

STANDARD SPECIFICATIONS
FOR
SUMMIT TOWNSHIP SEWER AUTHORITY (STSA)
IN
SUMMIT TOWNSHIP
ERIE COUNTY, PENNSYLVANIA
2006



PRICE: \$25.00

**SUMMIT TOWNSHIP SEWER AUTHORITY
8890 OLD FRENCH ROAD; ERIE, PA 16509-5459
PHONE: (814) 868-4495 * FAX (814) 866-5821**

**GENERAL SPECIFICATIONS – SANITARY SEWERS
2006**

TABLE OF CONTENTS

<u>Title</u>	<u>Section</u>
<u>Division 1 – General Requirements</u>	
Project Approval.....	1000
Special Requirements.....	1020
Shop Drawing and Samples.....	1300
Testing.....	1400
Site Security.....	1500
Project Closeout.....	1700
Cleaning.....	1710
Project Record Documents.....	1720
<u>Division 2 – Site Work</u>	
Site Conditions.....	2013
Erosion and Sedimentation Control.....	2020
Site Preparation.....	2103
Excavation, Backfill and Compaction.....	2220
Bedding.....	2224
Sanitary Sewers and Force Main.....	2730
Surface Restoration.....	2900
<u>Division 3 – Standard Details</u>	

SECTION 1000
STSA STANDARD SPECIFICATIONS
PROJECT APPROVAL

PART 1 – GENERAL

1.01 Description

Prior to initiation of construction of any improvements to the STSA Sewer System, all Federal, State and Local permits and/or approvals are required to be obtained by the Developer and/or contractor on other designated responsible party. Failure to obtaining necessary permits and/or approvals is sufficient basis for STSA to suspend or terminate all work on approved improvements.

1.02 Scope

- A. Although not intended to be an exclusive listing, permits and/or approvals provided in this Section maybe necessary for constructing improvements to the STSA Public Sewer System.
- B. A Developer's Agreement between responsible party and the STSA for improvements to its System.
- C. A Water Quality Management Part I and II Permits from the Pennsylvania Department of Environmental Protection.
- D. Appropriate Occupancy Permits, as applicable, from Federal, State and Township highway authorities for all sewer utilities located within such public right-of-way. All such permits shall identify STSA as permittee for all sewers to be dedicated for public ownership, operation and maintenance.
- E. Appropriate Easements or right-of-ways, on forms provided by or accetable to the STSA, shall be fully executed and duly recorded for all public improvement s to be located on private property. Said easements right-of-ways must be signed and recorded prior to initiation of construction.
- F. An Erosion and Sedimentation Control Plan must be developed and approved by the designated DEP Agent currently the Erie County Conservation District. The Agency approved Erosion and Sedimentation Control Plan must be part of the construction plans and specifications.
- G. As appropriate a Waterway Encroachment Permit for all sewer improvements adjacent to or crossing a Waterway of Commonwealth. Such permits are administered by the DEP and/or Erie County Conservation District.

- H. Approval of all construction plans, specifications and shop drawings from the STSA for all improvements made to the Wastewater Conveyance System under its jurisdiction.

* * * * *

SECTION 1020
STSA STANDARD SPECIFICATIONS
SPECIAL REQUIREMENTS

PART 1 - GENERAL

1.01 Location

- A. The project site is to be located in Summit Township, Erie County, Pennsylvania. The most recent edition, with applicable revision dates and notes, of the plans and specifications for all sewer extensions must be provided to and approved by the STSA.

1.02 Scope

- A. Contract documents and the accompanying construction drawings must provide for the complete construction of all sanitary sewer extension and pump station. The work involved is covered by contract documents. Any labor, equipment, machinery, or apparatus not specifically mentioned or shown on the project drawings which may be found necessary to complete or perfect any portion of work in a substantial manner and in compliance with the requirements stated or implied in these specifications and/or plans, shall be supplied by the Contractor without additional compensation. The Contractor shall visit the site and become familiar with all site restrictions and special requirements. The Contractor shall be familiar with and responsible for knowledge of the entire specifications and all project plans.
- B. While the specifications contain general and special construction requirements, all general construction methods employed on this project shall be consistent with installation instructions of materials suppliers and shall be carried out in every instance in accordance with the established standards of acceptable present day practice for the types of construction involved.

1.03 Survey Markers

- A. Contractors on this project shall exercise care and take steps to protect existing property or survey control markers adjacent to their work. Any survey marker or property corners removed or displaced by Contractor operations on this project will be reset by a surveyor licensed to practice in the State of Pennsylvania and at involved Contractor's expense.
- B. An Engineer/Surveyor will provide the following survey control for Contractors use in laying out and constructing the work:

- One (1) centerline and one (1) off-set for manholes and other major structures or deflections.
- Cut sheets for structures as appropriate.
- Temporary vertical control points at selected locations along pipeline runs.

All other horizontal and vertical control required for construction shall be furnished by the Contractors. Construction errors caused by horizontal/vertical control supplied by the Contractor shall be corrected at the Contractor's expense. Any control markers set by the Engineer and removed or displaced by Contractor operations will be reset by the involved Contractor at its expense.

1.04 Excavation

- A. Excavation included in this project shall be unclassified. Excavation, regardless of material encountered, shall be included in and paid for at the unit or lump sum price of the contract work as indicated in the proposal. No additional compensation shall be received by the Contractor for excavation, regardless of materials encountered.

1.05 State Highway Occupancy Permits

- A. Highway occupancy work permits, as required, will be obtained from the Pennsylvania Department of Transportation and Summit Township Supervisors. The Contractor is advised that any and all construction in, on, or along State highway rights-of-way shall conform to and meet the requirements of the Pennsylvania Department of Transportation. Contractor's attention is directed to the special highway occupancy permit requirements and the provisions of the standard highway occupancy specifications included in these contract documents.
- B. No work shall begin within the limits of any State highway rights-of-way until permits for such work have been issued to the Owner. The work within highway rights-of-way may be subject to inspection by representatives of PA DOT. Contractors shall be responsible for advance notification of PA DOT officials as required by the Highway Occupancy Permit.
- C. The Contractor's bid price shall not include inspection fees which may be imposed by PA DOT.

1.06 Land and Right-of-Way Acquisition

- A. The land rights-of-way(s) necessary for locating the physical facilities shall be furnished prior to construction. In addition, all other permits required including highway occupancy must be obtained.

- B. Should the Owner/Developer for any reason be prevented or enjoined from promptly completing its obligation under this item, the Contractor shall not be entitled to make or assert claim for any damage by reason of any delay resulting from said Owner's/Developer's inability to complete its obligation under this item. It is mutually agreed, however, that the contract time for completion of the work under this contract will be extended by such time as the Owner/Developer determined will compensate for the time lost by reason of such delay.
- C. The Contractor(s) shall assume all risk, expense and liability for any work, disturbance or construction traffic outside the limits of state or township highway right-of-ways. Also, when the Owner has obtained rights-of-way on private property, the Contractor shall limit all activity within the limits of the right-of-way. Any traffic, work, or disturbance outside of right-of-way or Owner property limits shall be at the Contractor's sole risk and expense. All contractors are completely responsible for obtaining the use of private properties as required for construction traffic, operations or storage of materials.

1.07 Contract Completion

- A. Time is of the essence in completing the work. Contract completion time on this project is stipulated in the contract documents. The Contractor shall take all necessary steps to assure that work is substantially completed within the stipulated time period. Failure to substantially complete the contract work within the stipulated time frame shall be just cause for the Owner to assess liquidated damages.
- B. The Contractor shall not be granted time extensions for contract completion due to unsuitable weather conditions, unless it can be demonstrated by the Contractor that the weather encountered was significantly more severe than normal weather conditions during the subject time period. The Contractor in submitting his bid on this work shall account for potential delays due to unsuitable weather which normally occurs during the specified contract completion period.

1.08 Site Restrictions

- A. The Contractor shall carefully inspect project work areas and become familiar with all site restrictions and project requirements before commencing work.
- B. The Contractor shall confine and perform the work at the construction site to areas permitted by: Law; Ordinances; Permits; and Contract Documents. The Contractor is completely responsible and liable for any work or activities outside Owner property or right-of-way limits. Sanitary sewer easements and associated mapping are available upon request to the Contractor from the Owner/Developer.
- C. The Contractor shall not encumber the construction site with his materials or equipment.

- D. The Contractor will, if required by Engineer, move any stored products, which interfere with the operations of the Owner or other Contractors at the construction site.
- E. The Contractor shall not restrict or obstruct adjacent residents from free access to their property and driveways.
- F. The Contractor shall take extra precautions in regard to the overhead electric lines in performing the work and when equipment crosses under said lines.

1.09 Suspension of Work

- A. The Engineer does not have authority to stop or suspend work operations by the Contractor.

1.10 Dust Control

- A. All contractors shall be responsible for taking every precaution to minimize dust. If necessary in areas of excavation where traffic is to be maintained, water, calcium chloride solution or other approved control materials shall be applied as a palliative. At the close of each working day any highway areas which have excessive dirt, debris, dust and/or could cause a traffic safety problem, shall be swept clean by the involved Contractor at his own expense. The Contractors are completely responsible and liable for taking sufficient precautions and measures from preventing excessive dirt, debris and/or dust in highway areas.

1.11 Approval of Material Manufacturers

- A. These specifications name approved materials manufacturers for certain key items of construction. On other items only a technical specification is listed. These designations are made to establish a standard of quality for materials to be furnished on this project and uniformity in bidding format in the interest of fairness to all bidders.
- B. Wherever used in the Contract Documents, the phrase "or approved equal" means that materials, components and equipment may be proposed for use in lieu of those named. They will be considered acceptable if, in the opinion of the Engineer, they will perform the functions imposed by the design, and if they meet the standards of the named items. The Engineer shall have final judgment on the acceptability of proposed substitutions.
- C. The Contractor shall not substitute an alternate manufacturer's product or materials without written approval of the Engineer by addenda duly issued to all bidders on any contract prior to bid opening.

- D. Bidder requests for substitution will only be considered if received in writing by the Engineer a minimum of ten (10) days prior to date of receipt of bids. Engineer's decision on approved substitution(s) will be rendered via addendum at least five (5) days prior to bid opening. It is distinctly understood that the Engineer will use his own judgment in determining whether or not any proposed substitution is equal in quality to that specified; that the decision of the Engineer on all such questions shall be final; and that in the instance of any Engineer's decision which the Bidder or Contractor considers adverse, no claim of any sort will be made by the Contractor or Bidder against the Engineer or Owner.
- E. Submit two (2) copies of request for substitution to the Engineer. Include in request:
1. Complete data substantiating compliance of proposed substitution with Contract Documents.
 2. For Products:
 - a. Product identification including manufacturer's name and address.
 - b. Manufacturer's Literature:
 - 1) Product Description.
 - 2) Performance and Test Data.
 - 3) Reference Standards.
 - c. Samples.
 - d. Name and address of similar projects on which product was used, and date of installation.
 3. For Construction Methods:
 - a. Detailed description of proposed method.
 - b. Drawings illustrating methods.
 4. Itemized comparison of product substitution with product or method specified.
 5. Changes in construction schedule.
 6. Accurate cost data on proposed substitution in comparison with product or method specified.
 7. Relation of substitution to separate contracts.

F. In making request for substitution, Contractor represents:

1. He has investigated proposed product or method and determined that it is equal or superior in all respects to that specified.
2. He will provide the same or greater guarantee for substitution as for product or method specified.
3. He will coordinate installation of accepted substitution into Work, making such changes as required for Work to be completed, with no additional compensation provided.
4. He waives all claims for additional costs related to substitution in which it becomes apparent before, during or after installation.
5. Cost data is complete and includes all related costs under his Contract, but excludes:
 - a. Engineer's redesign.
 - b. Costs under separate contract.
6. Contractor requesting substitution shall bear additional costs to all parties due to his substitution.

G. Substitutions will not be considered if:

1. They are indicated or implied on shop drawings or project submittals without formal request.
2. Acceptance will require substantial revision of contract documents.
3. Substitution will not meet design, operation and/or maintenance standards as determined by the Engineer.
4. Proposed substitutions are not submitted in writing within the specified time period under Part 1.12(D).

1.12 Maintenance of Work Areas and Storage of Materials

- A. The Contractor shall at all times maintain construction areas in a neat and orderly manner. The Contractor is cautioned against use of private property for storage purposes without prior consent of the landowner. At the end of each working day, tools, materials, and equipment shall be returned to the designated area or areas unless otherwise permitted. At the close of each working day, the Contractor shall set sufficient barricades, flashers, and/or flares as required to protect the work and ensure the safety of the traveling public.

1.13 Highway Bonding Requirements

- A. Contractor shall be responsible for contacting the Summit Township Board of Supervisors to determine any requirements for bonding of any Township roads that may be used for construction-related traffic or impacted by construction work. Contractor shall comply with any such Township requirements prior to initiation of work. All costs to meet Township bonding requirements will be included in the Contractor's bid price with no additional compensation provided.

1.14 Damage to Existing Structures

- A. Any and all surface or subsurface, public or private structures and/or improvements, including electrical, piping, roadways, signs, mailboxes, drainage facilities, driveway sluices, guiderail posts or rails, or mechanical equipment, damaged by the construction related activities shall be replaced and/or repaired by and at the Contractor's expense.

1.15 Existing Utilities

- A. Contractor is required to follow Act 187 Pennsylvania One-Call procedures before making any excavations. PA One-Call system phone number is 1-800-242-1776.
- B. It shall be the responsibility of the Contractor to make every effort to ascertain data concerning elevations of the existing utilities in the line and around the proposed work. The project plans reflect approximate location and elevation of existing main line utilities in the project area while services are not shown. This Contractor, assisted by designate utility representatives, shall expose all existing main and service lines in the path of the proposed construction to verify their actual elevation and location. It is imperative that such information be ascertained well in advance of the work in order that appropriate adjustment can be made in the proposed construction where necessary to accomplish clearance. All existing utilities in the line of the proposed work shall be exposed and clearance verified by the Contractor prior to initiating any work.
- C. No separate or additional compensation shall be claimed or received by the Contractor for work under this item. Costs for advance location and verification of existing main and service line utilities in the path of the proposed work required by this contract shall be included in and paid for as part of the unit price for sewer construction, with no additional compensation provided.

1.16 Traffic Control

- A. The Contractor shall be responsible for developing a Traffic Control Plan and having said plan approved by PA DOT prior to start of construction. Costs for preparing and implementing the PA DOT approved Traffic Control Plan shall be included in the total contract price with no additional compensation provided. No time extensions will be granted for delays associated with approval of the Traffic Control Plan.

1.17 Continuity of Operation

- A. Under this contract the Contractor shall be responsible to see that the flow of sewerage in the existing sewer systems is not interrupted during periods of construction. Upon completion of construction, completion of all testing, successful start-up of each pump station, completion of all punch list items rendering an operable system complete, and accepted for operation by the Summit Township Sewer Authority.
- B. All connections into existing STSA manholes must be cored and sealed water tight using an approved type "boot" or slip-on PVC to concrete manhole adaptor water stop.
- C. All new connections into STSA manholes are to be temporarily plugged and braced until all new extensions lines are cleaned, tested and accepted for use by STSA.

1.18 Protection of Work and Property

- A. The Contractor shall erect and maintain at closures and intersections all necessary standard or approved barricades, suitable and sufficient red lights, danger signals, warning and closure signs; provide a sufficient number of watchmen; and take all necessary and legal precautions for the protection of the work and safety of the public. All barricades and obstructions shall be illuminated at night and all lights shall be kept burning from sunset until sunrise. Detour signs and all other signs for protection of work and property shall be provided by the Contractor who is working where such protection is necessary.

The Contractor shall be liable for all damages done to any structure arising through his negligence and carelessness. He shall take care of and maintain all sewers, drains and culverts encountered in the doing of said work, together with the house services therefrom. The Contractor shall take care of all pipes for water, steam or gas and all wire conduits crossing said work whenever it is necessary to interfere with said gas, sewer or other pipes or other structures to maintain service. The Contractor shall repair all damages done to any of the said structures through his acts or neglect and shall keep them in repair during the life of this contract. He shall in all cases leave them in as good condition as they were previous to the

commencement of the work. House connections and services shall be promptly repaired if broken and where pipes are disconnected or removed, temporary service shall be promptly installed. In case such repairs are not made promptly or satisfactorily, the Owner may have the repairs made, by Contractor or otherwise, and deduct the cost of same from any moneys due or to become due the Contractor. Care shall be taken not to move, without the consent of the Engineer, any sewers, drains, culverts, water, gas or other pipes, poles or other structures; and in crossing such pipes or structures, they shall be securely hung, braced and supported in place until the work is completed.

The Contractor is solely responsible for initiating, maintaining and supervising all site security/ protection and safety procedures and programs in connection with his work. Site security in the instance of plant general construction contracts shall include, as a minimum, those methods and facilities as may be set forth in Section 1500 of the contract documents.

In addition, Contractor shall take all necessary precautions for the safety of, and shall provide necessary protection to prevent damage, injury, or loss to:

1. All employees on the work and other persons or parties who may be affected thereby;
2. All the work and materials and equipment to be incorporated therein, whether in storage on or off the site;
3. The traveling public adjacent to work areas; and
4. Other property on the site or adjacent thereto including, but not necessarily limited to, trees, shrubs, vineyards, lawns, agricultural plantings, roadways, structures, utilities, and other surface/subsurface, public/private facilities not designated for removal, relocation or replacement in the course of contract construction.

In developing and carrying out required protection and safety program measures, the Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction at the project work location. Contractor's duties and responsibilities for the safety and protection in support of construction work shall continue until such time as all work is complete and the Engineer has issued a notice of final completion to the Owner and Contractor.

The Contractor shall designate a responsible representative at the site whose duties shall be the implementation of protection/safety program means, measures, and facilities, and the prevention of accidents. This person shall be the Contractor's resident superintendent unless otherwise designated in writing by the Contractor to the Owner. In emergencies affecting the safety or protection of persons, the work, or property at the site or adjacent thereto, the Contractor,

without instruction or authorization by the Owner or Engineer, is obligated to act to prevent threatened damage, injury, or loss of life. Any construction review of the Contractor's performance conducted by the Engineer is not intended to include review of the adequacy of the Contractor's safety/protection measures in, on, or near the construction site.

Contractor costs for all protection/safety related programs, work, and facilities shall be included in and paid for as part of the contract lump sum price and without separate or additional compensation whatsoever.

1.19 Superintendence and Supervision

- A. The Contractor must at all times have an authorized representative on the work to whom orders can be given, this representative to have full authority to carry out all orders given by the Engineer, and shall keep on the work during its progress a competent superintendent and any necessary assistants all satisfactory to the Engineer.

The superintendent shall represent the Contractor in his absence, and all directions given him shall be as binding as if given to the Contractor. Directions shall be confirmed in writing upon written request in each case. The Contractor shall give efficient supervision to the work, using his best skill and attention.

During the construction and maintenance period of the work of this contract, any orders given by the Engineer or his representatives to the manager, superintendent, or foreman of the Contractor in the absence of the Contractor shall have the same force and affect as if given to the Contractor.

The Contractor shall supervise and direct the work competently and diligently, devoting such attention thereto and applying such skills and expertise as is required to perfect and complete the work pursuant to contract terms. The Contractor is solely responsible for means, methods, techniques, sequences, and procedures of construction thereby assuring that finished work complies accurately with plan/specification requirements and contract terms.

If the Contractor in the course of the work finds any discrepancy between the plans and the physical conditions of the locality, or any errors or omissions in plans or in the layout as given by points and instructions, it shall be his duty to immediately inform the Engineer in writing, and the Engineer shall promptly verify the same. Any work done after such discovery, until authorized, will be done at the Contractor's risk.

Neither party shall employ or hire any employee of the other party without the other party's consent.

1.20 Changes, Additional and Extra Work

- A. The Engineer may at his own discretion make such minor changes in the Drawings as are deemed necessary by him to complete more fully the project or any part thereof, provided that they are of a character as not to affect materially the unit cost of the work involved.

If the Contractor claims that any instructions or revised Drawings by the Engineer involve extra cost under this Contract, he shall give the Engineer written notice thereof within seven (7) days after the receipt of such instructions or revised drawings, and in any event before proceeding to execute the work. The procedure shall then be as provided for in 1.16(b). No such claim shall be valid unless so made and approved by the Engineer.

The Owner reserves the right to change the location of any piece of apparatus or equipment up to the time of roughing in without additional expense to the Owner, unless such change requires additional material. If such a change of location requires a lesser amount of material than the original layout called for on the Plans, the Owner shall be entitled to a credit equal to the difference of the cost of installation.

- B. The Specifications and Drawings may be modified and changed from time to time in a manner not materially affecting the substance thereof, if such changes are necessary to carry out and complete the work agreed to be done and performed. If such changes and modifications materially increase the unit cost of the work, the increased expense will be paid by the Owner. If such modifications and changes diminish the unit cost of the work, the amount of said diminution may be retained or withheld by the Owner. No consequent loss or anticipated profit on work not executed will be paid to the Contractor.

The Owner without invalidating the Contract may order extra work or make any changes altering, adding to or deducting from the work, the Contract Sum being adjusted accordingly. All such work shall be executed under the conditions of the original Contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change. No claim for an addition to the Contract Sum shall be valid unless so ordered in writing.

1.21 Extra Work and Payments

- A. The Contractor shall do such additional work, other than that designated by the Drawings or in the estimate of quantities, as may be ordered in writing by the Engineer to complete fully the Project as planned and contemplated. Where the work is of such a character as provided in 1.15(a) above, the Contractor will receive in full payment for such additional work the unit prices shown in the Contract and in the same manner as if such had been included in the original Contract. Any additional work as provided in 1.15 (b) above, for which there is

no lump sum or unit price in the Contract will be done as "extra work" at a price to be agreed upon previously in writing by the Contractor and the Engineer and approved by the Owner. Where a unit price or lump sum cannot be agreed upon by both parties or where this method of payment is impracticable, the Engineer may order the Contractor to do such "extra work" on a "force-account" basis.

B. The Owner may, at any time, by a written order, and without notice to the Surety, require the performance of such changes and alterations in the work as it may find necessary or desirable. The amount of compensation to be paid to the Contractor for any changes and alterations as so ordered shall be determined as follows:

1. By such applicable unit prices, if any, as set forth in the Contract;
or
2. If no such unit prices are set forth, then by a lump sum mutually agreed upon by the Owner and the Contractor; or
3. If no such unit prices are set forth and if the parties cannot agree upon a lump sum, then by the actual net cost in money to the Contractor of the materials and of the wages of applied labor (including premiums for Workmen's Compensation Insurance) required for such changes and alterations, plus such rental for plant and equipment (other than small tools) required and approved for such changes and alterations plus twenty percent (20%) as compensation for all other items of profit and costs or expenses including administration, overheads, superintendence, insurance (other than Workmen's Compensation Insurance), materials used in temporary structures, allowances made by the Contractor to subcontractors, additional premiums upon the Performance Bond of the Contractor and use of small tools. The provisions hereof shall not affect the power of the Contractor to act in case of emergency as herein provided. The Engineer shall have the right to examine the book and records of the Contractor relative to the cost figures in the work referred to above.

No verbal order or suggestion given by any employee of the Owner shall be construed as authorizing or laying the basis for any claim on the part of the Contractor for extra compensation either for extra work or materials or for damages because of the Contractor's compliance therewith. Such verbal orders and suggestions as to the performance of the work may be freely given, but in case they appear to the Contractor to involve extra work for which he should receive extra compensation, he must make written demand for a written order for such extra work. In case of dispute as to what does or does not constitute extra work, a decision will be made by the Engineer.

1.22 Deductions for Uncorrected Work

- A. If the Engineer deems it inexpedient to correct work injured or done not in accordance with the contract, an equitable deduction from the contract price shall be made therefore, provided orders for reconstruction at Contractor's expense are not invoked.

Any materials or workmanship of inferior quality or not in accordance with the approved drawings and these specifications brought to or incorporated in the work shall be immediately removed by the Contractor from the vicinity or built new; and if the directions of the Engineer are not complied with after written notice, the said Engineer shall be at liberty to remove the same at the expense of the Contractor and deduct the cost thereof from any money which may be due.

1.23 Removal of Improper Material

- A. All materials to be provided by the Contractor shall be of the best quality and if the Contractor shall bring or cause to be brought on the work materials which do not conform to the requirements of this contract, the Engineer shall order the same to be removed forthwith; and in case of the neglect or refusal of the Contractor or those employed by him to remove such materials, to cause the same to be removed at the expense of the Contractor and to deduct the cost of such removal and all other expenses incident thereto from the amount which may be due to the Contractor on this contract. And in case of the violation of this provision, the amount of costs and expenses shall be deducted by the Engineer from the final or any other estimate of the amount due to the Contractor on this contract.

1.24 Payment Withheld

- A. The Owner may withhold, or on account of subsequently discovered evidence, nullify the whole or a part of any certificate to such extent as may be necessary to protect itself from loss on account of:
1. Defective work not remedied.
 2. Claims filed against the Contractor or reasonable evidence indicating probable filing of claims.
 3. Failure of the Contractor to make payments properly to subcontractors or for material or labor.
 4. A reasonable doubt that the contract can be completed for the balance then unpaid.
 5. Damage to another contractor.

1.25 Manhole Tops and Obstructions

- A. The Contractor, shall without extra charge, but as a part of the grading and preparations for construction, bring all manhole tops to the proper elevation and place protectors or casting to preserve street center monuments at the proper elevation, providing such castings are furnished him by the Owner; also to bring to the proper elevations all existing catch basins and all water valve manholes or castings.

1.26 Clean-up

- A. All Contractors shall, as directed by the Engineer, remove from the Owner's property and from all public and private property, at his own expense, all temporary structures, rubbish and waste materials resulting from his operations.

1.27 Sanitary Convenience

- A. Sanitary conveniences complying with the regulations of the State Health Department or other bodies having jurisdiction therewith, shall be provided for the use of the workmen. At the completion of the work, any temporary conveniences provided under this article shall be removed.

1.28 Public Convenience and Safety

- A. The Contractor shall conduct the work as to insure the least obstruction to pedestrian and vehicular traffic. The convenience of the general public and of residents adjacent to the project shall be provided for in an adequate and satisfactory manner. Unless otherwise directed, sidewalks and crossings shall be kept open for pedestrians. Streets shall not be unnecessarily obstructed and unless the Engineer authorizes the complete closing of a street, road, or alley, the Contractor shall provide for the maintenance of traffic thereon at his own expense.

1.29 Existing Conditions

- A. The Contractor shall visit the site and familiarize himself with existing conditions before submitting his bid. Contractor shall adjust his bid to take into account any existing conditions that will affect his work.

1.30 Basis of Payment

- A. The cost of all work required under this section shall be included in and paid for as part of the Total Contract Price as set forth in the proposal and without separate or additional compensation whatsoever.

1.31 Payment for Stored Materials

- A. No payments will be made for stored materials or equipment. Payments will only be made for work completed and accepted as determined by the Engineer.

1.32 Guarantee

- A. The Contractor shall guarantee his work and shall remedy, without cost to the Owner, any defects which may develop therein during a period of one (1) year from the date of the Owner's approval of the Completion Certificate issued by the Engineer.

* * * * *

SECTION 1300
STSA STANDARD SPECIFICATIONS
SHOP DRAWINGS AND SAMPLES

PART 1 - GENERAL

1.01 Description

- A. Related Requirements Specified Elsewhere
 - 1. Testing and Quality Control: Section 1400
 - 2. Project Record Documents: Section 1700
- B. Submit, to the STSA/Engineer for approval, shop drawings, product data and samples required by the specification sections.
- C. Make submittals to allow for checking, resubmittal and rechecking, if required, without causing delay of the Construction Schedule.
- D. Schedule submittals to be completed within 45 days after Award of Contract. Indicate items requiring more than 45 days with an explanation for the additional time and on what dates they will be submitted. The dates indicated for each submittal shall take into account the lead time required for ordering and fabricating of the various items.

1.02 Shop Drawings

- A. Original drawings, prepared by Contractor, Subcontractor, supplier or distributor, which illustrate some portion of the work showing fabrication, layout, setting or erection details.
 - 1. Identify details by reference to sheet and detail numbers shown on shop drawings.
 - 2. Sheet size, multiple of 8-1/2 x 11 inches, not to exceed size of contract drawings when unfolded.
 - 3. Photographic reproductions of contract drawings will not be accepted as shop drawings and will be rejected.

1.03 Product Data

- A. Manufacturer's catalog sheets, brochures, diagrams, schedules, performance charts and other standard descriptive data.

1. Modify product data to delete information which is not applicable to project.
2. Supplement standard to provide additional information applicable to project.
3. Clearly mark each copy to identify applicable materials, products or models.
4. Show dimensions and clearances required.
5. Show performance characteristics and capacities.
6. Show wiring or piping diagrams and controls.

1.04 Samples

- A. Physical examples to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged.
 1. Office samples to be of sufficient size and quantity to clearly illustrate:
 - a. Functional characteristics of product or material, with related parts and method of attachment.
 - b. Full range of color samples.
 2. Field samples and mock-ups:
 - a. Erect at project site at location acceptable to Engineer.
 - b. Construct samples or mock-up complete, including work of all trades required in finish work.

1.05 Contractor Responsibilities

- A. Review, approve, stamp and sign shop drawings, product data and samples prior to submission to STSA/Engineer for approval.
- B. Verify:
 1. Field measurements.
 2. Field construction criteria.
 3. Catalog numbers and other data.
- C. Coordinate each submittal with requirements of Work and Contract Documents.
- D. Contractor's responsibility for errors and omissions in submittals is not relieved by STSA/Engineer review of submittals.
- E. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by STSA/Engineer review of submittals unless Engineer gives written acceptance of the specific deviations.

- F. Notify STSA/Engineer in writing, at time of submission, of deviations in submittals from requirements of Contract Documents.
- G. Do not start, fabricate or install work requiring submittals until submittals meeting contract Requirements have been returned to the Contractor.
- H. After STSA/Engineer review, Contractor is to distribute copies of submittals to parties requiring same for coordination work.
- I. Make required copies for distribution of shop drawings and product data that have been stamped and signed by the STSA/Engineer.

1.06 Submission Requirements

- A. Schedule submissions to allow 20 working days for review.
- B. Submit number of copies of product data that will be required for distribution (including maintenance manuals) plus three copies that will be retained by STSA/Engineer.
- C. Submit number of samples specified in each technical section.
- D. Accompany submittal with transmittal letter, containing:
 - 1. Date.
 - 2. Engineer's project title and number.
 - 3. Contractor's name and address.
 - 4. Notification of deviations from Contract Documents.
 - 5. Additional pertinent data.
- E. Submittals shall include:
 - 1. Date and revisions dates.
 - 2. Engineer's project title and number.
 - 3. The name of:
 - a. Owner (STSA)
 - b. Engineer
 - c. Contractor
 - d. Subcontractor
 - e. Supplier
 - f. Manufacturer
 - 4. Identification of product.
 - 5. Relation to adjacent structure or materials.
 - 6. Field dimensions, clearly identified as such.

7. Technical Specification section number.
8. Applicable standards.
9. A blank space, 4 x 4 inches, for the Engineer stamp.
10. Identification of deviations from Contract Documents.
11. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of field measurements and compliance with Contract Documents.

a. Submittals without Contractor's stamp will be returned.

F. Shop Drawing Submittal Cover Sheet

1. Attach submittal cover sheet, with all blanks filled in for each shop drawing, product data and sample.

1.07 Resubmission Requirements

A. Shop Drawings

1. Revise initial drawings as required and resubmit as specified for initial submittal.
2. Indicate on drawings changes which have been made other than those requested by the Engineer.

B. Product Data and Samples: Submit new data and samples as required for initial submittal.

1.08 Contractor's Distribution of Submittals

A. Distribute copies of shop drawings and product data which carry the Engineer stamp to:

1. Contractor's file.
2. Job site file.
3. Record Document file.
4. Other Contractor's, as required for coordination.
5. Subcontractor's as required for coordination.
6. Supplier.
7. Fabricator.

B. Distribute samples as directed by Engineer.

1.09 Engineer

A. Review design concept of Project.

- B. Review of separate items does not constitute review of an assembly in which item functions.
- C. Stamp and initial or sign certifying to review of submittal.
- D. Explanation of Engineer's Stamp:
 - 1. Approved: No correction, no marks.
 - 2. Approved Subject to Comments Noted: Minor amount of corrections; all items can be fabricated at Contractor's risk without further correction checking is complete and all corrections are obvious without ambiguity.
 - 3. Revise and Resubmit: Major amount of corrections; noted items must not be fabricated without further correction; checking is not complete; details of items noted by checker are to be further clarified; items not noted to be corrected can be fabricated at Contractor's risk under this stamp.
 - 4. Not Approved: Drawings are rejected as not in accordance with the Contract, too many corrections, or other justifiable reason. The drawing must be correct and resubmitted. No items are to be fabricated under this stamp.

1.10 Required Submittals

- A. Refer to Project Specifications

* * * * *

SECTION 1400
STSA STANDARD SPECIFICATIONS
TESTING

PART 1 - GENERAL

1.01 Description

- A. The work included under this Section applies to all construction contracts. This section covers the requirements of the Contractor's Testing and Quality Control Program. Costs for all quality control procedures, Contractor testing, and Contractor obtained independent testing laboratory services, as specified in the Contract Documents shall be included in the total contract price with no additional compensation provided.
- B. Where reference is made to a specification, it shall be the latest revision and all addenda at the time called for bids, except as noted on the plans or elsewhere herein.
- C. Whenever reference is made to the PA DOT or PennDOT requirements, standards, or specifications, it shall mean the Pennsylvania Department of Transportation specifications, Publication 408, latest edition.
- D. For those reference standards frequently used during completion of the project work, the Contractor shall obtain copies of such standards and distribute them to key personnel responsible for directing the work.

1.02 Testing Laboratory Services

- A. For the concrete, aggregate and structural fill, testing requirements outlined herein, the Contractor shall obtain the services of an independent testing laboratory regularly engaged and certified as required in the testing of soils and concrete construction materials. The qualifications of the proposed testing laboratory will be submitted to the Engineer and approved prior to start of construction. All associated costs for the independent laboratory testing services shall be paid by the Contractor. The independent testing laboratory shall be utilized for testing work as specified herein. The testing laboratory shall be certified by the State Department of Transportation having jurisdiction in the project area. In instances where one (1) testing laboratory is not qualified to perform all the specified tests, the Contractor shall obtain additional independent testing laboratory services as required to meet these specifications. The selected testing firm(s) shall be experienced in soils aggregate and concrete materials testing and monitoring projects of this nature. The Engineer shall have the right

to disapprove of the selected independent testing firm after start of construction if the procedures used or test results fail to meet accepted industry standards. The Contractor shall then obtain the services of another acceptable testing firm, with no additional compensation provided.

1.03 Contractor's Quality Control Program

- A. The Contractor shall provide and maintain an effective Quality Control Program. The quality of all work shall be the responsibility of the Contractor. Sufficient observations and tests of all items of work, including that of subcontractors, to insure conformance to applicable Specifications and Drawings with respect to the quality of materials, workmanship, construction, finish, functional performance and identification shall be performed on a continuing basis. The Contractor shall furnish qualified personnel, appropriate facilities, instruments, and testing devices necessary for the performance of the Testing and Quality Control Program. The controls shall be adequate to cover all construction operations, shall be keyed to the proposed construction operations and sequence, and shall be coordinated by the Contractor's quality control and testing personnel.
- B. The on-site quality control supervisor for this Contract shall be a qualified construction foreman or superintendent experienced and knowledgeable in projects of this nature. This person shall demonstrate his ability to perform correctly the duties required of him to the satisfaction of the Engineer and shall be physically at the Project site whenever work is in progress and shall be in charge of the Contractor's Quality Control and Testing Program for this Project.
- C. The Contractor shall implement a Quality Control and Testing Plan to insure conformance of all items of work, including that undertaken by his subcontractors, to applicable Drawings and Specifications with respect to materials and workmanship.

1.04 Quality Assurance

- A. The Engineer will monitor the Contractor's work. The Contractor shall provide access to his work so that the STSA/Engineer can monitor the work. The Contractor shall assist the STSA/Engineer, as requested, in sampling and testing proposed material sources, construction and other work.
- B. Service of the Engineer as specified in this section is intended for the Owner's verification of the Contractor's compliance with the requirements of the Contract Documents.
- C. Under no circumstances is it the intent of the Engineer to directly control the physical activities of the Contractor or the Contractor's workmen's accomplishment of work on this project. The Engineer does not have authority to stop work.

- D. The presence of the Engineer at the site is to provide the Owner a source of professional advice, opinions and recommendations based upon the field representative's and/or Engineer's observations of the Contractor's work and does not include any superintending, supervisions or direction of the actual work of the Contractor or the Contractor's workmen.
- E. Any construction review of the Contractor's performance conducted by the Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.
- F. Quality assurance activities by the Engineer shall not relieve the Contractor of his obligations to comply with the Specifications.

1.05 General Requirements

- A. To facilitate independent laboratory testing services and quality control personnel, the Contractor shall:
 - 1. Furnish to the Laboratory or allow Laboratory personnel access to such samples of materials as may be necessary for testing purposes.
 - 2. Furnish such casual labor, equipment and facilities as is necessary to obtain and handle samples at the project.
 - 3. Advise the Testing Agency sufficiently in advance of operations to allow for completion of tests and for the assignment of personnel.
 - 4. Provide and maintain, for the sole use of the Testing Agency, adequate facilities for safe storage and proper curing of concrete test cylinders on the project site for the first 24 hours as required by ASTM C31-69.
 - 5. Maintain records at the project site showing the date and extent of each concrete placement.
 - 6. Provide safe access to items to be tested in accordance with OSHA requirements. This includes sheeting and ladders for deep excavation; scaffolding and ladders for inspection and testing of superstructure items.
- B. All specified testing and inspection services shall be provided by the Contractor at his own expense.
- C. The Contractor shall maintain quality control over suppliers products, services, site conditions and workmanship to produce work of specified quality.
- D. The Contractor shall comply with all listed reference standards and/or specifications.

- E. Neither observations inspections, tests, and/or approval by the Engineer and/or persons other than the contractor, shall relieve the Contractor from his obligations to perform the work in accordance with the requirements of the Contract Documents.

1.06 Workmanship

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand pressures, stresses, vibration and cracking.

1.07 Manufacturer's Instructions

- A. For mechanical and electrical components furnished on this project, submit 3 copies of manufacturer's printed instructions for product data, delivery, storage, assembly, installation, adjusting, finishing, operating, and maintenance, as appropriate.
- B. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

1.08 Manufacturer's Certificates

- A. When required by individual Specification section, submit manufacturer's certificate, in triplicate, that products meet or exceed specified requirements.

1.09 Mockups

- A. When required by individual Specification section, erect complete full-scale mockup of assembly at the Site.

1.10 Manufacturer's Field Services

- A. When specified in respective Specification sections, require manufacturer to provide qualified personnel to observe field conditions; conditions of surfaces and installation; quality of workmanship; and testing, adjustment and balancing of equipment as applicable and to make appropriate recommendations.
- B. The manufacturer's representative shall submit written report to Contractor and Engineer listing observations and recommendations.

PART 2 - PRODUCTS

2.01 General

- A. Materials shall be shipped, delivered and stored in the manufacturer's undamaged crating and packaging.

2.02 Storage

- A. Material shall be protected and stored off the ground on blocking and appropriately and entirely covered. Material shall be completely protected from sunlight, weather and vandalism. Any material stored improperly, for excessive time or showing signs of degradation (i.e., UV bleaching of PVC piping) will be rejected by the STSA and removed by the Contractor from the project site.

2.03 Certificates of Compliance

- A. The Contractor shall submit manufacturers' certificates of compliance in triplicate for all permanent materials and equipment certifying, that the products, as identified for each lot delivered, comply with the requirements of the Specifications in all respects.
- B. Materials used on the basis of a certificate of compliance may be sampled and tested at any time. The fact that material is used on the basis of certificate of compliance will not afford relief from responsibility for incorporating material in the work which conforms to the requirements of the Contract, and any such materials not conforming to such requirements will be subject to rejection, whether in place or not.
- C. The certificate of compliance shall be accomplished by a certified copy of test results or shall state that such test results are on file with the producer or manufacturer and shall be furnished to the Engineer on request. Include on the certificate the information specified for samples, the name and address of the organization performing the tests, the date of the tests and the quantity of material shipped.

PART 3 - EXECUTION

3.01 General Requirements

- A. Prior to use of any material, testing information for the proposed material source shall be submitted and approved by the STSA/Engineer.
- B. Testing prior to and during construction shall be done by the Contractor at the minimum frequency defined in the Contract Documents.

- C. The Contractor's control system shall provide for review and observation of each feature of the work to insure that work is carried out in accordance with the Drawings and Specifications. The Contractor shall not conceal any feature of work containing uncorrected defects. The Contractor's Quality Control Program shall include three phases of monitoring and tests.
1. Phase I monitoring shall be performed prior to beginning each feature of construction work. Phase I monitoring for the applicable feature of work shall include:
 - a. A review of submittal requirements and all other Contract requirements with the foreman of supervisors directly responsible for the performance of the work.
 - b. Checks to assure that provisions have been made to provide required field control testing.
 - c. Examination of the work area to ascertain that all preliminary work has been completed.
 - d. Verification of all field dimensions and advice to the Engineer of any discrepancies.
 - e. Physical examination and testing of materials and equipment to assure that they conform to the specified requirements and that all materials and/or equipment are on hand.
 2. Phase II monitoring shall be performed as soon as work begins on a representative portion of the particular feature of work and shall include examination of the quality of workmanship as well as a review of control testing for compliance with Contract requirements.
 3. Phase III monitoring shall be performed continuously as any particular feature of work progresses, to assure compliance with the Contract requirements including control testing, until completion of that feature of the work.
- D. If any portion of the work shows low test results, evidence of detrimental placing or curing conditions, the STSA/Engineer may require additional testing, compaction, cored samples or rewelding at the Contractor's expense. If source of proposed materials changes, the STSA/Engineer will also require additional testing, with no additional compensation provided.

3.02 Shop Tests

- A. In accordance with the requirements outlined herein, the materials listed below shall be tested at the shop or plant of, the manufacturer. Each manufacturer of such materials shall be fully equipped to carry out the tests herein designated. Upon demand of the Engineer, the manufacturer shall perform such additional number of tests as the Engineer may deem necessary to establish the quality of the material offered for use.

The Engineer shall be furnished with certified records or reports to contain a sworn statement that the tests have been made as specified. All testing shall be completed in conformance with applicable methods prescribed by the ASTM, AWWA or such other organization(s) as may be specifically required, and in general accordance with the best commercial methods available. Additional shop testing of other materials may be required under the applicable specification section.

<u>MATERIAL</u>	<u>TEST METHOD(S)</u>	<u>TESTS</u>
Cast Iron Pipe hydro (Pit-Cast)	ASTM A44	Chemical Analysis, static test (each piece)
Cast Iron Pipe (centrifugally cast)	Fed. Spec. WW-P-421	Same as Pit-Cast
Ductile Iron Pipe	ANSI/AWWA C151/A21.51 and ANSI/AWWA C111/A21.22	As specified in ANSI/AWWA C151/A21.51 and ANSI/AWWA C111/A21.22
Reinforced Concrete Pipe	ASTM C76	As specified in ASTM- C76 C301-84
Prestressed Concrete	AWWA C301-84	As specified in AWWA C301-84
Pressure Pipe		
PVC Pipe	ASTM D1599 and ASTM D2444	As specified in AWWA ASTM D1599 and ASTM D2444
PVC Pressure Water Pipe (AWWA C-900)	AWWA C-900	As specified in ASTM C- 900

- B. In cases where the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, require any of the work to be specifically inspected, testing or approved by someone other than the Engineer, the Contractor shall give the Engineer timely notice of scheduled inspections and readiness.
- C. Neither observations inspections, tests, and/or approval by the STSA/Engineer and/or persons other than the Contractor, shall relieve the Contractor from his obligations to perform the work in accordance with the requirements of the Contract Documents.
- D. The Owner, the Engineer and authorized representative thereof shall at all times have access to the Project Site. In addition, representatives and agents of any. Local, Federal or State regulatory agency shall be permitted to inspect all work, materials, payrolls, personnel records, material invoices and other relevant data and records. The Contractor shall provide proper facilities for such access and observation of the Work and also for any inspection or testing thereof.
- E. When required, samples shall be furnished to the STSA/Engineer by the Contractor in the appropriate sizes; types, and quantities. These samples shall be delivered to the STSA/Engineers properly marked or tagged. Material requiring destruction or otherwise rendered useless in the course of testing shall become the property of the Owner. Those items not damaged or destroyed shall be returned to the Contractor after inspection and/or testing. The Contractor shall examine the Contract Documents and ascertain those items requiring sampling and shall make provision for ordering and procuring such additional items as are necessary over and above the quantities required for the satisfactory completion of the work.
- F. If any completed work or partially-completed work is covered contrary to the order of the STSA/Engineer, if so ordered by the STSA/Engineer it shall be uncovered for his observation. If any work has been covered which the STSA/Engineer has specifically requested to be left uncovered, or if the STSA/Engineer considers it necessary or advisable that covered work be inspected or tested the, Contractor at the Engineer's request shall uncover that work and make same available for observation, inspection or testing as the STSA/Engineer may require. In performing this, the Contractor shall furnish all necessary labor, materials, tools and equipment. If it is found that the work is defective, as determined by the STSA/Engineer, the Contractor shall bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If however, such work is not found to be defective, as determined by the STSA/Engineer, the Contractor will be allowed an increase in the Contract Price or an extension of the Contract time, or both, directly attributable to only such uncovering, exposure, observation, inspection, testing and reconstruction, and an appropriate Change Order shall be issued.

- G. The STSA/Engineer may make any independent tests as he deems necessary. The Contractor shall cooperate with the STSA/Engineer with sampling and testing as requested by the Engineer. The data generated by the STSA's Engineer's testing program will govern over data generated from the Contractor's required quality control program and any other test data. If such tests or observations by the Engineer indicate failure to comply with the plans and specifications, the Contractor shall correct the work at no additional cost to the Owner or Engineer.
- H. The STSA/Engineer may undertake the review of materials at the source. In the event this is undertaken, the following conditions shall be met:
 - 1. The STSA/Engineer shall have the cooperation and assistance of the Contractor, its subcontractors and suppliers.
 - 2. The STSA/Engineer or his representatives shall have full entry at all times to such parts of the facility as may concern the manufacture or production of the materials being furnished.
 - 3. Adequate safety measures are to be provided and maintained.
- I. The STSA/Engineer reserves the right to require retesting of any or all materials, which have been tested and accepted at the source of supply, after the materials have been delivered to the project and prior to incorporation into the work and to reject all materials which, when retested, do not meet the requirements of these specifications.

3.03 Field Tests - General

- A. Pipeline, concrete and aggregate testing is specified herein. Additional tests may be specified under the applicable specification section for other materials or equipment items.
- B. The installation of all sewers, water lines, plumbing, plant piping and equipment, shall be tested in the field in the presence of the Engineer or his authorized assistant, in the manner prescribed in the sections of these Specifications pertaining to such installations. The Contractor shall furnish all necessary labor, equipment and materials for such tests and with the exception of the STSA/Engineer's expenses, shall bear all costs thereof.
- C. At the STSA's Engineer's sole option, testing of pipelines and aggregate material must be completed and accepted by the STSA/Engineer before payment is requested by the Contractor for this work.
- D. Concrete thrust blocks shall be constructed and cured prior to any pipelines testing work.

3.04 Pressure Pipes - Field Test

A. This section pertains to hydrostatic testing of all pressure pipes. After the pipe has been installed all pressure pipe shall be tested to a specified pressure in excess of the specified working pressure of the pipe. All pipe carrying public water supply shall be tested according to Section 4 of AWWA Specification C600-77. All newly laid pressure pipe or any valved sections thereof shall be subjected to a hydrostatic pressure of at least 1.5 times or 50 psi greater than the working pressure at the point of testing.

1. Test pressure restrictions shall:

- a. Not be less than 1.25 x the working pressure at the highest point along the test section.
- b. Not exceed pipe or thrust restraint design pressure.
- c. Be of at least 2-hr. duration.
- d. Not vary by more than ± 5 psi.
- e. Not exceed the rated working pressure of the valves or hydrants when the pressure boundary of the test section includes closed gate valves or hydrants.
- f. Not exceed the rated pressure of the valves.

2. Pressurization:

Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer.

3. Air Removal:

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged, or left in place at the discretion of the Engineer.

4. Examination:

All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Engineer.

B. Leakage Test: A leakage test shall be conducted concurrently with the pressure test.

1. Leakage Defined: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

2. Allowable leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$\text{Maximum allowable leakage} = 10 \\ \text{Gal./inch/diameter/mile/24 hrs.}$$

3. When hydrants are in the test section, the test shall be made against the closed hydrant.

4. Acceptance of Installation: Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than that specified above the Contractor shall, at his own expense, locate and repair the defective material until leakage is within the specified allowance. Retesting at the Contractor's expense shall be performed until test results meet specified values.

5. All visible leaks are to be repaired regardless of the amount of leakage.

3.05 Field Testing Gravity Sanitary Sewers

A. Cleaning And Lamping:

This section pertains to all gravity pipelines not under pressure during normal operation including sanitary sewers, drain lines, etc. This section does not pertain to storm sewer lines and subdrainage pipes.

1. Upon notification by the Contractor of the completion of any work herein contracted for, the STSA/Engineer will carefully inspect all sewers, gravity pipe appurtenances, and all other work done by the Contractor.

2. All gravity pipe to be tested shall be flushed through their entire length. Also, in each stretch of sewer pipe is intended to be straight, a light shall be directly visible from one end to the other. Any defects discovered by cleaning and lamping shall be remedied by the Contractor. Any deposit of rubbish found in the sewer, manhole, or other appurtenances shall be removed and the work left perfectly clean at all points prior to testing.

B. Air Testing

1. Air testing shall be the acceptable method of leakage testing. The following shall apply:
 - a. The duration permitted for a prescribed low pressure air exfiltration pressure drop between two consecutive manholes shall be not less than that shown in the table below. The prescribed drop shall not exceed 0.5 psi from 3.5 to 3.0 psi in excess of the ground water pressure above the top of the sewer.

Minimum Duration for Air Test
Pressure Drop

<u>Pipe Size (inches)</u>	<u>Time (Minutes)</u>
4	2 1/2
6	4
8	5
10	6 1/2
12	7 1/2
15	9 1/2

2. The Contractor shall at his expense, and without separate or additional compensation whatsoever, furnish acceptable testing apparatus and testing water and conduct testing of sewers as prescribed in this section. Cost of testing shall be included in and paid for as part of the total contract price with no additional compensation provided.

- C. Where any section of sewer shall fail to pass the air leakage test, it will not be paid for until the Contractor has located and corrected the deficiency and the section has passed a subsequent leakage test. Where excessive number of sections are failing to pass the air leakage test, pipe laying operations may be suspended until such time as cause for failure, whether materials or installation methods for both, has been established and Contractor has committed to a course for correction of the problem.

D. Where a section has failed to pass the hydrostatic or air leakage test, Contractor shall employ approved type air isolation testing to locate the deficient portion(s) of the failing section. If the air test confirms a leaking joint or joints, Contractor shall excavate, remove and reconstruct the faulty section. Repairs will be made using solid pipe coupling(s). The use of flexible pipe coupling(s) (i.e., Fernco Type) is not acceptable. All pipe sections with repairs must be retested. In any instance where the leak cannot be defined and located and where the section fails to meet the hydrostatic or air test procedure, the Contractor shall completely remove and reconstruct the failing section manhole to manhole using new pipe materials throughout. Costs associated with air testing, repairs and retesting, or removal and reconstruction of failing section will be borne solely by the Contractor and without separate or additional compensation under the contract.

E. Deflection Testing:

1. Deflection testing is required for one flexible (PVC, Ductile Iron, etc.) piping installed for the STSA.
2. Deflection testing shall be performed not less than 30 days following pipe installation and backfilling operations but prior to final restoration.
3. After completing appropriate cleaning, the deflection test must be completed using a nine (9) arm mandrel. Said mandrel shall have diameter equal to 95% of the inside pipe diameter. The test shall be performed in all instances without pulling devices.
4. Any and all locations found to have excessive deflection must be excavated and be repaired by re-bedding or replacement of the pipe. {Note: Pipe replacement to utilize hard pipe coupling(s), not flexible (Fernco Type) Fittings}.
5. A pipe section between manholes failing deflection testing must be re-tested. Unless otherwise indicated by the STSA, the minimum re-testing time after repair/replacement remains 30 days.

3.06 Field Testing Gravity Sanitary Sewers with Active Laterals

A. Television and Video Taping

1. All new sanitary sewers with live sanitary lateral connections shall be televised and video taped no sooner than 30 days after backfilling is complete. The purpose is to look for any visual leaks, breaks, debris and joint separations. During the internal inspection, the Contractor shall pull a packer through the pipe and individually air test each existing pipe joint. All leaks shall be repaired by excavating, removing and replacing the failed section of sewer. Contractor shall re-televiser and air test sewer after

repairs have been performed. Sealing of leak with grout or other product will not be acceptable for sewer less than three (3) years old. The Contractor is responsible for performing this work and the cost for this work will be included in the unit price for sanitary sewer installation with no separate payment for this work. The Contractor is to provide the Summit Township Sewer Authority with one (1) copy of each of the video tapes.

3.07 Field Testing Sanitary Manholes and Pump Station Wet Wells

Manholes and pump station wet wells shall be air tested for leakage in accordance with ASTM C1244-93, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

- A. Installation and operation of vacuum equipment and indicating device must be in accordance with manufacturer's recommendations and performance specifications which have been provided by the manufacturer and accepted by the Engineer. The vacuum equipment must be capable of testing the entire manhole, including the casting and riser rings. Vacuum testing shall be completed prior to installation of internal chimney seals.
- B. With the vacuum tester set in place:
 - 1. Connect the vacuum pump to the outlet port with the valve open.
 - 2. Draw a vacuum of ten (1) inches of mercury (Hg) and close the valve.
- C. Accepted standards of leakage will be established from the lapsed time for a negative pressure change from ten (10) inches to nine (9) inches of mercury. The maximum allowable leakage rate for a four (4) foot diameter manhole must be in accordance with the following:

<u>Manhole Depth</u>	<u>Minimum Elapsed Time for a Pressure Change of 1 inch Hg</u>
10 feet or less	60 seconds
>10 feet but <15 feet	75 seconds
>15 feet but <25 feet	90 seconds

For manholes five (5) feet in diameter, add an additional fifteen (15) seconds and for manholes six (6) feet in diameter, add an additional thirty (30) seconds to the time requirements for four (4) foot diameter manholes. For all manholes deeper than twenty-five (25) feet, the Engineer will determine the applicable minimum elapsed time.

- D. If the manhole fails the test, necessary repairs must be made and the vacuum test and repairs must be repeated until the manhole passes the test.
- E. If manhole joint sealants are pulled out during the vacuum test, the manhole must be disassembled and the joint sealants replaced.
- F. Manholes will be subject to visual inspection with all visual leaks being repaired.

3.08 Concrete Testing

- A. The independent testing laboratory engaged by the Contractor and approved by the STSA/Engineer shall perform the following tests and inspections in compliance with the ASTM or other standards specified.
 - 1. Aggregate
 - a. Tests of proposed aggregates for conformance with ASTM C 33.
 - b. Compressive Strengths Tests: ASTM C39-72 (1979). One set of 3 cylinders for each 50 cubic yards, or fraction thereof, placed in one day. One (1) specimen tested at 7 days, one (1) specimen tested at 28 days and one (1) specimen held as a spare. The spare cylinder shall be held by the testing laboratory and shall not be discarded until authorized by the Engineer.
 - c. Slump Tests: ASTM C143-78. One test for each 8 cubic yards, or fraction thereof, placed in one day. Each concrete truck shall be tested as a minimum.
 - d. Air Content Tests: ASTM C231-78. One test for each 28 cubic yards, or fraction thereof, placed in one day. Each concrete truck shall be tested as a minimum.
 - e. Temperature: Note temperature of each truckload of concrete at point of discharge. Note air temperature during placing period.
- B. The STSA/Engineer may stipulate increased test frequency in special structural situations. Also, in instances where prior tests have failed to develop specified compressive stress levels, or where air temperature during any pour may fall below 40 degrees F. or rise above 85 degrees F., additional test frequency may be required by the Engineer, with no additional compensation provided.

3.09 Aggregate Materials Testing

- A. For Pipe Bedding; Structural Fill, Select Trench Backfill; and Subbase Aggregates, the Independent Testing Laboratory engaged by the Contractor and approved by the Engineer shall perform the following tests prior to construction.
1. A minimum of two (2) separate analyses and test results specified below shall be submitted for each proposed material listed above prior to start of construction. Additional testing outlined below will be required if material quality appears to vary from approved test results as determined by the Engineer or if material source changes during the construction period.
 - a. Gradation analysis and AASHTO or PA DOT gradation certification.
 - b. Optimum Moisture - Maximum density curve for each material used in accordance with ASTM D698, D1557 or D2049, as determined by the Engineer.
 - c. Testing of proposed materials for all parameters outlined under Section 703.2 (a) Table B of PennDOT Manual 408, for verification of specified material class.
 2. In addition to the above testing, the Contractor shall furnish to the STSA/Engineer a suitable size sample of the proposed materials listed above, prior to start of construction.
- B. As alternative to testing items A.1.a and A.1.c above by the Contractor's independent laboratory, Contractor may submit certification(s) to the STSA/Engineer that the proposed aggregate material source is approved by PA DOT as meeting the specified materials properties. Separate certifications shall be submitted for each specified material for each proposed material source. Engineer reserves the right to require additional testing by the Contractor's independent laboratory to confirm suitability of proposed materials.
- C. The results of tests performed under Items A.1.b above will be used as bases for comparison of in-place density requirements as a percentage of maximum dry density determined in accordance with ASTM D698 (Proctor) or ASTM D1557 (Modified Proctor) and/or as a percentage of relative density determined in accordance with ASTM D4253 and D4254.
- The laboratory test method that results in the highest required in-place density will be used as a basis for construction control and elevation of in-place density testing results.

3.10 In-Place Density Testing

- A. The Independent Testing Laboratory engaged by the Contractor shall perform in-place density testing of pipe bedding, structural fill, select trench backfill, native backfill and subbase material as specified herein.
- B. The in-place density testing shall be performed by trained and qualified personnel using ASTM approved methods appropriate to the material being testing and the results required. Acceptable methods include the following:
 - ASTM D1556 – Density of Soil in Place by the Sand Cone Method.
 - ASTM D2167 – Density of Soil in Place by the Rubber Balloon Method.
 - ASTM D2922 – Density of Soil and Soil Aggregate in Place by Nuclear Methods.
- C. The frequency of in-place density testing shall be as follows:
 - 1. General
 - a. In-place density testing shall be performed for each material and type of construction/installation at the frequencies specified below.
 - b. The testing frequencies specified below are a minimum; increased testing frequency may be required if specified in-place densities are not consistently and uniformly achieved.
 - 2. Pipelines
 - a. For the first 1000 feet of pipeline installation by each crew, a minimum of 1 field density test per lift of bedding and backfill shall be performed for each 100 lineal feet of pipeline placed.
 - b. For the remainder of pipeline installation by each crew, a minimum of 1 field density test per lift of bedding and backfill shall be performed for each 600 feet of pipeline installed in non-cartway and non-parking areas. Testing of pipelines in cartway and parking areas shall be accordance with Article 3.10(c)(2)(a).
 - c. The location of density tests of bedding and backfill shall be such that approximately one-half of the tests are on each side of the pipe.

3. Structures

- a. A minimum of 1 test of structural fill shall be performed for each structure.
 - b. Granular structural backfill shall be tested at a frequency of 1 test per lift.
- D. The results of each test shall be made available to the Contractor's and Engineer's representatives at the site at the time of the test. In addition, the Independent Testing Laboratory shall maintain records of the location and results of each in-place density test performed. These records shall be provided to the Engineer on a weekly basis and the complete set of records shall be submitted to the Engineer at the completion of the project.

3.11 Other Testing Requirements

- A. Other specification sections may contain additional testing requirements not noted herein. The Contractor shall be required to comply with all specified testing requirements outlined in the contract documents.

3.12 Basis of Payment

- A. The cost of all work required under this section shall be included in and paid for as part of the Total Contract Price as set for the in the proposal and without separate or additional compensation whatsoever.

* * * *

SECTION 1500
STSA STANDARD SPECIFICATIONS
SITE SECURITY

PART 1 - GENERAL

1.01 Description

- A. During the contract period through date of final acceptance of the completed project by the Owner, it shall be the sole responsibility of the Contractor to completely secure the construction and borrow source site(s) in such a manner as to protect work in progress, completed work, stored materials, and ensure the safety of pedestrian and vehicular traffic. All site security/safety devices installed shall be kept clean and in good repair so as to be readily discernible at all times to persons or parties approaching the site. The Contractor shall assume all responsibility and liability in adequately protecting and securing the job site(s) from the public.

1.02 Protecting Openings

- A. The Contractor shall provide adequate protection around all excavations so as to safeguard the work, protect construction personnel, and warn the public of impending danger. All such openings and/or surface obstructions shall be protected with barricades, signs and warning devices. All temporary safety devices shall be adjusted during the progress of the work so as to meet changing conditions.

1.03 Barricades, Signs and Warning Devices

- A. As a minimum effort in providing site security, the Contractor shall restrict access to the construction sites to only those personnel directly associated with project construction activities. This shall be accomplished through the installation of temporary fencing across and along public access routes to the sites. Such fencing shall be rigidly constructed and maintained throughout the contract period. If required, the Contractor shall securely mount "No Trespassing" and "Keep Out" signs along the temporary fence perimeter and at other locations as needed to secure the construction sites from the public.

Further, it shall be the Contractor's responsibility to secure all entries and exists to all construction sites by placing and removing rigid, flashing barricades during non-working hours.

1.04 Basis of Payment

- A. The cost of all work required under this section shall be included in and paid for as part of the total Contract price as set forth in the proposal and without separate or additional compensation whatsoever.

* * * * *

SECTION 1700
STSA STANDARD SPECIFICATIONS
PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 Description

A. Related Requirements Specified Elsewhere

1. Location, Scope and Special Requirements: Section 1020
2. Project Record Documents: Section 1720
3. Closeout Submittals Required of Trades: The respective sections of specifications

1.02 Substantial Completion

A. Contractor

1. Submit written notice to the Engineer that Project, or designated portion of Project, is substantially complete.
2. Submit list of major items to be completed or corrected.

B. Engineer will make an inspection within ten days after receipt of notice, together with Owner's Representative.

C. Should Engineer consider that Work is substantially complete:

1. Contractor shall prepare, and submit to Engineer, a list of items to be completed or corrected, as determined by the inspection.
2. Engineer shall prepare and issue a Certificate of Substantial Completion containing:
 - a. Date of Substantial Completion.
 - b. Contractor's list of items to be completed or corrected, verified and amended by Engineer.
 - c. The time within which contractor shall complete or correct work of listed items.
 - d. Time and date Owner will assume possession of Work or designated portion thereof.
 - e. Responsibilities of Owner and Contractor for:
 - 1) Insurance.
 - 2) Utilities.

- 3) Operation of mechanical, electrical and other systems.
- 4) Maintenance and cleaning.
- 5) Security.

f. Signatures of:

- 1) Engineer.
- 2) Contractor.
- 3) Owner.

3. Owner occupancy of Project of Designated Portion of Project:

- a. Owner will occupy project, under provisions stated in Certificate of Substantial Completion.

4. Contractor shall complete work listed for completion or correction within designated time.

D. Should Engineer consider that Work is not substantially complete:

1. Engineer shall immediately notify Contractor, in writing, stating reasons.
2. Contractor shall complete Work and send second written notice to Engineer, certifying that Project, or designated portion of project, is substantially complete.
3. Engineer will reinspect Work.

1.03 Final Inspection

A. Contractor shall submit written certification that:

1. Contract Documents have been reviewed.
2. Project has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in presence of Owner's representative and are operational.
5. Project is completed and ready for final inspection.
6. Affected roadways have been restored to the satisfaction of PennDOT and Summit Township.

B. Engineer will make final inspection within ten days after receipt of certification.

C. Should Engineer consider that Work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.

D. Should Engineer consider that Work is not finally complete:

1. Engineer shall notify Contractor and Owner's Representative, in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies and send second written notice to Owner's Agent certifying that Work is complete.
3. Engineer will reinspect Work after Owner's approval.

1.04 Reinspection Costs

- A. Should Engineer be required to perform second inspection because of failure of Work to comply with original certifications of Contractor, Owner will compensate Engineer for additional services and deduct amount paid from final payment to Contractor.

1.05 Closeout Submittals

- A. Project Record Documents: Section 1720.
- B. Submit 3 copies of manuals containing operation and maintenance data for all equipment installed on this project.
- C. Spare Parts and Maintenance Materials: Conform to requirements of individual technical sections.
- D. Deliver evidence of compliance with requirements of governing authorities.
1. Certificates of Inspection
 2. Certificate of Occupancy
- E. Deliver Certificate of Insurance for Products and Completed Operations.

1.06 Evidence of Payments and Release of Liens

- A. Contractor's Affidavit of Payment of Debts and Claims: AIA G706.
- B. Contractor's Affidavit of Release of Liens: AIA G706A, with:
1. Consent of Surety to Final Payment: AIA G707.
 2. Contractor's release of waiver of liens.
 3. Separate releases of waivers of liens for subcontractors, suppliers and others with lien rights against property of Owner, together with list of those parties.
- C. Submittals shall be duly executed before delivery to Engineer.

1.07 Final Adjustment of Accounts

- A. Submit final statement of accounting to Engineer.
- B. Statement shall reflect all adjustments.
 - 1. Original Contract Sum.
 - 2. Additions and deductions resulting from:
 - a. Previous Change Orders.
 - b. Cash Allowances.
 - c. Other Adjustments.
 - d. Deductions for Uncorrected Work.
 - e. Deductions for Liquidated Damages.
 - f. Deductions for Reinspection Payments.
 - 3. Total Contract Sum, as adjusted.
 - 4. Previous Payments.
 - 5. Sum remaining due.
- C. Engineer will prepare final Change Order, reflecting approved adjustments to Contract Sum not previously made by Change Orders.

1.08 Final Application for Payment

- A. Contractor shall submit final application in accordance with requirements of General and Supplementary Conditions.

1.09 Final Certification for Payment

- A. Engineer will issue final certificate in accordance with provisions of General Conditions.

* * * * *

SECTION 1710
STSA STANDARD SPECIFICATIONS
CLEANING

PART 1 - GENERAL

1.01 Description

- A. Related Requirements Specified Elsewhere
 - 1. Location, Scope and Special Requirements: Section 1020
 - 2. Cleaning for Specific Products or Work
- B. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by operations.
- C. At completion of work, remove waste materials, rubbish tools, equipment, machinery and surplus materials, and clean all sight exposed surfaces; leave project clean for occupancy.

1.02 Safety Requirements

- A. Standards: Maintain project in accord with safety and insurance standards.
- B. Hazards Control
 - 1. Store volatile wastes in covered metal containers and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- C. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
 - 1. Do not burn or bury rubbish and waste materials on project site.
 - 2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
 - 3. Do not dispose of wastes into streams or waterways.

PART 2 - GENERAL

2.01 Materials

- A. Use only cleaning materials recommended by manufacturer or surface to be cleaned.
- B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 During Construction

- A. Execute cleaning to ensure that building, grounds and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to lay dust and prevent blowing dust. Erect dustproof barriers to keep dust from drifting through the building or work areas.
- C. At reasonable intervals during progress of work, clean site and public properties and dispose of waste materials, debris and rubbish.
- D. Provide containers for collection of waste materials, debris and rubbish.
- E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off Owner.

3.02 Final Cleaning

- A. Employ experienced workmen, or professional cleaners, for final cleaning.
- B. Broom clean paved surfaces; rake clean other surfaces of grounds.
- C. Remove all excess excavation, material, rocks and cleared excavation.
- D. Clean all mechanical equipment that was operated during construction.
- E. Maintain cleaning until project, or portion thereof, is occupied by Owner.

* * * * *

SECTION 1720
STSA STANDARD SPECIFICATIONS
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 Description

A. Related Requirements Specified Elsewhere

1. Shop Drawings, Product Data and Samples: Section 1300

1.02 Maintenance of Documents

A. Maintain, at job site, one copy of:

1. Contract Drawings
2. Specifications
3. Addenda
4. Approved Shop Drawings
5. Supplemental Instructions
6. Change Orders
7. Other Modifications to Contract
8. Field Test Records
9. Correspondence file

B. Store documents in approved locations, apart from documents used for construction.

C. Provide files and racks for storage of documents.

D. Maintain documents in clean, dry legible condition.

E. Do not use record documents for construction purposes.

F. Make documents available at all times for inspection by Engineer and Owner.

1.03 Recording

A. Label each document "PROJECT RECORD" in 2 inch printed letters.

B. Keep record documents current.

C. Do not permanently conceal any work until required information has been recorded.

- D. Contract Drawings: Legibly mark to record actual construction:
1. Elevations of various elements of foundation.
 2. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 3. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 4. Field changes of dimension and detail.
 5. Changes made by Supplemental Instructions or Change Order.
 6. Details not on original Contract Drawings.
- E. Specifications and Addenda: Legibly mark-up each section to record.
1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
 2. Changes made by Supplemental Instructions or Change Order.
 3. Other matters not originally specified.
- F. Shop Drawings: Maintain as record documents. Legibly mark-up approved shop drawings to show changes made after review.

1.04 Submittal

- A. At completion of project, deliver record documents to the Engineer.
- B. Accompany submittal with transmittal letter, in duplicate containing:
1. Date
 2. Project title and number
 3. Contractor's name and address
 4. Title and number of each record document
 5. Certification that each document as submitted is complete and accurate
 6. Signature of Contractor, or his authorized representative.

* * * * *

SECTION 2013
STSA STANDARD SPECIFICATIONS
SITE CONDITIONS

PART 1 - GENERAL

1.01 Description

- A. All Bidders shall visit the sites of the proposed work and review the character of soil and surface conditions.

1.02 Subsurface Information

- A. All Bidders may make additional explorations/ investigations as necessary to prepare their bids and perform the construction. Subsurface explorations shall be reasonable in nature, shall not jeopardize existing structures, and restoration to prior conditions shall be completed immediately after completion of the exploration work to the satisfaction of the Owner. If bidders desire to perform additional subsurface explorations, they shall contact and coordinate access to the site with the Owner.

1.03 Excavation

- A. All excavation work on this project for all contracts is unclassified with no additional compensation provided regardless of materials encountered. No additional compensation shall be provided for excavation of rock, shale, boulders, clay or any other materials. All costs for excavation work shall be included in the applicable contract unit prices, without additional compensation.

PART 2 - PRODUCTS

NONE SPECIFIED

PART 3 - EXECUTION

3.01 Differing Site Conditions

- A. The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in the contract documents or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract.

- B. The Engineer and Owner shall investigate the conditions, and if it is found by the Engineer and Owner that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of or the time required for, performance of any of the work under this contract, an equitable adjustment shall be made and the contract modified in writing accordingly.
- C. No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required above.
- D. No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this Contract.

* * * * *

SECTION 2020
STSA STANDARD SPECIFICATIONS
EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 Description

- A. The successful bidder on this project is totally responsible for effecting and carrying out these erosion and sedimentation control plan measures specified herein and any requirements as may be imposed on this work by regulatory agencies of jurisdiction including, but not necessarily limited to, the Pennsylvania Department of Environmental Resources, the Pennsylvania Fish Commission, the Erie County Soil Conservation District, the U.S. Army Corps of Engineers and/or the U.S.D.A. Soil Conservation Service. Payment for all work under this specification shall be included under the total contract price with no separate or additional compensation provided.
- B. This work shall consist of construction, installation and maintenance of sediment control structures to limit erosion and collect sediments during construction. The work includes but is not limited interim stabilization, to construction of sediment basins, ditches, installation of silt fence and/or hay bales and tracking and rolling ground surfaces.
- C. The work shall be done at the construction sites and nearby affected areas, at stockpile areas, along haulage and access routes and at any other areas affected by the construction operation.
- D. The Contractor is responsible for limiting the disturbed areas to the extent practical and restoring all disturbed areas to a suitable condition upon completion of the construction.
- E. If for any reason work is stopped for a period of time, such as over the winter months, then upgrading the temporary erosion and sedimentation control facilities may be required, with no additional compensation provided.
- F. The Contractor will also be responsible for maintaining erosion and sedimentation facilities during the entire construction period and until final stabilization is achieved.
- G. Upon completion of the work and final stabilization, the erosion and sediment control facilities shall be removed by the Contractor unless otherwise directed by the Engineer.

- H. This Erosion and Sedimentation Control Plan is intended to serve as a minimum requirement and general guide- line. As such, the Contractor shall be responsible for implementing additional measures for erosion and sedimentation control as may be required during the course of the construction work, with no additional compensation provided.
- I. The Contractor is completely responsible for final site grading and restoration of all borrow site(s).

1.02 Related Work Specified Elsewhere

- A. Site Preparation: Section 2013
- B. Excavation, Backfill and Compaction: Section 2220
- C. Surface Restoration: Section 2900
- D. Appendix: Erosion and Sedimentation Control Plan

1.03 Proposed Project

- A. The proposed project involves the construction of a sewer line along (site description) in Summit Township, Erie County, PA. The project consists of: (sanitary sewers, pump stations and force main).
- B. All Contractors and Subcontractors undertaking earthwork operations shall conform to the requirements of this plan. The prime contractor shall be responsible for subcontractor(s) performance of erosion and sedimentation control practices.

1.04 General Characteristics of the Project Work Area

- A. The topography of the construction area is as shown on the engineering drawings. Soils in the vicinity are described in the plan.
- B. Surfaces encountered during construction will consist predominately of stabilized shoulder, grass or vegetated areas. Most of the project work area is along Township and State roadways.

PART 2 - MATERIALS

2.01 Sedimentation Fencing

- A. The sedimentation fencing shall meet the requirements of Class 3, Type A fencing as outlined in Section 735 of PennDOT Manual 408. Sedimentation fencing shall be supported by stakes on 8 foot centers.

2.02 Geotextile

- A. Geotextile for erosion and sedimentation control purposes shall meet the requirements of Class 2, Type A geotextile material as outlined in Section 735 of PennDOT Manual 408. Geotextile material shall be suitably anchored.

2.03 Hay Bales

- A. Hay bales shall be fresh and tightly bound and a minimum of 18 inches high. Hay bales shall be adequately held in place using wooden stakes.

2.04 Grass Seed

- A. Refer to Specification Section 2900

PART 3 - EXECUTION

3.01 Staging of Earthmoving Activities

- A. All earthmoving activities on this project shall be planned, scheduled and carried out so as to minimize potential for erosion associated problems. Topsoil from excavation work shall be stockpiled for use in final restoration. Topsoil for borrow source stockpiles shall be temporarily seeded if required to prevent soil erosion. Existing surfaces to be disturbed shall be kept to an absolute minimum. Unnecessary disturbance of natural vegetation except in immediate excavation areas is not permitted. The removal of existing trees, shrubs, and brush will be kept to an absolute minimum thereby maintaining the aesthetic and erosion control values of established vegetation.

3.02 Ditching

- A. The Contractor shall construct ditches as necessary to limit runoff from entering work areas, stockpiles and borrow areas and other areas as necessary to control runoff and allow for proper treatment prior to leaving the site.
- B. The ditches shall be protected with adequate erosion control. Culverts shall be installed as necessary and shall be adequately sized and cleaned when silted.

3.03 Grading

- A. Disturbed areas shall be sloped to drain to a runoff control structure.
- B. Disturbed areas shall be rolled with a smooth faced roller to limit erosion. This also applies to stockpile areas.

3.04 Installation of Sedimentation Fence and Hay Bales

- A. Silt fence or hay bales shall be installed across all drainage ditches and at the site boundaries to limit sediment transport. The maximum spacing shall be 200 ft.
- B. The fence or hay bales shall be adequate height to prevent overtopping and shall be adequately secured to the ground to prevent water flow beneath the fence or between bales.
- C. Where required sedimentation fencing shall be installed upstream of catch basins and storm sewer inlets to prevent erosion and sedimentation. The fencing shall be installed in accordance with Section 865 of the referenced PennDOT Manual 408.
- D. Additional fencing shall be installed by the Contractor at stream or swale crossings to minimize erosion/ sedimentation potential with no additional compensation provided. Accumulated material shall be periodically removed to prevent wash out or break through. Material removed may be properly disposed of on-site for use in site grading work with prior approval of the Engineer.

3.05 Temporary Control Measures

- A. Limiting Exposed Areas - All earthmoving activities shall be planned in such a manner as to minimize the extent of disturbed areas.
- B. Surface Water Diversion - All surface water shall be diverted away from excavations, unstabilized slopes and embankment areas. Surface water shall not be discharged into unstabilized slopes or other areas. Stabilized earthen water berms or diversion ditches shall be constructed at the top of bank areas as required to divert runoff away from bank or slope areas.
- C. Velocity Control - All permanent grass lined channels for the conveyance of water around, through, or from the project area shall be designed or contain channels to limit the velocity of flow in the facilities to less than 1.5 feet per second. Higher velocities may be permitted if no erosion occurs. Where steep slopes do not allow a velocity of 1.5 feet per second or less or erosion occurs, the Contractor shall utilize rock lined diversion ditches to minimize undercutting and erosion. Size of rock lining shall conform with standard design procedures for rip rap channel lining based on anticipated velocities.
- D. Interim Stabilization - All slopes, channel, ditches, or any other disturbed area shall be temporarily stabilized as soon as possible after the final grade or final earth moving has been completed. Where it is not possible to permanently stabilize a disturbed area and/or borrow source stockpiles immediately after the final earthmoving has been completed or where the activity ceases for more than twenty (20) days, interim stabilization measures shall be undertaken by the Contractor and shall be subject to prior approval of the Engineer. Interim

stabilization measures will be tailored to the situation and may include mulching with plain or treated hay, covering with construction plastic membrane or geotextile fabric, temporary seeding, rock lining or a combination of these. Any and all temporary mulching shall be securely anchored by approved methods.

- E. All pumping from excavation and trenches shall be ponded sufficiently to remove sedimentation and silt before being allowed to reach a water course.

3.06 Permanent Control Measures

- A. Surface Restoration - Final restoration of disturbed areas on this project is a Contractor responsibility and includes grading to specified contour; installation of a minimum of 2 inches of topsoil including borrowed topsoil if necessary; raking free of stones; seeding; mulching; and adding soil supplements in accordance with the requirements of Section 802, 803, 804 and 805 of PennDOT Publication No. 408. Section 2900 of the specifications outline the required seed formulas for the project work areas.

3.07 Waste Excavation

- A. Any surplus waste material not suitable for site grading/restoration purposes shall be hauled off site by the Contractor and properly disposed of with no additional compensation provided. The Contractor shall be completely responsible for off site disposal of surplus waste materials. Refer to Sections 2220 for additional requirements.

* * * * *

SECTION 2103
STSA STANDARD SPECIFICATIONS
SITE PREPARATION

PART 1 - GENERAL

1.01 Description

- A. Work under this section shall include clearing, grubbing, removal of all obstructions/debris, stripping and stockpiling of topsoil, including but not limited to the area to receive structures, pipelines and areas impacted by construction activities. The work shall also include preservation from injury or defacement of all vegetation and objects to remain.
- B. No clearing, grubbing or stripping is intended or authorized except on lands and/or permanent easements acquired for project purposes by the Owner. Any clearing, grubbing or stripping damage resulting from Contractor operations beyond the limits of the Owner's lands and/or easements is a Contractor responsibility. Logs and other wood and debris resulting from the clearing, grubbing, and stripping operations of the Contractor shall become the property of the Contractor.
- C. All areas within proposed pipelines and earthwork limits shall be cleared, grubbed and stripped. All areas within the proposed chain link fenced perimeter of the pump station sites shall be cleared and grubbed. These minimum areas are provided as a construction guide. Additional clearing, grubbing, or stripping required for construction of the project in accordance with these specifications and/or construction plans shall be completed by the Contractor, with no additional compensation provided.
- D. All costs for clearing, grubbing, stripping and waste disposal in accordance with these requirements shall be included in the total contract price, with no additional compensation provided.

1.02 Related Work Specified Elsewhere

- A. Erosion and Sedimentation Control: Section 2020
- B. Excavation, Backfill, and Compaction: Section 2220
- C. Surface Restoration: Section 2900

1.03 Submittals

- A. If burning and/or landfill type disposal is proposed for surplus waste materials, the Contractor shall provide evidence that appropriate permits and/or approvals have or will be obtained prior to start of such activities.

PART 2 - PRODUCTS

NONE SPECIFIED

PART 3 - EXECUTION

3.01 Clearing

- A. Clearing shall consist of removal and deposition of standing trees and snags, brush, downed timber, logs, other growth, rubbish of any nature, natural obstructions or such material which in the opinion of the Engineer is unsuitable.
- B. With the exception of those trees or shrubs not authorized for cutting, the Contractor shall cut or otherwise remove all trees, saplings, brush, vines, windfalls, snags, leaves, bark, refuse, and all other foreign matter. Except where clearing will be accomplished by machine uprooting, large trees, stumps, and stubs shall be cut to within 12" of the ground surface. Small trees, saplings, brush and vines shall be cut off flush with the ground. Clearing shall also include Contractor removal of fences, buildings, or structures within the work area.
- C. Progression of clearing activities is to be such that clearing is done immediately prior to excavation to limit erosion.
- D. Clearing shall be completed as required for all buildings, tanks, structures and pipelines.

3.02 Grubbing

- A. Grubbing shall consist of the removal of stumps, roots, buried logs, and other objectionable material below the ground surface.
- B. All small holes or other small depressions remaining after grubbing shall be backfilled with suitable material and compacted to the required density as directed by the Engineer.
- C. Cleared and grubbed areas shall, where necessary, be graded to provide drainage and prevent ponding of water.

- D. Under the grubbing operation the Contractor shall remove all stumps, remove all roots 3" in diameter or larger to a depth of 18" and remove all roots 1/2" in diameter or larger to a depth of 6". Removal depths indicated shall be measured from existing ground or finished grade level, whichever is lower.
- E. Grubbing shall be completed as required for all buildings, tanks, structures and pipelines.

3.03 Disposal

- A. All materials collected and accumulating from the clearing and grubbing operations shall be disposed of by and at the expense of the Contractor. Disposal methods shall be in compliance with all Local, State and/or Federal regulations for solid waste and air quality pertaining thereto. Disposal shall be completed concurrently with conclusion of clearing and grubbing operation in any section and shall not be left until final project clean-up. The Contractor is completely responsible for proper disposal of all materials collected and accumulating from clearing and grubbing operations.
- B. It shall be the Contractor's responsibility to meet all federal, state and local government requirements including but not limited to filing for and obtaining all required licenses/permits.
- C. No discarded material shall be left in windrow or piles adjacent to or within the construction limits. The manner and location of disposal of materials shall be the Contractor's responsibility and shall be such as will not create an unsightly or objectionable view.
- D. Disposal by burning shall only be allowed with prior authorization of agencies and officials having jurisdiction thereover. Where disposal by burning is proposed, Contractor shall make all arrangements, secure written agency approvals, and pay any and all special permit fees. All fires shall be controlled watch, and maintained by the Contractor. The Contractor assumes all costs, risks, and liability for burning disposal methods. Ashes accumulating from burning disposal shall be removed and properly disposed of off-site. The Contractor shall adhere to special requirements or regulations enacted by government agencies of jurisdiction such as burning bans, limited fires, etc.
- E. Prior to depositing any clearing or grubbing debris at any off-site location, excepting State licensed landfills, Contractor shall obtain a written agreement between himself and the landowner of property where disposal is to take place. A copy of such agreement shall be furnished to the Owner and Engineer.
- G. No additional compensation shall be provided to the Contractor for proper disposal of all waste materials.

3.04 Stripping

- A. After clearing and grubbing all topsoil shall be stripped to a minimum strip depth of six (6) inches, unless otherwise directed.
- B. The surface of the finished stripped areas shall be left in a suitable condition without excessive chuck holes or voids.
- C. Topsoil shall be stockpiled in a designated area for use in re-vegetation and surface restoration. Material not suitable for topsoil or backfill shall be removed from the site and properly disposed of, at the Contractor's expense.
- D. Topsoil stockpiles shall be lightly compacted to create a stable pile. Final surfaces shall be rolled with a smooth drum roller to create a compacted smooth surface to limit erosion.
- E. The outer surface of stockpiles shall be temporarily seeded in accordance with Section 2900 if required to limit erosion.

* * * *

SECTION 2220
STSA STANDARD SPECIFICATIONS
EXCAVATION, BACKFILL AND COMPACTION

PART 1 – GENERAL

1.01 Description

- A. This work under this section is included in the contract work. This section pertains to all excavation, backfill and compaction work associated with pipelines, structures, excavation/fill areas and other applicable work for all construction contracts.

1.02 Related Work Specified Elsewhere

- A. Testing and Quality Control: Section 1400
- B. Erosion and Sedimentation Control: Section 2020
- C. Bedding: Section 2224
- D. Sanitary Sewers and Force Main: Section 2730
- E. Surface Restoration: Section 2900

1.03 Quality Assurance

- A. Initial test results, and analysis and samples shall be submitted to the Engineer for proposed filter stone structural fill and special trench backfill materials in accordance with Section 1400. Additional testing will be required in accordance with Section 1400 requirements if material source and/or quality changes, with no additional compensation provided.
- B. Reference Standards and Codes: Comply with current applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. ASTM D422 - Particle-Size Analysis of Soils
 - 2. ASTM D698 - Moisture-Density Relations of Soils using 5.5 lb (2.5 kg) Hammer and 12 inch (304.8 mm) Drop. (Standard Property Test)
 - 3. ASTM D1556 - Density of Soils in Place by the Sand Cone Method.
 - 4. ASTM D1557 - Moisture-Density Relations of Soils using 10.0 lb (4.5 kg) Hammer and 18 inch (457 mm) Drop. (Modified Proctor Test)

5. ASTM D2049 - Relative Density of Cohesion less Soils
6. ASTM D2167 - Density of Soil in Place by the Rubber-Balloon Method
7. ASTM D2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods.

1.04 Submittals

- A. The test results specified in Section 1400 and proposed material sources shall be submitted to the Engineer prior to start of construction.
- B. Provide the Engineer with a listing of proposed excavation and compaction equipment for use on this project.

PART 2 - PRODUCTS

2.01 Special Trench Backfill

- A. All pipeline/manhole excavations which are located in cartway or driveway areas, State or private facilities shall receive special trench backfill above the excavation bottom or bedding materials (Section 2224) for the entire trench width and depth. Special trench backfill shall consist of course aggregate materials of PA DOT No. 2A gradation Type C, meeting the requirements of Section 703.2 of PA DOT Manual 408 meeting the requirements of Section 703.3 of PA DOT Manual 408.
- B. All pipeline/manhole excavations which are located in Municipal cartways shall receive special trench backfill similar to State or private drive areas. Special trench backfill in Municipal cartways shall consist of materials specified by Summit Township (i.e., B19 Limestone Type A course aggregate).

2.02 Subbase Aggregate Foundation Materials

- A. Subbase aggregate foundation materials for use below buildings, foundations and structures as noted on the construction plans, shall consist of crushed aggregate meeting the requirements of Section 703.2 of PA DOT Manual 408 for Type C materials. Aggregate shall meet AASHTO No. 57 gradation requirements.

2.03 Structural Fill

- A. Structural fill materials for use below or adjacent to structures as noted on the plans shall consist of crushed gravel meeting the requirements of Section 703.2 of PA DOT Manual 408 for Type C materials. The crushed gravel shall meet the requirements of PA DOT 2A gradation as outlined in Section 703.2 of PA DOT Manual 408.

2.04 Bedding

- A. Refer to Section 2224 of these specifications.

2.05 Concrete Mud Mat

- A. If shown on the plans a concrete mud mat shall be poured to provide a level working surface. The concrete shall consist of Class C (2000 psi at 28 days) concrete as specified in Section 3310. A 4 inch concrete mud mat shall be installed by the Contractor if required to protect the subgrade prior to placement of the concrete foundation.

PART 3 - EXECUTION

3.01 General

- A. All excavation regardless of materials encountered shall be unclassified, with no additional compensation provided. No additional compensation shall be provided for excavation and removal of rock, shale, hardpan, boulders or any other materials.

3.02 Stripping

- A. Topsoil shall be stripped to a depth of not less than six (6) inches. On all areas where any type depth of grading is to be performed, including the areas within the lines of buildings, pipelines and structures, the topsoil shall be carefully removed and spread either on areas already graded and prepared for topsoil or in stockpiles conveniently located to the areas which are later to receive application of topsoil.

3.03 Embankment/Fill Areas - General Fill

- A. On hillsides in which the existing slope is steeper than five horizontal to one vertical, the Engineer may require the surface to be plowed to provide binding of the embankment with the original ground. When, in the opinion of the Engineer, existing slopes are excessive, the Engineer may require the original ground to be cut into steps or laid in horizontal layers. Excavation and removal of decayed vegetable matter, topsoil, or other unsuitable materials shall be completed to a minimum 6 inch depth or as directed by the Engineer, prior to fill placement.
- B. Materials removed from excavation areas, which are determined as suitable by the Engineer, may be used as general fill in the formation of fill/embankments outside areas where structures or pavements are located. Excavated material which is unsuitable or not required for embankment/fill areas shall be disposed of by the Contractor at his responsibility and expense, outside the limits of the job site.

- C. Earth or friable materials for general fill shall be placed in successive horizontal layers of loose material not more than twelve (12) inches in depth, spread uniformly by use of graders or other approved devices and rolled until thoroughly compacted with an approved three (3) wheel power roller weighing not less than ten (10) tons. The Engineer may permit the contractor to use approved sheep-foot tamping rollers. Fill placement at points not accessible to the motorized rollers or other approved vehicular compaction equipment shall be made in horizontal layers of loose materials not exceeding four (4) inches in depth and thoroughly compacted by hand mechanical tampers.
- D. All general fill shall be compacted with rollers or mechanical tampers to not less than 90% of the maximum dry density as determined by ASTM Test D-1557. The maximum placement depths and compaction methods specified above are intended as minimum requirements only and do not relieve the Contractor from the responsibility of obtaining specified compacted density requirements. General fill shall be placed and compacted at a moisture content within two (2) percent of the optimum moisture content as determined by ASTM D-1557.
- E. No roots, leaves, grass, ice, snow, boulders or any form of vegetation shall be placed in general fill areas.
- F. The Contractor shall be responsible for the stability of all embankment and shall replace all sections which, in the opinion of the Engineer, have been damaged or displaced due to carelessness or neglect on the part of the Contractor or due to natural causes such as storms or excessive precipitation.
- G. During grading operations, cuts and fills shall be kept shaped and drained at all times.

3.04 Excavation and Backfill for Structures

- A. All excavation for buildings and structures shall be performed as required or to the dimensions indicated on the drawings. If suitable bearing is not encountered at the planned footing or foundation elevations, the excavation shall be carried to such elevations as are approved by the Engineer. Prior to construction of foundations, the excavation shall be inspected by the Engineer and no foundation work shall be started prior to the Engineer's approval of the excavation below the depths indicated on the drawings or as directed by the Engineer. Where excavation is made below plan elevation or below elevations directed by the Engineer, through the fault of the Contractor, the excavation shall be restored to the proper elevation by placing Class C concrete or structural fill in the excavation as directed, or the heights of wall/footings shall be increased as may be directed by the Engineer. Correction of over excavation shall be as directed and shall be at

the Contractor's expense. If structural fill (PA DOT No. 2A crushed gravel Type C materials) is used to backfill these excavations, the fill shall extend laterally beyond the limits of the footing or wall a width equal to its depth below the footing bottom.

- B. Grading in the vicinity of structures shall be controlled to prevent water running into excavated areas. Any accumulation of water in excavations shall be removed by pumping or other means at the Contractor's expense.
- C. After completion of footings, walls and removal of forms, and prior to backfilling, the excavation shall be cleaned of all trash and debris. All backfill materials shall be prior approved by the Engineer.
- D. For five (5) feet outside the limits of all structures, basements, or retaining walls, backfill shall be placed in layers of four (4) to six (6) inches in depth and compacted by hand rollers or hand tampers to not less than 95% of the maximum dry density as determined by ASTM Test D-1557. When using hand mechanical vibratory equipment next to walls and footings, the Contractor shall exercise great care and suitably protect the structures from damage. Any damage caused to existing or recently completed structures by backfilling/compaction operations shall be completely corrected at the Contractor's expense. No heavy compaction equipment will be permitted within 5 ft. of structures, basements or retaining walls. Backfill for a distance 5 ft. outside structures may be accomplished using approved type motorized compaction equipment, unless otherwise noted or directed.
- E. Backfill shall be placed and compacted uniformly and Unequal backfill levels of 3 feet or more on both sides of a structure or adjacent structures is not permitted.
- F. Tests may be made by the Engineer for quality assurance to measure the in-lace density and water content. The Contractor shall allow the Engineer sufficient time to perform these tests. The Contractor shall also take tests as necessary for quality control.
- G. Excavations which extend below the planned bearing grade due to the presence of unsuitable materials, shall be backfilled with structural fill and compacted to 95% of the maximum dry density as determined by ASTM D-1557. If structural fill is used, the structural fill shall extend laterally beyond the limits of the footing or wall a width equal to its depth below the footing bottom.

3.05 Borrow Sources for Random Fill

- A. In cases where the amount of embankment exceeds the amount of excavation within the limits of the site as indicated by the drawings, and where material is not available from other Engineer sufficient quantities of suitable material from borrow pits located entirely beyond the limits of the job site at his own expense.

The Contractor shall notify the Engineer sufficiently in advance of borrow excavation requirements and proposed sites to permit the Engineer to view the proposed borrow pit(s). Embankments made from material excavated from a borrow pit or area that has not been prior approved by the Engineer, shall not be permitted. Borrow obtained from within the site shall be removed to uniform lines and grades satisfactory to the Engineer and in such a manner as will not detract from the general appearance of the improvement and shall not create unsatisfactory conditions. All borrow pits shall be stripped of brush, roots, grass and other vegetation prior to removal of material for embankment purposes.

- B. All borrow pit areas shall be restored in accordance with Section 2900 or to the satisfaction of the affected property owner(s). The Engineer may require written release of property owner(s) of borrow pits evidencing their approval of final grading and restoration work by the Contractor prior to release of retainage monies and/or final payment to the Contractor.
- C. No additional payment will be allowed for borrow excavation necessary to complete the grading plan as shown. Cost of all required borrow will be included in and paid for as part of the contract total lump sum bid price, with no additional compensation provided.

3.06 Bedding

- A. Prior to pipe laying operations, prepare subgrade and install bedding in accordance with Section 2224.

3.07 Concrete Mud Mats

- A. Concrete mud mats shall be placed on suitable bearing surfaces as determined by the Engineer. All loose, fractured, or unsuitable rock shall be removed prior to concrete placement. The concrete mud mat shall be installed to a minimum 4 inch depth to provide a level working surface for foundation construction. The Contractor shall comply with Division 3 requirements for concrete placement.

3.08 Subbase Aggregate Foundation

- A. The Contractor shall be required to make all excavations to accommodate minimum depth of subbase aggregate as shown on the drawings or as directed by the Engineer. The subgrade below the aggregate materials shall be compacted to 95% maximum dry density as determined by ASTM Test D-1557 using approved type vibratory equipment. Compaction of subgrades below groundwater levels will require dewatering by the Contractor at his own expense prior to compaction as given above. Subbase aggregate material shall be placed in maximum 8-inch lifts and compacted in place. Subbase aggregate materials shall be compacted to 95% dry density as determined by ASTM test D-1557. Compaction methods shall meet the minimum requirements outlined in Part 3.08 (c) of this section.

3.09 Structural Fill and Granular Subgrade Fill

- A. The Contractor shall be required to make all excavations to accommodate minimum depth of structural and/or granular subgrade fill as shown on the plans. The depth of excavation and placement of these controlled fill materials shall extend to suitable native foundation materials as determined by the Engineer after proofrolling by the Contractor. The structural fill must extend beyond the edge of the footings or foundation wall a minimum horizontal distance equal to the thickness of the structural fill beneath the foundation structure, but not less than 3 feet.
- B. The structural fill shall be compacted to at least 97 percent of the maximum dry density determined by ASTM D-1557 or D-4253 whichever is higher. Granular subgrade fill shall be compacted to obtain a minimum dry density of 95 percent as determined by ASTM Test D-1557. The Contractor shall allow the Engineer sufficient time after placement and compaction to make necessary observations and tests. Structural and granular subgrade fill shall be placed and compacted at a moisture content within \pm two (2) percent of the optimum moisture content per ASTM D-1557.
- C. If controlled fill materials are to be placed on slopes greater than 6 horizontal to 1 vertical, then the foundation materials shall be keyed into the slope in horizontal layers. Unequal or nonuniform depths of compacted materials and segregation of foundation materials shall be prevented.

3.10 Trench Excavations

- A. In general, all trench excavation shall be done by open cut methods. The widths of all trenches to a height of 3' above the top of the pipe shall be a maximum of 16" greater than the nominal diameter of the pipe, half of which is to be on each side of the trench centerline. The maximum trench widths to a height of 3' above the top of the pipe and which will control maximum widths on this project are as follows:

<u>Pipe Diameter</u>	<u>Maximum Trench Width to 3' Above Top of Pipe</u>
6"	22"
8"	24"
10"	26"
12"	28"
16"	32"
18"	34"
20"	38"
24"	40"
30"	46"

- B. The bottom of the trench shall be shaped with the specified bedding material so as to conform as nearly as possible to the outside of the pipe. Particular care shall be taken to recess the bottom of the trench in such manner as to relieve the bell of all load and maintain minimum depth of bedding under pipe bells.
- C. Trenching done with a power shovel to sloped open cuts shall not be made to full depth of the trench. Rather, the lower section or bottom three (3) feet shall be excavated as a vertical sidewall trench to maximum widths as shown in the previous table, if trench stability allows.
- D. The banks of pipe trenches shall be as nearly vertical as practicable. Care shall be taken not to over-excavate. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe. Stones shall be removed as necessary to avoid point bearing. When directed, trench subgrades shall be compacted as specified in Section 2224. Bedding materials shall be installed as specified in Section 2224.
- E. Trenches for underground pressurized pipe lines shall be of a depth to provide a minimum cover over the top of the pipe of 4.0 feet, unless otherwise indicated, from the existing ground surface or the indicated finished grade, whichever is lower, and to avoid interference of the proposed pipe lines with existing utilities. Contractor shall adhere to pipeline installation depths as shown on the construction plans or as provided on cut-sheets furnished by the Engineer.

3.11 Sheeting, Bracing and Shoring

- A. All excavations on this contract which are 5' or more in depth, which exceed any State or Federal regulatory agency's stipulated maximum depth for unshored excavations, or where excavations are in unstable material and shoring is necessary to facilitate proper and safe installation of the work, shall be shored and suitably protected. All shoring and open excavations shall meet or exceed O.S.H.A. and State Labor Department requirements. Shoring shall consist of timber or metal sheeting supported by a sound system of cross jacks acting against a sheeting whaler grid. For trench work, as an alternate to shoring by sheeting, Contractor may employ an OSHA approved type trench box of reinforced steel construction and workmen shall conduct the installation work from within such box. Refer to Section A13 for additional requirements.
- B. Unless otherwise directed, any excavation shoring placed by the Contractor will be removed on completion of construction in the shored area. Shoring systems in trench applications shall not employ vertical members which approach closer than twelve (12) inches from the crown or top of the pipe. Care shall be exercised in removing shoring or advancing trench boxes so that completed pipe facility is not damaged, displaced, or pulled apart at joints.

- C. Sheeting or shoring shall not be removed in areas where settlements could result in damage to nearby structures or utilities. If sheeting is left in place it shall be cut off at the top so that no member is left at an elevation closer than twenty-four (24) inches from the finished surface grade. Shoring ordered by the Engineer to be left in place will be considered as an addition to the contract work price. No separate or additional compensation will be received by Contractor for shoring not ordered left in place.

3.12 Excavation And Trench Dewatering

- A. The Contractor shall be completely responsible for dewatering any wet trench or excavation during the installation/construction period for foundations, pump stations, walls, footers, pipelines, manholes, or related structures. He shall build and maintain temporary structures to divert surface water away from and around excavation or trench and excavation areas. If necessary the Contractor shall install well points, sheeting, cofferdams, subgrade sumps with submersible pumps or other suitable methods for dewatering open excavations with no additional compensation provided. He shall furnish adequate pumps of the suction lift, trash type of sufficient capacity to completely dewater trench or excavation areas. No watermain, sewers, foundations, footers, walls or appurtenant structures shall be laid or built in water. Water in excavations or trenches shall not be allowed to flow over or rise to a level which will wet any poured concrete, concrete or special grout, or masonry construction until the work has set for at least twenty-four (24) hours. Dewatering of trenches and excavations will be done by and at the expense of the Contractor and without separate or additional compensation under the contract. Removal and disposal of water shall conform with the requirements outlined in the Erosion and Sedimentation Control Plan. If necessary, the Contractor shall install subgrade sumps with submersible pumps for dewatering open excavations, with no additional compensation provided.

3.13 Protection of Structures

- A. The Contractor shall at his expense, shore up or otherwise protect any and all buildings, bridges, walls or other public or private structures that may be encountered in the prosecution of the contract work. Contractor shall repair or arrange for repairs for any damage to such facilities as result of his contract operations.
- B. No extra payment will be made for said work or materials except that timber shoring which the Engineer may order left in place as permanent supports for said walls, buildings, bridges, or other public or private structures, shall be paid for at the unit price for same as set forth in the schedule of unit prices for additions or deductions in contract quantities, or at a previously negotiated and agreed to price. Payment for shoring left in place will only be made for protection of

existing structures jeopardized by Contractor operations. No additional payment will be made for shoring or other devices left in place to protect structures completed by the Contractor as part of the contract work.

3.14 Existing Utilities

- A. It shall be the responsibility of this Contractor to make every effort to ascertain data concerning location and elevations of existing utilities in the line of the proposed work. The project plans reflect approximate location of existing utilities in the project area. With respect to existing water, sanitary sewer, and storm sewers and service lines in the work area, the Contractor assisted by a representative of the Owner or Engineer shall, by excavation and exposing of existing lines, verify their actual elevation and location, if in the way of the proposed pipe routing. It is imperative that such information be ascertained well in advance of pipe laying operations in order that appropriate adjustment can be made in the proposed waterline routing where necessary to accomplish clearance. All existing utilities in the line of the proposed work shall be exposed and clearance verified by the Contractor at least 300 feet in advance of project pipe laying operations on any individual run. Utility notification in advance of operations is a Contractor responsibility. The Contractor shall follow Pennsylvania "One Call" procedures in notifying utility representatives.

3.15 Blasting

- A. No blasting is permitted.

3.16 Open Trench

- A. In no case shall more than one hundred (100) feet of trench be opened in advance of the completed work unless by written advance permission of the Engineer. Unless otherwise ordered, the excavation of the trench shall be fully completed at least twenty (20) feet in advance of the pipe laying operation.
- B. Pipe shall be bedded and backfilled such that no more than 30 ft. of pipeline is exposed at any one time.

3.17 Surplus Earth

- A. The Contractor shall not remove from the job site general fill excavated therefrom which may be suitable for required embankment areas or site grading. Surplus general fill which is in excess of plan earthwork quantities may be hauled to such places within the total project limits as the Engineer shall designate and there deposited and restored as directed. If no such place is designated, the Contractor shall dispose of such surplus material at his own risk and expense. No waste material shall be deposited on private property unless landowner release forms have been filed with the Engineer through the resident inspector.

3.18 Regular Trench Backfill

- A. Regular trench backfill shall consist of excavated native materials approved by the Engineer and without roots, organic matter and excessive clay. Backfill of trench excavations shall be placed and completed as soon as possible after pipe laying. Pipe embedment materials shall be placed as specified in Section 2224. The remainder of the trench backfill shall be excavated native materials unless otherwise directed or indicated for use of special trench backfill. The next two foot (2') of fill above the pipe embedment materials may be machine dumped, if steps are taken to assure that the materials are dumped so as to fall against the side of the trench, and hand compacted/tamped into place. The native backfill materials from the bottom of the trench to a point 24 inches above the top or crown of the pipe shall be material which does not contain stones larger than 2 inches in diameter. Backfill from a point 24 inches above the top of crown of the pipe may be machine placed, leveled, and mechanically compacted into place in lifts not exceeding 1-foot depths. The backfill material shall be compacted to a minimum 95% of the maximum dry density as determined by ASTM D-1557.
- B. Great care shall be exercised when compacting backfill material so as to prevent damage or misalignment of the pipeline. Any damage or misalignment shall be repaired at the Contractor's expense.

3.19 Special Trench Backfill

- A. All excavations on this contract which are located in cartway or driveway areas, shall receive special trench backfill above the pipe embedment materials for the entire trench width and depth.
- B. The station limits of the special trench backfill materials shall be designated by the resident inspector in the field. Wherever special trench backfill is required, the Contractor shall waste all excavated native materials, with Contractor being solely responsible for arrangement for wasting and proper disposal of such materials. Contractor shall then apply specified special trench backfill materials in maximum lifts of 12 inches and mechanically tamp into place using approved type pad compactor and methods for full depth of excavation. Special trench backfill shall be compacted to at least 95% of the maximum dry density as determined by ASTM D-1557. Backfilling procedures shall comply with those stipulated for regular trench backfill.

3.20 Surface Restoration

- A. All disturbed surfaces shall be restored in accordance with Section 2900.

3.21 Earthwork Quantities

- A. As indicated previously, no separate or additional payment will be received for off-site wasting or borrow source materials, as the cost of same shall be included in the total contract price. The Contractor is totally responsible for making his own calculations for site earthwork. The cost of site earthwork including excavation, embankment, off-site wasting/disposal, borrow source removal/transportation and other associated work items, shall be included in and paid for as part of the total contract price based on Contractor's estimate of site earthwork scope as required for this project, with no additional compensation provided.

3.22 Erosion and Sedimentation Control

- A. The Contractor shall strictly adhere to the Erosion and Sedimentation Control Plan contained in these contract documents. All run-off and trench dewatering shall be handled so as to minimize site erosion and discharges of sediment to surface waters. All necessary Erosion and Sedimentation Control devices shall be utilized, with no additional compensation provided.
- B. The Contractor shall also be required to comply with applicable provisions of the Surface Mining Conservation and Reclamation Act of May 31, 1945 Public Law 1198, Act No. 418 and all current amendments, with no additional compensation provided for compliance thereto.

3.23 Manhole Structures

- A. Manhole structures of the type and size specified including all grouting with frame and cover complete shall be installed at the locations and to the lines and grades established by the Engineer. Excavation for manholes shall be made to a vertical plane. Size of excavation shall not be greater than 24" larger than the outside dimension of the manhole walls on a square configuration. Excavation for manholes shall in all instances, unless waived by the Engineer, include a 12" undercutting with the undercut area to be filled with approved type and specified aggregate bedding materials (Section 2224), and mechanically tamped into place in 6" lifts. Manhole rim elevations shall be set to match slightly higher than existing ground or to match pavement finished grade unless otherwise directed by construction cut sheets issued by the Engineer. All manhole grouting including joints between manhole riser sections, lift hole plugs, frame and cover grouting to manhole precast section, and grouting of space between pipes and manhole walls shall be approved type special non-shrink or expanding grout as specified. Excavation area outside the manhole shall, upon completion of the manhole structure, be backfilled using native excavated materials in unimproved locations. Backfill around manholes in unimproved locations shall be placed by machine, leveled and mechanically tamped into place in lifts not exceeding 2'. Contractor is reminded to check for requirements for special trench backfill materials and

methods at any manhole located in an improved street, cartway, drive, or parking area. Backfill within these locations shall be placed in lifts not exceeding 6 inches and compacted to not less than 97% of the maximum density as determined by ASTM D-1557.

3.24 Inspection

- A. The whole work including both material and workmanship shall at all times be subject to inspection by the Owner or his authorized agents and inspectors. The Contractor must furnish such laborers as may be necessary or as may be required to aid the inspector in the examination and the culling of all material; and, in case the Contractor neglects or refuses to furnish such laborers, such laborers as in the opinion of the Engineer may be necessary, will be employed by said Engineer and the expense thus incurred will be deducted and paid out of any money then due or which may thereafter become due to said Contractor under the contract to which these specifications refer.
- B. No work shall in any case be covered or carried on which has not been inspected or approved by the Engineer or his authorized representative. Such inspection shall not, however, excuse the Contractor from any obligations to perform said work strictly in accordance with these specifications and to do first-class work. Work not meeting construction plan and specification requirements shall be removed/replaced or repaired by the Contractor as directed with no additional compensation provided.
- C. The Contractor shall be held responsible for the entire work until it is completed and until the same is accepted by the Owner and final settlement is made.

2.25 Moisture Control

- A. The materials in each layer of fill material to be compacted shall contain immediately prior to and during compaction the amount of moisture, within the limits specified necessary to obtain the desired compaction.
- B. The water content shall be as uniform as practical throughout any one layer of fill material immediately prior to and during compaction. Alternate zones of wet and dry material within the fill will not be permitted.
- C. Water shall be added to materials that are too dry in order to obtain the required density and moisture content.
- D. Material that is too wet shall be spread outside the fill area and permitted to dry, assisted by discing or other methods as necessary, until the moisture content is reduced to the specified amount and the specified density can be obtained. Discing, or other approved methods, will be required to work the moisture into the material until a uniform distribution of moisture is obtained.

- E. Areas where the surface becomes too wet or too dry prior to placement of a subsequent lift shall be treated so that the surface has the proper moisture content prior to placement of a subsequent lift.
- F. Water applied on a layer of fill shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to compaction. Should too much water be added to any part, so that the material is too wet to obtain the desired compaction, the compaction and all work on that section of the fill shall be delayed until the moisture content of the materials is reduced to an amount within the specified limits.
- G. The Contractor shall consider the moisture content of fill at the borrow source and adequately plan for moisture control in the cost of fill placement. Even if the moisture content at the borrow source is close to the required placement water content, the Contractor should expect to expend additional effort in adequately controlling the moisture content during and after placement at the construction sites.
- H. All equipment, water haulage, and pumping associated with scarifying, removing unsuitable fill adding water or otherwise necessary to properly control the moisture content of the fill material shall be included in the total contract price. No additional payment will be made to the Contractor for doing this work.

3.26 Final Clean-Up

- A. Immediately after the completion of the work or any consecutive portion thereof, the Contractor shall clean out all catch basins and manholes, remove all unused materials and refuse directly resulting from its prosecution or placed by him in the vicinity of the work, and restore the work area or access roads to a condition as clean as before the work was begun. The Contractor shall remove all temporary structures built by him, shall repair and replace all parts of existing embankments, fences, or other structures which were removed or damaged by the Contractor's operations. No additional compensation will be provided for this work. Refer to Section 1710 for additional requirements.

* * * * *

SECTION 2224
STSA STANDARD SPECIFICATIONS
BEDDING

PART 1 - GENERAL

1.01 Description

- A. This section pertains to the supply, placement, and compaction of pipeline and manhole bedding material.
- B. The entire length of gravity sanitary sewers; force main; and service laterals shall receive bedding materials as specified herein. Bedding materials for all pipelines shall extend from 6 inches below pipe invert to 6 inches above the top of pipe for the complete width of the trench.

1.02 Related Work

- A. Testing and Quality Control: Section 1400
- B. Excavation, Backfill, and Compaction: Section 2220
- C. Sanitary Sewer and Force Mains: Section 2730

1.03 Quality Assurance

- A. Reference Standards and Codes: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 - 1. ASTM D22 - Particle-Size Analysis of Soils
 - 2. ASTM D698 - Moisture-Density Relations of Soils Using 5.5 lb (2.5 kg) Rammer and 12 inch (304.8 mm) Drop.
 - 3. ASTM D1556 - Density of Soils in Place by the Sand Cone Method.
 - 4. ASTM D1557 - Moisture-Density Relations of Soils using 10.0 lb (4.5 kg) Rammer and 18 inch (457 mm) Drop.
 - 5. ASTM D2049 - Relative Density of Cohesion less Soils
 - 6. ASTM D2167 - Density of Soil in Place by the Rubber-Balloon Method.
 - 7. ASTM D2922 - Density of Soil and Soil-Aggregate in Place by Nuclear Methods.

- B. The Contractor will retain a testing laboratory to test and inspect bedding. Refer to Section 1400.

1.04 Submittals

- A. Obtain two separate samples from a potential borrow source for bedding material and submit test analysis outlined under Section 1400 to the Engineer for review and approval. Provide evidence that borrow source is approved by PennDOT for furnishing specified materials unless waived by the Engineer.

PART 2 - PRODUCTS

2.01 General

- A. Bedding material for pipeline runs shall conform with the requirements of Section 703.2 of PennDOT Manual 408 for AASHTO No. 8 gradation, Type C crushed and washed stone course aggregate material.
- B. In areas with excessively wet or unstable subgrade soils and with prior approval of the Engineer the Contractor may substitute coarser bedding material meeting the PennDOT Type C requirements and similar to AASHTO No. 57 gradation crushed and washed stone course aggregate materials.

2.02 Source

- A. The Contractor shall be responsible for providing material that meets the requirements of this section from a PA DOT approved source regardless of the associated costs.
- B. Material obtained by excavation at the job site or non-approved borrow sources shall not be used as bedding material under this project.

PART 3 - EXECUTION

3.01 Stockpiling

- A. If bedding material is stockpiled, place, handle, and remove for use so as to prevent segregation, mixing with organic or other deleterious materials, and any other condition which may impair its use, all to the satisfaction of the Engineer.

3.02 Trench Inspection

- A. Inspect the trench bottom and verify that the area to be filled with bedding material is free of debris, snow, ice, water, loose or soft soil, or loose rock material and that ground surfaces are not frozen.

3.03 Prepare Subgrade

- A. Remove soft areas of subgrade not readily capable of institute compaction, replace with bedding material and compact in accordance with this section.
- B. A secure and stable trench or excavation bottom must be provided for each and every part of the work. In no instance will the Contractor be allowed to install any project pipe, manhole, or structure on unstable materials. Where quicksand or other unstable material is encountered, it shall be undercut to one (1) foot or deeper as directed by the Engineer and stabilized by placing crushed stone coarse aggregate bedding (AASHTO NO. 57) of approved type or bulk Class "C" concrete. Where coarse aggregate or mass concrete bedding is authorized in unstable areas of excavation or trench, it shall be paid for at the contract extra work unit price per lineal foot or at a price per lineal foot negotiated and approved by the Engineer prior to installation.

3.05 Placement

- A. Bedding material shall not be dropped directly on the pipe.
- B. The layer of bedding material below the bottom of the pipe shall be placed before the pipe is laid in the trench. The bedding layer shall be compacted and struck off at the invert grade of the pipe prior to placing the pipe in the trench. Hand excavate joint bell ends as required for pipe placement.
- C. For PVC pipe materials, bedding shall be placed in the trench for a minimum 6 inches below the pipe invert and 6 inches above the top of the pipe, for the complete width of the trench. Subgrade conditions may require bedding thickness to be increased as directed by the Engineer.
- D. All bedding shall be carefully placed and spread in uniform layers so that all voids are filled.
- E. During placement, bedding shall be placed to about the same elevation on both sides of the pipe to prevent unequal loading and displacement of pipe. The difference in elevation of the bedding on both sides of pipe shall not exceed 4 inches at any time.
- F. Bedding above the initial layer may be placed as soon as compaction and pipelaying is completed, provided that the placing of this bedding shall be delayed at locations designated by the Engineer for the procurement of samples of compacted bedding for testing (if required). Also, if the tests indicate insufficient density of the compacted bedding about pipe, the Contractor will be required to remove the the bedding until the proper density is obtained, and replace the bedding above the initial layer bedding, all at the Contractor's expense.

3.06 Quality Control

- A. See Section 1400 - Testing and Quality Control. Additional material testing will be required if material quality or source changes during completion of the work.

3.07 Basis of Payment

- A. The Costs for bedding pipelines shall be included in the total contract price with no additional compensation provided.

* * * * *

SECTION 2730
STSA STANDARD SPECIFICATIONS
SANITARY SEWERS AND FORCE MAINS

PART 1 - GENERAL

1.01 Description

- A. This specification section pertains to the construction of all gravity sanitary sewers, pressure force mains and service laterals.
- B. All work shall be done in accordance with these specifications, the construction plans and appropriate details. The Contractor shall furnish all labor, materials and equipment necessary or incidental to complete the work, with no additional compensation provided.

1.02 Related Work Specified Elsewhere

- A. Testing and Quality Control: Section 1400
- B. Erosion and Sedimentation Control: Section 2020
- C. Site Preparations: Section 2103
- D. Excavation, Backfill and Compaction: Section 2220
- E. Bedding: Section 2224
- F. Surface Restoration: Section 2900

1.03 Submittals

- A. The Contractor shall provide a certificate to the Engineer furnished by the pipe and manhole manufacturers that all pipe, manholes, and appurtenances delivered to the project complies in all respects with the applicable standard specifications listed herein. Certification of piping, manholes and appurtenances materials shall be provided to and approved by the Engineer prior to shipment of piping, manholes and appurtenances to the job site. Failure to provide certification is sufficient grounds to reject pipe, manholes and appurtenances.
- B. For all pipe, manholes and appurtenances submit a schedule complete with manufacturers brochure/parts list, manufacturer specifications and thickness class/rating of materials.

- C. Submittals for special trench backfill and bedding shall be in accordance with Section 1400.
- D. Shop tests shall be performed in accordance with Section 1400.

PART 2 - MATERIALS

2.01 Pipe

- A. Gravity Sanitary Sewers and Service Laterals: Polyvinyl chloride (PVC) pipe shall be utilized. Polyvinyl chloride (PVC) pipe shall satisfy the requirements of ASTM Designation D-3034-77C for SDR 35 thickness class Type PSM Polyvinyl chloride sewer pipe and fittings. PVC pipe shall be joined by "push on" type gasket joints satisfying the requirements of ASTM Designation D3212-76. Solvent welding of PVC pipe joints will not be allowed. PVC pipe materials shall be similar to National Pipe and Plastics, Inc., Certain-Teed Products Corp. or approved equal. Service laterals and branch fittings shall be of the same type and manufacturer as mainline pipe. Service connections include 12" x 6" wye branch, 8" x 6" wye branch, 6" x 6" wye branch, 6" bends, 6" lateral pipe and 6" plug.
- B. Pressure Force Mains: Pressure rated Polyvinyl chloride (PVC) pipe shall be utilized. PVC force mains shall conform to AWWA Standard C-900 with DR-18 wall thickness. PVC pipe joints shall consist of an integral bell with solid cross-section electrometric ring meeting the requirements of ASTM D-1869 and E-477. PVC force main piping shall be similar to National Pipe and Plastics, Inc. J.M. Manufacturing Co., Class 150 (DR-18), or approved equal. Pipe shall not be deflected beyond manufacturer's recommendations.
- C. Ductile Iron: Ductile iron (DI), pipe shall be double cement mortar lined in accordance with ANSI A21.4 (AWWA C-104) and shall meet the requirements of ANSI A21.50-76 (AWWA C-150-76) and ANSI A21.51-86 (AWWA C-151-86). All ductile iron pipe shall be Class 52 ANSI thickness. Ductile iron piping shall utilize push-on joints. All pipe joints shall meet or exceed the requirements of ANSI A21.11 (AWWA C-111). DI pipe shall be similar to that manufactured by CLOW Corp., U.S. Pipe or approved equal. Pipe shall not be deflected beyond pipe manufacturer's recommendations.

2.02 Transition Fittings

- A. Transition fittings where required to connect to existing gravity sanitary sewers shall be determined by the Contractor and prior approved by the Engineer. Transition fittings for similar pipe materials (i.e., PVC to PVC) shall utilize hard walled push-on type pipe couplings. Transition fittings for dissimilar materials (i.e., PVC to VCP) may utilize stainless steel hardware and may be similar to FERNCO or approved equal.

2.03 Pressure Fittings

- A. All pressure fittings used for force main construction shall be of ductile iron construction meeting the requirements of ANSI A21.10 (AWWA C-110) or compact type ductile iron fittings meeting the requirements of AWWA C-153. All buried fittings shall employ mechanical joints. All fittings shall be cement mortar lined in accordance with ANSI A21.4 (AWWA C-104). Buried fittings shall be Class 50 ANSI thickness rating. All fittings shall be rated for 350 psi working pressure.

2.04 Bedding

- A. Bedding material shall be as specified in Section 2224. For all PVC sewer lines, aggregate bedding material shall be furnished and installed 6 inches below the pipe invert to 6" above the top of the pipe for the full trench width.

2.05 Special Trench Backfill

- A. Special Trench Backfill shall be as specified in Section 2220. Special trench backfill shall be furnished and installed in improved cartway or roadway areas as stipulated in Section 2220.

2.06 Concrete

- A. Concrete for cradles, anchors, manhole inverts and encasement shall be Class A (3300 psi at 28 days) as specified PA DOT Manual 408.

2.07 Manholes

- A. Precast Riser/Bases - 4' inside diameter (5' diameter when depth is 15' or greater, or, as noted on plans) meeting or exceeding the requirements of ASTM Designation C-478 with eccentric top cone with 24 inch opening. Cone sections shall have a vertical riser terminal end at the top to facilitate installation of internal chimney seals. Furnish manholes with 6 inch extended monobase on all units. Full barrel risers and slap tops with 24 inch opening shall be allowed only on manholes of less than five (5) feet in rim to invert depth and only with prior approval of the Engineer. Barrel riser joints shall be set up to receive field installation of double tar strip waterproofing (strips supplied by riser manufacturer) and interior parged coat of hydraulic sealing grout, waterplug or equal rubbed to a smooth finish. All manholes shall be set up watertight on the exterior surface with waterproof bituminous paint. Manholes shall have shop cast or cored holes to receive all inlet and outlet piping connections at design grade elevations. Holes for piping connections shall be furnished with approved type integrally mounted and cast, flexible sleeves through which the piping will pass, similar to the Z-Lok connector by A-Lok Products, Inc. or approved equal.

- B. Slab tops in cartway areas shall be held 18 in. below finished grade with precast grade rings or double brick riser to bottom of frame/cover casting.
- C. Steps - Plastic coated steel type with one (1) manufacturer furnished throughout. Steps shall be integrally cast and spaced vertically at not more than 12" center to center.
- D. Castings - "NO 1975 East Jordan Iron Works, Inc., or approved equal. Frame shall weigh at least 225 pounds with cover (lid) to weight not less than 170 pounds. Cover shall feature an inside perimeter projection extending at least 3" beyond frame bearing flange. Cover shall be furnished in checkered pattern with one through pick hole and two one inch vent holes. Cover shall be furnished to provide 24 inch clear opening. Cover to be furnished with raised lettering to read "Sanitary Sewer".

Proposed substitutions for named casting manufacturers will be considered in strict accordance with Section 1020 of the Contract Documents. However, in addition to items specified, proposed substitutions will be evaluated on local availability system operating experience and methods and materials used for future grade adjustment.

The preference of the OWNER to select from named manufacturers for casting materials in lieu of proposed equal substitutions shall be final and without appeal.

- E. Grout - Expanding, waterproofing type, "WATERPLUG", Embeco, "or approved equal". Grout shall be field mixed to paste consistency and applied by Contractor to finish grout outside of riser joints, lift holeplugs, inside/outside of frame to riser joint, and annular space(s) between riser and pipes as they pass through manhole walls as required to achieve watertight seal.
- F. Where watertight covers are required by the construction plans, they shall be watertight manhole frame, cover, inner cover, and locking bar by EAST JORDAN IRON WORKS, INC., or approved equal. All watertight frames shall be secured to precast manhole section via approved type 3/4" anchor bolts with expansion shields installed through at least three (3) - 1" holes to be provided in watertight frame base flanges.
- G. Drop manholes are required and must be shown on the construction plans for all manholes with influent and effluent invert elevation differences greater than or equal to 24". They shall be as shown on the Standard Details in back of these specifications or the construction plans. Inside drops shall be provided for 6" and 8" pipe. Manholes for inside drops shall be at least 5'-0" inside diameter. Inside drop fitting must be identical or equal to Reliner by Duran, Inc., Lyme CT.

- H. Internal Manhole Chimney Seal – The Contractor will furnish and install prefabricated seals within the entire chimney area of all manholes included in the project. These internal casting seals shall consist of a flexible internal rubber sleeve and extension on stainless steel compression bands. Seals shall be similar and equal to Cretex Specialty Products and shall be installed in accordance with manufacturer instructions. All costs for furnishing surface preparation and installing the seal and extensions shall be included in the unit price provided in the bid proposal. Payment shall be based upon the actual number of seals and extensions installed.
- I. External Manhole Joint Seal – All 48” and 60” inside diameter manholes (and 72” ID pumping station sumps) joint shall be provided with an exterior wrap seal. The wrap seal be a minimum 9” width and shall have an outer layer of polyethylene with an under layer of rubberized mastic reinforced with woven polypropylene fabric. External joint wraps shall be installed in combination and in addition to the double mastic joint seals and interior grout parging. Seals shall be similar and equal to Cretex Specialty Product and shall be installed in accordance with manufacturers instructions. All costs for furnishing surface preparation and installing the external joint wrap shall be included in the unit price provided in the bid proposal. Payment shall be based upon the actual number of seals installed.
- J. Manhole Inflow Protectors – Upon completion of all sewer, cleaning, testing and acceptance of gravity sewers by the Owner, the Contractor shall furnish and install inflow protector inserts. Inserts shall be manufactured specifically for use in collection system manholes and shall be manufactured from ABS material meeting ASTM D-4673 testing. An Owner approved insert is man-pan or approved equal (www.pollardwasher.com/emarket/pages/theonpondesignpage.asd). All costs for furnishing and installing inflow protector inserts shall be included in the unit price provided in the bid proposal. Payment shall be based upon the actual number of inserts installed.

2.08 Steel Casing

- A. The Contractor shall furnish and install steel casing for gravity sewers and force mains bored in place. Steel casing shall have a minimum wall thickness of 0.330 inch and a minimum yield strength of 35,000 psi. Casing shall be new steel pipe having inside diameter as required by the plans. Steel casing shall meet ASTM

Designation A-139 requirements with AWWA Standard C-203 coal tar enamel coating on the outside. Joints shall be securely and continuously welded in place.

2.09 Tracer Tape

- A. For the entire length along PVC force main, the Contractor shall install 3 inch wide tracer tape with a message "Caution Pipeline Buried Below" repeated every 16" - 36". Tracer tape shall be conductively traceable at the recommended 2 ft. bury depth using a standard pipe locating device. Tracer tape shall be reinforced and corrosion resistant similar to the Sentry-Line by Reef Industries, Inc. or approved equal.

PART 3 - EXECUTION

3.01 General

- A. PVC pipe shall be laid in accordance with ASTM Designation D2321-74. Pipe shall not be deflected beyond manufacturer's requirements or specifications. Appropriate pipe fittings shall be installed on the force main as shown on the plans or to suit field conditions to prevent excessive pipe deflection, with no additional compensation provided.
- B. All force main pipe shall be provided with a minimum 5 ft. of earth cover over the top of pipe. All pipe shall be constructed to the horizontal and vertical alignments as shown on the construction plans, or as directed by the Engineer.

3.02 Laying Pipe

- A. General: All pipe shall be laid in close conformity to line and grade and shall have a full, firm and even bearing at each joint and along the entire length of pipe. Pipe laying shall begin at the downstream end and progress upstream, unless waived by the Engineer. For gravity sanitary sewers the bell end shall be upstream with the spigot end downstream.
- B. All pipe delivered to the site shall be thoroughly inspected by the Contractor for defects. All defective pipe material shall be immediately rejected and removed from the site. Handling and Assembly of Pipe: All pipe shall be handled and assembled in accordance with the manufacturer's instructions and AWWA Standards. Great care shall be used in unloading pipe from the trucks. No pipe shall be allowed to be dropped from the cars or the trucks or to be slid out and one end allowed to drop. Pipe shall be rolled off on skids and let down slowly and carefully. Care shall be taken to prevent pipe from being knocked against each other. Pipe shall be delivered along the ditch with the bells facing in the direction into which it is to be laid. If PVC pipe is to be exposed to sunlight for prolonged periods, it shall be suitably covered and protected.

3.03 Bedding and Backfilling Pipe

- A. All sanitary sewers and force mains shall receive bedding pursuant to Section 2224. The type of materials to be used in bedding and backfilling and the procedure of placement shall conform to the applicable details in the plans and provisions of Section 2224, Bedding and Section 2220, Excavation, Backfill and Compaction.
- B. Special care shall be exercised in placing and compacting material immediately adjacent to pipes in order to avoid damage to the pipe and to prevent pipe misalignment.
- C. Movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be done at the Contractor's risk.

3.04 Testing

- A. All gravity sewer lines and service laterals shall be thoroughly cleaned using a jet flushing system, air tested in accordance with Section 1400. All force mains shall be hydrostatically pressure tested in accordance with Section 1400. All gravity sewer lines shall be tested for deflection in accordance with Section 1400. All manholes (and pump station sumps) shall be vacuum tested in accordance with Section 1400.
- B. The Contractor shall provide suitable braced bulkheads, plugs and other accessories required to accommodate pipe testing functions.
- C. The Contractor shall test the first 1500 feet of gravity sewers and force main, prior to proceeding with additional pipe laying operations. Thereafter, pipe testing shall be completed at appropriate intervals not to exceed 3,000 ft. The Engineer reserves the right to withhold payment(s) for installed pipe which has not been suitably tested and shown to meet requirements.
- D. Infiltration/exfiltration in any portion of force main shall not exceed 10 gallons per inch of pipe diameter per mile per day.

3.05 Concrete Thrust Blocks

- A. All bends, and fittings on force mains shall be blocked to the wall of the trench with Class A concrete as shown on the plans. Backfilling over concrete thrust blocks shall not be completed until concrete has cured for at least 24 hours.

3.06 Concrete Encasement

- A. In the case where the pipe crosses creeks or large drainage ditches, the pipe shall be encased in concrete for a distance of 6 inches above, below and on each side of the pipe. The location and length of concrete encasement is shown on the construction plans.

Concrete shall be Class A (3300 psi at 28 days). Backfilling over concrete encasement shall not be completed until concrete has cured for at least 24 hours.

3.07 Horizontal/Vertical Control

- A. The installed gravity sewer pipelines at any location shall not differ more than 0.10 ft. vertically and 0.5 ft. horizontally from the invert elevations and horizontal alignment as shown on the plans or as staked in the field. Alignment shall meet deflection test criteria. The Engineer may at his discretion require removal and replacement of line sections which do not meet requirements, with all replacement or removal work at the Contractor's expense. If reverse grades are encountered not allowing continuous gravity flow, or less than a minimum grade of 0.4% is provided, the sewer line shall be completely removed and replaced.
- B. For force main construction the Engineer shall furnish the Contractor with baseline horizontal control and temporary bench mark elevations. The Engineer shall furnish major points in horizontal control only which will encompass offset staking at maximum 300 ft. intervals. The Contractor shall also be required to provide additional offset alignment stakes for horizontal control. No additional compensation shall be provided for horizontal and vertical control furnished by the Contractor.
- C. For gravity sewers the Engineer shall provide offset horizontal staking and cut elevations at manhole locations only. The Contractor will be responsible for all other supplemental control to achieve design alignment and grade.

3.08 Rights-of-Way

- A. The Owner either owns or will acquire rights-of-way for the construction of these lines in the locations as designated on the plans. Whenever it is required as part of this contract to perform work within the limits of private property or in rights-of-way, such work shall be done in conformity with all agreements between the Owners in this contract and the property owners.
- B. The Owner shall obtain agreements for work on private rights-of-way as are required for execution of all work under this contract and will use all diligence in acquiring said agreements.

- C. It is possible, however, that all necessary right-of-way agreements will not have been obtained at the time of start of construction. In such event, the Contractor shall begin his work upon such lands and rights-of-way as the Owner may have previously acquired and no claim for damages whatsoever by the Contractor will be allowed by reason of any delay in obtaining the remaining right-of-way agreements. Should the Owner be prevented or enjoined from proceeding with the work by reason of its inability to procure any required lands or rights-of-way, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay or to withdraw from the contract except by consent of the Owner. Time for completion of the work will be extended by such time as the Owner determines will compensate for the time lost by such delay.

3.09 Protection of Work Areas

- A. The Contractor shall provide suitable fences, barricades or other protection, or a watchman if necessary during all periods when ditches are open and shall protect the traveling public from the ditch and shall maintain traffic along the work area(s) during construction. The Contractor shall keep the Owner and Engineer harmless from any claims arising from the negligence of the Contractor or his employees during the construction of this work. No additional compensation shall be provided for providing suitable devices to protect the public from the work area.
- B. The Contractor is totally responsible for the adequacy of measures employed during construction to protect work areas from the public and work personnel.

3.10 Existing Utilities

- A. It shall be the responsibility of this Contractor to make every effort to ascertain data concerning location and elevations of existing utilities in the line of the proposed work. The project plans reflect approximate location of existing main line utilities in the project area whereas existing service lines are not shown. With respect to existing water and sanitary sewer service lines in the work area, the Contractor, shall, by excavation and exposing of existing lines, verify their actual elevation and location if in the way of proposed piping routing. It is imperative that such information be ascertained well in advance of pipe laying operations in order that appropriate adjustment can be made in the proposed waterline routing where necessary to accomplish clearance. All existing utilities in the line of the proposed work shall be exposed and clearance verified by the Contractor at least 300 feet in advance of project pipe laying operations on any individual run. Utility notification in advance of operations is a Contractor responsibility. The Contractor shall follow Pennsylvania "One Call" procedures in notifying utility representative.

- B. When, in the opinion of the Engineer, adjustment of proposed pipeline grades to accomplish clearance with existing utilities is not feasible based on advance location and verification findings of the Contractor, the existing utility shall be modified by and at the expense of the Owner subject to an approved Change Order. However, where adjustment in proposed pipeline and/or relaying of same is necessitate as a direct result of the Contractor's failure to expose existing utilities at least 300 feet in advance of the pipe laying operation on any run, such modification, reconstruction, or relaying of the proposed pipeline or affected utility line shall be done by and at the Contractor's expense.
- C. No separate or additional compensation shall be claimed or received by the Contractor for work under this item. Costs for advance location and verification of existing utilities in the path of the proposed pipe line work required by this contract shall be included in and paid for at the contract unit prices or lump sum for pipe lines complete in place as set forth in the Proposal and contract documents.

3.11 Water Mains Near Sewers

- A. Horizontal Separation: Whenever possible, a sewer line should be laid at least 10 feet, horizontally, from any existing water main. A sewer line, under special conditions, may be laid closer provided that the line is laid in a separate trench, or on an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.
- B. Vertical Separation: Whenever sewers cross water mains the sewer line should be laid at such an elevation that the bottom of the water main is 18 inches above the top of the sewer. This vertical separation should be maintained for that portion of the sewer line location within 10 feet horizontally of any sewer or drain it crosses, said 10 feet to be measured as the normal distance from the water main to the drain or sewer.
- C. Unusual Conditions: Where conditions prevent the minimum horizontal or vertical separation or when it is necessary that a watermain must pass under a sewer or a drain, a vertical separation of at least 18 inches shall be maintained between the bottom of the sewer and top of the watermain. The watermain joints shall be equidistant and as far away as possible from the sewer lines. The sewer or drain line shall be adequately supported to prevent excessive deflection.
- D. Sewer Manholes: No water pipe shall pass through, or come into contact with, any part of a sewer manhole.

3.12 Blasting

- A. No blasting is permitted.

3.13 Shoring and Sheeting

- A. Whenever necessary and to conform with O.S.H.A regulations, the sides of the trench shall be braced and rendered secure and either open or close sheeting or suitable bracing to be drawn only as the trench is refilled; all such bracing and sheeting being done at the Contractor's expense. Sheeting left in permanently by the written order of the Engineer, and only such will be paid for at the price bid or at an agreed upon price. When left in the trench, sheeting shall be cut off at a point one (1) foot below the surface. The Contractor shall, at his own expense, shore up and otherwise protect any building or roadway which may be endangered by the work.
- B. The Contractor may employ suitable OSHA approved trench boxes to adequately protect the workmen in lieu of shoring and sheeting methods.
- C. The Contractor shall be completely responsible for work safety and shall comply with Section 2220 requirements.

3.14 Inspection

- A. The whole work including both material and workmanship shall at all times be subject to inspection by the Engineer, Owner, or their authorized agents and inspectors. The Contractor must furnish such laborers as may be necessary or as may be required to aid the inspector in the examination and the culling of all material; and, in the case the Contractor neglects or refuses to furnish such laborers, such laborers as in the opinion of the Engineer may be necessary, will be employed by said Engineer and the expense thus incurred, will be deducted and paid for out of any money then due or which may thereafter become due to said Contractor under the contract to which these specifications refer.
- B. No work shall be in any case covered or carried on that which has not been inspected or approved by said Engineer or Engineer's representative. Such inspection shall not, however, excuse the Contractor from any obligations to perform said work strictly in accordance with these specifications and do first class work. Work not so constructed shall be removed and made good by the Contractor whenever so ordered with reference to any previous oversight in inspection. This shall apply to both labor and material.
- C. The Contractor shall be held responsible for the entire work until it is completed and until the same is accepted by the Owner and final settlement is made.

3.15 Use of Streets

- A. During the progress of the work, the Contractor shall accommodate both vehicular and foot traffic and shall provide free access to existing fire hydrants, water and gas valves. Gutters and waterways must be kept open or other provisions made

for the removal of storm water. Municipal street intersections with approval of the municipality may be blocked only one-half at a time. State highway may not be blocked unless in accordance with the approved Traffic Control Plans. The Contractor shall lay and maintain temporary driveways, bridges, and crossing as such in the opinion of the Engineer are necessary to reasonably accommodate the public. No additional compensation will be provided for such work.

3.16 Manholes

- A. The Contractor shall furnish, install and construct manholes at all locations shown on the project construction drawings. Manholes shall be built using precast concrete riser sections and cast iron castings grouted in place. Manholes shall be of four (4) feet in diameter except in instances where five (5) feet is noted on the job plans or large size is required to accommodate connecting pipelines or inside drops. Manholes shall be installed to the line, rim, and invert control data indicated for each structure. Unless otherwise approved, a minimum 0.2' foot drop is required through the manhole invert.
- B. Excavation for manholes shall be made to a vertical plane. Size of excavation shall not be greater than grouped' larger than the outside dimension of the manhole walls on a square configuration. Excavation for manholes shall include a 12" undercutting with the undercut area to be filled with approved type bedding materials specified in Section 2224 and mechanically tamped into place in 6" lift. Manhole rim elevations shall be set to match existing ground or pavement finished grade unless otherwise directed by the Engineer. All manhole grouting including joints between manhole riser sections, lift hole plugs, frame and cover grouting to manhole precast section, and grouting of space between pipes and manhole walls shall be approved type special non-shrink or expanding grout as specified. All joints on the interior of the manhole shall be grouted. Excavation area outside the manhole shall, upon completion of the manhole structure, be backfilled using native excavated materials. Backfill around manholes in unimproved locations shall be placed by machine, leveled and mechanically tamped into place in lifts not exceeding 2'. Contractor is reminded to check for requirements for special backfill materials and methods at any manhole located in an improved street, cartway, drive or parking area.

3.17 Protecting Structures

- A. The Contractor shall at his expense shore up or otherwise protect any and all buildings, bridges, or public or private structures that may be encountered in the prosecution of the contract work. Contractor shall repair or arrange for repairs for any damage to such facilities as a result of his contract operations.

- B. No extra payment will be made for said work or materials except that timber shoring which the Engineer may order left in place as permanent supports for said buildings, bridges, or other public or private structures, shall be paid for at the unit price or an agreed for same the schedule of unit prices for additions or deductions in contract quantities or at a previously agreed to price.
- C. The Contractor shall excavate and remove any driveway, culvert pipes in the path of the proposed work. The removed culvert pipes shall be relayed by the Contractor as his expense and at the prior location and grade. Any damage to culvert pipes caused by construction related activities shall be repaired or replaced to the satisfaction of the Engineer or property Owner at the Contractor's expense.

3.18 Ownership of Materials

- A. All old paving, brick, curbing, crosswalks, gutters, culverts, water pipe, iron pipe and castings or other materials removed during the work and which are to be ordered replaced shall be removed from the job site and disposed of by and at the Contractor's expense. Should the owner of such materials removed wish to maintain ownership, upon direction of such owner, the material shall be neatly stockpiled by the Contractor at location designated by such owner.

3.19 Work in Freezing Weather

- A. When temperatures fall to 32°F, all grouting and concrete materials entering into the construction are to be preheated and used while warm. Special mortar at manhole structures shall only be placed where area has been protected and heated to at least 40°F. When any mortar or cement concrete work is carried out under freezing conditions, the heated area must be maintained for at least 24 hours or the installation shall be protected from frost by covering with hay, straw, or similar substance to a depth of at least 2' before auxiliary heat is removed. Where areas cannot be appropriately protected by covering with hay or straw and where it is impractical to completely cover the work area with an enclosure and heat the work area at least 40°F, the work shall be suspended.

3.20 Subcontractors

- A. All anticipated subcontractors shall be prior approved by the Engineer. Name(s) of subcontractor(s), background information, and extent of work to sublet, if any shall be filed with the Engineer for review pursuant to contract terms.

3.21 Surface Restoration

- A. Surface restoration shall be completed in accordance with Section 2900.

- B. Surface restoration shall immediately follow pipe laying operations and shall be completed in strict conformance to provisions of the plans and the Erosion and Sedimentation Control Plan (Section 2020).

3.22 Surplus Earth

- A. The Contractor shall not remove from the line of work any sand, gravel or earth excavated therefrom which may be suitable for refilling the trench until the same shall have been refilled. Surplus earth when so ordered by the Engineer shall be hauled away to such places within the total project limits as the Engineer shall designate and there deposited; but if no place be designated, the Contractor shall dispose of surplus earth at his own risk and expense. No waste material shall be deposited on private property unless landowner release forms have been filed with the Engineer through the Resident Project Representative.

3.23 Removal of Water

- A. The Contractor shall at all times during the construction period provide proper and satisfactory means and devices for the proper removal of all water entering the excavations. Such water shall be removed promptly as it collects so that it shall not interfere with the proper laying of the pipe, making the joints, and placement of concrete. The cost of doing such work shall be included in the price bid for the various time work. Removal and disposal of water shall conform with the Erosion and Sedimentation Control Plan contained in these contract documents.

3.24 Clearing and Grubbing

- A. Work under this paragraph shall be in accordance with Section 2103 of these specifications and shall include clearing, grubbing, removal of obstructions/debris, stripping and stockpiling of topsoil, including but no limited to the area to receive structures, pipelines and areas impacted by construction activities. The work shall also include preservation from injury or defacement of all vegetation and objects to remain.
- B. No clearing, grubbing or stripping is intended or authorized except on lands and/or permanent easements acquired for project purposes by the Owner. Any clearing, grubbing or stripping damage resulting from Contractor operations beyond the limits of the Owner's lands and/or easements is a Contractor responsibility. Logs and other wood and debris resulting from the clearing, grubbing and stripping operations of the Contractor shall become the property of the Contractor.
- C. All areas within proposed pipelines and earthwork limits shall be cleared, grubbed and stripped. All areas within the proposed chain link fenced perimeter of the pump station sites shall be cleared and grubbed. These minimum areas are provided as a construction guide. Additional clearing, grubbing or stripping

required for construction of the project in accordance with these specifications and/or construction plans shall be completed by the Contractor, with no additional compensation provided.

- D. If burning and/or landfill type disposal is proposed for surplus waste materials, the Contractor shall provide evidence that appropriate permits and/or approvals have or will be obtained prior to start of such activities.
- E. All costs for clearing, grubbing, stripping and waste disposal in accordance with these requirements shall be included in the total contract price, with no additional compensation provided.

3.25 State Highway Occupancy Permits

- A. The Owner will obtain permits for all construction to be undertaken within actual State Highway right-of-way on this contract. The Contractor is responsible for conducting and carrying out his work on State Highway in total conformance with all specifications and regulations as required by applicable permits of the controlling agency. While the Owner will use all diligence in obtaining the State Highway Permit, such permit may not be available at start of construction. If not available, the Contractor will commence work in other areas where occupancy is available to the Owner. Should the Owner be prevented or enjoined from obtaining highway permit, the Contractor shall not make or assert claim of any kind for delays caused by Owner's inability to obtain such permits. It is agreed, however, that the contract time may be extended by reason of such delay. Contractor shall comply with all PA DOT permit requirements.
- B. The Contractor is responsible for advance notice of PA DOT officials prior to work activities in state highway right-of-ways.

3.26 Pipeline Installation by Boring and Drilling

- A. The Contractor shall complete borings well in advance of adjacent pipe laying operations so that appropriate adjustments may be made, if necessary and only if prior approved by the Engineer.
- B. Where indicated on the project plans, pipelines on this project shall be installed through steel casing pipe of the size specified, with casing pipe being placed by approved type jacking and drilling/boring methods. Jacking and drilling/boring methods shall involve operating a horizontal drill inside the casing pipe being installed. Cutting edge of drill head shall not extend more than 12" beyond the lead edge of the casing pipe. In unstable or wet material, the drill shall not be turned unless the casing pipe is being advanced. Free drilling/boring and separate

jacking for casing pipe installation will not be approved. Upon completion of the installation of the casing pipe, the drill shall be removed and if grade is acceptable, the pipe shall be connected and pushed through the casing pipe section.

- C. Pipe shall be blocked up within the casing pipe using pressure treated lumber blocks and stainless steel bands. Wood blocks shall be equally spaced on at least three sides of the pipe and securely banded in place to prevent pipe movement within the casing pipe. Wooden blocks shall be spaced at minimum 8 ft. intervals.
- D. The casing opening at both ends shall be sealed off using approved methods to prevent debris and dirt from entering the casing pipe yet allowing free draining of water.
- E. Bore pit and receiving pit shall be backfilled from bottom of excavation to spring line of pipe with AASHTO #57 gradation PA DOT Type C crushed stone. From spring line of pipe to finish elevation backfill with PA DOT No. 2A gradation Type C aggregate (Special Trench Backfill). Cost of bedding and backfill of bore pit and receiving pit to be included in unit price for boring item. No additional payment will be given.

3.27 Service Connections and Laterals

- A. In completing the pipe laying operation, the Contractor must leave service line fittings and run service lateral stub outs to serve each property. Service line wye branch fittings shall be left in the main line at locations as designated by the resident inspector. Where Contractor has any doubt as to the location for service line wye branch to serve any property, and where the resident inspector is temporarily unavailable, the Contractor is responsible for contacting the Owner of premises to be served to verify property Owner's preference for location of service wye branch fitting and lateral service line.
- B. Service connections shall include 6" wye branch, bends, pipeline run and plug at end of pipe. Service lines shall extend to highway right-of-way limits or easement limits on private property and shall be laid at a minimum grade of $\frac{1}{4}$ " per foot unless otherwise directed. The Contractor shall confirm required service line grade and depth with Engineers site representative prior to installation.
- C. When service lateral is not being placed immediately with the mainline construction, the wye branch shall be plugged. Plugs must be premium joint of same type as used in mainline pipe construction. On Contractor return to construct the lateral service run, the wye branch plug shall be removed, the lateral extension installed and the terminus of the lateral run plugged using premium joint type pipe plug. The Contractor shall furnish and install tracer tape about 2 ft. below ground for the last 5 ft. of service lateral run.

- D. At end of each lateral service line, the Contractor shall install an approved type metal sewer marker. Sewer markers shall be 4"x 4" x 1/4" steel plate welded to a 3/4" diameter steel reinforcing rod. A 6" length of rod at end opposite plate shall be bent at right angles as an anchor. Sewer markers shall be placed in the trench backfill at and exactly over end of service lateral run with anchor section down. The metal plate shall be left 6 to 12 inches below finished ground. Contractor will also place 2"x 2" hardwood stake with orange ribbon above ground at location of all service connections. No separate or additional compensation shall be received for sewer markers. Cost for sewer markers shall be included in the total contract price.

3.28 Force Main Cleanouts

- A. Where indicated on the plans the Contractor shall furnish and install force main cleanouts. The cleanouts shall consist of a 6" wye, bends, pipeline run and plug. The cleanout shall extend 2" to 4" below finish grade elevation. The fittings and pipeline for cleanouts shall be of the same type and manufacturer as used for the force main.

3.29 Traffic Control

- A. The Contractor is responsible for developing a traffic control plan for construction work along Township, State and Interstate highways and having such plan approved by PA DOT before construction begins. No additional compensation will be provided for developing and implementing an approved traffic control plan. Any delays associated with obtaining approval of the traffic control plan shall not be considered grounds for obtaining a time extension to the contract completion date.
- B. The Contractor shall incorporate the following Department standards (or current revised editions) in developing a traffic control maintenance plan to be developed in accordance with these specifications and submitted to and approved by the Department of Transportation prior to initiation of any construction activity.
1. PA DOT Publication No. 90 and 203 Handbook for work area traffic control.
 2. PA DOT Bulletin 15, tentative list of commercial producers of approved construction methods.
 3. PA DOT Publication No. 43: Manual on maintenance protection of traffic on construction projects.
 4. PA DOT Publication No. 68: Regulations governing official traffic control devices.

- C. Work area traffic control along Township road rights-of-way shall conform to the approved traffic control plan for State Highways unless otherwise directed by the Engineer.
- D. The traffic control plan to be developed by the Contractor shall incorporate the advice of the Pennsylvania Department of Transportation district office. The plans shall be custom designed for the specific project work area with all features thereof to comply with the requirements of Pennsylvania Department of Transportation. The traffic control plan shall be in satisfactory form to permit the Pennsylvania Department of Transportation and Owner approval at the job preconstruction conference. The plans shall be geared to afford minimum inconvenience and maximum safety for the traveling public and workers during the construction period.
- E. Two way traffic is to be maintained at all times. The project embraced by each contract is located along a main thoroughfare. As such, it is essential that disruption of vehicular traffic be held to a minimum during the construction period. Where required in order to accommodate two way traffic patterns adjacent to construction, shifting of traffic lanes may be required to accommodate construction activities, pursuant to the PA DOT approved Traffic Control Plan.
- F. Any changes to this plan shall require Contractor submittal of proposed modification to the Pennsylvania Department of Transportation and approval thereof before such changes can be implemented.
- G. During non-working hours all non-restored areas will be barricaded with barriers equipped with Type "C" steady burn lights.

3.30 Temporary Plugs

- A. Prior to leaving the job site each day after completion of pipe laying work, the Contractor shall furnish and install a temporary plug in the exposed end of the pipe to prevent any dirt or debris from entering the pipe.

3.31 Roadway Drainage

- A. The Contractor shall at all times maintain roadway drainage systems, culverts, drainage pipes and ditches to prevent unobstructed flow. Where required, the Contractor shall install temporary piping to convey roadway drainage around or through work areas. Temporary piping shall be in sufficient size to convey storm flows and associated runoff.

3.32 Clay Dikes

- A. At locations shown on the drawings, the Contractor shall install and compact clay dikes in the trench to prohibit groundwater monument through the trench. This installation shall be completed as shown on the detail in the contract drawings. Compacted clay dikes shall extend vertically from undisturbed ground at trench bottom to within two feet (2') of final grade over full width of trench. A keyway shall be made as shown on the plan detail.
- B. Each dike shall consist of trench bedding and specified backfill mixed with powdered bentonite (15%± by volume) fill compacted by mechanical tamper to not less than 95% of maximum density at optimum moisture content in lifts not to exceed 1 foot each.
- C. Additional dikes may be needed due to groundwater conditions found during construction. These dikes will be field located as needed by the Engineer, or his resident project representative.

3.33 Manhole Inverts

- A. Concrete inverts shall be constructed in all manholes to the lines and grades indicated on the construction drawings and to provide smooth flow and intersecting channels. Concrete inverts shall be formed by placing concrete adjacent to continuous half sections of pipe laid through the manhole and in conformance with the Standard Details.

3.34 Work Items and Basis of Payment

- A. Sanitary sewer and force main installation and related work under this project will be paid for at the unit prices set forth in the Bid Proposal for various items of work complete as specified and without separate or additional compensation. Quantities for payment shall be based on the as-built field measurements of the Engineer for work authorized and constructed. The basis for trenched and bored pipeline quantities and payments by the Owner shall be the actual horizontal payments by the Owner shall be the actual horizontal plan projection of the installed pipeline. Payment footage shall be center to center of manholes less 3'-0". The Bid Proposal unit prices for service (lateral) lines, borings, and force main construction are valid regardless of depth. No additional compensation shall be received regardless of installed depth of service lines, borings, and force main. The depth of main line gravity sewers for payment purposes shall be based on depth from ground surface (elevation which existed immediately prior to construction) to the invert elevation of the pipeline. No changes in any unit prices will be allowed if final construction quantities differ by less than 25% from the quantities contained in the Bid Proposal.

- B. Unit prices for installed pipe lines include all fittings, bedding, excavation, backfill, testing, seeding, restoration and clean-up complete as specified. No payment will be allowed for stored materials including pipe. The cost for force main fittings and thrust blocks shall be included in the unit price of installed force main, with no additional compensation provided. Unit prices for sewer manholes shall include the concrete invert along with placement of approved type bedding and restoration.
- C. Payment for service connections and laterals shall be made based on actual lineal feet of installed pipe with fittings included in the length of pipe installation. The unit price for force main cleanout shall include wye connection, bend, fittings, pipe to ground surface and cap per construction plan detail. No additional compensation shall be received under these bid items for required fittings to accommodate pipeline run.
- D. The following items associated with the work are included below. This list is not all inclusive and additional incidental work items may be required. No separate or additional compensation will be due the Contractor for the following items. Costs for this work shall be included in the Contractor's total bid price.
1. Advance location of all existing utilities.
 2. Advance location and exposing existing sewer lines and connections thereto.
 3. Erosion and Sedimentation Control procedures, materials or structures.
 4. Repairs to existing utilities/service lines damaged by the Contractor.
 5. Protecting existing utilities and structures.
 6. Supplemental vertical/horizontal control, alignment staking or offsets.
 7. Shoring and sheeting.
 8. Dewatering.
 9. Resetting of property or survey markers displaced.
 10. Relocation, repair or replacement of existing fences, mailboxes, signs or other public or private property damaged or required to be relocated as result of Contractor operations.
 11. Seeding and surface restoration including final clean-up.
 12. Dust control measures.

13. Topsoil placement for surface restoration.
14. Removal and disposal of surplus earth.
15. Removal and disposal of large boulders, rock, or shale not suitable for backfill.
16. Clearing, grubbing and stripping.
17. Concrete thrust blocks on force mains.
18. All force main fittings/bends to prevent excessive force main deflection and/or as shown on the plans. Tracer tape for PVC force main.
19. Pipeline testing.
20. Mobilization/demobilization.
21. Temporary and permanent plugs.
22. Maintenance of roadway drainage systems including installing temporary piping as required.
23. Connections to existing manhole.
24. Pipeline bedding.

* * * * *

SECTION 2900
STSA STANDARD SPECIFICATIONS
SURFACE RESTORATION

PART 1 - GENERAL

1.01 General

- A. Under this item the Contractor is totally responsible for completing surface restoration in kind to match surface conditions existing prior to start of construction activities, pursuant to these specifications.
- B. For vegetated areas this work shall consist of all operations incidental to surface restoration and to the establishment of vegetation on all cut and fill slopes, regraded slopes, in the borrow areas and in other areas indicated on the contract drawings, designated by the Engineer, or disturbed by construction related activities including waste areas. The Contractor shall completely restore all disturbed vegetated areas of the construction sites by effecting topsoiling, fertilizing, mulching and seeding in accordance with these specifications.
- C. Unless specified otherwise herein, all topsoiling, seeding and mulching operations shall be completed in accordance with PA DOT Sections 802, 803, 804 and 805 of PA DOT Manual 408.
- D. In areas with existing asphalt or concrete surfaces the Contractor shall completely remove all disturbed surface materials and replace with approved type materials as specified herein.
- E. The Contractor shall complete required excavation and site grading to restore existing road side ditches to the same depths and slopes as existed prior to start of construction. The construction plans show areas to receive rip-rap placement after completion of construction.
- F. The Contractor shall replace all posts, signs, mailboxes, driveway sluices and drainage facilities in undamaged condition. Items damaged by the Contractor shall be replaced with new, comparable quality facilities. It is a Contractor responsibility to report preexisting damage conditions on any item to a representative of the OWNER. In the absence of such preconstruction condition documentation of damage, subsequent claims by others will be remedied by the Contractor.

- G. The Contractor may use on-site sources for topsoil generated by the construction work. However, the Contractor will be responsible at its expense to furnish and install sufficient topsoil per specifications to restore all disturbed areas. No additional compensation shall be provided if the Contractor is required to import topsoil from off-site sources to complete restoration work.

1.02 Submittals

- A. Certifications from suppliers for seeds, mulch, fertilizer and limestone shall be submitted by the Contractor to the Engineer prior to use, stating that the materials meet the specified requirements.
- B. For asphalt materials, the Contractor shall furnish to the Engineer the name and qualifications of the PA DOT approved source supplier. The Contractor shall also furnish to the Engineer the current year PA DOT approved asphalt mix design information. Aggregate for gravel driveways shall be tested and sampled in accordance with Section 1400. No materials shall be ordered or installed on the job site until source, test and mix design information has been approved by the Engineer.
- C. For rip rap erosion protection, submit test results to the Engineer in accordance with Section 1400.

PART 2 - MATERIALS

2.01 Topsoil

- A. Topsoil shall conform to PADOT Section 802.2 and have a pH between 5.5 and 7.6.

2.02 Seed Mixes

- A. Seed mixes shall conform to PADOT Section 804.2(b).

2.03 Mulch

- A. Mulch shall be hay, straw or wood cellulose and shall conform to PADOT Section 805.2(a)1.

2.04 Fertilizer

- A. Fertilizer (10-20-20) shall conform to PADOT Section 804.2(a)2 for seeded areas.

2.05 Limestone

- A. Limestone for soil pH adjustment shall be ground agriculture limestone and shall conform to PADOT Section 804.2(a)1.

2.06 Asphalt

- A. As required by the construction plans, the following materials shall be furnished and installed for asphalt bituminous concrete surface restoration in compliance with the referenced sections of the PA DOT Manual 408, dated 1994.

Section 420 - Bituminous Wearing Course ID-2

Section 421 - Bituminous Binder Course ID-2

Section 460 - Bituminous Tack Coat

Section 461 - Bituminous Prime Coat

- B. All asphalt or bituminous concrete materials shall be supplied from PA DOT approved sources.

2.07 Concrete

- A. Concrete materials for surface restoration shall meet Class AA requirements (3750 psi at 28 days) as specified in PA DOT Manual 408. All concrete shall be supplied from PA DOT approved source.

2.08 Paved Shoulders

- A. Any State Highway shoulders disturbed by construction related activities shall be replaced by the same PA DOT type or classification of shoulder, as directed by the Engineer. Materials for paved shoulder replacement shall conform with the applicable requirements of Section 700 (or other pertinent sections) of PA DOT Manual 408. Refer to the construction plans for additional information on paved shoulder restoration.

2.09 Crushed Aggregate

- A. Crushed aggregate for restoration of gravel drives shall be crushed limestone meeting the requirements of PA DOT No. 2A gradation, Type A material.

2.10 Rip Rap

- A. Rip rap for ditch areas shall be type R-4 and meet the requirements of PA DOT Manual 408. Rip rap shall be placed to a minimum 18 inch depth.

PART 3 - EXECUTION

3.01 Topsoil Cover Placement

- A. Topsoil shall be utilized on all disturbed vegetated areas to be restored. Areas to be covered by topsoil shall be graded as shown and as directed by the Engineer. Using acceptable methods, loosen the soil to a depth of 2 inches before placing topsoil.
- B. Topsoil shall be placed on prepared areas only when in a moderately dry condition as approved by the Engineer in order to minimize clodding and compaction which can result from multiple passes with construction equipment. Topsoil shall not be placed on frozen grades and/or in a wet or frozen condition.
- C. The surface of topsoiled areas shall be left in a rough or furrowed manner along slope contours to limit erosion and maximize available soil moisture during the interim period between topsoiling and seeding operations.
- D. Final grading of the topsoiled areas shall be accomplished to assure free drainage with no depressions or drainage courses.
- E. The topsoil cover shall be disturbed with a bulldozer or other approved equipment to a minimum depth of 2 inches prior to seeding.

3.02 Seedbed Preparation

- A. Seedbed preparation shall be accomplished using spring-tooth harrows, tandem discs or other agricultural tillage equipment approved by the Engineer which can satisfy the seedbed preparation requirements.
- B. Areas to be seeded shall be harrowed disced to a state of tillage acceptable to the Engineer. All stone or undesirable material over 2 inches in greatest dimension shall be removed and disposed of as approved.
- C. Tillage operations shall be conducted along the contour in order to limit erosion. The final finished seedbed will result in a furrow-like configuration which will help to minimize erosion and optimize soil moisture.
- D. Seedbed preparation shall take place in as short a time as possible prior to seeding in order to minimize the time that the prepared seedbed is allowed to remain subject to water or wind erosion without vegetative protection.
- E. Fertilizer and limestone may also be incorporated into the topsoil during seedbed preparation.

3.03 Fertilizer and Liming

- A. Fertilizers will be applied as required to topsoil in order to supplement potential nutrient deficiencies and improve the availability of essential plant elements.
- B. Subsequent to final topsoiling and prior to fertilizing, soil samples will be obtained and analyzed and recommendations made for fertilizer and limestone additions.
- C. Limestone will be applied to the topsoil if needed to raise the pH of the soil to the appropriate level to enhance the availability of essential plant elements. Limestone and fertilizer will be applied, as needed, preferably prior to seedbed preparation, in order that these soil amendments can be incorporated through the topsoil layer. Unless otherwise directed limestone shall be applied at the following rate:

<u>Topsoil pH</u>	<u>Limestone Rate (lbs/1000 S.F.)</u>
6.5 or greater	0
6.0	40
5.5	80

- D. Unless otherwise specified, limestone and/or fertilizer shall be incorporated to the depth of 2 inches below the finished grade.

3.04 Seeding

- A. Seeding mixtures shall be as follows unless otherwise directed by the Engineer. Additional seed application may be required by the Engineer depending on the time of seeding.
 - 1. Temporary Erosion Control: Annual (domestic) ryegrass conforming to Formula E requirements of Section 804.2(b) of PA DOT Manual 408.
 - 2. Grass or Vegetated Areas: PA DOT Formula B conforming to Section 804.2(b) of PA DOT Manual 408.
 - 3. Steep Slopes: For slope areas greater than 3H to 1V or when designated by the Engineer, the seed mix shall be crown vetch mixture conforming with the requirements of Formula C in PennDOT Section 804.2 (b).
 - 4. Roadside Ditches: PADOT Formula D conforming to Section 804.2(b) of PADOT Manual 408.
- B. Seeding shall be accomplished by hydraulic placement (hydroseeding). Hand placement may only be used in areas which cannot be hydroseeded.

- C. Seeding for final restoration purposes shall be performed for all disturbed areas except asphalt, concrete or gravel surfaces.

3.05 Mulching

- A. Hay or straw will be primarily used as mulch where seeding has been accomplished by drilling. Hay or straw shall be air dried and will be applied at the rate of 2.0 to 2.5 tons per acre. Hay or straw mulch will subsequently be anchored into the soil utilizing a cultipacker or other suitable equipment or sprayed with an asphalt or other equivalent emulsion to provide protection from wind.
- B. Cellulose wood fiber may be utilized as mulch when seeding is accomplished by hydroseeding. This mulch will be applied at the rate of 1,500 pounds per acre as part of the hydro-mulch slurry. A latex emulsion will also be added to the cellulose wood fiber to provide protection from wind.
- C. In areas with slopes exceeding 3H:1V, the Contractor shall utilize mulch blankets in conformance with PADOT Section 806 to protect seed and mulch from wash-out or erosion. No additional compensation shall be provided for utilizing jute matting or other approved erosion protection devices outlined in PADOT Section 806 as required to protect newly seeded areas from erosion.

3.06 Care During Construction

- A. The Contractor shall care for the seeded and mulched areas until final acceptance of the project. Such care shall consist of providing protection against traffic by approved warning signs or barricades and repairing of any areas damaged following the seeding or mulching operations due to wind, water, fire or other causes. Such damaged areas shall be repaired to reestablish the condition and grade of the area prior to seeding and shall then be refertilized, reseeded and remulched as specified herein. The Contractor shall keep seeded areas mowed until acceptance of the contract by cutting to a height of 3 inches when growth reaches 6 inches or when the growth tends to smother seedlings or as directed.

3.07 Seeding Performance

- A. Performance after three months from the time of seeding shall be reviewed by the Owner, the Engineer and the Contractor. The vegetation must be to the satisfaction of the Owner and Engineer. Any bare or spotty vegetated areas shall be fertilized, reseeded and mulched by the Contractor at the Contractor's expense. If the Contractor fails to take expeditious action as directed by the Engineer or Owner to repair or replace previously seeded areas, then the Owner reserves the right to obtain the services of other parties to complete restoration with all

associated costs deducted from the contract amount. The Owner reserves the right to retain a sufficient amount from the contract price until seeding restoration is properly completed and vegetative growth is well established.

3.08 Asphalt Removal and Replacement

- A. Construction shall be in total conformance with applicable Sections 420.3, 421.3, 422.3, 461.3 and 460.3 of said Manual Form 408, except as may be modified herein. The initial field function shall involve marking of excavation limits on existing pavement surface and sawcutting to full depth of improved surface materials for neat removal.
- B. After sawcutting and carefully removing existing roadway or driveway surface structures, Contractor shall complete trench excavations to install the required pipelines and support structures. After placing special trench backfill as specified under Section 2220, the Contractor shall prepare the upper limit of the trench backfill materials to receive final surface restoration as specified under this item. Such preparation shall include undercutting special trench backfill which has been temporarily brought to finish grade to accommodate traffic handling and will involve leveling of trench backfill to subgrade line as required and the final compaction of trench materials. Trench material compaction shall involve proof rolling with heavy axle over-the-road equipment loaded to maximum allowable Pennsylvania axle weight followed by final hand leveling and addition of special trench backfill materials to grade. After leveling, the surface of the special trench backfill materials shall be finally compacted to maximum 95% dry density as determined by ASTM D-1557 using approved type vibratory pad equipment meeting the Engineer's approval. Surface restoration shall then be installed using specified materials.
- C. Contractor shall install one 4½" lift of ID-2 binder and then one 1½" lift of ID-2 wearing to finished grade as directed (6 inches total). Prior to placing binder and wearing courses, exposed surfaces of all existing bituminous materials to be in contact with new materials shall receive a tack coat of BM-1 asphalt cement or alternate materials as may be approved by the Engineer. Tack coating applications shall conform with PA DOT Manual 408 requirements.

3.09 Concrete Surfaces

- A. Concrete surfaces shall be sawcut pursuant to the requirements of Part 3.08(A) of this Section.
- B. Concrete surfaces shall be restored by placing a minimum of six inches of Class A concrete above special trench backfill materials. The concrete finish shall match the existing adjacent surface.

- C. A layer 66/66 of welded wire fabric shall be placed in the center of the concrete pavement prior to pouring concrete.

3.10 Paved Shoulders

- A. Any removal and replacement of paved or improved shoulders of State highways shall be prior approved by the Engineer and completed pursuant to the construction plans and in conformance with all applicable requirements of PA DOT Manual 408, and PA DOT standard plan requirements.

3.11 Rip Rap Erosion Protection

- A. The rip rap shall be installed per Section 850 of PADOT Manual 408 to provide an even distribution of pieces. Rearrange individual rocks, if necessary, to insure uniform distribution. The rip rap shall be installed to provide 12" depth of continuous stone to the limits directed by the Engineer's representative.

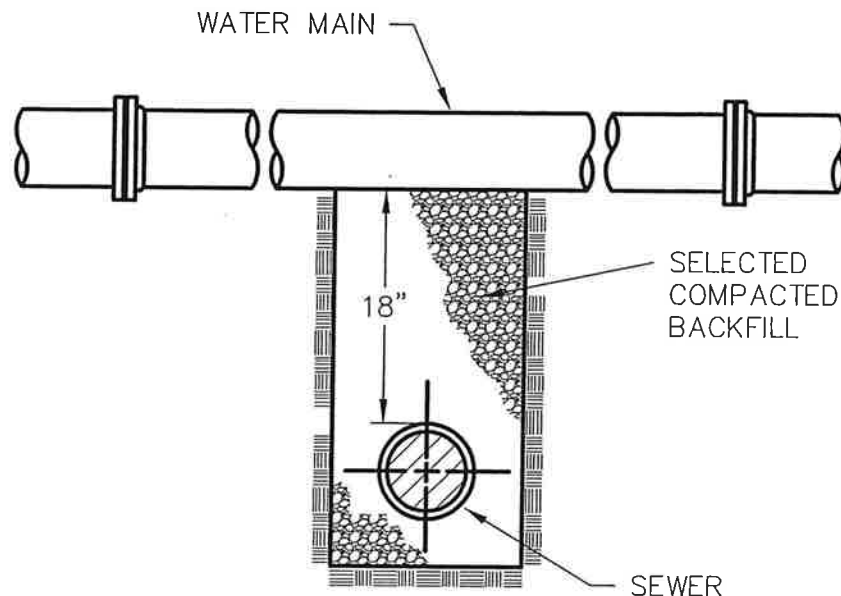
3.12 Basis of Payment

- A. No separate or additional compensation shall be received for surface restoration of vegetated areas as specified herein. All costs for surface restoration of vegetated areas shall be included in Contractor's unit or total contract price for work performed under this project. Unit prices as provided in the Bid Proposal shall be the basis of payment for restoration of asphalt surfaces, concrete surfaces, crushed aggregate, and rip rap erosion protection.
- B. Maximum removal/payment limits for asphalt, concrete driveway and aggregate surfaces for pipeline construction is 4 feet wide. Any removal, damage, or unraveling of existing paving materials beyond the designated removal/payment limits as stipulated in the contract documents as result of Contractor operations will be restored to comply with this specification by and at the Contractor's expense and without separate or additional compensation under the contract. Where actual removal/restoration is to a lesser extent than the limits stipulated herein, quantities for payment will be calculated on the basis of actual field surface measurements obtained by the Engineer's representative at the site.
- C. Costs for pavement sawcutting/removal, tack coating, bituminous primer coating, tools and equipment necessary or incidental thereto shall be included in the unit price for asphalt pavement removal and replacement with no additional compensation provided. All costs for concrete pavement cutting and reinforcement shall be included in the unit price for concrete surface restoration, with no additional compensation provided.

- D. No separate or additional payment shall be claimed or due the Contractor for installation/removal of special trench backfill temporarily applied to facilitate traffic, pending final surface restoration under this specification or complete reconstruction of damage to pavement structures beyond specified removal limits.
- E. Upon notice by the Owner or Engineer, the Contractor shall be required to reseed, regrade and/or topsoil disturbed areas in which revegetation has not been sufficiently reestablished to effect restoration in kind requirements. No additional compensation shall be provided to the Contractor for reseeding or additional work efforts required to reestablish vegetation cover in compliance with these specifications.
- F. The Contractor shall repair, regrade and restore any areas which have settled and/or do not match existing undisturbed surfaces, as determined by the Engineer. No additional compensation shall be provided to the Contractor for additional work efforts required to properly restore disturbed areas.
- G. If weather conditions permit, restoration work shall follow pipe laying operations within fourteen (14) days after backfilling and grading work is completed. The Owner reserves the right to withhold payment for pipeline installation, if the Contractor fails to expeditiously and properly restore disturbed areas in compliance with these specifications, as soon as possible after pipeline installation in that particular area. Upon written notice to the Contractor, the Owner reserves the right to deduct all associated costs from the contract amount for obtaining other outside contractors to complete restoration work in areas which have not been expeditiously and properly restored by the Contractor in compliance with these specifications.

* * * * *

DIVISION 3 – STANDARD DETAILS



VERTICAL SEPARATION:

WHENEVER SEWERS MUST CROSS UNDER WATER MAINS, THE SEWER SHALL BE LAID AT SUCH AN ELEVATION THAT THE TOP OD THE SEWER IS AT LEAST 18" BELOW THE BOTTOM OF THE WATER MAIN. WHEN THE ELEVATION OF THE SEWER CAN NOT BE CARIED TO MEET THE ABOVE REQUIREMENTS, THE WATER MAIN SHALL BE RELOCATED TO PROVIDE THIS SEPARATION, WITH MECHANICAL-JOINT PIPE FOR A DISTANCE OF 10 FEET EXTENDING ON EACH SIDE OF THE SEWER. ONE FULL LENGTH OF WATER MAIN SHOULD BE CENTERED OVER THE SEWER SO THAT BOTH JOINTS WILL BE AS FAR FROM THE SEWER AS POSSIBLE.

WHEN IT IS IMPOSSIBLE TO OBTAIN PROPER HORIZONTAL AND VERTICAL SEPARATION AS STIPULATED ABOVE, BOTH THE WATER MAIN AND SEWER SHOULD BE CONSTRUCTED OF MECHANICAL-JOINT CAST IRON PIPE AND SHOULD BE PRESSURE TESTED TO ASSURE WATER-TIGHTNESS.

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



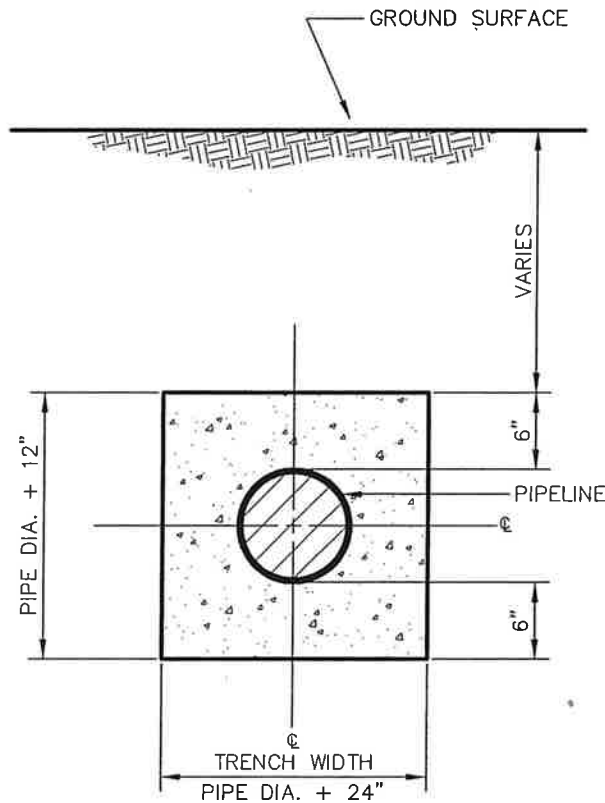
**CONSTRUCTION STANDARDS
STANDARD WATER~SEWER
CROSSING DETAIL**



Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heiengr.com

Revisions:

Drawing No:



PIPE ENCASEMENT DETAIL

NOT TO SCALE

NOTE: USE CLASS 'A' CONCRETE OR
BETTER FOR ALL ENCASEMENTS.
DO NOT BACKFILL WITHIN
24 HOURS AFTER CONCRETE
POUR.

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



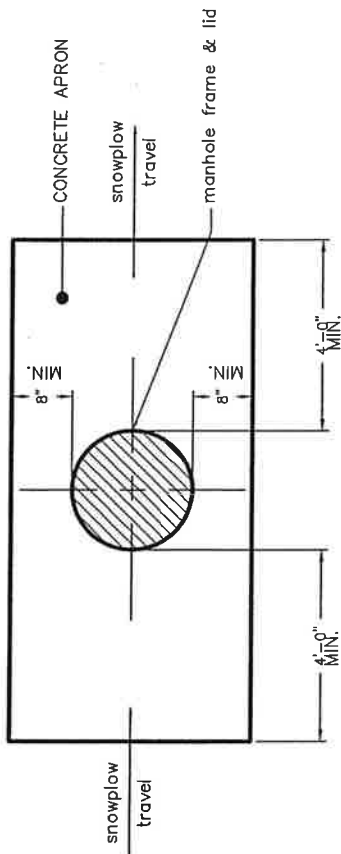
**CONSTRUCTION STANDARDS
CONCRETE ENCASEMENT
AT STREAM CROSSING**



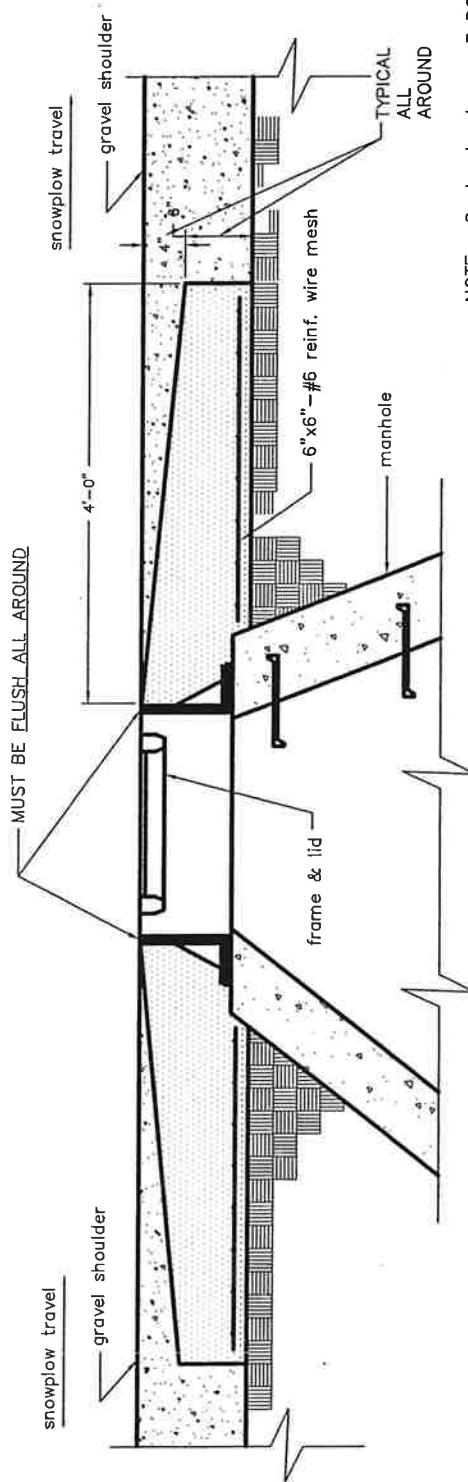
Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heiengr.com

Revisions:

Drawing No:



PLAN VIEW
NO SCALE



SECTION VIEW
NO SCALE

NOTE: Contractor to use PaDOT CLASS "AA" Entrained Air \geq 6% concrete for all aprons.

Summit Township
Sewer Authority

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495

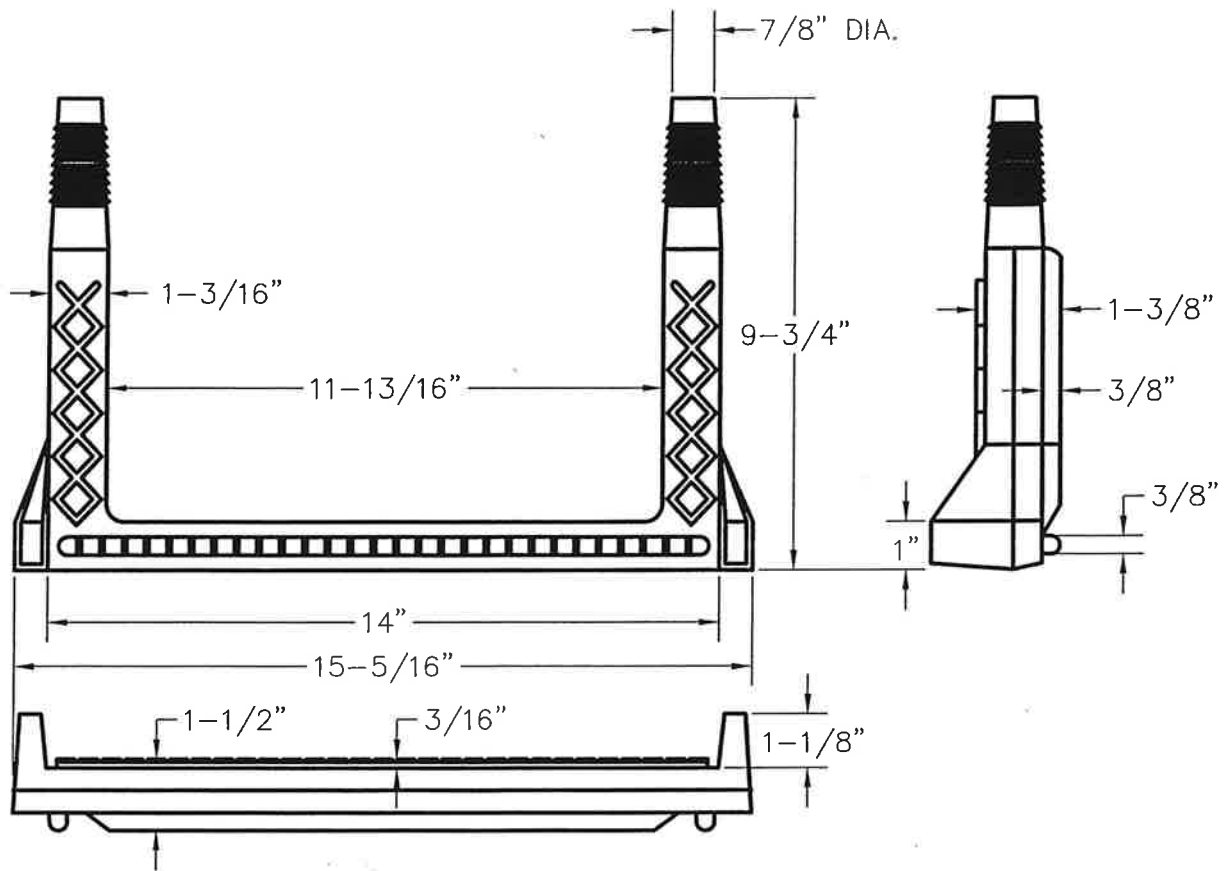


CONSTRUCTION STANDARDS
MANHOLE APRON
DETAIL

Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814) 725-9859 ~ hill@heingr.com

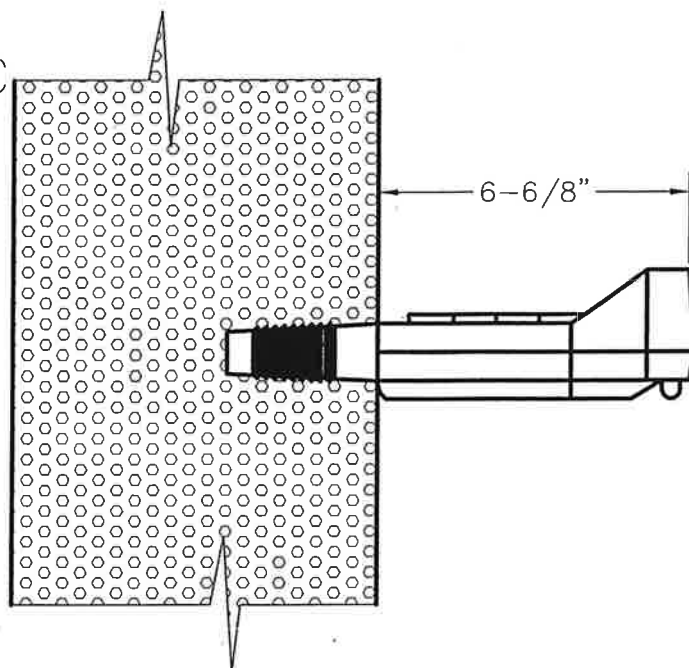
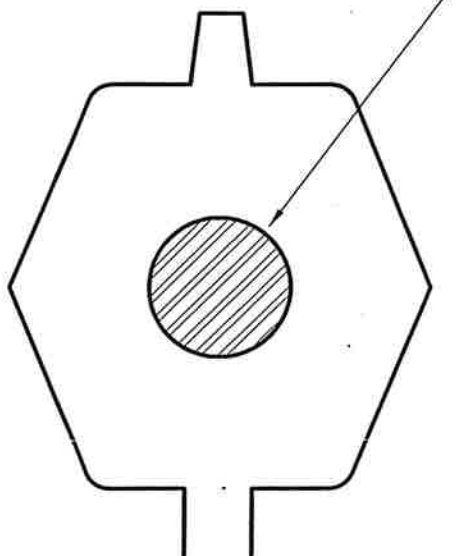
Revisions:

Drawing No:



Copolymer Polypropylene Plastic

NO.3 DEFORMED STEEL ROD



**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



**CONSTRUCTION STANDARDS
CONCRETE ENCASEMENT
AT STREAM CROSSING**



Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heiengr.com

Revisions:

Drawing No:

FRAME & SOLID COVER FOR MANHOLES SHALL BE "EAST JORDAN IRON WORKS, INC." #1975 OR APPROVED EQUAL

2" RAISED LETTERING ON COVER TO READ "SANITARY SEWER". REFER TO PLANS AND SPECIFICATIONS FOR WATERTIGHT MH COVERS.

PORTLAND CEMENT EXCEPT IN PAVEMENT

CONCRETE LEVELING RINGS BONDED BETWEEN INSIDE & OUTSIDE WITH 1/2" MIN. MORTAR. MIN. 4" AND MAX. 8" HEIGHT ADJUSTMENT

MANHOLE INSERTS TO BE MAN-PAN

PRECAST ECCENTRIC TAPER TOP (ASTM-C478) ADDITIONAL TRANSITION PIECE(S) REQUIRED FOR MANHOLES 5' I.D. AND LARGER

COMPACTED BACKFILL

STEEL REINFORCED POLYPROPYLENE MANHOLE STEPS OR APPR'D. EQUAL

PRECAST MANHOLE RISERS (ASTM-C478) AS REQUIRED SPIGOT END DOWN

EXTERNAL JOINT SEALS "MAC WRAPS" TO BE CRETEX SPECIALTY PRODUCTS

DURA-SEAL III OR APPROVED EQUAL REQUIRED FOR PRECAST HOLES; GROUT WITH WATERPLUG OR APPROVED EQUAL AROUND OUTSIDE OF SEAL

PRECAST CONCRETE MANHOLE MONOBASE (ASTM-C478)

RIM ELEVATION AS SHOWN ON PLAN

FINISHED GRADE

THE TOP SECTION HAS BEEN ROTATED 90° FOR CLARITY

DOUBLE TAR STRIP JOINT PER SPECS.

GROUT INSIDE & OUTSIDE OF JOINT WITH NON-SHRINKING MORTAR

COMPACTED BACKFILL SHALL BE:

1. **PennDOT** (Ditchline to Pavement & Drives = **2A CRUSHED STONE**)
2. **TOWNSHIP** (Ditchline to Pavement) = **B19**
3. **LAWN AREA** = **SUITABLE RETAINED**

SEE PLAN FOR INVERT ELEVATION

PROVIDE 4' DIA. M.H. IF NOT OTHERWISE INDICATED ON PLANS.

FILLET: USE CLASS A CONCRETE, SLOPE 2" PER FT. EACH SIDE

12" AASHTO NO. 8 BEDDING

1/2 PIPE FORMED FLOW TROUGH

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495

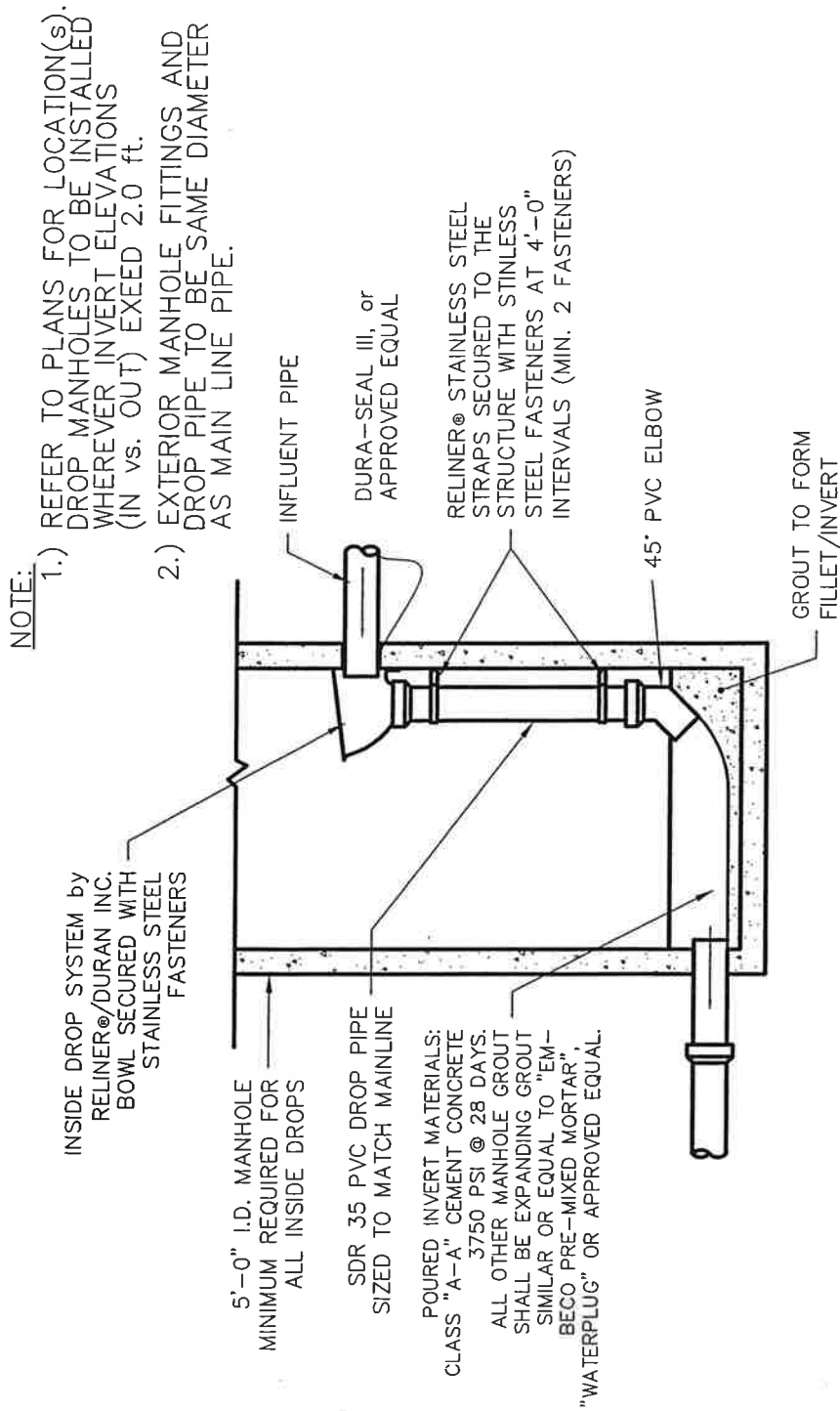


**CONSTRUCTION STANDARDS
MANHOLE APRON
DETAIL**

Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@helegr.com

Revisions:

Drawing No:



**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495

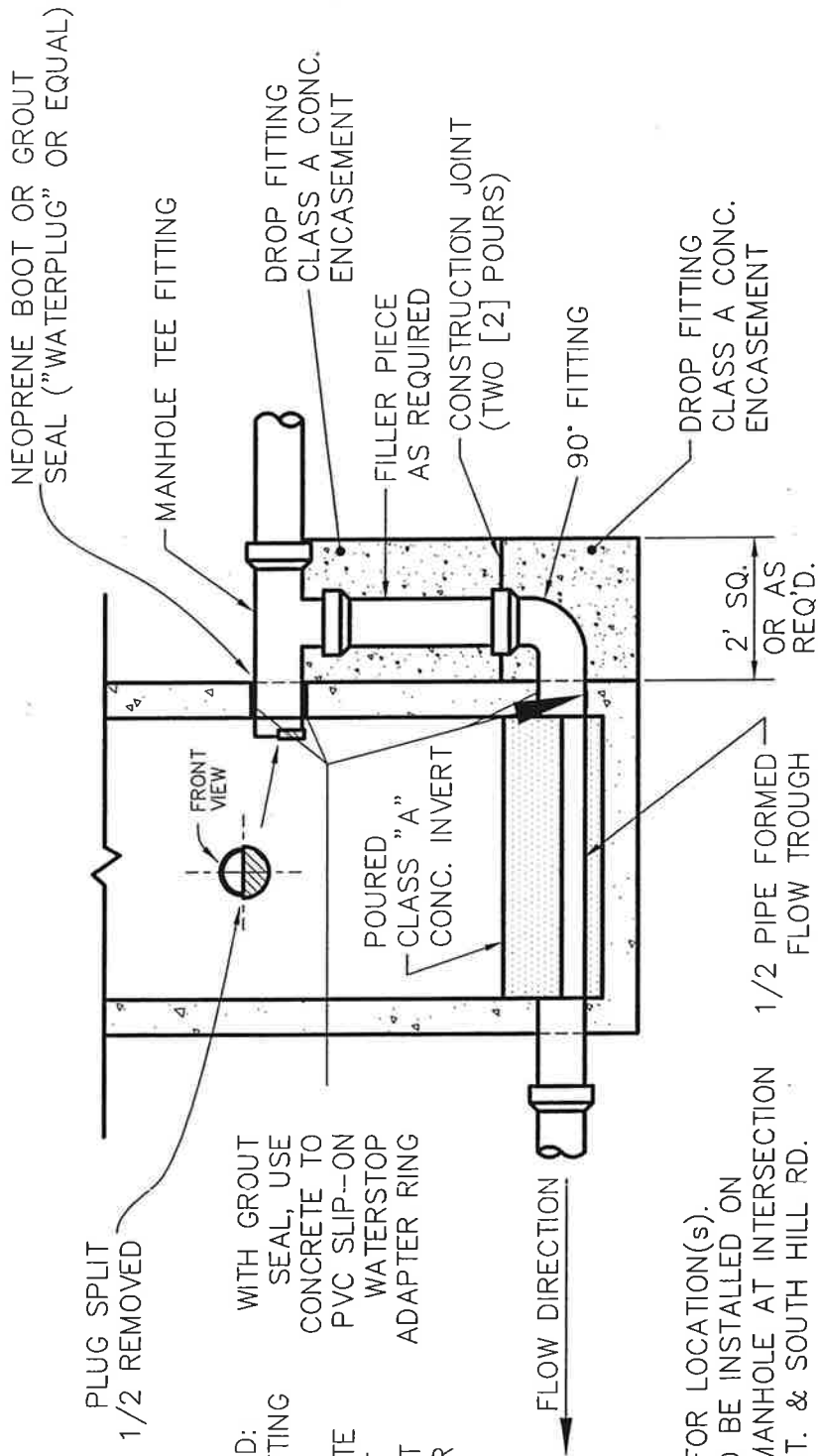


**CONSTRUCTION STANDARDS
INSIDE DROP
MANHOLE CONNECTION**

Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814) 725-8859 ~ hill@heengr.com

Revisions:

Drawing No:



UNLESS OTHERWISE SPECIFIED:
POURED INVERT & DROP FITTING
ENCASEMENT MATERIALS:
CLASS "A" CEMENT CONCRETE
ALL OTHER MANHOLE GROUT
SHALL BE NO SHRINK GROUT
SIMILAR TO "WATERPLUG" OR
APPROVED EQUAL.

NOTE:

- 1.) REFER TO PLANS FOR LOCATION(S).
OUTSIDE DROPS TO BE INSTALLED ON
Exist. AUTHORITY MANHOLE AT INTERSECTION
OF CHERRY ST. EXT. & SOUTH HILL RD.
- 2.) EXTERIOR MANHOLE FITTINGS AND
DROP PIPE TO BE SAME DIAMETER
AS MAIN LINE PIPE.

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495

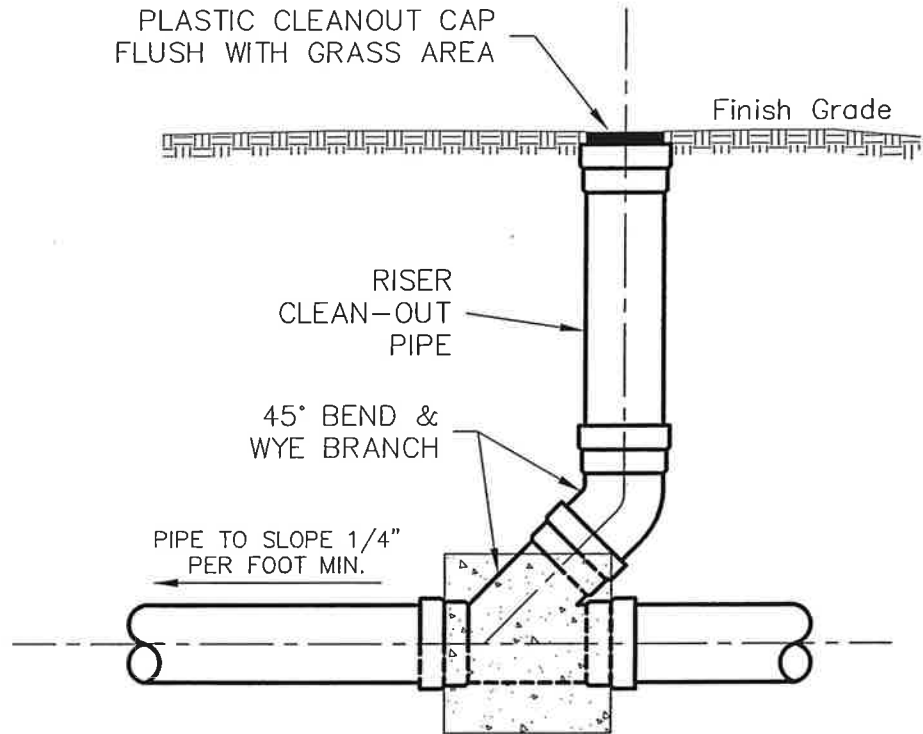


**CONSTRUCTION STANDARDS
OUTSIDE DROP
MANHOLE CONNECTION**

Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)726-8659 ~ hill@heengr.com

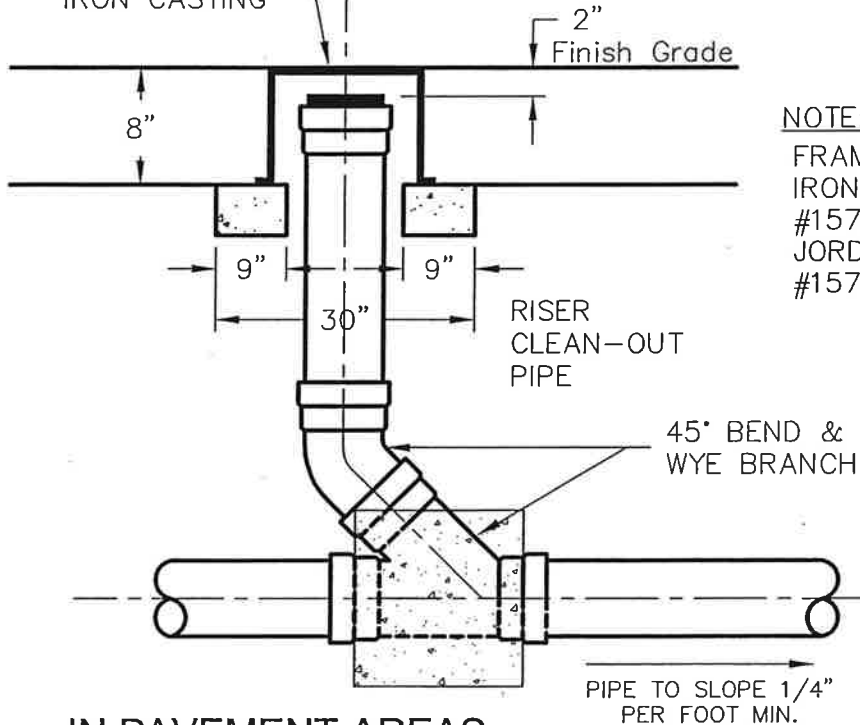
Revisions:

Drawing No:



IN GRASS AREAS

PLASTIC CLEANOUT CAP
UNDER H2O TRAFFIC
LOADING WATER TIGHT
IRON CASTING



IN PAVEMENT AREAS

NOTE:

FRAME TO BE EAST JORDAN
IRON WORKS PRODUCT
#157410; LID TO BE EAST
JORDAN IRON WORKS PRODUCT
#157421 OR APPROVED EQUAL

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



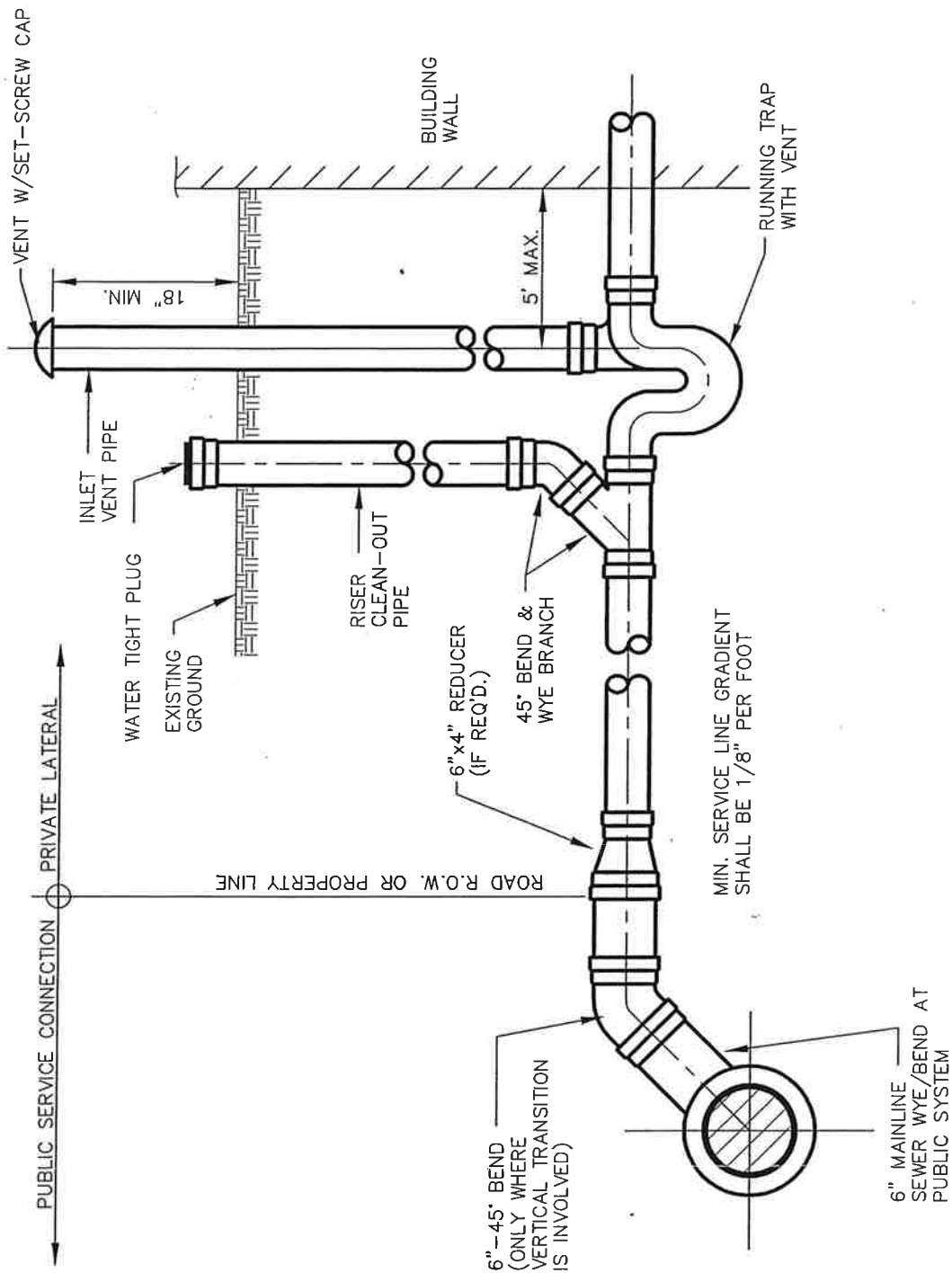
**CONSTRUCTION STANDARDS
SANITARY CLEANOUT FOR
6" LATERAL**



Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heiengr.com

Revisions:

Drawing No:



**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495

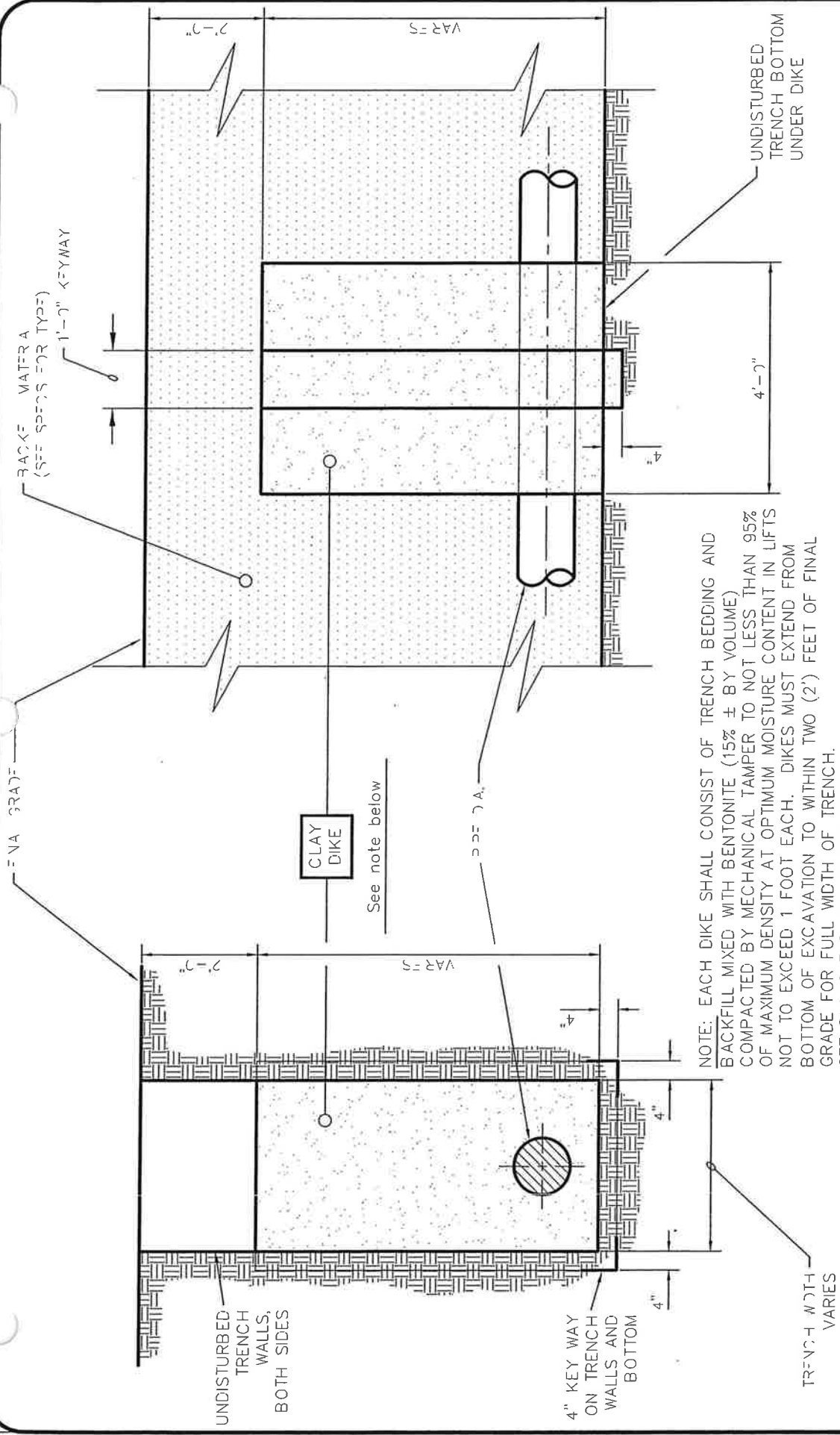


**CONSTRUCTION STANDARDS
POURED INVERT & GROUTING
FOR MONOBASE MANHOLES**

Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814) 725-8659 ~ hill@heingr.com

Revisions:

Drawing No:



NOTE: EACH DIKE SHALL CONSIST OF TRENCH BEDDING AND BACKFILL MIXED WITH BENTONITE (15% ± BY VOLUME) COMPACTED BY MECHANICAL TAMPER TO NOT LESS THAN 95% OF MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT IN LIFTS NOT TO EXCEED 1 FOOT EACH. DIKES MUST EXTEND FROM BOTTOM OF EXCAVATION TO WITHIN TWO (2') FEET OF FINAL GRADE FOR FULL WIDTH OF TRENCH. SEE PLANS FOR DIKE LOCATIONS.

FRONT ELEVATION
No Scale

SIDE ELEVATION
No Scale

**Summit Township
Sewer Authority**
Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495

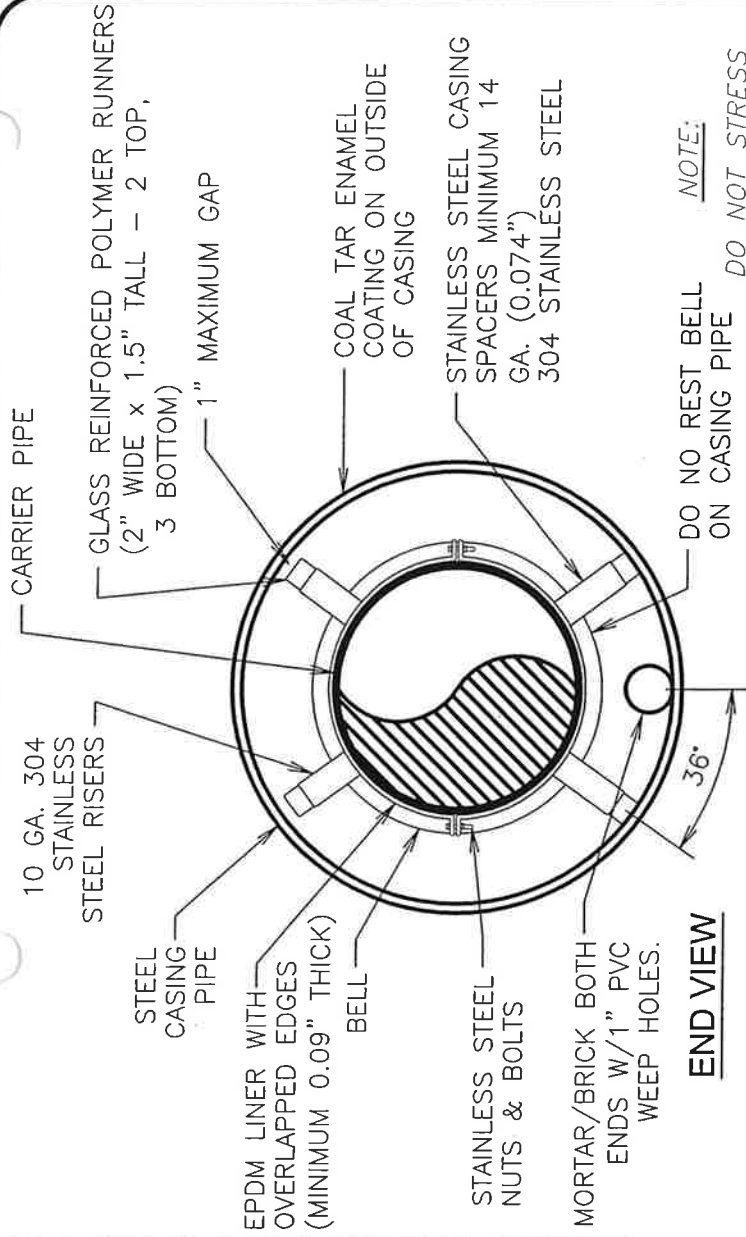
CONSTRUCTION STANDARDS
**CLAY DIKE
DETAIL**

Revisions:

Drawing No:

Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814) 725-8659 ~ hill@heingr.com

NOMINAL INSIDE DIAMETER (inches)	WHEN COATED NOMINAL THICKNESS (inches)	WHEN NOT COATED NOMINAL THICKNESS (inches)
18 and under	0.250	0.312
20 and 22	0.281	0.344
24	0.312	0.375
26	0.344	0.406
28	0.375	0.438
30	0.406	0.469
32	0.438	0.500
34 and 36	0.469	0.531
38	0.500	0.562
40	0.531	0.594
42	0.562	0.625
44 and 46	0.594	0.656
48	0.625	0.688



NOTE:

DO NOT STRESS
CARRIER PIPE BY
OVER TIGHTENING
SPACERS.

END VIEW

STAINLESS STEEL CASING
SPACERS (MINIMUM 3
PER SECTION OF PIPE) AS
PER SECTION OF PIPE) AS
MANUFACTURED BY CASCADE
WATERWORKS MANUFACTURING
COMPANY OR APPROVE
EQUAL(SEE SPECS)

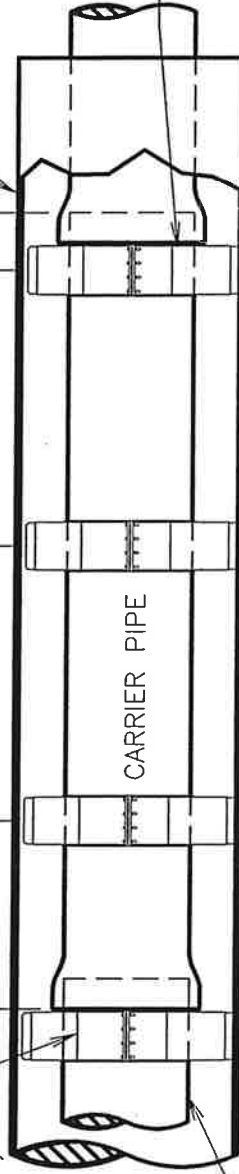
20 LF OF 6" DIA. C-900 PVC PIPE

3'-7 1/2"

8'-0"

8'-0"

STEEL
CASING PIPE



SIDE VIEW

CARRIER PIPE

SPACERS @ SPOT
END OF PIPE
TO BE PLACED
@ EDGE OF STOP/HOME
MARK ON PIPE

Summit Township
Sewer Authority

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



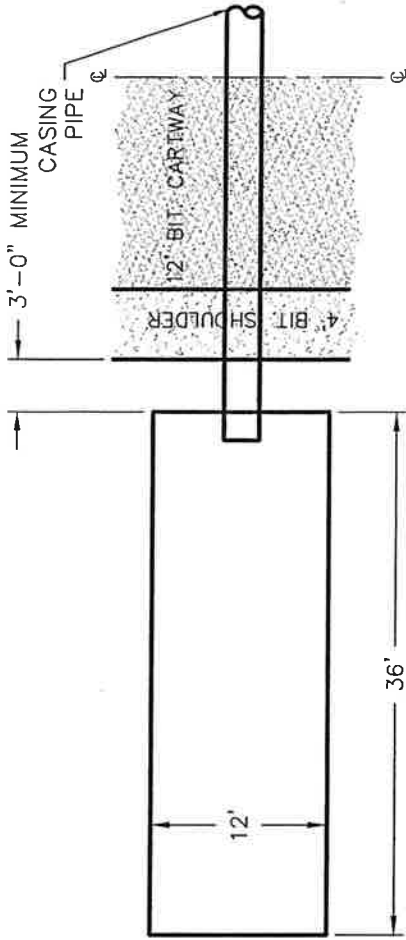
CONSTRUCTION STANDARDS
CASING PIPE INSTALLATION
DETAIL

Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heingr.com

Drawing No:

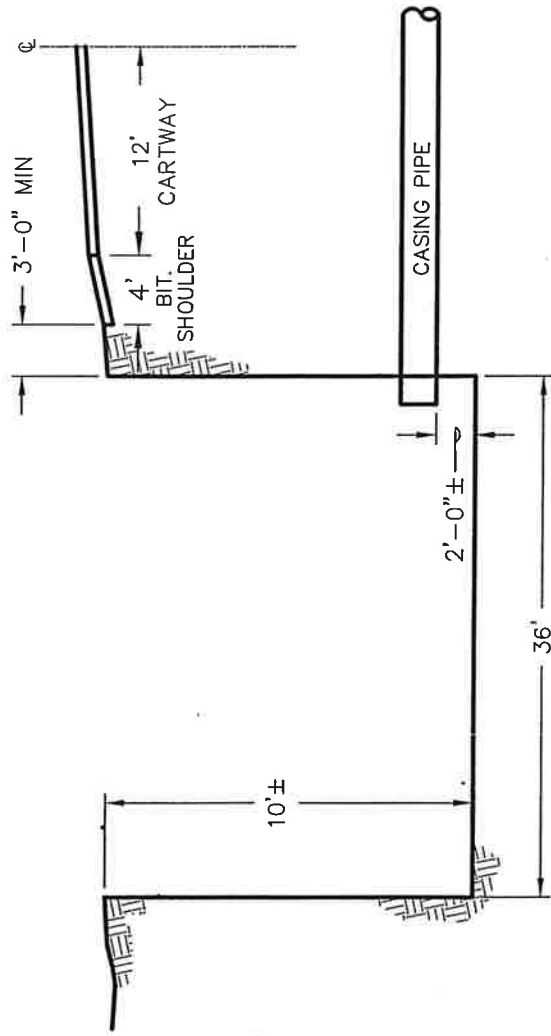
Revisions:

PLAN



NOTE:
CONTRACTOR TO INSTALL
STRUCTURAL SHEETING AND
BRACING AROUND BORE PIT TO
ADEQUATELY SHORE ALL
VERTICAL WALL FACES.

PROFILE



**Summit Township
Sewer Authority**
Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495

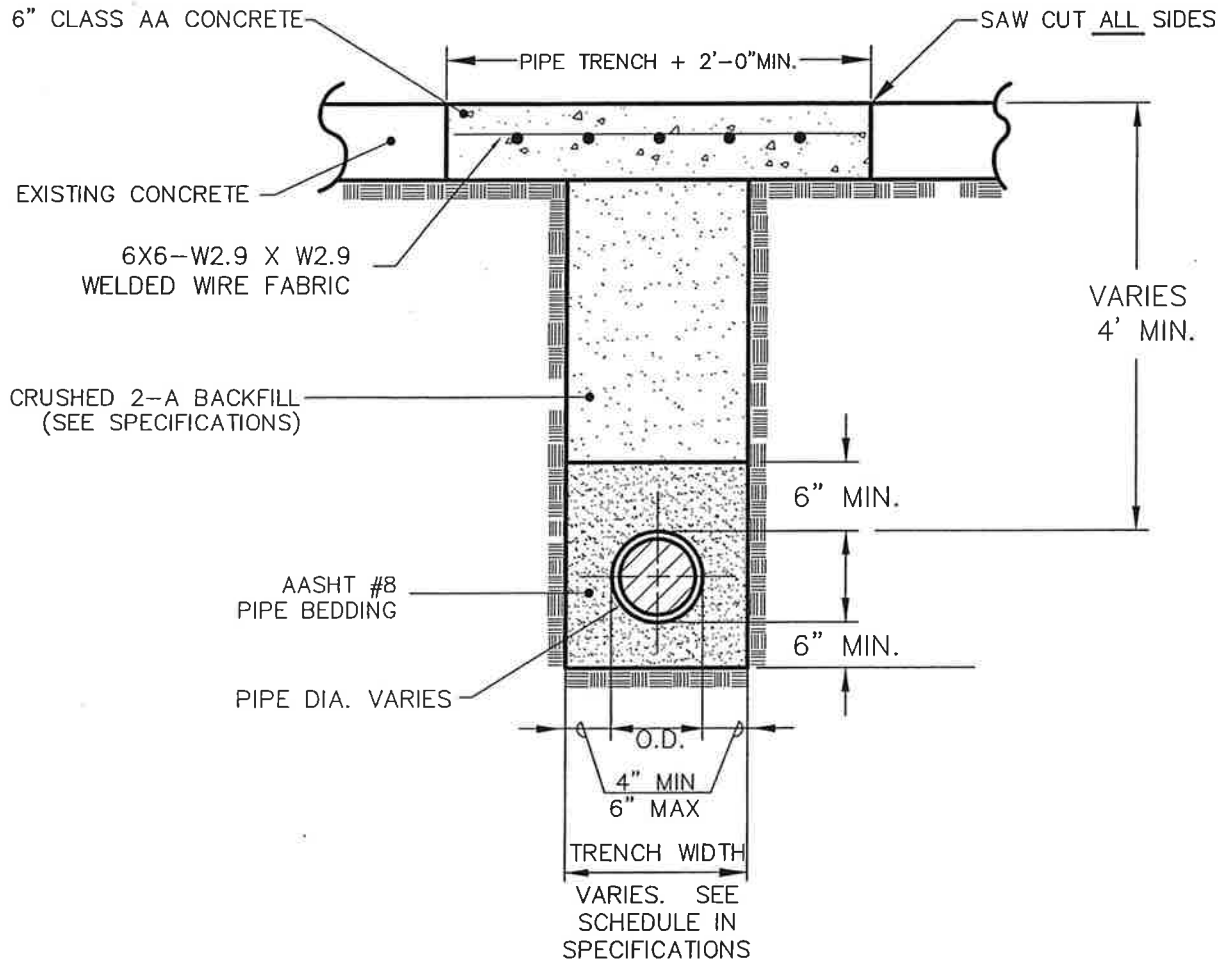


**CONSTRUCTION STANDARDS
BORE PIT PLAN & SECTION
DETAIL**

Revisions:
Drawing No:
Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heingr.com

NOTE:

RESTORATION SHALL MEET MINIMUM DETAIL REQUIREMENTS AS SHOWN, OR "IN KIND"—FIELD CONDITIONS, WHICHEVER IS GREATER.



MINIMUM CONSTRUCTION & RESTORATION DETAIL
FOR
TRENCHING AND/OR SURFACE EXCAVATIONS
IN CONCRETE DRIVEWAYS

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



**CONSTRUCTION STANDARDS
TRENCH DETAIL IN
CONCRETE SURFACES**



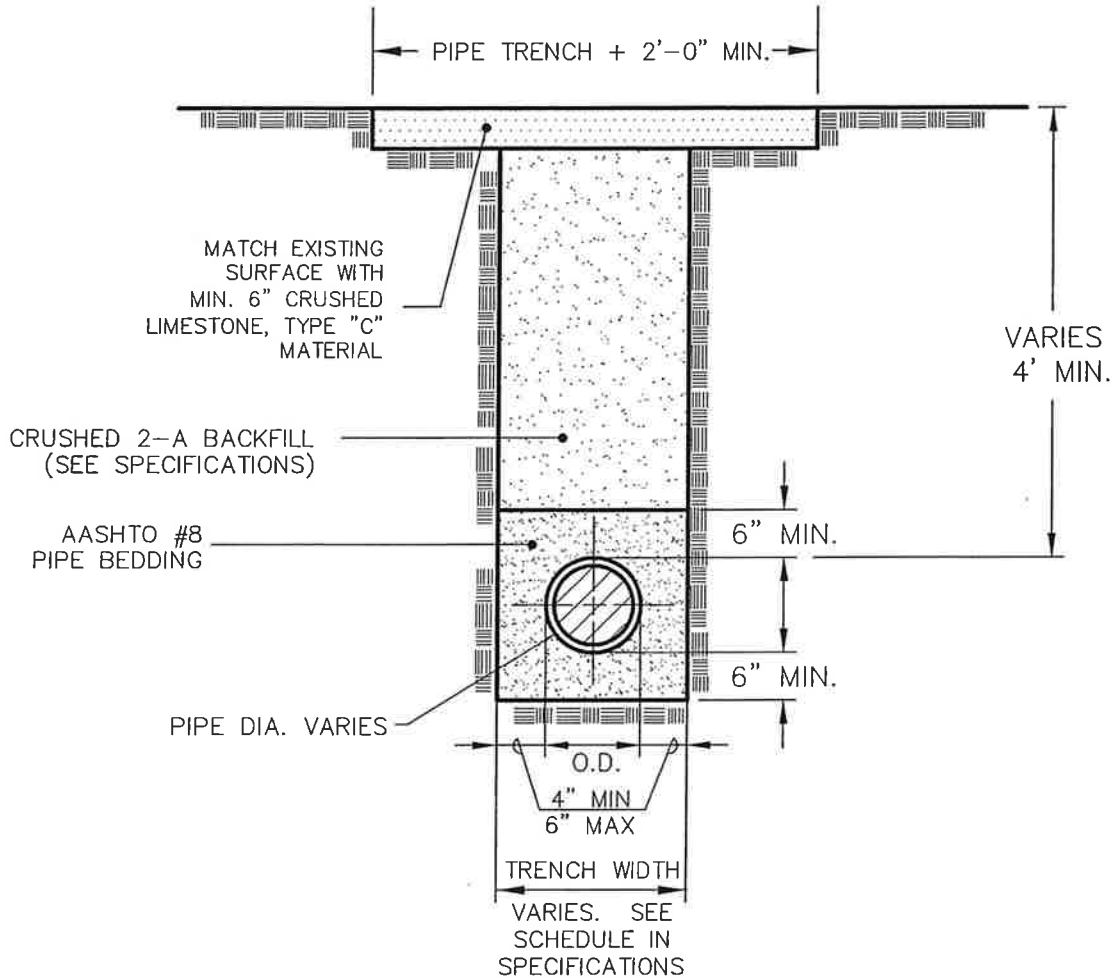
Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heiengr.com

Revisions:

Drawing No:

NOTE:

RESTORATION SHALL MEET MINIMUM DETAIL REQUIREMENTS AS SHOWN, OR "IN KIND" – FIELD CONDITIONS, WHICHEVER IS GREATER.



MINIMUM CONSTRUCTION & RESTORATION DETAIL
FOR
TRENCHING AND/OR SURFACE EXCAVATIONS
IN
CARTWAYS HAVING EXISTING GRAVEL SURFACE &
STABILIZED PaDOT GRAVEL SHOULDERS

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



**CONSTRUCTION STANDARDS
TRENCH DETAIL IN
GRAVEL SURFACES**



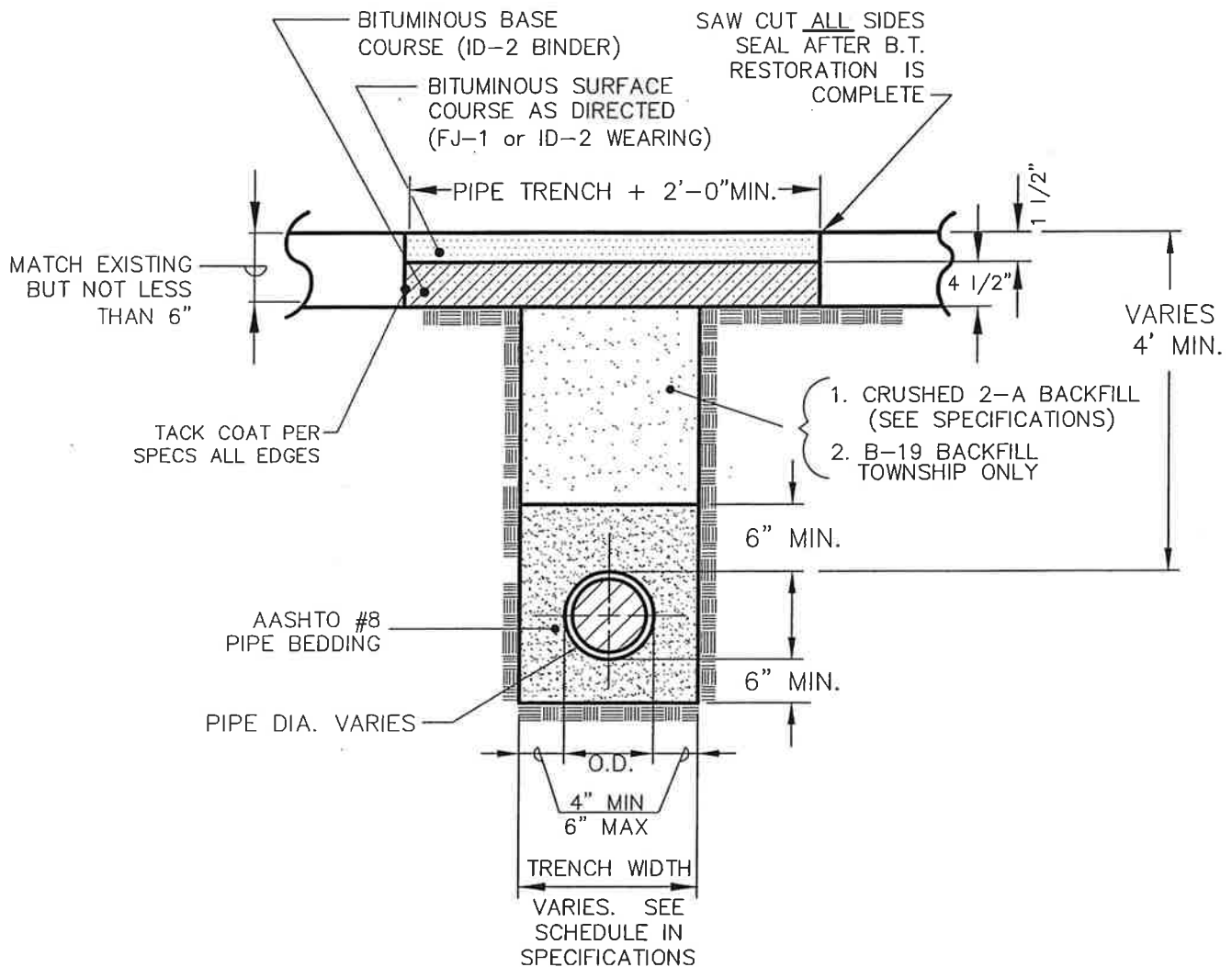
Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heingr.com

Revisions:

Drawing No:

NOTE:

RESTORATION SHALL MEET MINIMUM DETAIL REQUIREMENTS AS SHOWN, OR "IN KIND"—FIELD CONDITIONS, WHICHEVER IS GREATER.



MINIMUM CONSTRUCTION & RESTORATION DETAIL
FOR
TRENCHING AND/OR SURFACE EXCAVATIONS
IN

CARTWAYS & SHOULDERS HAVING EXISTING BITUMINOUS SURFACES
(FOR ALL PAVED DRIVEWAY CROSSINGS, TOWNSHIP, & STATE ROADS)

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



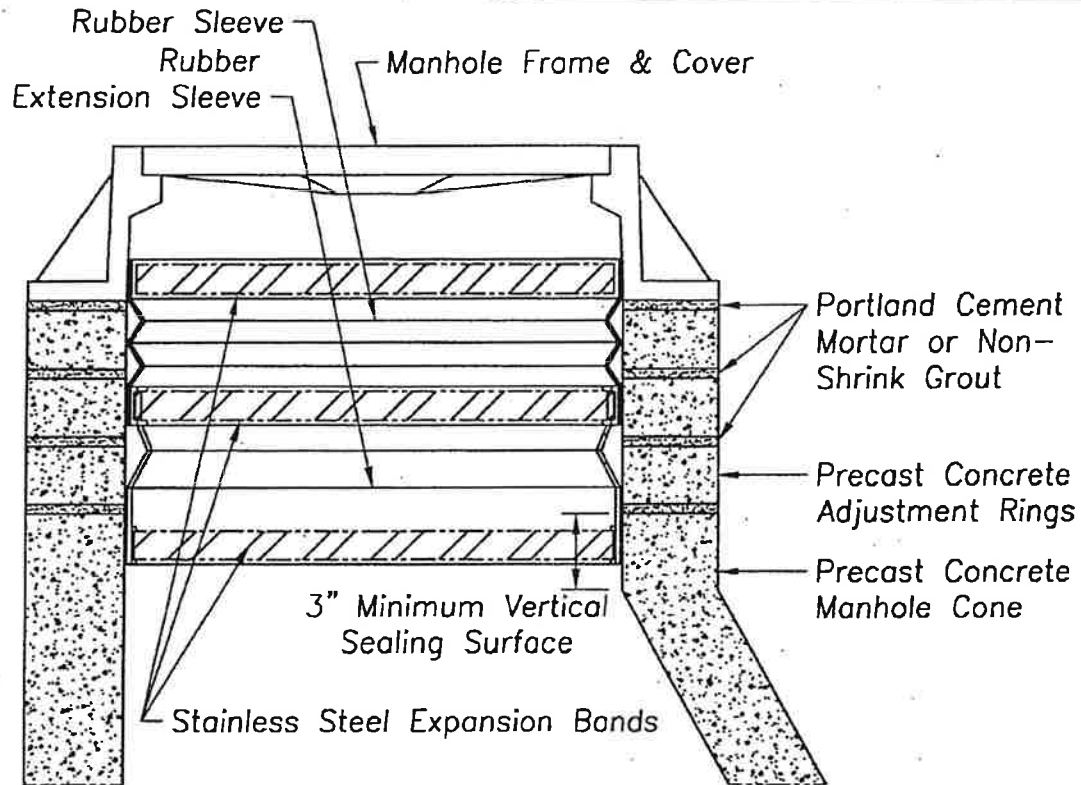
**CONSTRUCTION STANDARDS
TRENCH DETAIL IN
BITUMINOUS SURFACES**



Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heincgr.com

Revisions:

Drawing No:



PRECAST MANHOLE WITH INTERNAL SEAL

1. The rubber sleeve is available in heights of 8.5" (Standard) a 10" (Wide) & a 13" (Extra Wide). The same expansion bands are used on all three.
2. See the chimney height table below for seal and extension combinations needed to span from the frame to the top of the cone on manholes with various chimney heights. Frame offsets or diameter differentials will reduce these span heights.
3. The top of the cone shall have a minimum of 3" high vertical sealing surface that is smooth and free of any form offsets or excessive honeycomb.

CHIMNEY HEIGHT TABLE

COMBINATIONS OF SEALS AND EXTENSIONS	TO SPAN HEIGHTS OF:		
	W/ STANDARD SEAL	W/ WIDE SEAL	W/ EXTRA WIDE SEAL
Seal Only	0" to 4.5"	2" to 7.5"	6" to 12"
Seal + 7" Extension	Over 4.5" - 10.5"	Over 7.5" - 13.5"	Over 12" - 18"
Seal + 10" Extension	Over 10.5" - 13"	Over 13.5" - 16"	Over 18" - 20.5"
Seal + Multi Extensions	Over 13"	Over 16"	Over 20.5"
Add 6" of coverage for each additional 7" Extension.			
Add 8.5" of coverage for each additional 10" Extension.			

A CRETEX SPECIALTY PRODUCT

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



**CONSTRUCTION STANDARDS
INTERNAL MANHOLE
CHIMNEY SEAL DETAIL**

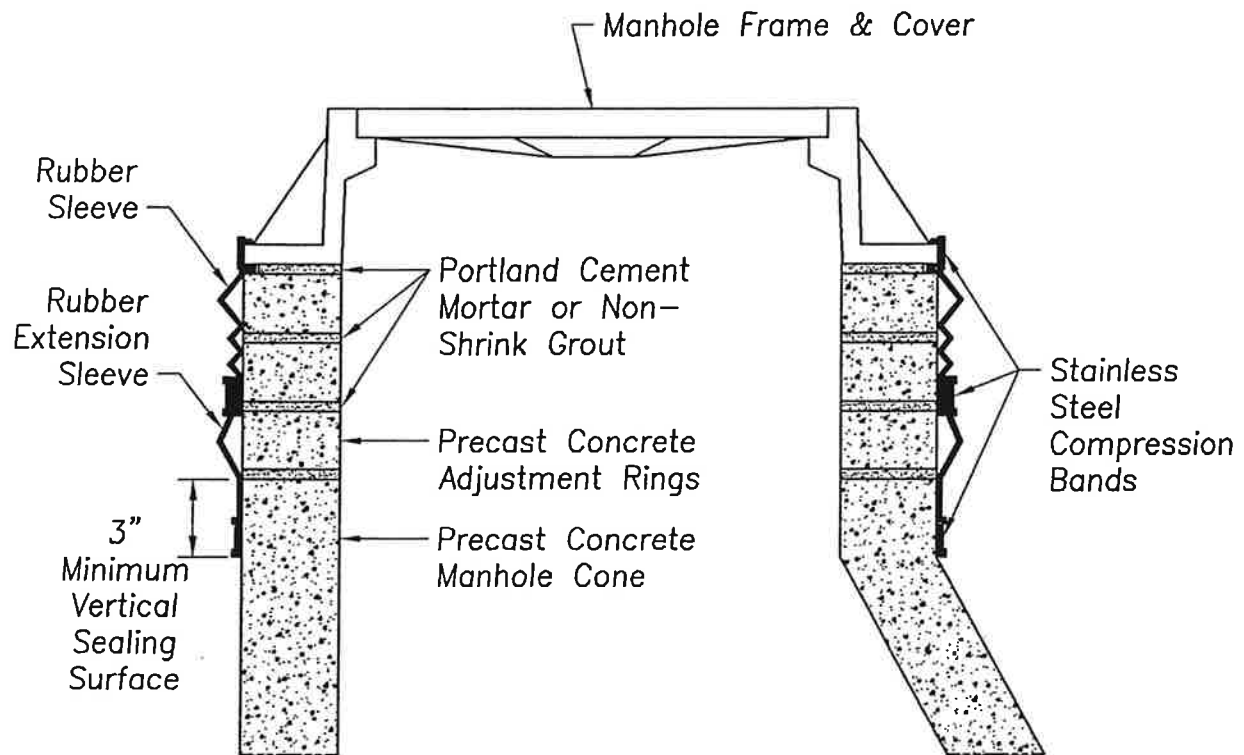


Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heingr.com

Revisions:

Drawing No:

--



PRECAST MANHOLE WITH EXTERNAL SEAL

1. The rubber sleeve is available in heights of 9" (Standard) and 6" (Narrow).
2. See the chimney height table below for seal and extension combinations needed to span from the frame to the top of the cone on manholes with various chimney heights. Frame offsets or diameter differentials will reduce these span heights.
3. The top of the cone shall have a minimum of 3" high vertical sealing surface that is smooth and free of any form offsets or excessive honeycomb.

CHIMNEY HEIGHT TABLE

COMBINATIONS OF SEALS AND EXTENSIONS	TO SPAN HEIGHTS OF:
Narrow 6" Only	0" to 3"
Standard 9" Only	Over 3" - 6.5"
Standard Seal + Extension	Over 6.5" - 13.5"
Standard Seal + Multi Extensions	Over 13.5"
Add 7" of coverage for each additional Extension.	

A CRETEX SPECIALTY PRODUCT

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



**CONSTRUCTION STANDARDS
EXTERNAL MANHOLE
JOINT WRAP DETAIL**

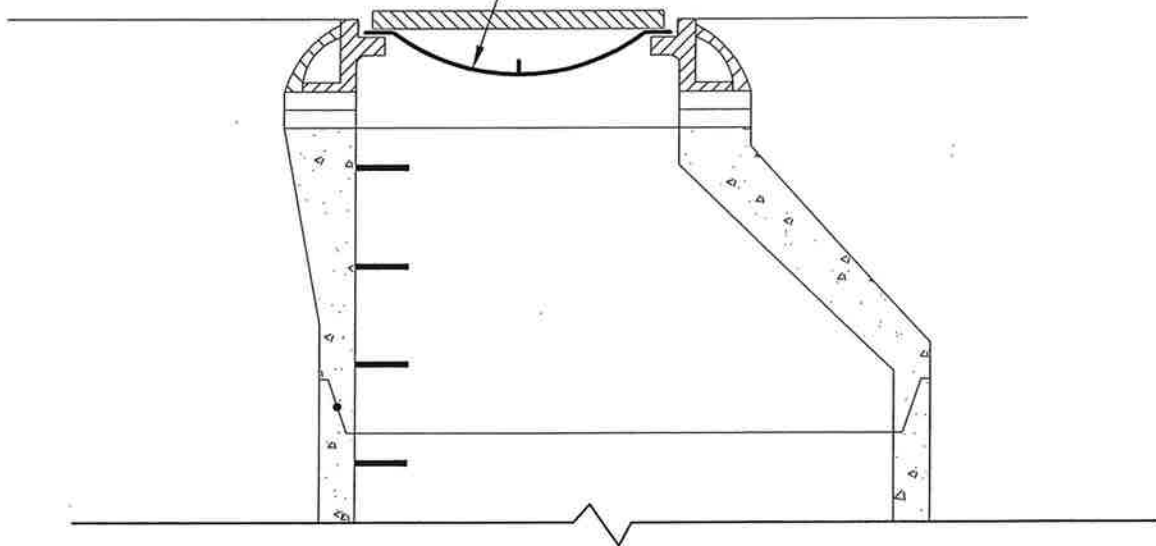


Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heingr.com

Revisions:

Drawing No:

MANHOLE WATERTIGHT INSERT
MAN-PAN OR APPROVED EQUAL



**Summit Township
 Sewer Authority**
 Erie County, Pennsylvania
 8890 Old French Road
 Erie, PA 16509-5459
 814-868-4495



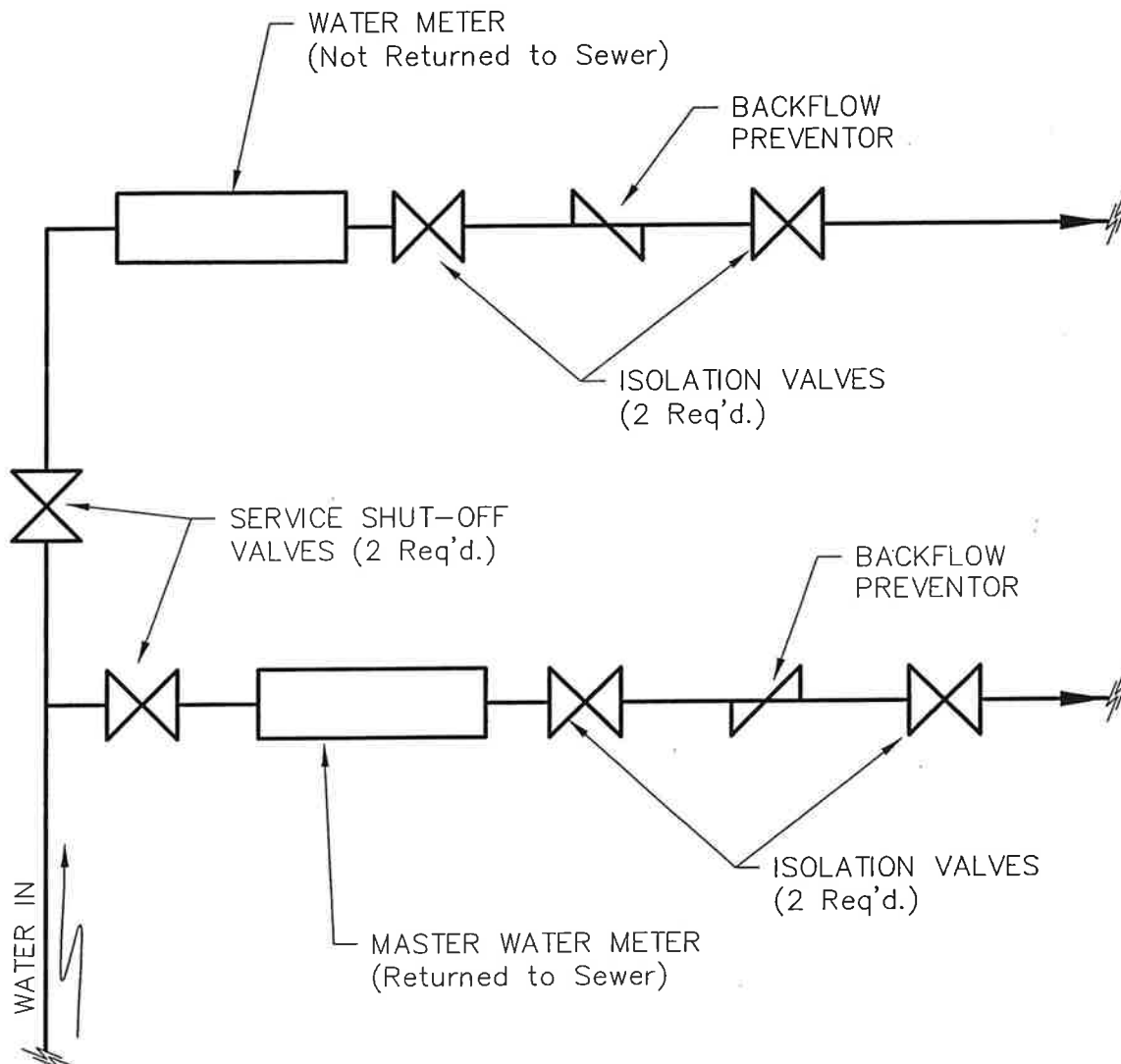
CONSTRUCTION STANDARDS
MANHOLE LID
WATERTIGHT INSERT



Hill Engineering, Inc.
 8 Gibson Street - North East, Pennsylvania
 (814)725-8659 ~ hill@heiengr.com

Revisions:

Drawing No:



**COMMERCIAL/INDUSTRIAL
ISOLATION METERINGS
W/O SUBTRACT METER**

**Summit Township
Sewer Authority**

Erie County, Pennsylvania
8890 Old French Road
Erie, PA 16509-5459
814-868-4495



**CONSTRUCTION STANDARDS
COMMERCIAL/INDUSTRIAL
ISOLATION METERINGS**



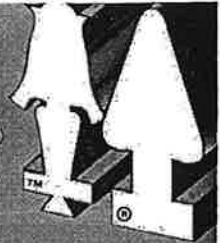
Hill Engineering, Inc.
8 Gibson Street - North East, Pennsylvania
(814)725-8659 ~ hill@heiengr.com

Revisions:

Drawing No:



The Company With Connections®



PIPE TO MANHOLE CONNECTOR FOR SANITARY SYSTEMS

Z•LOK CAST IN BOOT CONNECTOR

Z•LOK PIPE TO MANHOLE CONNECTOR

The **Z•LOK Pipe to Manhole Connector** is a flexible connector specifically engineered to produce a positive watertight seal for pipes entering precast concrete structures and the structure itself. Its heavier wall is designed to provide the highest performance. The **Z•LOK CONNECTOR** is manufactured to meet or exceed the requirements set forth in ASTM C-923-00 titled *"Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals"*.



MATERIAL

The **Z•LOK CONNECTOR** is molded from an EPDM compound engineered to conform with the requirements of section 4.1.1 of ASTM C-923-00. Alternative compounds are available for unusual applications upon special order.

All stainless steel hardware is in compliance with section 4.2, *"Mechanical Devices"* of ASTM C-923-00.

KEY ADVANTAGES

The **Z•LOK CONNECTOR** assures a positive watertight connection and provides up to 25° of omnidirectional deflection and 1.50" of vertical or horizontal movement without loss of seal, providing greater flexibility in the design and installation of pipelines and structures. These design features of the **Z•LOK CONNECTOR** prevent infiltration due to shear caused by settlement or ground movement.

The inner rubber O-ring design eliminates rubber wrinkling, compensates for pipe irregularity and wall thickness insuring a watertight seal.

The unique bi-directional design, permits the **Z•LOK CONNECTOR** take-down clamp to be fastened from either the inside or outside of the structure. Once fastened, immediate backfilling is possible enhancing project safety and overcomes the normal problems encountered with water, running sand and other unstable trench conditions.

When casting the **Z•LOK CONNECTOR** into the structure, making it an integral part of the wall, 50% of the opportunity for infiltration is eliminated.

PRODUCT REFERENCES

A.) ASTM C-923-00

Resilient Connector Between Reinforced Concrete Manholes Structures, Pipe and Laterals.

B.) ASTM C-1244-00

Standard Test Method For Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test

C.) ASTM C-478C

Standard Specification for Precast Reinforced Concrete Manhole Sections

PERFORMANCE STANDARD

The **Z•LOK Connector** meets or exceeds all material and test requirements of ASTM C-923-00: *"Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals"*.

See following chart:

RESILIENT TEST REQUIREMENTS OF A.S.T.M. C-923-00

TEST	RESULTS	ASTM METHOD
Chemical resistance 1 N Sulfuric acid 1 N Hydrochloric Acid	no weight loss no weight loss	at 22°C for 48h
Tensile strength	1200 psi or 8.5 MPa, min	D 412
Elongation at break	350% min.	
Hardness	±5 from mfg's. specified hardness	D 2240 (Shore A durometer)
Accelerated oven-aging	decr. of 15%, max. of original tensile strength, decr. of 20% max. of elongation	D 573, 70±1°C for 7 days
Compression set	decr. of 25%, max. of original deflection	D 395, Method B, at 70°C for 22h
Water absorption	increase of 10%, max. of original by weight	D 471, immerse 0.75 by 2-in. or 19 by 25-mm Specimen in distilled water at 70°C for 48h
Ozone resistance	rating 0	D 1171
Low-temp brittle point	no fracture at -40°C	D 746
Tear resistance	200 lbf/in. or 34 kn/m	D 624, Method B

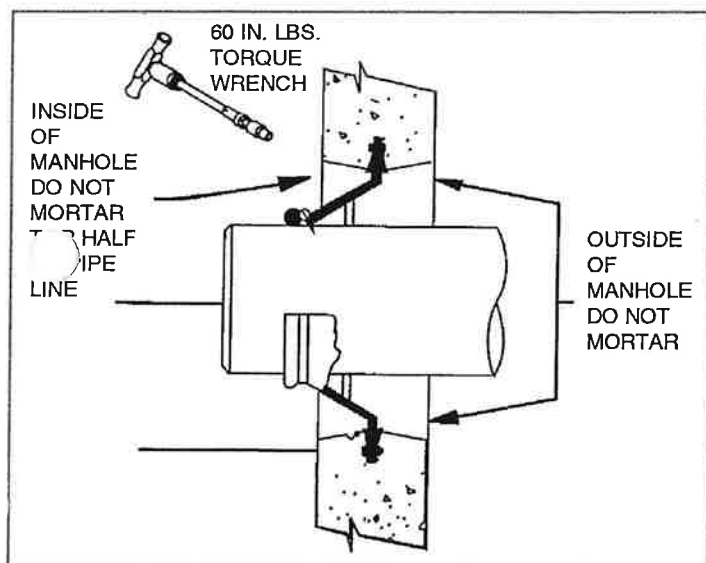
Copyright ASTM INTERNATIONAL. Reprinted with permission

PART 6 • DIMENSIONAL DATA

Z-LOK RING NO.	PIPE O.D. MIN.	INCHES MAX.	CLAMP NUMBER
C107-1	1.25"	1.75"	CL-040
C107-2	2.00"	2.50"	CL-040
C107-3	2.75"	3.75"	CL-088
C107-4	4.25"	6.25"	CL-128
C107-6	6.25"	8.25"	CL-128
F208-8	8.25"	9.10"	CL-152
C107-8	8.25"	10.25"	CL-188
C107-10	10.25"	12.25"	CL-188
C107-12	12.25"	14.25"	CL-248
C107-15	14.25"	16.00"	CL-EV15-18-L
C107-16	16.25"	18.00"	CL-EV15-18-L
C107-18	18.25"	21.25"	CL-EV15-18-L

NOTE:

- F208-8 GASKET CAN BE USED ON C107-6 MANDREL
- WHEN ORDERING CLAMPS, PIPE OD'S ARE REQUIRED
- C107-1 AND C107-2 USE THE SAME MANDREL
- C107-16 AND C107-18 USE THE SAME MANDREL
- REDI-LOK CLAMP IS REQUIRED FOR C107-15 THROUGH C107-18 GASKETS



WARNING: To ensure the Z-LOK Connector remains a flexible watertight connector, it is A•LOK Products, Inc. strong recommendation that no mortar be placed between the pipe and wall of the concrete structure. The use of mortar in this area would decrease the effectiveness of the connector to compensate for shear caused by settlement or ground movement.

NOTE: The 60 in.-lb. Torque Wrench is available through A•LOK Products, Inc.

CAUTION: When installing pipe stubs for future pipeline installation, all stubs must be properly restrained to prevent any movement by means other than the Z-LOK Connector.

ANY QUESTIONS REGARDING Z-LOK CONNECTOR, PLEASE CALL 1-800-822-2565

PRODUCT SPECIFICATIONS

A flexible pipe to manhole connector shall be used whenever a pipe penetrates into a precast concrete manhole or structure.

The connector shall be the **Z•LOK CONNECTOR** as manufactured by **A•LOK PRODUCTS, INC.**, Tullytown, PA, or approved equal.

The design of the connector shall provide a flexible, watertight seal between the pipe and concrete structure. The connector shall assure that a seal is made between:

(1) The connector and the structure wall by casting the connector integrally with the structure wall during the manufacturing process in a manner that it will not pull out during pipe coupling.

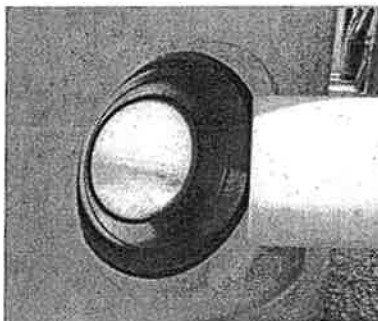
(2) The seal between the connector and the pipe shall be made by compressing the connector against the outside circumference of the pipe by means of a stainless steel take-down band.

The connector shall be made from materials that conform to the physical and chemical requirements outlined in Section 4, "Materials and Manufacture" of ASTM C-923-00 "Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals", and the overall design will meet or exceed Section 7, "Test Methods and Requirements" of ASTM C-923-00.

The connector shall be sized specifically for the type of pipe being used and shall be installed in accordance with the recommendations of the manufacturer.

INSTALLATION INSTRUCTIONS

Z-LOK CONNECTOR – INWARD POSITION



STEP 1:
Bevel pipe.
Clean connector.
Clean pipe of dirt & debris.

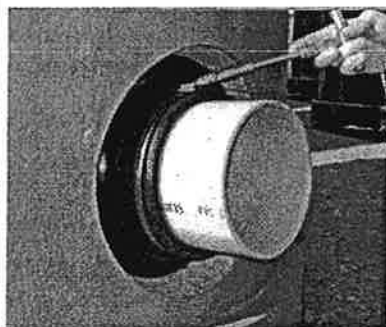
INSIDE Z-LOK CONNECTOR INSTALLATION



STEP 2:
Center pipe in connector and push through.

STEP 3:
Attach proper size clamp beside o-ring then center pipe in connector and **VERY IMPORTANT** tighten clamp with torque wrench to 60 inch pounds.

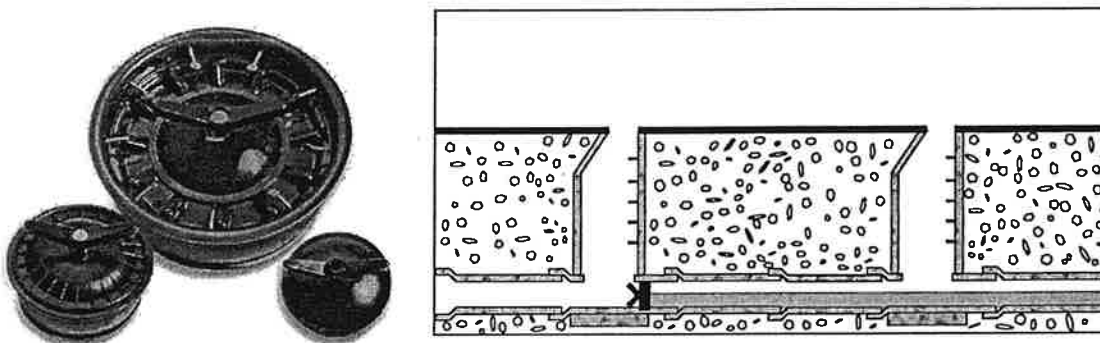
OUTSIDE INSTALLATION



STEP 4:
When installing a Z-LOK connector in the outside the manhole position pull pipe back out after inserting so the connector flips outward, then **VERY IMPORTANT** - center pipe in connector and tighten the take down clamp to 60 inch pounds with a torque wrench.

Hand-Tite® Mechanical Pipe and Bypass Plugs

The Hand-Tite plug is a reusable mechanical device suitable as a temporary or permanent plug for pipe. Pipe plugs are available in 4" through 8" sizes, and Bypass plugs are available in 4" through 18" sizes. Made from durable plastic (HDPE, Nylon 6) and a soft 40 durometer gasket ensures a good seal. This product has no metal parts to corrode or rust, with an exception on the 15" and 18" plugs which use stainless steel and brass components. A large wing nut makes installation easy. The design of this product allows for installation in the end or the spigot of the pipe.



Pipe Plug		Pipe Use Range		Maximum Back Pressure			Model #	Units/Case	Shipping Weight (lbs.)
Nominal Size	Product Code	Minimum Pipe Diameter (inches)	Maximum Pipe Diameter (inches)	Bypass Size (inches)	Water Head (feet)	Air (psig)			
4"	83886	3.75	4.75	None	12	5	4	50	0.9
5"	83887	4.75	5.75	None	12	5	5	30	1.1
6"	83888	5.75	6.75	None	12	5	6	30	1.5
8"	83889	7.875	8.75	None	12	5	8	12	2.5

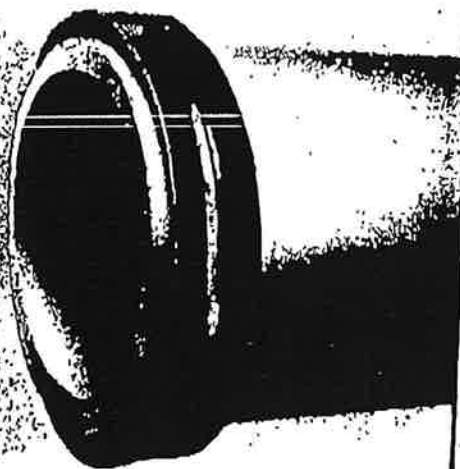
Bypass Plug

4"	83890	3.75	4.75	3/8" FPT	12	5	BPM4	50	0.9
5"	83891	4.75	5.75	3/8" FPT	12	5	BPM5	30	1.1
6"	83892	5.75	6.75	3/8" FPT	12	5	BPM6	30	1.5
8"	83893	7.875	8.75	1/2" FPT	12	5	BPM8	12	2.5
10"	83894	9.5	11	1/2" FPT	12	5	10	8	5.7
12"	83895	11.5	13	1/2" FPT	12	5	12	6	7.2
15"	83896	14.5	16	1/2" FPT	12	5	15	1	12
18"	83897	17.5	19	1/2" FPT	12	5	18	1	17

LARGE-DIAMETER WATERSTOPS. CONCRETE MANHOLE ADAPTERS

for pipes entering manhole walls.

LARGE DIAMETER WATERSTOPS FOR SEWER PIPE 8" AND LARGER



Order by specifying the outside diameter (O.D.) of the pipe which is to receive the waterstop. Minimum size: 8.5 inches O.D.

LARGE DIAMETER WATERSTOPS help eliminate leaks around pipe entering manhole walls, yet are flexible enough to permit lateral pipe movement without destroying seal integrity. It is particularly useful for pipe to which concrete will not adhere, such as plastic pipe.

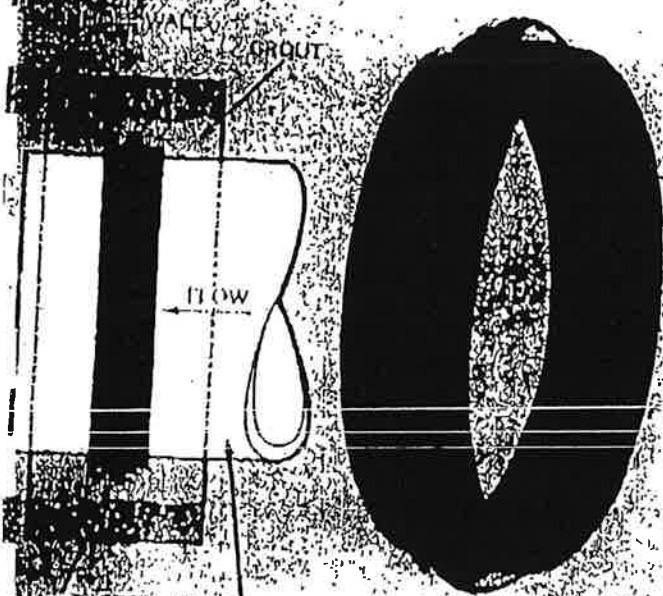
The waterstop is made of elastomeric P.V.C., is corrosion proof and is unaffected by acid or alkali, however the waterstop is subjected to many various conditions that are beyond the manufacturers control. High ground water tables, quality of grout, workmanship and field conditions can effect its ability to seal. Discretion must be used in its application and installation.

DUE TO THE MANY VARYING FACTORS THAT CAN INFLUENCE THE WATERSTOP EFFECTIVENESS AS A SEAL, FERNCO DOES NOT WARRANT THIS PRODUCT AS A POSITIVE WATER SEAL.

HOW TO INSTALL: Slide custom waterstop over clean end of entrance pipe. Position waterstop on center line of manhole wall. Tighten the stainless steel band to 60 inch lbs. torque. Stainless steel band is furnished with the waterstop. Grout around the waterstop as normally done to close an opening in a concrete wall.

For waterstops smaller than 12", see below.

APPLICATIONS



CONCRETE MANHOLE ADAPTERS (WATERSTOPS) help eliminate leaks around pipe entering manhole walls, yet are flexible enough to permit lateral pipe movement without destroying seal integrity. It is particularly useful for pipe to which concrete will not adhere, such as plastic pipe.

The CMA is made of elastomeric P.V.C., is corrosion proof and is unaffected by acid or alkali, however the CMA is subjected to many various conditions that are beyond the manufacturers control. High ground water tables, quality of grout, workmanship and field conditions can effect its ability to seal. Discretion must be used in its application and installation.

DUE TO THE MANY VARYING FACTORS THAT CAN INFLUENCE THE CMAs EFFECTIVENESS AS A SEAL, FERNCO DOES NOT WARRANT THIS PRODUCT AS A POSITIVE WATER SEAL.

CMAs are available for 4, 5, 6, 8, 10 and 12-inch pipe. CMAs in sizes larger than 12 inches are also available. (For large diameter waterstops, see above). Any given size fits a nominal pipe size regardless of pipe material.

