent overloading the test section with the full pressure of the compressor, the test equipment must be provided with an approved pressure relief device set to blow out at 10 psi. The air testing equipment and all accessories shall be subject to approval by Authority.

3. Hydrostatic Testing Procedure:

- a. After pipe has been installed, test line and drain. Use clean water to perform test.
- b. Force main shall be tested to 150 psi or 1.5 times the design pressure of pipe, whichever is greater. Design pressure shall be the rated total dynamic head of lift station pump. The test shall be for a minimum of two hours, unless otherwise directed by the WTMA, with no pressure drop during testing.

D. Minimum Testing Requirements

1. Contractor shall take care to securely fasten and brace all line plugs in the pipe section being tested so that none of the plugs are suddenly released when the compressed air is applied to the pipe section.
2. Contractor shall be responsible for any damages caused by the internal pressurizing of the sewer line.
3. All gauges, air piping manifolds and valves of the air testing equipment shall be located above ground at the top of the trench.
4. Special care shall be exercised during removal of plugs. The pressure in the piping of the test section shall be completely relieved before any plug shall be removed.

14.04 SUBMITTALS

A. Submit shop drawings or catalog cuts, as appropriate, for materials listed under Article 14.06 of this Section. Submit only those materials that are actually to be used in the Work. These materials generally include the following:

1. Pipe and Fittings

2. Cleanout caps
3. Cast Iron Protection Castings
4. Gaskets, couplings, adapters and other appurtenances.

B. Make submittals to Authority prior to start of construction.

14.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle piping, fittings and appurtenances in accordance with manufacturer's recommendations, and in such manner as to protect the materials from damage.
- B. Pipe and related materials shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such material be dropped or skidded against pipe already on the ground.
- C. Pipe and related materials shall at all times be handled with care to avoid damage. The interior shall be kept free from dirt and foreign matter. All pipe and appurtenances shall be carefully lowered or raised into place with suitable equipment in a manner that will prevent damage to the material. Under no circumstances shall pipe or accessories be dropped or dumped.
- B. All lumps, blisters and excess coating shall be removed from the ends of each pipe. The joints shall wire brushed and wiped clean and dry, and free from oil and grease before the pipe is installed.

14.06 MATERIALS

- A. The building sewer shall be constructed of any one of the following materials:
 1. Schedule 40 Polyvinyl Chloride (PVC) pipe and fittings conforming to ASTM standards, latest revision. All joints shall be chemically bonded in accordance with the manufacturer's recommendations.
 2. SDR 35 Polyvinyl Chloride (PVC) pipe and fittings conforming to ASTM standards, latest revision. All pipe and fittings shall utilize rubber gasket joints.
 3. Extra-heavy cast-iron soil pipe and fittings conforming to ASTM standards, latest revision, together with neoprene gaskets. The gaskets must be made to be used with the particular brand of pipe being used and conform to ASTM standards, latest revision. All joints shall be made in accordance with the pipe manufacturer's recommendations.
- B. PVC pipe (4, 6 or 8 inch Diameter) Schedule 40 PVC with Solvent Weld Joints:
 1. Pipe
 - a. Unplasticized polyvinyl chloride (PVC) gravity sewer pipe and fittings shall conform to ASTM D1785 and ASTM D 2466 respectively. Jointing shall conform to ASTM D2672.
 - b. Pipe joints shall be made in accordance with ASTM D2855. Cement shall be in accordance with ASTM D2564.

- c. All joints shall have a minimum set time prior to backfilling. Minimum set times are as follows.
 - 1) 30 minutes min. @ 60 to 100 degrees
 - 2) 1 hour min. @ 40 to 60 degrees F
 - 3) 2 hours min. @ 20 to 40 degrees F
 - 4) 4 hours min @ 0 to 20 degrees F

2. Fittings

- a. Unplasticized polyvinyl chloride (PVC) gravity sewer pipe and fittings with integral wall bell and spigot joints meeting ASTM D3034 specification for Type PSM PVC Sewer Pipe and Fittings, Standard Dimension Ratio (SDR) 35, or ASTM F 789 (For gasket joints only)
- b. The pipe shall be joined with an integral bell, bell-and-spigot type rubber gasketed joint. Rubber gasket shall conform to ASTM F 477. The rubber gasket shall be compressed radially on the pipe spigot to form a watertight seal in accordance with ASTM D3212.
- c. Fittings shall be made of PVC having a cell classification of 12454B or 12454C (only) as defined in ASTM D1784.
- d. Pipe stiffness at 5 percent deflection shall be 46 psi for all pipe diameters when tested in accordance with ASTM D2412.

3. Saddles

- a. Approval for the use of a saddle must be obtained from the Authority prior to installation. The use of saddles will be on a case by case basis.
- b. All holes cut into the mainline shall be cored by using a coring machine.
- c. Gasketed PVC bell inlet connection with stainless steel bands, clamps, bolts and fittings.
- d. PVC material shall conform to ASTM D3034, SDR 45.
- e. All tee saddles shall bear the manufacturer's identifying mark and size.
- f. Approved products and manufacturers.
 - 1) "Sealtite" by General Engineering Company, Frederick, MD
 - 2) Engineer Approved Equal.

- 4. Schedule 40 pipe shall be used to repair existing schedule 40 pipe.

C. PVC pipe (4, 6 or 8 inch Diameter) Schedule SDR 35

- 1. Unplasticized polyvinyl chloride (PVC) gravity sewer pipe and fittings with integral wall bell and spigot joints meeting ASTM D3034 specification for Type PSM PVC Sewer Pipe and Fittings, Standard Dimension Ratio (SDR) 35, or ASTM F 789 (For gasket joints only)

2. The pipe shall be joined with an integral bell, bell-and-spigot type rubber gasketed joint. Rubber gasket shall conform to ASTM F 477. The rubber gasket shall be compressed radially on the pipe spigot to form a watertight seal in accordance with ASTM D3212.
3. Fittings shall be made of PVC having a cell classification of 12454B or 12454C (only) as defined in ASTM D1784.
4. Pipe stiffness at 5 percent deflection shall be 46 psi for all pipe diameters when tested in accordance with ASTM D2412.
5. Saddles
 - a. Approval from the Authority for the use of a saddle must be obtained prior to installation. The use of saddles will be on a case by case basis.
 - b. All holes cut into the mainline shall be cored by using a coring machine.
 - c. Gasketed PVC bell inlet connection with stainless steel bands, clamps, bolts and fittings.
 - d. PVC material shall conform to ASTM D3034, SDR 45.
 - e. All tee saddles shall bear the manufacturer's identifying mark and size.
 - f. Approved products and manufacturers:
 - 1) "Sealtite" by General Engineering Company, Frederick, MD
 - 2) Engineer Approved Equal.

D. Cast Iron Pipe (4 and 6 Inch Diameter).

1. Pipe

Cast iron gravity sewer pipe and fittings of either "Service Weight" or "Extra Heavy" with integral wall bell and spigot joints meeting ASTM A74 specification for cast iron gravity sewer pipe and fittings
2. Fittings
 - a. Pipe shall be joined with an integral bell, bell-and-spigot type rubber gasket joint conforming to ASTM C564. Rubber gasket shall be compressed radially on the pipe spigot to form a watertight seal.
 - b. Fittings shall be made of either "Service Weight" or "Extra Heavy" cast iron and shall be of the bell-and-spigot type having a rubber gasket, which meets ASTM A74, and creating a watertight seal.

E. Rigid Pipe Coupling

1. SDR 35 PVC in-line rigid pipe couplings with rubber gaskets
2. Fittings manufactured in accordance with ASTM D3034 and D1784.
3. Rubber gaskets for fitting shall conform to ASTM F477.
4. Approved manufacturers

- a. GPK Products, Inc., Fargo, ND.
 - b. Or equal

- F. Flexible Pipe Couplings with Anti-Shear Stainless Steel Collar: Provide flexible pipe couplings with anti-shear stainless steel collar designed for differing pipe material connection; and for transition/reducing conditions of differing pipe material connections. **Flexible rubber couplings without an anti-shear stainless steel collar are NOT permitted.**
 - 1. Coupling Construction: Virgin PVC material which meets the performance requirements of Commercial Standard Specification CS 226-59 Couplings designed for pipe outside diameter coupling shall incorporate recesses to contain the stainless steel bands. Couplings provided with pre-assembled type 305 stainless steel bands.
 - 2. Acceptable Manufacturers:
 - a. FERNCO Inc., Distributed by the General Engineering Company
 - b. Or Approved Equal

- G. Cleanouts:
 - 1. Construction shall be in accordance with latest International Plumbing Code (2000) requirements/state-wide building code.
 - 2. Cleanouts shall be placed at the edge of the right-of-way for each individual property served (or to be served) by sewer service.
 - 3. Test tees shall be installed as indicated on the Building Sewer Detail and the appropriate Service Lateral Detail.
 - 4. Cleanouts shall be installed at all changes in vertical and horizontal directions greater than $22\frac{1}{2}^{\circ}$. Two $22\frac{1}{2}^{\circ}$ bends may be put together to form a 45° bend without a clean out requirement. Where changes in direction are less than 45° , cleanouts shall be located every fifty (50) feet. On straight pipe runs cleanouts may be placed up to eighty (80) feet apart
 - 5. On new service lateral construction and/or lateral replacement test tees shall be installed as indicated on the Detail Drawings.
 - 6. All cleanout piping (vertical stack piping) shall be the same pipe size as the service lateral or building sewer.
 - 7. Cleanouts shall have a threaded cap or plug.
 - 8. Cleanouts located in gravel or paved areas or in areas where vehicular traffic may occur shall have a cast iron cleanout box and cover plate. Acceptable manufactures:
 - a. General Engineering Company, Frederick, MD.
 - b. Or approved equal.
 - 9. **All new commercial and/or industrial properties are required to install a full “test” manhole located at the right-of-way line in lieu of the required cleanout. This also pertains to any existing commercial or industrial property that needs to replace the sanitary sewer service line.**

14.07. LAYING PIPE

- A. **There shall be a 10-foot horizontal separation between water service and service lateral/building sewer.**
- B. Service Laterals shall be installed a minimum of ten (10) feet from any street tree or street light.
- C. Where a building sewer penetrates a foundation wall, a wall sleeve 2 times the diameter of the building sewer shall be used. The gap between the wall sleeve and building sewer shall then be made watertight.
- D. Pipe to pipe connections shall be made in accordance with Pipe Reconnection Detail.
- E. Following trench excavation, pipe laying shall proceed upgrade with pipe laid carefully, hubs upgrade, spigot ends fully centered into adjacent hubs, and true lines to grades given.
- F. Provide test tees as indicated on Detail Drawings.
- G. Each Section of pipe shall rest upon the pipe bed for the full length of its barrel, with recessed excavated to accommodate bells and joints. Each pipe shall be firmly held in position so that the invert forms a continuous grade with the invert of the pipe previously placed.
 - 1. Lateral pipe having an inside diameter of 4 inches shall be laid at a grade not less than $\frac{1}{4}$ inch per foot.
 - 2. Lateral pipe having an inside diameter of 6 inches shall be laid at a grade not less than $\frac{1}{8}$ inch per foot. Pipe laid at $\frac{1}{8}$ inch per foot shall be laid with a transit and verified to the inspector's satisfaction.
 - 3. Lateral pipe having inside diameter greater than 6 inches shall be laid at a grade not less than 1% slope.
- H. Under no conditions shall pipe be laid in water, on sub grade containing frost and/or when trench conditions are unsuitable for such work. In all cases, water shall be kept out of the trench until concrete cradles, supports, encasements or saddles, where used, and materials in the joints, have hardened.
- I. Any pipe that has its grade or joint disturbed after laying shall be taken up and re-laid. Any section of pipe already laid and found to be defective shall be taken up and replaced with new pipe.
- J. Working on top of the completed pipeline, except as may be necessary in backfilling or tamping, shall be kept to a minimum.
- K. Maintain pipelines free and clear of debris during the progress of the work.
- L. At time when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug.
- N. Inspect pipe and fittings for defects or damage prior to lowering in the trench.
- M. Install pipe and fittings in accordance with manufacturer's written instructions.
- O. Use of a hydro-hammer for compaction shall not be permitted within a minimum of 4 feet of the top of the pipe.
- P. Install pipe couplings and adapters in accordance with manufacturer's written instructions.

14.08 CONNECTION OF NEW SERVICE LATERAL TO EXISTING SEWER MAIN

- A. Connection of the service lateral to the sewer main shall be made by removing a section of the sewer main and replacing it with an SDR 35 PVC wye branch connection or sanitary tee and then reconnecting this to the sewer main with rigid PVC gasketed couplings. When directed by the WTMA the mainline may be cored by using a coring machine. Other methods, such as a saddle or insert-a-tee may be used, only with the WTMA's express prior authorization.
- B. Pipe to pipe connections shall be made in accordance with Pipe Reconnection Detail.
- C. Test tees for air testing the service lateral and/or building sewer shall be installed at the service connection between the building sewer and the service lateral or at the right-of-way line.
- D. All sewer laterals shall pass an air test before Authority acceptance. Testing shall be the responsibility of the Contractor.. The building sewer shall be tested with low pressure air at 5.0 psi for a minimum of five (5) minutes. The maximum allowable drop in pressure over the five minute period is one (1) psi.

14.09 CLEANOUTS

- A. Service Laterals and Building Sewers: All service laterals and building sewers shall have cleanouts located not more than:
 - 1. 4" lateral up to 50 feet apart on runs having pipe bends greater than 22.5°, otherwise 80 feet maximum distance apart.
 - 2. 6" lateral 80 feet apart
 - 3. larger than 6" lateral 100 feet apart
- B. Cleanouts shall be placed at each bend greater than 22¹/₂. Note that two 22¹/₂ degree bends may be used together to create a 45 degree bend without a cleanout.
- C. Change in Direction: cleanouts shall be installed in accordance with the International Plumbing Code (2000) requirements. Access shall be provided to all cleanouts.
- D. All cleanouts are to have a cast iron protection casting installed regardless of location in paved areas or unpaved areas.
- E. 90° bends shall utilize a long sweeping radius elbow and a cleanout. In most circumstances two 45° bends shall be joined together for 90° bends.

14.10 CLEANING

- A. No debris, silt or other material shall be allowed in the lateral. If required, the pipe shall be cleaned by hydro flushing with water or by passing through the pipe a full gauge squeegee in a manner approved by the Authority.
- B. Cleanup.
 - 1. Removal of debris, which may have been stored within the public rights-of-way, including the road, cart way or sidewalk, shall be removed within 24 hours of completion of the building sewer work.

2. Any concrete sidewalk or curb removed for making a sewer connection must be temporarily restored within 48 hours and permanent replacement must be completed within 30 days from the time installation has been approved.

SECTION 15

RIGHT-OF-WAY GATE

15.01 RELATED DOCUMENTS

Drawings and general provisions for Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

15.02 RIGHT-OF-WAY GATE

- A. General Requirements: Install a gate system of the type specified herein on off street rights-of-ways to prevent unauthorized entry. The exact location for the gate system shall be selected by the Authority.
- B. Gate System Design: Provide a chain link fence gate with hinge and locking posts, as specified in Section 16 of these specifications: "Above Ground Wastewater Pumping Stations.

SECTION 16
PUMPING STATION

**SPECIFICATIONS FOR ABOVE GROUND PUMPING
STATIONS**

**WASHINGTON TOWNSHIP MUNICIPAL
AUTHORITY**

11102 BUCHANAN TRAIL EAST

WAYNESBORO, PA

17268

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SECTION 16

DESIGN CRITERIA FOR WASTEWATER PUMPING STATION

16.1 GENERAL

The purpose of this document is to establish minimum technical and design standards for developers and engineers for the design and acceptance of wastewater pumping stations within the service area of the Washington Township Municipal Authority (WTMA). The standards are intended to ensure uniformity and quality of construction for wastewater pumping stations throughout Washington Township. Any deviation from the standards contained herein shall be subject to the approval of the WTMA. Plans and specifications shall be prepared and certified by a professional engineer registered in the Commonwealth of Pennsylvania.

Certain equipment manufacturers have been noted herein for the purposes of establishing standards for the level of quality of materials and workmanship, reliability, ease of maintenance, and minimization of spare parts inventory. All equipment and materials shall be new and unused.

16.2 DESIGN DATA

- A. All work shall be in accordance with the requirements of the Pennsylvania Department of Environmental Protection (PA-DEP) and the PA-DEP Domestic Wastewater Facilities Manual (DEP # 1357-/91), or most recent revision. All work shall also be in conformance with NFPA-70 (National Electrical Code), NFPA 820 (Fire Protection in Wastewater Treatment Collection Facilities) and NFPA 58 (Standard for Storage and Handling of Liquefied Petroleum Gases) latest editions. Utility work for Power and Telephone services shall meet all requirements of the Utility Company providing service.
- B. Pumps shall be capable of handling the maximum peak hourly flow with one unit out of service. For ratio of peak hourly flow/design average flow see "Recommended Standards for Wastewater Facilities", 1990 Edition, Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, page 10-5.

16.3 SUBMITTALS

- A. At the time of application the following shall be submitted to the WMTA for approval:
 - 1. Completed application form
 - 2. All calculations and assumptions for the system head curve, total dynamic head, flow qualification, wet-well volume, pump duty cycle at average and peak daily flow, force main line velocity, net positive suction head available, reprime data, as well as any other design calculations.
 - 3. Site plan showing subject pumping station relative to area under development and the existing sewer system
 - 4. Building blueprints for the pumping station.
 - 5. All pump curves.
 - 6. Recommended spare parts list from the equipment manufacturer

- B. Five copies of the equipment submittal drawings shall be submitted to the WTMA for approval prior to fabrication of the equipment.
- C. Prior to acceptance of the pumping station, the following shall be submitted to the WTMA for approval:
 - 1. Five copies of the manufacturer's O/M manuals for all mechanical and electrical equipment.
 - 2. One copy of manufacturer's certified test data including reprime performance tests.
 - 3. As-built drawings for the entire site, including electrical, building and utility information

16.4 SITE REQUIREMENTS

- A. The pumping station site shall have a minimum size of forty (40) feet by forty (40) feet.
- B. Access to the station shall be via a dedicated asphalt or concrete paved road with a minimum width of sixteen (16) feet. In unusual cases, curbs and gutters may be required by the Engineer. In no case shall the profile grade exceed 12 percent. The entire pump station area will be paved with a minimum of 4 inches of BCBC. The site will be graded as to create a minimum slope of 1 inch per 1/2 foot away from the building.
- C. The pumping station shall be designed to remain fully operational and accessible during a one hundred (100) year flood event. Applicable regulations of State and Federal agencies regarding flood plain obstructions shall be followed.
- D. The pumping station shall be located within dedicated easements.

16.5 FENCING

- A. Height – Fencing shall be of the chain link type, seven (7) feet high, with bottom reinforcing wire. Except where specifically indicated otherwise, fencing shall include extension arms supporting three (3) strands of barbed wire. Height of fence is measured from ground line to top strand of barbed wire. The entire fencing shall be the standard product of a manufacturer specializing in the manufacture of chain link fencing.
- B. Placement – The fence will be placed two (2) feet from the rear and side property lines. In the front the fence will be placed on the right-of-way line.
- C. Fabric – The chain link fence fabric shall be nine (9) gauge galvanized wire having a uniform square mesh measuring approximately two inches between its parallel sides.

The fabric shall be fastened to the line posts by means of No. 6 gauge zinc-coated wire slips spaced approximately 12" apart. It shall be attached to the top rail by means of a double wrap at intervals of approximately 2'0". Fabric shall be attached to the terminal posts by means of a tension strip held by specially designed clips which are bolted to the post.
- D. Line-Posts – Line post shall be galvanized steel 2-1/2" O.D. posts, weighing 3.65 pounds per lineal foot, of sufficient length to allow for installation to a depth of approximately 3'0" below ground level. The post shall be spaced in the line of fence not farther apart than 10'.
- E. Terminal Posts – End, corner, and gate posts for a single gate 4'0" opening and up to a 16'0" opening for double gates shall be 4" O.D. galvanized steel posts, weight 5.79 pounds

per lineal foot. Each post shall be of sufficient length to allow for a depth approximately 3'0" below ground level.

1. Both line and terminal posts shall be set in cylindrical concrete foundations. A hole shall be excavated for the full depth of the post, not less than 10" in diameter for all line posts and 12" in diameter for terminal posts.
 2. The fence shall have a continuous top rail for its full length of standard galvanized pipe, 1-5/8" O.D.; weight 2.27 pounds per lineal foot, the top rail shall pass through openings provided for that purpose in the post tops and each length shall be coupled with insert sleeve coupling.
 3. A one-piece, press steel arm, zinc-coated after fabrication, shall be clamped to the top of each line post so as to include upward to an angle of 45 degrees. Arms shall be formed with tongue for permanently attaching barbed wire topping.
 4. At all changes in relative grade greater than 15%, pull post and diagonal braces shall be provided.
- F. Barbed Wire – The top 1'0" of the fence shall consist of three strands of barbed wire attached to 45-degree arms. Barbed wire shall be zinc-coated, 4 point thickset with barbs spaced 4" apart.
- G. Tension Wire – A No. 7 gauge coil spring wire, zinc-coated, shall be stretched along the bottom of the fence and securely fastened to the line posts. The chain link fabric shall be attached to the wires by means of 12 gauge zinc-coated pig rings spaced at intervals of approximately 2'0".
- H. Truss Braces – A truss brace of standard galvanized pipe 1-5/8" O.D., weight 2.27 pounds per lineal foot, with a 5/16" diameter truss rod and turnbuckle attachment shall be installed between each end or gate post and the adjacent line post.
- I. Gates – Gate frames shall be made of 4" O.D. galvanized steel posts, weight 5.79 pounds per lineal foot, joined at the corners by arc welding, to form a rigid panel. Frame shall be filled with chain link fabric of the same gauge as used on the fence. The fabric shall be fastened in the frame on all four sides by means of adjustable hood bolts and tension rods. Three strands of barbed wire shall be fastened to the extended end bars of gate frames.
- All gates shall be as shown on the Drawings, equipped with all necessary accessories of an approved type, including latches, and stops for both open and closed positions. A latch for locking shall be provided. Locks for each gate shall be provided by the owner. Contact the Authority for keying information. The main gate will have a minimum width of sixteen (16) feet.
- J. Galvanizing – All miscellaneous parts excluding the fence above and below the ground shall be zinc-coated throughout by the hot-dip spelter process.
- K. Sign – A sign shall be placed on the gate identifying the pump station and phone numbers to call in the event of an emergency.
- L. Shop Drawings – The Contractor shall prepare and submit Shop Drawings for WTMA's approval, before fence installation may begin.
- M. Installation – Provide and install a chain link fence including the necessary gates, terminal post, and fittings, as indicated on the standard drawings in these specifications.

16.6 PUMPING STATION BUILDING

- A. The building shall be constructed so that the face of the building is parallel to the road or street.
- B. The building shall be of masonry construction. The developer shall encase the building in brick or use textured block as approved by the Authority. All walls must be insulated with zon-ite block insulation. Color charts shall be submitted to the Authority for approval of the color for the brick or block.
- C. All work shall be protected during the cold weather. Concrete block shall be Grade N with a Type I moisture content. Mortar and grout shall comply with ASTM C150 Type I.
- D. The building shall have a minimum 8 foot clear ceiling height, 10 ft. overall width and 20 ft. overall length. The size shall be increased if necessary to provide adequate clearance for equipment operation and maintenance. The building shall have one insulated steel double entry with a removable center post. The door shall have a minimum opening of six (6) feet, with key lock and stainless steel hardware. The building shall have no windows.
- E. The roof of the building shall be constructed with wood trusses with a minimum pitch of 3.5 to 12. The maximum span of the trusses will be two (2) feet from center to center. The roof shall be covered with shingles having a life expectancy of 30 years. The roof shall extend one (1) foot beyond the walls, on all sides. Color shall be approved by the Authority.
- F. The floor shall be a reinforced concrete slab with a minimum thickness of eight (8) inches. Two (2) floor drains shall be installed with drain line discharging into the wet well. A trap and flap valve shall need to be installed on the drain line.
- G. Internal walls shall be covered with one (1) coat of prime and then two (2) coats of epoxy paint. The ceiling shall be covered with 5/8-inch water-resistant drywall. The ceiling then shall be painted with one coat of primer and two coats of epoxy paint. The ceiling and walls shall be painted white. Twelve (12) inches of batt insulation shall be placed above the drywall in the ceiling, providing a minimum R-19 rating.
- H. Key locksets to the Authority's existing master-key system. Deliver four (4) master keys to the Authority only.
- I. A minimum of 4'0" of unobstructed floor space shall be provided in all directions around the pumping equipment and electrical panels or as otherwise accepted by the WTMA.
- J. A ventilator shall be provided using forced air as opposed to exhaust. Ventilation requirements are 12 air changes per hour for continuous duty or 30 air changes per hour for intermittent duty. A ventilation louver shall be provided on the wall opposite to the ventilation fan. The ventilation shall be controlled by a wall switch and thermostat.
- K. If public water is available, one frost free hydrant shall be required to be installed inside the building.
- L. Sufficient wall or ceiling mounted electric heat shall be provided to prevent freezing inside the building at -10 degrees F ambient temperature. A remote thermostat shall be required.
- M. One (1) dusk to dawn light shall be mounted to the front of the building so that it illuminates both the gate and the door.
- N. A minimum of one (1) 110-volt receptacle shall be provided with ground fault protection and weatherproof covers outside of the building near the front door.

- O. A minimum of one (1) 110-volt receptacle shall be provided with ground fault protection and weatherproof cover on each of the interior walls. A maximum of two (2) 110-volt receptacles can be connected to one (1) twenty (20) amp breaker. The 220-volt receptacle will have its own twenty (20)-amp breaker. All wiring and parts shall carry the UL listing and be NEMA rated.
- P. Interior lighting shall be 2 lamps, 60-watt rapid start fluorescent fixtures. The bulbs will have waterproof protective coverings over them. Interior lighting shall maintain a minimum of 40 to 50 foot-candles at floor level.
- Q. In general, the building type and architecture should match and compliment adjacent buildings and properties. It shall also meet all applicable building codes.
- R. One (1) five (5) pound fire extinguisher shall be mounted to the wall just inside the door.

16.7 WET WELL

- A. All penetrations through the slab to the wet-well shall be sealed to prevent sewer gas leakage.
- B. A 36" x 36" diamond plate aluminum door shall be provided for access to the wet-well. The door shall have three hundred (300) pounds per square foot load rating with an automatic hold open arm. Hatches shall be as described below:
 - 1. Single leaf construction, watertight gasketed hatch.
 - 2. Hatch shall be furnished with flush stainless steel hinges, angle, stiffeners and slam hatches.
 - 3. Hatches shall have extended aluminum frame with continuous anchor and shall be constructed of ¼ inch minimum aluminum diamond plate design.
 - 4. Hatches shall be provided with an auto-lock, hold open device and torsion spring assembly.
 - 5. All hardware, including all parts of the latch and lifting mechanism assemblies, all open arms and guides, and all brackets, hinges, pins and fasteners shall be stainless steel.
 - 6. A 1-inch minimum drain coupling shall be provided in the hatch frame. Drain line shall be routed outside to a drywell two (2) foot in diameter carried to frost depth.
 - 7. Hatches shall be lockable with two sets of keys.
 - 8. Aluminum hatch shall be as manufactured by Halliday Products, Bilco or approved equal.
- C. The bottom of the wet-well shall be sloped 1:1 toward a drain placed in the center of the wet-well. Floor slope shall begin below pumps off elevation.
- D. A minimum four (4) inch ductile iron pipe shall extend to the bottom of the wet-well. The end of this pipe at the bottom of the wet-well shall be a ninety (90) degree elbow and a flare fitting on the end. The ninety (90) degree elbow shall be encased in the concrete sloping towards the center of the wet-well. The other end of the pipe shall have a quick disconnect fitting mounted on the building exterior. This pipe shall serve a dual purpose as a bypass suction pipe and for cleaning of the wet-well.

- E. A four (4) inch ductile iron pipe shall extend from the force main and shall have a plug valve placed at the tee of the force main. The other end of the pipe shall have a quick disconnect fitting mounted on the building exterior. This pipe can serve a dual purpose as a bypass suction pipe and for cleaning of the wet-well.
- F. The wet-well shall have a ductile iron four (4) inch vent pipe with a one hundred eighty (180) degree turn-down outside of the building. The vent shall be cast into the wet-well top slab and be made of PVC.
- G. A ladder or manhole rungs of corrosion resistant materials shall provide access to the bottom of the wet-well. Grating shall be installed ten (10) feet below the hatch. The grating shall be removable around the ladder to allow access to the bottom of the wet-well.
- H. For 3-inch pumps passing 2.5-inch solids, a strainer basket to remove rags shall be required. The strainer basket bars shall be two (2) inch on center and the basket mounted on guide tracks and removable without entering the wet-well. The basket and guide tracks shall be constructed of welded aluminum and anchored with stainless steel nuts and bolts. An aluminum winch stand shall be provided for removal of the basket.
- I. The wet-well volume shall be of sufficient capacity to ensure that the time between pump run cycles is within the requirements of the electric motor manufacturer. For duplex pumping stations with alternating pumps, the wet-well cycle time between pump on and pump off levels shall be a minimum of 10 minutes for motor sizes less than 15 HP or 15 minutes for motor sizes greater than 15 HP when the inflow to the wet-well is one-half (1/2) of the pump rated capacity.
- J. Adequate distance between the pump off level and the pump suction intake pipe shall be provided to prevent vortexing.
- K. Vault Design
 1. All vaults shall be designed by a licensed Professional Engineer registered in the State of Pennsylvania, and engaged by the manufacturer.
 2. All dead loads, live loads, flotation, erection, temperature and anchorage stresses shall be considered.
 3. The calculations shall be prepared in a neat and legible manner, sealed by the licensed Professional Engineer performing the calculations.
 4. For design, groundwater shall be assumed at the top of the vault and the design shall provide for a fifteen (15) percent factor of safety against flotation.
 5. The concrete shall have a minimum 28 day compressive strength of 4000 psi.
 6. Pre-cast concrete vaults shall conform to the requirements of this specification and ASTM C478.
 7. All tongue-and-groove joints in the pre-cast wall, including the joint at the top of the base, shall be made up using gaskets, and shall conform to ASTM C443. Joints may also be made up using Butyl joint sealant rope material in lieu of the gasket. The pre-cast sections shall be provided with a special groove to receive and hold the gasket in position during joint assembly. After joint assembly, the gap between sections shall be packed on the inside and outside with WTMA approved Hydraulic Cement, and shall be trowelled smooth so that no projections remain on the inside. There shall be no concrete or concrete bearing between the various sections. The gasket shall not support the weight of the section.

8. No joints shall be permitted below the high water alarm level for the pumps.
9. Slab tops shall be set in a full bed of mortar. The slab top shall be crowned a minimum of ¼ inch per foot for drainage.
10. All openings found in the concrete shall be reinforced with additional diagonal bars tied to each layer of wall or slab reinforcement. Any required inserts and wall openings shall be coordinated with mechanical requirements prior to casting the units.
11. All exterior surfaces of pre-cast concrete vaults, except for the top of the cover slab, shall be waterproofed using two coats of Koppers Bitumastic black solution or approved equal.
12. A foundation mat of AASHTO No. 57 stone to support the base shall be provided. Mat shall be six (6) inches minimum depth and shall bear on sound undisturbed earth; excavate and remove sub grade material as necessary to reach sound sub grade. Stone sub grade mat shall be a minimum of two feet greater than the footprint of the vault base, and shall be compacted to a uniform, level surface.
13. Pre-cast base shall be accurately located and uniformly supported on the foundation mat in a level position.
14. Install wall sections in properly oriented position; follow manufacturer's instructions for joining together each section using the gaskets.
15. All joints shall be packed with WTMA approved Hydraulic Cement.
16. Units shall be installed plumb and level.
17. All materials and protection against flotation shall be provided during the installation process.

16.8 PUMPS AND ASSOCIATED CONTROLS

- A. The pumps shall be located above grade inside the pump station building. Suction lift centrifugal pumps shall be manufactured by Gorman-Rupp.
- B. All valves, discharge piping and controls shall be furnished by Gorman-Rupp. Pumps shall be belt driven, self-priming, T-Series. Pumps shall have a large cover plate opening to allow for unclogging and removal of the impeller. Each pump shall be equipped with the following:
 1. Spring assisted discharge check valve.
 2. Discharge plug valve.
 3. Air release valve, automatic, spring assisted.
 4. Suction and discharge gauges, glycerin-filled, 3-inch diameter
 5. Drain valve with quick connect piping.
 6. High pump temperature thermostat
- C. Pump Construction:
 1. Pump Casing: Made of gray iron No. 30, shall be foot supported, and have a horizontal centerline suction and vertical discharge.
 - a. The casing shall have a top mounted 3-1/2 inch priming fill port with a safety lock bar cover. In consideration for safety, hand nut threads must provide slow release of

pressure, and clamp bar must be retained by detent lugs. A Teflon gasket shall prevent adhesion of the fill port cover to the casing.

- b. Casing shall have no openings of smaller diameter than the specified sphere size.
 - c. Casing shall be designed to retain sufficient liquid to ensure automatic repriming and unattended operation.
 - d. A minimum 1-1/4 inch diameter drain hole shall be provided for attachment of the pump drain kit.
 - e. Suction flap valve: Molded neoprene with integral steel and nylon reinforcement. A blowout center shall protect the pump casing from hydraulic shock or excessive pressure. Removal or installation of the check valve must be accomplished through the cover plate opening without disturbing the suction piping. Sole function of the suction flap shall be to save energy by eliminating need to reprime after each pump cycle.
- Pumps requiring a suction check valve to assist reprime shall not be acceptable.**

2. Cover plate: Cover shall be cast iron Class 30.

- a. Retained by four (4) hand nuts for complete access to pump interior. Cover plate removal must provide ample clearance for removal of stoppages, and to allow removal or service to the impeller, seal, wear plate or suction flap valve.
- b. A replaceable wear plate secured to the cover plate by four (4) welded studs and nuts. The wear plate shall be ANSI 1015 HRS. The wear plate shall be of sufficient width to maintain the manufacturer's recommended clearance between the entire edge of each impeller vane and the wear plate. Wear plate attachment hardware shall be located out of the direct flow path of the liquid into the impeller. Two (2) Buna-N o-rings shall seal cover plate to the pump casing.
- c. A pressure relief valve shall be supplied in the cover plate. Relief valve shall open at 75 – 200 psi.
- d. Pusher bolt capability to assist in removal of cover plate. Pusher bolt threaded holes shall be sized to accept same retaining cap screws as used in rotating assembly.
- e. Easy-grip handle shall be mounted to face of cover plate.

3. Rotating Assembly

- a. **Impeller:** Two (2) vaned, semi-open, non-clog, cast in ductile iron with integral pump out vanes on the back shroud. Impeller shall thread onto the pump shaft and be secured with a lock screw.
- b. **Shaft:** Shaft shall be constructed of Alloy Steel No. 4130 and shall employ an Alloy Steel No. 4130 shaft sleeve.
- c. **Mechanical seal:** A mechanical seal shall seal the pump shaft against leakage. The stationary sealing member and the mated rotating face shall be tungsten titanium carbide. Each of the mated surfaces shall be lapped to a flatness of one half light band (5.8 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating so that faces will not lose alignment during periods of shock loads that will cause deflection, vibration, and axial movement of the pump shaft. The seal shall be warranted for a minimum of two (2) years from the date of shipment.

d. **Lubrication:** Separate oil filled cavities, vented to atmosphere shall be provided for shaft seal and bearings. Oil cavities must be cooled by the liquid pumped. Three lip seals will prevent leakage of oil. The bearing cavity shall have an oil level sight gauge and fill plug with check valve. The clear sight gauge shall provide easy monitoring of the bearing cavity oil level and condition of oil without removal of the fill plug. The check valve shall vent the cavity but prevent introduction of moist air to the bearings.

The seal cavity shall have an oil level sight gauge and fill plug with vent. The clear sight gauge shall provide easy monitoring of the seal cavity oil level and condition of oil without removal of the vented fill plug. Double lip seal shall provide an atmospheric path providing positive protection of bearings, with capability for external drainage monitoring.

e. **Seal plate:** Replaceable seal plate shall be constructed of gray iron No. 30 and shall be bolted to the bearing housing.

f. **Shaft bearings:** Shall be antifriction ball or tapered roller bearings, of ample size and proper design to withstand all radial and thrust loads which can reasonably be expected during normal operation. Pump designs in which the same oil lubricates both the shaft bearings and the shaft seal shall not be acceptable.

g. **Oil sight gauge:** Provide an oil level sight gauge for visual observation of the shaft bearing oil level.

h. **Pusher bolt:** Pusher bolt capability to assist in removal of rotating assembly. Pusher bolt threaded holes shall be sized to accept same cap screws as used for retaining rotating assembly.

4. Suction and discharge spools: Each pump shall be equipped with one-piece, cast iron spools, flanged on each end. Each spool shall have one (1) ¼ inch NPT tapped hole with pipe plugs for mounting of gauges or other instrumentation.

D. Pump Serviceability: The pump manufacturer shall demonstrate to the WTMA's satisfaction that due consideration has been given to reducing maintenance costs by incorporating the following features:

1. Special Tools: No special tools shall be required for replacement of any components within the pump.

2. Removable Cover Plate: The pump shall be equipped with a removable cover plate, allowing access for service and repairs without removing suction or discharge piping. The cover plate shall be large enough to allow clearance of stoppages and to permit removal and replacement of the impeller or seal plate assembly through the cover plate opening.

3. Replaceable Wear Plate: The pump shall be fitted with a replaceable wear plate. Replacement of the wear plate, impeller, seal, and suction check valve shall be accomplished through the removable cover plate.

4. Rotating Assembly: The entire rotating assembly, which includes bearings, shaft, seal, and impeller, shall be removable as a unit without removing the pump volute or piping. The rotating assembly shall be easily detached from the pump by removal of four bolts.

5. Impeller clearance adjustment: Adjustment of the impeller face clearance (distance between impeller and wear plate) shall be accomplished by external means.
 - a. Clearances shall be maintained by external shim less cover plate adjustment, utilizing collar and adjusting screw design for incremental adjustment of clearances by hand. Requirement of realignment of belts, couplings, etc., shall not be acceptable. Cover plate shall be capable of being removed without disturbing clearance settings.
 - b. There shall be provisions for additional clearance adjustment in the event that adjustment tolerances have been depleted from the cover plate side of the pump. Impeller clearance adjustment shall be accomplished by moving the entire rotating assembly towards the wear plate, to compensate for wear. The removal of stainless steel shims from the rotating assembly side of the pump shall allow for further adjustment.
 - c. Clearance adjustment which requires movement of the shaft only, thereby adversely affecting seal working length or impeller back clearance, shall not be acceptable.
- E. All pumps shall be equipped with fixed speed motors and be of non-clog design capable of passing a minimum of 2-1/2 inch sphere for 3-inch pumps and a minimum of 3-inch sphere for larger pumps through all openings within the pump.
- F. For any design flow, a minimum of two fixed speed pumps shall be provided; each capable of pumping in excess of the peak hourly flow.
- G. No specific tools shall be required to replace any of the pump components.
- H. Gauge Kit – Each pump shall be equipped with a glycerin filled compound gauge to monitor suction pressures, and a glycerin filled pressure gauge to monitor discharge pressures. Gauges shall be a minimum of 4 inches in diameter, and shall be graduated in feet water column. Rated accuracy shall be 1 percent of full-scale reading. Suction gauges shall be graduated in feet up to +30 feet water column minimum. Gauges shall be mounted on a resilient panel and frame assembly which shall be firmly secured to pumps or piping. Gauge installations shall be complete with all hoses and fittings, and shall include a shutoff valve installed in each gauge inlet at the point of connection to suction and discharge pipes.
- I. Pump Drain Kit – The pump drain kit shall consist of a 10' length of plastic hose with a quick connect female kamlock fitting on one end of hose and two sets of fittings for pump drains. Each set of fittings for pump drains includes a pipe nipple, bushing, bronze gate valve and quick connect male kamlock fitting.
- J. Pumps, motors and controls shall be tested as a unit at the pump manufacturer's facility prior to shipment. Provide the Authority with a copy of the certified test data. Suction lift pumps shall include certified reprime performance tests and certified dimensional drawings indicating size and location of priming recirculation port or ports.
- K. Fabricated Steel Base – Common fabricated steel base shall be provided for pump and motor assemblies. Bases shall be comprised of a base plate, perimeter flange, and reinforcements. Base plate shall be fabricated of steel not less than 1/4" thick, and shall incorporate openings for access to all internal cavities to permit complete grouting of unit base after installation. Perimeter flange and reinforcements shall be designed to prevent flexing or warping under operating conditions. Base plate and/or flange shall be drilled for hardware used to secure unit base to concrete pad as shown on the contract drawings. Unit base shall contain provisions for

lifting the complete pump unit during shipping and installation. A layer of neoprene rubber shall be installed between the steel base and the concrete on which the base is mounted.

- L. Drive Transmission – Power shall be transmitted from the motors to the pumps by means of v-belt drive assemblies.
- M. Supports and Thrust Blocks – All pipes connected to the pump station shall be supported according to good commercial practice to prevent piping loads from being transmitted to the pumps. Pump station discharge force main piping shall be anchored with thrust blocks where shown on the contract drawings.

16.9 Emergency Standby Power

A. 20 HP Pumps or Less:

1. The pump will be equipped with a Wisconsin auto start backup system. The Wisconsin engines will use LP gas. The exhaust from the Wisconsin motors will be vented to the outside via flexible stainless steel piping.
2. One (1) LP gas tank shall be placed to the rear of the building. The LP gas tank and fuel supply piping shall be sized to adequately furnish the engine with LP gas when the temperature reaches 10 degrees F and the tank is 60% full. LP gas pipe size shall be per engine supplier's recommendations. The tank shall contain sufficient propane for the emergency generator to run 5 days without refilling the tank.
3. Provide thermally actuated fresh air intake vent assembly consisting of two (2) louvers, actuator assembly, mounting frame, and external screen. Air intake vents shall progressively open at 75 degrees F and progressively close at 60 degrees F as a result of thermal expansion or contraction of wax-like material contained in an enclosed plunger actuator.
4. Provide thermally actuated exhaust vent assembly consisting of two (2) louvers, actuator assembly, mounting frame, and external screen. Exhaust vents shall progressively open at 75 degrees F and progressively close at 60 degrees F because of thermal expansion or contraction of wax-like material contained in an enclosed plunger actuator.
5. Provide critical grade muffler for engine exhaust.
6. The manufacturer shall have an authorized repair facilities located within 100 miles of the Washington Township Municipal Authorities service area.
7. The proposed shop drawings shall comply with the Engineer's recommendations for quality assurance.

B. For greater than 20 HP Pumps

1. Subject to compliance with the approved shop drawings, provide products by Caterpillar or approved equal by Kohler, Detroit Diesel or Onan Corp.
2. The prime mover shall be liquid cooled, diesel fueled, and engine of four-cycle design at an operating speed of 1800 RPM with a 0.8 power factor.
3. The engine is to be cooled with a unit-mounted radiator, fan, water pump, and closed engine coolant recovery system providing visual diagnostic to determine if the system is operating with a normal engine coolant level.

4. The intake air filter must be mounted on the unit. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have a replaceable single spin on full flow oil filter. Engine oil drain must be provided to outside the mounting base for cleaner and more convenient engine servicing. A fan guard shall be provided.
5. The engine shall have a battery charging DC Alternator with voltage regulator.
6. The engine fuel system shall be designed to operate on No. 2 diesel fuel. A secondary fuel filter, water separator, manual fuel priming pump, fuel shut off solenoid and all fuel lines shall be installed at the point of manufacture.
7. Sensing elements must be located on the engine for low-pressure shutdown, high engine temperature shutdown, low coolant level shutdown, over speed shutdown, and over crank shutdown.
8. The engine shall have an engine mounted, thermostatically controlled water jacket heater or crankcase heater to aid in quick starting. Wattage shall be as recommended by the engine manufacturer.
9. The following items shall be factory installed:
 - a. Heavy Duty battery of adequate voltage and amperage to operate and start the engine
 - b. Flexible stainless steel connector between engine exhaust manifold and the engine exhaust system.
 - c. Stainless steel exhaust silencer, muffler and support structure. Measured sound level at a distance of 10 feet from the exhaust discharge is 72 dBA or less.
 - d. The fuel supply tank shall be of dual walled construction and be sized with sufficient capacity to operate the engine under full load for 5 days without refueling.
 - e. Nameplates for each major system component, resistance to seismic forces for each item equal to a minimum force value equal to the weight of item,
 - f. Skid of adequate strength and rigidity with lifting attachments.
10. Alternator as approved by the engineer.
11. Shall be designed to meet environmental conditions at point of installation
12. The controls, outdoor set enclosure remote enunciator installation, and pre-acceptance testing shall be as approved by the Engineer.
13. The complete standby electric generating system including components shall be warranted by the Manufacturer against defective materials and factory workmanship for a period of 2 years or 500 hours of operation, whichever comes first. Such defective parts shall be repaired or replaced at the Manufacturers option, free of charge for parts, labor and transportation.
14. Startup shall include a day of training.

16.10 Valves

- A. All valves shall have ports designed to pass 3-inch spherical solids.
- B. Air Release Valves

1. Each pump shall be equipped with one automatic air release valve, designed to permit the escape of air to the atmosphere during initial priming or unattended repriming cycles. Upon completion of the priming or repriming cycle, the valve shall close to prevent recirculation. Valves shall provide visible indication of valve closure, and shall operate solely on discharge pressure. Valves which require connection to the suction line shall not be acceptable.
2. All valve parts exposed to sewage shall be constructed of cast iron, stainless steel, or similar corrosion resistant materials. Diaphragms, if used, shall be fabric reinforced neoprene or similar inert material.
3. A cleanout port, 3 inches or larger in diameter, shall be provided for ease of inspection, cleanout, and service.
4. Valves shall be field adjustable for varying discharge heads.
5. Air release valve discharge pipe shall be 1-1/4 inch.

C. Plug Valves

Four (4) and Six (6) Inch Plug Valves: The discharge header shall include a 3- way plug valve to permit either or both pumps to be isolated from the common discharge header. Valves shall have ports designed to pass spherical solids equal to the pumps capability. The plug valve shall be non-lubricated, tapered type. Valve body shall be semi-steel with flanged end connections drilled to 125 pound standard. Valve shall be furnished with a drip tight shutoff plug mounted in stainless steel bearings, and shall have a resilient facing bonded to the sealing surface. Valve shall be operated with a single lever actuator providing lift turn, and reseal action. The lever shall be equipped with a locking device to hold the plug in the desired position.

D. Check Valves

1. For four (4) inch or six (6) inch check valves, each pump shall be equipped with a full flow type check valve, capable of passing a 3" spherical solid, with flanged ends and be fitted with an external lever and spring. The valve seat shall be constructed of stainless steel and shall be replaceable. The valve body shall be cast iron and incorporate a 3" cleanout port. Valve clapper shall have a molded neoprene-seating, surface incorporating low pressure sealing rings. Valve hinge pin and internal hinge arm shall be stainless steel supported on each end in brass bushings, sealing bushing shall have double o-rings. O-rings shall be easily replaceable without requiring access to interior of valve body. Valve shall be rated at 175-PSI water working pressure, 350-PSI hydrostatic test pressure. Valves other than full flow type or valves mounted in such a manner that prevents the passage of a 3" spherical solid shall not be acceptable.
2. For eight (8) inch or larger check valves, each pump shall be equipped with a full flow type check valve, capable of passing a 3" spherical solid, with flanged ends and be fitted with an external lever and spring. A 316 stainless steel body ring shall be threaded into the valve port. Valve clapper shall be cast iron, rubber face, and shall swing completely clear of waterway when valve is full open. The seating shall be by a ring in the valve body. Hinge pin shall be of 188 stainless steel construction and shall be utilized with bronze bushings and packing type seal. Valves shall be equipped with removable cover plate to permit entry or for complete removal of internal components without removing

the valve from the line. Valve shall be rated at 175-PSI water working pressure, 350-PSI hydrostatic test pressure. Valves other than full flow type or valves mounted in such a manner that prevents the passage of a 3” spherical solid shall not be acceptable.

16.11 Spare Parts

The following spare parts shall be provided:

- Mechanical seal (2)
- Cover plate o-ring (2)
- Shaft sleeve
- Suction flap valve
- Quart of seal lubricant (2)
- Shim pack (2 sets)
- Rotating assembly o-rings
- Spare fuses of each type in the control panel (2 each)

16.12 Motors

- A. The pump motors shall be horizontal, open drip proof, induction type, with premium efficiency characteristics and normal starting torque and low starting current characteristics, suitable for 3 phase, 60 hertz, voltage to match facility voltage, AC electrical current. Provide inverter duty motors for projects requiring the use of inverter motor drives. The motors shall not be overloaded at the design condition or at any head in the operating range as specified.
- B. Each motor shall be in current NEMA design cast iron frame with copper windings, 1.15 service factor and Class F insulation.
- C. Finish:

Exterior surfaces of pumps, piping, and steel framework shall be chemically or mechanically cleaned prior to painting. Exposed surfaces are to be coated with a gray, non-lift water reducible primer possessing low VOC, high solids characteristics. The bright white semi-gloss acrylic enamel shall incorporate rust inhibitive additives. The finish coat shall be 1.0 to 1.5 MIL dry film thickness (minimum), resistant to oil mist exposure and solvent contact. Salt spray exposure test shall be rated 100 hours (minimum). The factory finish shall allow for over-coating and touch up after installation.

16.13 Electrical

A. Electric Service

1. Standard electric equipment is 120/240 volt 3 phase, 4 wire. Electric Service shall be 240 volt, three phase. If 120/240 volt three phase is not available, transformers shall be utilized to transform 480Y/277 3 phase or 208Y/120 volts 3 phase to 120/240 volt 3 phase. **Phase conversion equipment to convert single-phase power to three-phase power shall not be acceptable.** The use of Variable Frequency Drives with input and output line reactors are an acceptable alternative.

2. Design shall include all arrangement with utility company to provide power to facility. Design shall be in accordance with all utility company requirements.
3. The main electrical panel shall be service entrance rated with a main circuit breaker and circuit breakers to feed building loads.
4. A surge protection device shall be provided on the main service panel board.

B. Automatic Dialing Alarm System

1. Telephone service shall be brought to the facility.
2. Provide a solid-state dialer capable of dialing up to eight (8) telephone numbers, each up to twenty-four (24) digits in length. Upon closure of up to eight (8) normally open contacts, the dialer will call a predetermined telephone number and transmit a voice recording. If the number called is busy or the dialer is not acknowledged, the dialer will continuously dial up to eight (8) telephone numbers.
3. Alarm conditions are as follows:
 - Power failure (internal to dialer)
 - Power failure – Emergency Generator Activated
 - Pump No. 1 failure
 - Pump No. 2 failure
 - High water alarm
 - Backup high water alarm (float switch)
 - Low level alarm
 - Spare
4. Transmit messages with user-recorded voice. Tapes are not permitted. Provide acknowledgment capabilities by both touch-tone and call back.
5. Voice messages shall be kept intact during power failure or when all power is removed for up to one (1) year.
6. The unit shall be capable of dialing any phone number on command and function as a speakerphone.
7. Power requirements shall be 115 VAC with twenty (20) hour battery backup and battery charge.
8. Include integral surge protection.

C. Controls

1. The pump control panel shall be manufactured by a UL panel builder and the assembly shall bear a serialized UL label for “Enclosed Industrial Control Panels”. All wiring, workmanship, and schematic wiring diagrams shall comply with the National Electrical Code (NEC).
2. Obtain pumping equipment, motors, motor starters, pump controls and appurtenances from the pump manufacturer whose responsibility it is to insure that the pumping equipment is properly coordinated and operating in accordance with these specifications.
3. The pump control panel including the liquid level controls shall be constructed and tested at the pump manufacturer’s facility.

4. Control voltage shall be 110 volt. Control wiring to the wet well or other classified areas shall be intrinsically safe (low voltage) or explosion proof, meeting the requirements of the National Electrical Code.
5. All equipment shall be wired for automatic restart capability after restoration of power.
6. Elapsed time meters shall be provided for each pump on the motor control panel.
7. Electrical components shall be as manufactured by Allen-Bradley, General Electric, or Furnas. Circuit breakers for motor controllers shall have through the door operating mechanisms to prevent the door from opening when the breakers are in the "on" position. Motor starters, relays and selector switches shall be NEMA rated. Motor control circuits shall have a "Hand-Off-Auto" selector switch, an "On" pilot light, an "Overload" pilot light and an overload "Reset" pushbutton.
8. The liquid level controller shall be an "Electronic Pressure Switch" (EPS2000) manufactured by Gorman-Rupp. The EPS2000 wet well level controller shall be a solid state air bubbler system and shall include a digital back lighted display, NEMA 4X enclosure, 4-20 ma output for remote wet well monitoring, time delay to prevent simultaneous motor starts, DC power supply, a high wet well level alarm and low wet well level alarm.
9. Liquid level controller shall utilize two (2) industrial rated air pumps to deliver approximately 5 cubic feet of air per hour. A selector switch shall be furnished to provide manual alternation of the air pumps. An airflow indicator shall provide visual indication of airflow rate. Air bell shall be provided for installation in the wet well.
10. The standby engine shall have DC electronic pressure switch liquid level controls to drive one pump during failure of utility power and during scheduled exercise periods. A 115-volt battery charger to maintain the charge on the 12-volt DC battery supplied with the engine shall be provided.
11. A power conduit and wiring to all equipment as called for in these specifications shall be provided. All wiring shall be in conduit except final flex type connections to equipment subject to vibration.

16.14 Protection of Equipment

The pumping station should be placed into service soon after delivery of the equipment. If operation is delayed, the equipment including controls shall be stored indoors free from excessive dust in a low humidity, heated environment.

16.15 Start-Up

- A. An authorized service technician from the original equipment manufacturer shall be provided for installation start-up. Start-up shall include operator training on the pumping station, generator operation, and maintenance.
- B. The WTMA shall be notified forty-eight (48) hours prior to start-up and an Authority representative shall be present during the period of start-up.
- C. A copy of the technician's start-up report showing all field data control, set points and equipment condition shall be furnished to the WTMA.
- D. Sufficient water for start-up and equipment check shall be the responsibility of the developer.

16.16 Clean-Up

In State Highways, Municipal and private roads and improved private property, the Developer shall ensure that the Contractor cleans up as the work progresses and shall maintain his construction areas in a clean condition up until acceptance by the Owner or the Township, without regard to who caused the need for clean up. In unimproved areas, the Contractor shall clean-up before acceptance of the work by the Owner or the Washington Township Municipal Authority.

SECTION 17
SUMMARY OF WTMA PUMPING STATION DESIGN
CRITERIA

DESIGN PARAMETER	DESIGN VALUE
1. FLOW DEVELOPMENT	
A. Single family dwellings, GPD/EDU	230.4 GPD/EDU
B. Others	Text or manuals
2. RATIO OF PEAK HOURLY FLOW/DESIGN	
AVERAGE FLOW	4.0
3. SITE	
A. Fence	Chain link
B. Roadway	All weather, single lane, less than 12% grade
C. Maximum landscaped slope - %	15%
D. Flood protection, flood event	100 Year
4. BUILDING	
A. Minimum clear ceiling height – ft.	8
B. Unobstructed floor space around pumps – ft.	4
C. Ventilation requirements, air changes – hour	12 continuous, 30 intermittent
D. Potable water service line – inches	$\frac{3}{4}$
E. Interior lighting, 2 bulb, 40 W fixtures	2 watts/SF minimum

F. Interior electrical receptacles, 110 volt	1 per wall
5. WET – WELL	
A. Minimum wet-well bottom slope	1:1
B. Detention time between pump run cycles – minutes	15
6. PUMPS	
A. Maximum pumping rate	> peak flow
B. Minimum number of pumps	2
C. Pump type	Suction lift, constant speed
7. ELECTRICAL	
A. Incoming service, volt/phase	208/230/460, 3 phase
B. Control voltage, volts	110
8. FORCE MAIN	
A. Pipe material of construction	Ductile iron
B. Depth of cover – foot	4
C. Line velocities – fps	2.5 – 4.5

SECTION 18
APPLICATION FORM FOR WASTEWATER PUMPING
STATION

A. General Information

- 1. Name of project served _____

- 2. Total area served, acres _____

- 3. Estimated start of construction _____

- 4. Estimated completion date _____

B. Applicant

I, the undersigned, am fully aware that the statements made in this application for approval of a wastewater pumping station are true, correct and complete to the best of my knowledge.

Printed name

Mailing Address

Signature of Applicant

Telephone Number

Print Name and Title

Date

Representing

C. Engineer

This is to certify that this application has been prepared under my direction and the plans and specifications for this wastewater pumping station have been designed by me and are in conformance with sound engineering practices.

Printed Name

Mailing Address

Signature of Engineer

Company Name

Print Name

Telephone Number

Registration Number

Date

SECTION 19

OPTIONS CHECKLIST

Facility Name

Address

Submittals

1. At time of application
 - Application form
 - Hydraulic calculations
 - Force main profile
 - Site plan
 - Building plans
2. During Construction
 - Equipment submittal drawings
 - Color charts for building, roof, interior paint
3. Prior to Start-Up
 - Operation and maintenance manuals for all electrical and mechanical equipment
 - Manufacturers recommended spare parts lists
 - Certified pump performance tests
4. Prior to acceptance
 - Start-up report

Site Requirements

5. Lot size
 - Minimum site size
6. Access road
 - Asphalt or concrete
 - Minimum width
 - Maximum grade

- 7. Fencing
 - Height
 - Type
 - Barbed Wire
 - Gates – Drive through and Walk through
- 8. Site paving
 - Completely paved inside fenced area
- 9. Flooding
 - Accessible during 100 year flood
 - High water in wet well discharges from upstream manhole
 - Flooded wet well should not flood upstream basement
- 10. Site dedicated
 - Deed to municipality
- 11. Landscaping
- 12. Sign

Building

- 13. Construction (choose one)
 - Built in place
 - Brick
 - Concrete block
 - Textured block
 - Fiberglass
 - 6 x 6 enclosure
 - 7 x 10 enclosure with roll off cover
 - Fiberglass shelter
 - Pre-cast concrete
 - Wood frame and siding

14. Minimum size
- Clear ceiling height
 - Width and length
 - Clearance around equipment
15. Doors
- Single or double
 - Aluminum, steel, or fiberglass
 - Hardware – stainless steel, plated steel
 - Insulated
16. Key locksets to master key system
17. Windows
18. Roof
19. Insulation – ceiling
20. Potable water – if available
- Hose bib
 - Sink
 - Frost-Free Hydrant
21. Floor Drain (choose one)
- Cap & duckbill valve
 - Water trap
22. Interior painting – walls, ceiling, equipment, piping, floor
23. Fire extinguisher

24. Ventilation

- Exhaust fan or intake fan
- Air changes/hour
 - 15 for continuous duty
 - 30 for intermittent duty
- Intake and exhaust louvers
- Controls
- Thermostat, wall mounted
- Wall switch
- Cycle timer
 - Heater – electric or gas, wall mounted thermostat
 - Indoor 120 volt receptacles – number, GFI
 - Outdoor 120 volt receptacles – number, GFI, weatherproof covers
 - Circuit breaker panel, spare breakers
 - Interior lighting
 - Exterior lighting, switch and/or photocell, wall mounted or pole mounted
 - Emergency lights on rechargeable battery with wall switch
 - Hoist
 - Desk/workbench
 - Telephone

Wet Well

25. Sizing

- Minimum diameter
- Minimum cycle time for determining operating volume
- Adequate depth to prevent vortexing
- Location of inlet to prevent air entrainment

27. Access door
- Aluminum access cover, 300 lbs/sq ft, automatic hold open arms, stainless steel hardware
 - Wet Well platform – aluminum grating at 10 foot level
28. Ladder (choose one)
- None
 - Manhole rungs
 - Aluminum
 - Stainless steel
29. Pipe penetrations sealed between wet well and dry well
- Link seal
 - Grout
 - Gasketed
30. Support brackets for piping
- Stainless steel
31. Bottom slope
- 1:1 slope
 - Bottom slope starts below pump off elevation
32. Inlet opening
- Flange and flare, increasing elbow
33. Ventilation (choose one)
- Vent pipe, 4-inch, and 90-degree turndown
 - Forced air, exhaust air, or portable ventilator
34. Controls
- Wall switch or limit switch on access cover
35. Basket strainer (if required)
- Aluminum or stainless steel
 - Opening size
 - Winch stand with manual or power winch
36. Wet well coating
37. Electrical equipment in wet well

Pumps

38. Type (choose one)

- Suction lift pumps located above ground
 - Cleanout cover
 - Serviceability
 - Accessibility
 - Maintenance and repair
- Submersible pumps installed in wet well
 - Explosion proof or non-explosion proof
 - Guide rails – galvanized steel or stainless steel

39. Valve location

- Above ground
- Below ground valve box

40. Lifting device

- Portable or fixed winch stand
- Above ground socket or embedded
- Mechanical or power winch
- Truck mounted power winch
- Portable tripod mounted winch

41. Lifting cable, material, attachment

42. Solids passing capability

43. Future flow capabilities

44. Spare Parts

Pump Options and Accessories

45. Pump drain kit with quick disconnect

46. Gauges (**choose one**)

- Resilient mounted, glycerin filled, size, suction and discharge
- Suction and discharge fittings with portable gauge kit

47. Air release valves

- Manual
- Automatic

48. Special materials for pump components – impeller, wear plate and seal plate material

- Stainless steel
- Austempered Ductile Iron
- Ductile Iron (standard)

Optional Equipment

49. Flow meter (choose one)

- Volumetric
- Mag meter
- Doppler

50. Wet well aeration blower – centrifugal

- Interlocked with pump motor starters
- Adjustable cycle timer

51. Chemical feed equipment for H₂S control

Valves and Piping

52. Check valves

- Spool type
- External lever and spring
- Cleanout cover
- Solids passing capability

53. Shutoff valves – ¼ turn plug valves

54. Bypass discharge piping with quick connect couplings

- Sized to match portable pump connections
- Coupling location – mounted to outside wall or inside enclosure

55. Bypass suction pipe with quick disconnect

56. Main station shutoff valve on force main

- 57. Header pipe size and material
- 58. Air release valves prior to check valve – diaphragm type
- 59. Suction pipe material – ductile iron, No PVC
- 60. Pipe supports

Drive

- 61. Motor – size, service factor, enclosure rating
- 62. V-belt drive, safety factor
- 63. Belt guard

Force Main

- 64. Materials – PVC, ductile iron
- 65. Minimum velocity
- 66. Minimum size
- 67. Minimum cover over force main
- 68. Future flow capabilities
- 69. Air release valve and vacuum breakers
 - Size
 - Placement
 - Pit size
 - Shutoff valves
 - Manufacturer if standardized
- 70. Cleanouts
- 71. Bedding requirements

Pump Controls

- 72. Panel location (choose one)
 - Wall mounted
 - Attached to pump base

73. Starters (choose one)

- Across the line
- Reduced voltage solid state (with or without run to bypass contractors)
- Variable frequency drives

74. Electrical service – 3 phase service

75. Alarms (choose all that apply)

- High water
- High pump temp (suction lift only)
- Low water
- Motor temp & moisture (submersible only)
- Low building temperature
- Intrusion alarm
- Independent high water alarm
 - Intrinsically safe float switch
 - Non-intrinsically safe float switch
 - Activated without 120 volt control power available

76. Alarm monitoring device (choose one or more)

- Telephone dialer – Number of channels, 8 channel, manufacturer if standardized
- Land line phone service or cellular phone service
- Alarm horn
- Alarm light, with flasher or without

77. Control power, 120 volt, 1 phase

- Control power transformer
- Separate 120 volt power source

78. Elapsed time meters

79. Optional elapsed time meter for two pumps running

80. UL listed controls

81. Transient voltage surge suppressors

82. Phase monitor

83. Grounding

Level Controls

84. Type (choose one)

Air bubbler with air bell (standard)

Bubbler – pipe material, size, and schedule _____

Float switches, intrinsically safe or non-intrinsically safe

Pressure transducer

Ultrasonic sensor

85. Controller with digital display (choose one)

EPS 2000

SMS – volumetric flow meter, elapsed time meters, etc., record of alarm conditions

Troubleshooting

Modem

Software

Auxiliary Power (choose one or more)

86. Emergency generator

Transfer switch

Inside building or outside in weatherproof enclosure

Ventilation requirements

87. Auto start engine

LP or Natural gas

Fuel line size

Fuel tank size requirements

Ventilation requirements

88. Portable pump installed at pump station with separate level controls

Piping connections

Garage door

Battery charger

Independent level controls

Gasoline or diesel

89. Portable generator

Developers Responsibilities

90. Escrow/maintenance fund

91. Warranty terms

Additional comments: _____

Inspectors Name

Date of startup

SECTION 20

SUBMERSIBLE GRINDER PUMP STATION

20.01 WORK INCLUDED

- A. Submersible Grinder Pump Station Approval Process
- B. Grinder Pump Station and Force Main requirements
- C. Installation requirements

20.02 REQUIREMENTS FOR SUBMERSIBLE GRINDER PUMP STATION

- A. Submersible grinder pump stations shall meet the following requirements:
 - 1. Receive Grinder Pump Station approval from the WTMA.
 - 2. Use only equipment on WTMA's List of Approved Grinder Pump Station Equipment.
 - 3. Meet the requirements set forth in Section 20 of this Manual.
- B. Grinder Pump Station Applications
 - 1. Details for submersible grinder pump station are included Section 20.03 of this manual.
 - 2. The DEVELOPER/OWNER (as may apply) shall furnish a complete factory built and tested Grinder Pump Station(s), each consisting of grinder pump(s) and all necessary appurtenances to form a complete package system.
 - 3. For each project where the use of grinder pumps has been proposed, the DEVELOPER shall submit for approval by the WTMA an application containing the following information:
 - a. Name and address of developer
 - b. Project location
 - c. Name of manufacturer and model number of equipment to be used (From WTMA's List of Approved Grinder Pump Station Equipment)
 - d. Site plan and elevation drawings showing the location of building(s) using grinder pump stations, location and elevations of gravity sewers to the grinder pump stations, elevations of the top and the base of each grinder pump station, and location and elevations of the pressure sewers.
 - e. Calculations justifying pump horsepower and impeller diameter selection.
 - f. Calculations justifying the anti-flotation system.
- C. List of Approved Grinder Pump Station Equipment
 - 4. Only equipment from the WTMA's List of Approved Grinder Pump Station Equipment shall be acceptable. Said List shall be maintained by the WTMA and will be available upon request.

2. To be considered for placement on the approved list, the developer, supplier or supplier's representative must submit a written request to the WTMA to have the equipment placed on the approved list. The request must include data demonstrating that the grinder pump station equipment meets the requirements of section 20.03. Information to be submitted includes but is not limited to Manufacturer's literature, illustrations, specifications and engineering data defining materials of construction, dimensions, weights, pump and motor performance and complete electrical schematics.
3. A separate request for placement on the approval list shall be made for each different type of equipment made by a given manufacturer and approval will be granted on a model number basis such that only those model numbers on the list will be acceptable. The only exception to this requirement is that a pump model not on the list will be acceptable if the pump is made by the same manufacturer of a pump on the list, the two pumps differ only in motor speed, horsepower or impeller diameter and the two pumps have identical designs and materials of construction.
4. Placement on the List of Approved Grinder Pump Station Equipment does not constitute approval of performance of the equipment in actual use and satisfactory performance of the equipment shall be the responsibility of the DEVELOPER.
5. For each request to have equipment placed on the approved list, the WTMA will evaluate the equipment and record the time required to evaluate equipment. **The DEVELOPER, supplier or other person making said request shall reimburse the AUTHORITY for the charges of the engineering review irrespective of whether, or not the WTMA accepts the equipment for placement on the list.**
6. The WTMA's policy requires that all grinder pumps installed in its wastewater system have a repair or maintenance facilities located within a 20 miles radius of Waynesboro, Pennsylvania. This facility shall maintain a complete inventory of repair parts for the grinder pump station.
7. Attention is directed to the fact that the drawings and overall system design are based on a particular piece of equipment from a particular manufacturer. These specifications are intended to provide guidelines for standard equipment of a recognized manufacturer who already meets all the requirements of this specification.

20.03 SUBMERSIBLE GRINDER PUMP STATION

A. General

1. Simplex grinder pump station shall be used at each residential property location.
2. Grinder pump station shall be installed in a fiberglass-reinforced polyester basin for outdoor installation only. **Indoor installation will not be permitted.**
3. Grinder pump station shall consist of submersible centrifugal grinder pump and motor, complete with fiberglass basin, electrical junction box with sufficient length of power cable and all internal wiring, slide away mounting system, level control system, anti-floatation device, high water alarm, anti-siphon function, control panel, piping, valves, delivery, factory testing warranty and **field start-up and testing.**
4. A control panel shall be provided for each unit and installed on the exterior of each home.

5. The manufacturer of the grinder pump station shall be preapproved by the WTMA in advance of any wastewater system design approval. A list of Grinder Pump Stations preapproved by the WTMA is available at the WTMA's office or the DEVELOPER may elect to submit a request for an "or equal" approval per Section 20.02 C above.
6. Anyone desiring preapproval of a Grinder Pump Station shall submit the required information a minimum of 15 days prior to design approval or bid opening date. The request must demonstrate to the satisfaction of the WTMA that all safety requirements, materials of construction, and design features of specified equipment are being met and that the manufacturer has a minimum of 10 years experience in the design and manufacture of units of identical size(s) and performance to the specified units.
7. Warranty: The manufacturer shall provide a warranty on any defective part(s) and labor for a period of twenty-four (24) months after notice of the owner's acceptance, but no greater than twenty-seven (27) months after receipt of shipment.
8. Each grinder pump shall be submerged, operated, and tested for performance compliance to its respective curve. All control panels shall be factory performance tested prior to shipment.
9. All grinder pump stations shall be manufactured, and assembled in the United States of America.
10. Abbreviations:
 - a. A.S.T.M. - American Society for Testing Materials
 - b. A.A.S.H.T.O. - American Association of State Highway and Transportation Officials

B. Grinder Pump and Accessories

1. Grinder Pump

- a. The DEVELOPER shall submit calculations justifying the pump horsepower and impeller diameter selected.
- b. Major components of the pump end, such as casing, impeller, seal plate and intermediate housing, shall be of ASTM class 30 cast iron construction. Pump shaft and hardware shall be 300 series stainless steel.
- c. The grinder pump shall be a centrifugal pump. The use of positive displacement pumps is excluded unless the receiving pressure piping is constructed of a SDR 11 PVC or ductile iron piping.
- d. A Control panel shall be provided which shall be mounted on the exterior of the building and within sight of the Grinder Pump Station. The control panel shall include:
 - 1) The Grinder Pump Station shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled, factory wired and tested grinder pump station assembly shall be U.L. listed. Grinder pump stations not U.L. listed will not be acceptable.
 - 2) Red flashing alarm light, mounted on top, identifying a system failure.

- 3) The manufacturer shall provide 50 feet of SOW power cable wired from the station junction box to be connected to the control panel unless field conditions dictate other requirements. The wiring design shall provide for a sealing method to seal the cable entry point and to provide strain relief at the point of cable entry.
- e. Grinder Assembly: the combination pump impeller (rotor) and grinder unit shall be attached to the common motor and pump shaft made of 416 stainless steel. The grinder unit shall be on the suction side of the pump impeller and discharge directly into the impeller inlet leaving no exposed shaft to permit packing of ground solids. The grinder shall be capable of grinding all materials found in normal domestic sewage, including plastics, rubber, sanitary napkins, disposable diapers, and wooden articles into a finely ground slurry with particle dimensions no greater than ¼ inch. Both stationary and rotating cutters shall be made of 440C stainless steel hardened to Rockwell 55C or 60C and ground to close tolerance.

2. Pump Motor

- a. The pump motor shall be a submersible type, suitable to operate on a 230 volt or 115 volt, 60 Hz, single phase service. Stator windings shall be of proper size to drive the pump at any point on the pump curve. Single-phase motor shall have start winding as well as run winding thermal protection to prevent stator burn out under high torque starting or operating conditions.
- b. The motor shall be oil filled to lubricate upper and lower motor ball bearings as well as to act as a cooling medium for the stator.
- c. The motor shall be provided with an electric sensing probe to detect any water leakage past the lower seal before damage is done to the motor. The seal probe circuit sensitivity shall not be affected by cable length between the motor and the seal probe circuitry in the control panel.
- d. The stator windings shall be mounted in corrosion-resistant, hermetically sealed submersible type housing. The Stator windings shall have Class B insulation, (130°C. or 266°F.), NEMA L design or MG1 (single phase) and shall be potted in a heat-dissipated epoxy, forming a high strength leak proof assembly to prohibit liquid or other contaminants from entering the windings.
- e. The motor shall be provided with a heat sensor thermostat in the motor windings to detect an overheat condition and stop the pump. When the temperature drops to a safe level, the pump will automatically reset.
- f. Motor power and control wires shall be sealed between the motor and terminal housings to prevent oil from entering the terminal housing as well as to act as a secondary barrier in the event water enters the terminal housing. A watertight compression type fitting shall provide further protection for each cable.
- g. Motor housing, terminal housing, and end plate shall be constructed of cast iron of no lesser grade than Class 30. Motor shaft and hardware shall be 416 stainless steel.

3. Pump Suspension System

- a. The pump suspension system shall enable the pump to be removed from the basin by lifting the grinder pump unit only. Systems requiring removal of pump hardware or breaking of unions (or couplings) will not be acceptable. Removal of grinder pump shall consist of:
 - 1) Removing basin cove
 - 2) Shutting isolation valve
 - 3) Lifting out pump assembly
 - 4) Removing pump cables form easily accessible waterproof junction box.
- b. Mounting system shall be serviceable without entering the basin to replace or adjust components mounted on the bottom of the basin.
- c. The slide rail assembly shall consist of series 300 stainless steel upper guide rail brackets with the slide rail assembly of 14 gauge series 300 stainless steel. The stationary and movable portions of the hydraulically sealed discharge coupling assembly shall be machined cast iron. The upper guide rail bracket shall mount to the basin wall and position the upper end of the stainless steel guide rail while the discharge pipe positions the lower end of the guide rail.
- d. Stainless steel guide brackets shall be attached to the pump for positioning of the unit on the guide rail during installation or removal of the unit within the basin.

4. Level Control

- a. Non-fouling wastewater level detection for controlling pump and alarm operation shall be accomplished by use of a detection mechanism specifically designed for use in a sewage grinder pump basin and shall be removable at ground level without the need to remove the pump. Switches utilized in the system shall be magnetic reed switches, hermetically sealed within a watertight PVC casing. The universal float tree bracket shall allow the float tree to be mounted on either side of the guide rails for ease of installation around inlets or other obstructions. Level detection equipment mechanism must be designed to provide protection from fats, oils, grease and solids via a specific isolator. Switches shall be mounted firmly in place in such a way that prevents tangling or fouling in the basin. The switch shall not require any regular preventive maintenance.
- b. Three switches shall be used to control level; one for pump turn on, one for pump turn off and one for high-level alarm.

5. Junction Box

- a. NEMA 6 watertight junction box shall be installed in the basin for connection of the pump and control wiring. The box shall be constructed of self-extinguishing ABS plastic with minimum wall thickness of 1/4 inch. The box cover shall be hinged, with four 300 series stainless steel fasteners and sealed with a neoprene gasket. Individual corrosion-resistant and liquid tight cable connectors constructed of thermoplastic with neoprene bushing and sealing ring shall be provided. The box and all connections shall be completely watertight and shall be capable of withstanding an external liquid pressure of 10 PSI. All fittings and hardware shall be of non-corrosive construction.
- b. Conduit and wiring between basin and control panel shall be installed in accordance with National Electric Codes and all electrical codes.

- c. The junction box shall be mounted within easy reach from ground level and must open in such a manner that all connections within can be viewed from the surface without leaning into the basin.

C. Valves, Fittings and Piping

1. Valves, fittings, and piping shall conform with Detailed Drawings and meet or exceed properties provided herein:
 - a. The station discharge piping shall consist of 1 1/4 inch schedule 40 steel pipe or SCH 80 PVC. A ball check valve shall be installed between the pump discharge and the movable fitting within the station.
 - b. The check valve shall be designed to work in wastewater, non-clog, full port check, minimum head loss, and 18' of static pressure required to seat valve. The housing shall be ASTM class 30 cast iron, powder coated, series 300 stainless steel hardware and a nitrile, nylon reinforced flapper. The check valve shall be located between the station shutoff valve and the pump and be integrated with an anti-siphon device designed to work at 150-PSI working pressure.
 - c. The movable fitting shall be positive seal, slide design having a working pressure rating of no less than 150 PSI. The movable fitting, when in position shall be held against the stationary fitting by the construction of the stainless steel rail, aligning the movable fitting for proper sealing of the two surfaces under pressure. A non-corrosive lifting cable with a minimum breaking strength of 3780 pounds shall be provided for pump installation and removal.
 - d. The 1.25" isolation valve shall be non-clog in design and the ball shall not impede flow through the valve. The valve shall be a True Union Ball Valve, Schedule 80 PVC rated at 150 PSI. The valve shall be of a quick disconnect design, 1/4 turn, leak tight shut-off and full port bore. It shall be installed in the discharge piping to provide shut-off capabilities during pump removal, and shall be fitted with an integral stainless steel extension handle. The extension handle shall extend up to within six (6) inches of the top of the basin and shall be secured at the top of the basin with a stainless steel bracket. The gate valve shall be accessible within 6 inches of the top of the basin.
 - e. Anti-siphon Valve: the pump discharge shall come with a factory installed, gravity operated, flapper type integral anti-siphon valve built into the discharge piping

D. Grinder Pump Station Basin

1. The basin shall be constructed of fiberglass-reinforced polyester with molded top flange and bottom. The basin shall be free of imperfections, sound, watertight and of high quality workmanship. It must be impervious to microorganisms, mildew, mold, and fungus, and non-corrosive inside and outside when installed in soils deleterious to metal or concrete structures.
2. The basin shall have a diameter of 24" to 36" and have other dimensions as shown in the Detail Drawings.
3. Basin wall thickness shall be suitable to withstand wall collapse under a hydrostatic pressure of 120 pounds per cubic foot with a 1.5 safety factor.

4. An anti-flotation collar or bottom plate shall be furnished on the basin. The bottom plate shall be at least six (6) inches larger in diameter than the basin bottom. The bottom shall be an integral part of, and permanently bonded to, the basin.
5. The fiberglass basin shall be equipped with a steel cover or vented polyethylene cover or aluminum cover coated with a high temperature baked epoxy green-colored paint. .

E. Controls

1. Control Components:

- a. The control components for operation and protection of the grinder pump station shall include as a minimum:
 - 1) Circuit breakers, fuses terminal strips, ground lug, capacitors when required, IEC rated motor starters, relays, alarm light, and internal push to run button.
 - 2) Each control panel shall include a visual and audible, with silence, high water alarm device. Alarm circuit shall be separately fused from the motor control circuit. The visual alarm shall be red fluted lens mounted on top of the enclosure in such a manner as to maintain rainproof integrity. The 90 db audible device shall be capable of being deactivated by means of a NEMA 4X silence button mounted on the exterior of the enclosure. Visual alarm shall remain on as long as a high water condition exists in the basin. Both visual and audible will automatically reset when the high water condition subsides.
- b. The control assembly shall be completely factory wired except for power feed lines, motor connections, and level control switches. Wiring shall be done in accordance with all applicable standards set forth by the National Electric Code and shall be color coded and numbered as indicated on factory wiring diagrams.
- c. All components shall be electrically grounded to a common ground screw mounted on the removable back panel. Upon installation of the control assembly, and before connection of any power feed lines, installer shall extend a grounding wire from the control panel main ground screw to external ground in accordance with NEC and local electrical codes.

2. Control Enclosure.

- a. The pump control enclosure shall be of fiberglass or stainless steel construction designed for corrosion resistance in compliance with NEMA 4X standards. The outer door shall have a minimum horizontal swing of 180° and shall be held in a closed position by a padlock. The outer door shall be mounted on a stainless steel continuous hinge and have a seal around its entire perimeter. When the enclosure contains an inner swing panel it shall be mounted on a continuous piano type hinge. The inner swing panel shall be fabricated from steel having a minimum thickness of 0.06 inches (16 gauge). The inner swing panel shall have provisions for mounting all basic controls and instruments. It shall have a minimum horizontal swing of 90° and shall be held in closed position by quarter-turn door latches.
- b. The enclosure shall have a removable back panel of a minimum thickness of 0.078 inches (14 gauge), secured to the enclosure on collar studs or weld nuts.

The back panel shall be pre-drilled and tapped to accept mounting of control components. Self-tapping screws shall not be used to mount any component.

- c. The enclosure shall be mounted at a position where it is visible from the sewage grinder pump station.

20.04 PRESSURE PIPE (FORCE MAIN)

F. General

1. Pressure pipe shall be polyethylene plastic pipe of a minimum of 1.25 inch in diameter.
2. Pressure pipe to be PVC SDR 21 (or SDR 11 in the use of positive displacement pumps)
3. Schedule 80 PVC may be permitted, written approval required by WTMA.
4. Approved Manufacturers:
 - a. Plexco Plastic Piping Systems
 - b. Engineer Approved equal

20.05 INSTALLATION

A. Grinder Pump Station

1. The DEVELOPER shall submit the following to the Authority for approval:
 - a. Site plan showing location of grinder pump station, routing of all piping, and electrical wiring
 - b. Manufacturer's catalog data that demonstrates compliance with specifications and figures
 - c. Installation details
2. The grinder pump station shall be installed at a location to be determined by the property owner or developer.
3. The depth of the grinder pump station will be dependent upon the location and depth of the existing house service. The influent to the basin shall be set so that a minimum grade of two (2) percent for the new gravity service line can be maintained. The minimum total unit depth from the invert of the sump to the top of the entry hatch shall be no less than six (6) feet and no greater than twelve (12) feet. The top of the station shall be 6-inches above final grade.
4. All grinder pump stations shall be installed on a bed consisting of 1B stones or A.A.S.H.T.O. No. 8 or No. 57 Coarse Aggregate and shall have a concrete anti-flotation collar poured around the bottom. The basin shall be set on a concrete pad with the anti-flotation collar secured to the concrete with bolts or steel clips; or, the concrete shall be poured around the perimeter of the basin above the anti-flotation collar. In either case, the CONTRACTOR shall submit calculations justifying the method chosen and the volume of concrete to be used.
5. The remaining excavated area shall be backfilled to six (6) inches below grade with excavated material containing no soil lumps, stones, concrete, or foreign objects

larger than one (1) inch in maximum dimension. Six (6) inches of topsoil with seed and supplements shall be placed to grade the surrounding area.

6. If the excavated material does not meet the requirements described above, a backfill material consisting of A.A.S.H.T.O. No. 8 or No. 57 Coarse Aggregate shall be used to a point six (6) inches below the finished grade.
7. The OWNER/DEVELOPER shall schedule an inspection by the AUTHORITY before beginning work, before backfilling equipment and piping, and at completion of work. The installation shall be approved by the AUTHORITY. The DEVELOPER shall be responsible for complete and approved installation.
8. Pressure sewer shall be hydrostatically tested by the installer to the satisfaction of the ENGINEER in accordance with the procedures and requirements established in Section 13 of these specifications.
9. Electrical system shall meet all of the latest requirements of the National Electric Code and the Public Utility furnishing power to the system. Nothing contained in this manual shall be construed to conflict with these requirements and should a conflict occur, these requirements shall apply.
10. The electrical installation shall be inspected by an electrical inspector prior to station startup.

B. Pressure Pipe

1. Pressure sewer shall be hydrostatically tested by the installer to the satisfaction of the ENGINEER in accordance with the procedures and requirements of the WTMA. This shall usually be a hydrostatic test to 1 ½ times the maximum pump shutoff head unless another standard is allowed by the Authority.
2. Pipe to be installed with appropriate bedding and backfill as indicated on the Sewer Detail Drawings.
 - a. Connections to manholes will only be reviewed on a case-by-case basis and connections to manholes, if allowed, shall be made via core-drill and installation of a rubber boot.
 - b. Connections to sewer mainline will only be reviewed on a case-by-case basis by the Engineer.

20.06 ABANDONMENT OF EXISTING SEPTIC TANKS

When a septic tank is being replaced by a grinder pump station, that septic tank shall be abandoned according to the Ordinances of the Washington Township Supervisors. The septic tank shall be pumped, the top broken in and the tank back filled.

SECTION 21

SANITARY SEWER FLOW CONTROL

21.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Specifications, apply to this Sections.
- B. Specifications, as applicable, including proprietary specifications of individual system and product manufacturers.

21.02 WORK REQUIRED

- A. The Contractor shall furnish all materials, labor, equipment, power and maintenance to implement a temporary system for conveying the existing wastewater flow past the work area for the time required to complete the sanitary sewer system maintenance/rehabilitation operations.

21.03 SUBMITTALS

- A. Flow Control System Plan – The Contractor shall submit a flow control plan to the Engineer/Owner for review and discussion purposes prior to initiating work on the project. This shall include the name(s) of any subcontractor(s) providing this service, if applicable.

21.04 QUALITY ASSURANCE

- A. The design, installation, and operation of the temporary flow control system shall be the Contractor's responsibility. The flow control system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
- B. In developing the temporary flow control system plan, the Contractor shall take into account pump performance data/curves; quantity, capacity, and location of all equipment; size, type and routing of all suction and discharge pipes; and means of connecting the system.
- C. When bypass pumping is required, the contractor shall provide one standby pump equivalent in size to the largest single pump in service. The standby pump shall be fully connected and ready for operation so that, upon starting the motor, the standby pump will convey the flow.
- D. The Contractor shall furnish oil, fuel, grease, lubricants, tools and spare parts that may be required to maintain the operation of the pumps throughout the work period, as recommended by the manufacturer. The Contractor shall be solely responsible for maintaining the temporary bypass pumps and appurtenances.

21.05 WORK ON PRIVATE PROPERTY OR IN RIGHTS-OF-WAY

- A. Permission to work on private property or obtaining rights-of-way, if required, shall be secured by the Owner.

- B. If, for the contractor's convenience (e.g. material storage areas, staging areas, additional site access, etc.), Contractor desires permission to work on private property (other than private properties where permission to work and/or rights-of-ways have been secured by the Owner), Contractor shall secure permission and provide Owner with appropriate documentation.
- C. The Contractor shall protect from damage all property, including land, trees, shrubs, fences, and other existing improvements and replace in kind all those damaged as a result of the Contractor's operations.
- D. The Contractor shall pay all claims for property damage outside of the immediate work area or rights-or-way, as designated by the Owner/Engineer.

21.06 SPECIAL PRECAUTIONS

- A. The Contractor shall give notice of sewer system interruptions to the Owner and affected property owners.
- B. When flow in a sewer is plugged, blocked, or bypassed, sufficient precautions shall be taken to protect the sewer from damage that could potentially result from sewer surcharging. As a guide, the Contractor shall endeavor to limit the level of surcharging to 5 psi (11.6 feet), a standard test pressure for new sewers. Further, precautions shall be taken to insure that temporary flow control measures do not cause flooding or damage to public or private property served by the sewers.
- C. The Contractor shall take care to prevent spills and discharges of raw wastewater to the ground, trenches and State waters. Any spills and discharges shall be properly cleaned up and reported immediately to the Owner.
- D. If any spills of raw wastewater occur, due to the failure of the Contractor to maintain the temporary flow control system, the contractor shall be responsible for the cost of spill cleanup and any fines levied on the Owner by any state, federal, or other applicable agency.
- E. Contractor shall provide subcontractor(s) or personnel experienced in the cleanup of sewage spills satisfactory to the Owner.

21.07 MATERIALS

A. Plugs

1. Plugs shall be inflatable, designed for use in sanitary sewer applications
2. All plugs shall be equipped with a steel cable for firm attachment to a stationary object at ground level to prevent loss of the plug in the sewer.

B. Pumps

1. Pumps shall be capable of pumping wastewater, grit, and other debris normally present in sanitary sewers. Pumping equipment shall be of adequate capacity to maintain sewer flows.

2. Pumps shall be complete with suction and discharge piping and fittings and all other appurtenances for a complete installation.

21.08 EXECUTION

- A. Flow Control shall be performed as required to comply with these specifications. No discharge of sewage onto the ground or into the trench will be allowed.
- B. The Contractor shall cease temporary flow control measures and re-establish gravity flow conditions at the end of each workday, unless explicit permission is granted by the Owner.
- C. The Contractor shall maintain adequate hoisting equipment for the pumps and ancillary equipment at the site, if applicable.
- D. At the end of the work period, the contractor shall remove the pumps and appurtenances and restore the site to the satisfaction of the Owner.