

TECHNICAL SPECIFICATIONS

FOR THE

GRIFFITH'S FIELD CSO ABANDONMENT PROJECT

CONTRACT 2020-1

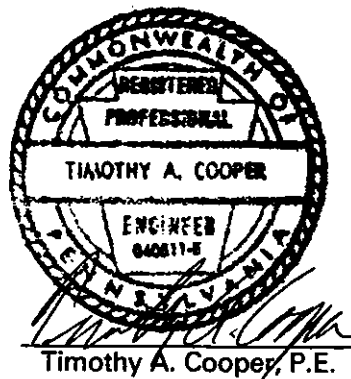
PROJECT NO. 20-0002

EBENSBURG MUNICIPAL AUTHORITY
CAMBRIA TOWNSHIP, CAMBRIA COUNTY, PENNSYLVANIA

APRIL 2020

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Specifications/Project Management:



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SECTION 01010 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contracts, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 PROJECT DESCRIPTION

- A. The project proposes to eliminate the existing Griffith's Field CSO by removing an existing 8" PVC line and meter and installing approximately 20 L.F. of 18" PVC sewer main and one manhole to connect to the existing 18" VCP sewer main.

1.3 QUALITY ASSURANCE

A. Qualifications of Workmen

- 1. The Contractor will at all times be responsible for the Work performed by his employees and/or any of his respective subcontractors or persons employed thereby. All workmen will have sufficient knowledge, skill, and/or experience to properly perform the work assigned to them. A supervisor familiar with the requirements of this Project, or trade foremen delegated by him, will be present at all times during the performance of the Work to direct, schedule, and assign the various items of Work described in these Specifications.

B. Applicable Laws, Codes, and Standards, and Regulations

- 1. The installation of equipment and facilities will conform with all applicable laws, codes, and regulations and the requirements of all referenced standards. All references will be understood to be the latest revision thereof, in effect at the time of bidding.

C. Conflicting requirements

- 1. In the event of any conflict between pertinent laws, codes, and regulations and the requirements of the referenced standards or these Specifications, the more stringent provisions will govern.

1.4 PRODUCT HANDLING

A. Protection

1. Use all means necessary to protect equipment, facilities, materials, and components before, during and after installation and to protect the installed work and materials of all trades.

B. Replacements

1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

C. Packaging

1. Prepackaged materials will be delivered to the job site in their original unopened containers, bearing their manufacturer's label.

D. Storage

1. Store all materials and equipment in accordance with the manufacturer's recommendations and protect all stored materials from weather damage. Do not use materials stored beyond the maximum recommended shelf life.

E. Handling and distribution

1. The contractor will handle, haul, and distribute all materials and all surplus materials for the different portions of the Work, as necessary or required; will provide suitable and adequate storage room for materials and equipment during the progress of the Work; and will be responsible for the protection, loss of, or damage to materials and equipment furnished by him, until the final completion and acceptance of the Work.
2. Storage and demurrage charges by transportation companies and vendors will be borne by the Contractor.
3. Facilities and labor for the storage, handling, and inspection of all materials and equipment will be furnished by the Contractor. Defective materials and equipment will be removed immediately from the site of the Work.

PART 2 - SPECIAL REQUIREMENTS

2.1 GENERAL

- A. The intent and meaning of the Contract Documents is that the Contractors, under the terms of the Contract, will take such action as necessary and/or required to provide labor, supervision, materials, supplies, equipment, power, transportation, as indicated or may be reasonably inferred from each Drawing and each section of these Specifications, all of which are collectively necessary and/or required for the execution of the Work.
- B. The Contractor must at all times diligently pursue to completion of the various work elements and coordinate this Project with the Owner. The Contractor will direct his efforts in such a manner as to assure completion in accordance with approved schedules.
- C. The Contractor will note that the drawings are general in detail and scope and that all such Work will be provided by the Contractor, whether specifically indicated on the Drawings or not, which is necessary for the completion of the Work or for the proper operation and appearance of the finished installation, in accordance with the intent of the Contract Documents for this project.
- D. The contractor shall be responsible for the cost of all utilities such as water, power, gas, etc. required to complete the project.
- E. The Contractor shall employ a competent survey crew to lay out the work from the initial points of construction as given by the Engineer. He shall set all offset stakes; set, test, and check all elevations and levels; locate level and plumb lines for other parts of the construction as the work progresses. The Contractor shall furnish all stakes required for the survey and layout work. He shall also furnish men to assist the Engineer in checking the survey and layout work if required.
- F. The Contractor shall replace promptly and without cost to the Owner all construction proving defective or which show undue wear within a period of one (1) year after such construction has been approved as such by the Owner in writing.
- G. The Contractor must, at all times, diligently pursue the completion of various work elements and coordinate this Project with the Owner's operations. The Contractor will direct his efforts in such a manner as to assure completion in accordance with approved schedules.
- H. During its progress and on its completion, the Work will conform truly to the lines, levels, and grades indicated on the Drawings or given by the Engineer and will be built in a thoroughly substantial and workmanlike manner, in strict accordance with the Drawings, Specifications, and other Contract Documents, and the directions given from time to time by the Engineer. Work done without instructions having been given therefore by the Engineer, without proper lines or levels, or performed during the absence of the Engineer, will not be estimated or paid for except when such work is

authorized by the Engineer or taken down, removed, and replaced at the Contractor's expense.

- I. The contractor will make all measurements and check all dimensions necessary for the proper construction of the Work called for by the Contract Drawings and/or Documents. During the prosecution of the Work, he will be responsible for making all necessary measurements to prevent mis-fitting in said Work and for the accurate construction of the entire work. Where the dimensions and locations of existing structure are of importance in the installation or connection of any part of the Work, the Contractor will verify such dimensions and locations in the field before the fabrication of any material or equipment which is dependent upon the correctness of such information.
- J. Prior to the performance of the work of any section of these Specifications, the Contractor will carefully inspect the prior work of all trades and verify that all such work is complete to the extent that the intended work may properly commence. All materials to be used in such work will be inspected and verified by the Contractor to be in accordance with the original design, the approved shop drawings, and the referenced standards. In the event of discrepancy, immediately notify the Engineer and do not proceed with work in areas of discrepancy until all such discrepancies have been fully resolved.
- K. The Contractor will provide adequate means of ingress and egress in regard to the Project site and facilities thereon whenever such provisions may be necessary for bringing in or removing large or heavy equipment.
- L. The Contractor will provide all openings, sleeves, recesses, and chases in the existing structures where required and/or necessary for the installation of various items of Work.
- M. Except for new work required by the Contract Documents, existing structures, facilities, streets, curbs, fences, landscaping, walks, etc. that are damaged or removed due to required construction work, will be patched, repaired or replaced and left in their original state to the satisfaction of the Engineer and of any authorities having jurisdiction wherever. In the event that such authorities require patching or repairing to be done with their own labor and materials, the Contractor will abide by such regulations and shall bear the costs for such work.
- N. The Contractor shall be responsible for the support of utility poles during construction and/or transportation. Any work necessary to support poles/wires shall be considered incidental to construction unless otherwise indicated in the Contract Documents.
- O. It shall be the responsibility of the Contractor to provide the necessary protective equipment and labor to assure the safety of the traveling public. The Contractor shall provide flagmen and proper roadway signing in the accordance with PA DOT

Publication 213. It shall be the responsibility of the Contractor to review the adequacy of the protective measures being provided and to adjust them as the work progresses.

- P. The Engineer will cooperate in working out the construction problems involved, but without relieving the Contractor of his responsibility thereof.
- Q. The Contractor shall be responsible for contacting the municipality to discuss bonding requirements for roads being used for hauling. The cost of bonding the posted roads for this project due to weight hauling restrictions as well as the costs for any associated repairs shall also be paid by the Contractor at no additional cost to the owner and shall be considered incidental under the unit price cost of sanitary sewer pipe.

2.2 CONTRACTOR USE OF PREMISES

- A. General: Limit use of the premises to construction activities in areas indicated; allow for Owner occupancy and use by the public.
 - 1. Confine operations to areas within Public Right-of-Ways and Sanitary Sewer Easements indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed. No use of private land will be permitted until written permission from the owner of the land is received.
 - 2. Keep driveways and entrances serving the premises clear and available to the Public as needed.
- B. Unless otherwise indicated on the drawings, the Contractor shall be responsible for determining the various widths of existing public rights-of-way on public highways, roads, avenues, streets, and alleys. The Owner shall secure a construction right-of-way across private property. If the Contractor requires additional rights-of-way beyond that secured by the Owner, the Contractor shall be responsible to secure such additional temporary easements as required, at no additional cost to the Owner. Any damage to property beyond the limits of rights-of-way provided by the Owner, shall be the sole responsibility of the Contractor. Should temporary construction easements and ingress/egress be required, the Contractor shall properly secure written releases, in a form approved by the Owner's Solicitor, from property owners both prior to commencement of construction and upon completion of construction. The Contractor shall transmit three (3) copies of all such releases to the Engineer for review and approval.
- C. The Contractor shall make his own arrangements with outside parties relative to the use of private land for storage of equipment and materials or for use as disposal site.

- D. The Contractor shall prior to the start of construction, photograph and videotape all curbs, sidewalks, wall, light posts, steps, structures, shrubbery, driveways, fences or other property improvements which are damaged.
- E. Unnecessary damage to private or public property, caused by the Contractor shall be repaired to the satisfaction of the Owner at the Contractor's expense. The Contractor shall restore to a condition similar to the condition that existed prior to the damage, any direct or indirect damages caused by the Contractor or in consequence of an act or omission on the part of the Contractor, his employees, agents or subcontractor. Should any property require repair or replacement or rebuilding by the Owner as a result of damage caused by the Contractor thereof will be deducted from any money due or to become due to the Contractor a sum sufficient to reimburse the Owner of the property for damage incurred.

2.3 REVISIONS AND SUBSTITUTIONS

- A. Any Contractor initiating a change or revision to the Specifications or Drawings (including substitution of equipment), for his own convenience, shall be responsible for any additional costs incurred as a direct result of that change. This requirement shall apply even though the Owner and the Engineer approve the revision; it does not apply when the change or revision is initiated by the Engineer or Owner.
- B. Any costs involved for the revision to or alteration of a Contractor's installed work, which is necessary for the installation of equipment, piping, or any other work by another Contractor, shall be the responsibility of the Contractor installing the new work, unless it can be shown that the installed work is not in accordance with the requirements of the Drawings and Specifications.

2.4 SITE VISIT

- A. The Contractor shall, prior to submitting his proposal, visit the site of the Work for this Contract to familiarize himself with all conditions which will affect the Work.

2.5 SAFETY AND SECURITY

- A. Safety
 - 1. The Contractor will take all necessary precautions and provide all necessary safeguards to prevent personal injury and property damage. The Contractor will provide protection for all persons including, but not limited to, his employees and employees of other contractors or subcontractors; members of the public; and employees, agents, and representatives of the Owner, the Engineer, and regulatory agencies that may be on or about the Work.

2. The Contractor will provide and maintain all necessary safety equipment such as fences, barriers, signs, lights, walkways, guards, and fire prevention and fire-fighting equipment and will take such other action as is required to fulfill his obligations under his Contract.
3. The Contractor will comply with all applicable Federal, State, and local laws, ordinances, rules, and regulations and lawful orders of all authorities having jurisdiction for the safety of persons and protection of property.
4. The Contractor will designate a responsible member of his organization at the site whose duty will be the prevention of accidents. This responsible person will have the authority to take immediate action to correct unsafe or hazardous conditions and to enforce safety precautions and programs.

B. Security

1. The Contractor will be responsible for the security and protection of the Work from damage and will protect from loss or damage all Contractor furnished machinery, equipment, facilities, materials, records, and supplies being handled, used, or maintained for the Work by the Contractor or his subcontractors, including property considered for progress payments, wherever located, until the final acceptance of Work by the Owner. The Contractor will provide, at his discretion, whatever measures deemed appropriate and/or necessary to provide security and protection of same, provided that such measures will not be of such nature as will interfere with normal, proper, and necessary work of the Owner's personnel or those of any other contractor or his subcontractors in the performance of their respective related work in or around the premises.

2.6 PROJECT COORDINATION

- A. The Contractor shall schedule and administer pre-construction meeting, periodic progress meetings, and specially called meetings throughout the progress of the Work for this Project. Contractor shall regularly meet with Contractors working on adjacent projects to clearly define responsibilities and coordinate timing of events.
- B. Construction progress schedule and associated sub-schedules shall be prepared by the Contractor subsequent to the award of the Contract and prior to the start of Work for this Project. The Engineer reserves the right to review and revise the schedules. Failure of the Contractor to comply with all the requirements for submission and updating of the construction schedule shall be sufficient cause for the Engineer and Owner to order immediate stoppage of Contractor's operations. The Contractor will cause his work to progress in such a manner as to coordinate with the Owner and other contractors on the

work so that the required construction and appurtenances may be built with safety during all stages of the construction and be completed in accordance with the schedule. The failure of the Contractor to reasonably maintain the progress of his work in accordance with an Engineer approved work schedule shall be sufficient cause for the Owner to order the immediate stoppage of the Contractor's entire operation.

2.7 STOPPAGE OF CONTRACTOR'S OPERATIONS BY OWNER

- A. The Contractor shall comply with the requirements of the Pennsylvania Department of Environmental Protection, Pennsylvania Department of Health, Pennsylvania Fish Commission, Pennsylvania Department of Transportation, and the Owner for all or parts of the proposed Work. Failure of the Contractor to comply with any of the applicable requirements of the above parties shall be sufficient cause for the Owner to order the immediate stoppage of the Contractor's entire operations. In the event of such an action by the Owner, the Contractor will not be eligible for any financial or contract time extension considerations from the Owner.

2.8 PROJECT IDENTIFICATION AND SIGNS

- A. Project sign in accordance with the Project Sign Detail shall be required if shown in the Bid Schedule. Signs shall be provided for the maintenance and protection of pedestrian and vehicular traffic safety.

2.9 ELECTRIC POWER LINES

- A. The Contractor is hereby notified that at locations the proposed Work is in close proximity to overhead high voltage power lines. It is the Contractor's responsibility when working near such power lines to take such precautions as are necessary or required and to inform his personnel and his subcontractors of and enforce all safety rules and regulations. The Contractor assumes all responsibility and liability for all property damage and bodily injury that may result from his or any of his subcontractor's personnel contacting directly or indirectly the overhead high voltage electric lines.
- B. The Contractor shall make all of the arrangements to protect, brace, move, relocate, or replace all of the utility poles affected by this Project. The Contractor shall relocate utility line and power poles as required, and assume all related costs thereto to accommodate the facilities to be constructed under this contract as required.

2.10 UTILITY COORDINATION

- A. The design is based on available underground utility information and field location where possible. The Contractor's attention is directed to the fact that there may be

conflicts between the proposed contract work and existing gas, sewer and water mains and laterals, as well as other utilities.

- B. It shall be the responsibility of the Contractor to make proper contacts with the owner of the facilities within the project area, in accordance with current law, so that the necessary relocations, adjustments, or reconstruction of such facilities may be determined. The Contractor shall cooperate with the owners of facilities on, under, or over the project by arranging and performing his work in and around such facilities and structures, without additional compensation, to facilitate their preservation. The work of the Contractor shall be arranged and performed in accordance with good engineering and construction practices. The Engineer will cooperate in working out the construction problems involved, but without relieving the Contractor of his responsibility therefor. The Engineer and Owner do not guarantee the accuracy of the location of the present subsurface utility installations or structures shown on the plans. Neither do the Engineer and Owner guarantee that all subsurface installations are shown.
- C. Delays may be expected in the performance of the work under contract in order to permit public and private facilities to be relocated, adjusted, reconstructed or to provide such safeguards as are necessary to protect public or private property. No charges or claims for additional compensation regardless of duration or extent, caused by the failure of the owners of facilities on, under or over the project to adjust their facilities or to protect public or private property during the progress of any portion of the work embraced in the contract, but the Contractor may be granted an extension of time for the completion of work.
- D. It shall be the responsibility of the Contractor to contact all utility companies, concerning their method of supporting exposed facilities; the Contractor will be required to comply with the requirements of the utility companies for providing temporary and permanent supports for all mains and laterals.
- E. Should the Contractor encounter a situation where it is believed that an existing underground utility will need to be relocated by the Contractor, he shall immediately notify the Engineer or his representative and a decision will be made within two (2) working days. A lump sum price shall be negotiated for each underground utility to be relocated by the Contractor and a change order will be issued.
- F. The Contractor shall exercise extreme care to protect all buried, surface and aerial facilities and utilities encountered in the work. All facilities and utilities shall be considered "in use". The Contractor will be held responsible for locating all underground structures and utilities including, but not limited to: water, steam, oil, and gas, mains; sanitary and storm sewers; and telephone, television and electric conduits which may be encountered during the construction operations. He shall arrange with the owners of such underground structures and utilities to assign a representative to mark the

locations. The Engineer reserves the right to require the Contractor to make exploratory excavations to locate existing utilities in critical areas in advance of the actual construction of the proposed pipe in that vicinity. The services of the representatives of the owners of such utilities for locating the said utilities, and the cost of exploratory excavations, shall be provided at no additional cost to the Owner.

- G. After confirmation of the exact location of the known existing utilities, the Contractor may proceed with the excavation. All "known" existing utilities damaged by the Contractor shall be replaced and/or repaired by the Contractor to the satisfaction of all parties concerned and at the Contractor's own expense and at no additional expense to the Owner. All utility repairs, replacements or relocations shall be performed to the standards and requirements of their respective owners and with the absolute minimum out-of-service time.
- H. All building service laterals (gas, water, sewer, etc.,) shall, for the purposes of this Contract, be considered as "known" to exist whether shown on the Contract Drawings or not.

2.11 ACCESS

- A. The Contractor (and/or Subcontractors, if applicable) shall at all times provide reasonable means of access (ingress and egress) to all places of business, residential homes, public utility facilities, and other buildings or structures or facilities. Where there are driveways, access approaches, roadways, walkways or the like; the Contractor (and/or Subcontractors, if applicable) shall not excavate and open trenches unless he shall immediately construct the proposed pipeline(s) and appurtenances and backfill same to a reasonable level to permit the safe passage of vehicular traffic and pedestrian traffic. These crossings shall be maintained properly to eliminate rough, sunken, raised, or unsafe conditions by the Contractor (and/or Subcontractors, if applicable) until the permanent pavement or surface is placed and the work complete. The Contractor is to note and understand that there shall be no compensation for the foregoing.
- B. The Contractor shall provide protection for pedestrian traffic at all locations where pedestrians could be injured. All open ditches must be fenced in. Where walks cross such ditches, bridged walkways must be provided with handrails on both sides. Bridged walkways must be adequately lighted. The Contractor shall furnish and adequately maintain all necessary barricades, signs, warning devices, lights and lighting that is required for the proper protection and safety of pedestrians.
- C. Traffic on Highways of the Commonwealth of Pennsylvania and on All Public Streets, Avenues, and Alleys within the Township and Boroughs shall be free to move at all times. Only one-half of a highway, street, avenue or alley shall be closed at any one time, unless express written approval is given by the Department of Transportation,

Borough and Township to close the entire street, avenue or alley. The Contractor shall provide all necessary barricades, warning signs, lanterns, red flags, cones, torches, flagmen, warning lights and devices and all other items to properly warn and control vehicular and pedestrian traffic and maintain them in operating conditions, to the satisfaction of the Department of Transportation, Borough, Township and Engineer.

- D. While work is being performed on highways, streets, avenues and alley, maintenance of traffic and protection of the traveling public approaching the construction shall conform to Pennsylvania Department of Transportation Bulletin 43 - "Specifications for Control and Protection of Traffic on 778 Construction and Maintenance Projects". The Bulletin, a supplement to Pennsylvania Department of Transportation's Specification Form 408, can be obtained upon request from the Pennsylvania Department of Transportation.
- E. The Contractor shall be responsible for the maintenance of streets and public thoroughfares outside the work area used by his vehicles during the progress of the work, to the extent of his cleaning up any materials spilled from or otherwise disturbed by his vehicles and restoring the said right-of-work to their original condition, if damaged by him. The cost, and expense incidental to the fulfillment of this Paragraph, shall be borne by the Contractor and should he create any public nuisance, in the opinion of the Owner, by his failure to fulfill the requirements of this Paragraph, then the Owner, upon written notice to the Contractor, may request the appropriate public authority where the nuisance occurs, to correct the damage and the cost of this work shall be deducted from any amounts due, or to become due, the Contractor under the terms of this Contract.

2.12 NOTIFICATION TO LOCAL NEWS MEDIA

- A. Contractor shall be required to release weekly updates to local news media (newspapers, radio stations, etc.) detailing the areas of construction for the following week and the type of work to be completed. The main purpose will be to notify local residents of the potential for utility interruptions and traffic pattern changes. A copy of the release shall also be provided weekly to the Owner, Engineer, and residents in the affected areas.

PART 3 - EXECUTION (Not applicable)

END OF SECTION 01010

SECTION 01026 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for unit prices.
 - 1. A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.
 - 2. Unit prices include all necessary material, overhead, profit and applicable taxes.
 - 3. Refer to Measurement and Payment Section; methods of measurement and payment for unit prices are specified in this Section.
 - 4. The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and to have this Work measured by an independent surveyor acceptable to the Contractor at the Owner's expense.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01026

SECTION 01027 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

1.3 APPLICATION FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Engineer and paid for by the Owner.
- B. Payment Application Times: The Engineer must receive each application for payment before the 2nd Monday of each month. The period of construction work covered by each application for payment is the period ending the Friday before the 1st Monday of each month and starting the day following the end of the preceding period.
- C. Payment Application Forms: Use forms provided by the Owner for Applications for Payment; sample copies are included within the Contract Documents.
- D. Application Preparation: Complete every entry on the form, including execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
 - 1. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application.
- E. Transmittal: Submit 6 (six) executed copies of each Application for Payment to the Engineer.
 - 1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Engineer.

- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
1. List of subcontractors.
 2. List of principal suppliers and fabricators.
 3. Contractor's Construction Schedule.
 4. List of Contractor's staff assignments.
 5. Copies of building permits.
 6. Copies of authorizations and licenses from governing authorities for performance of the Work.
 7. Initial progress report.
 8. Certificates of insurance and insurance policies.
 9. Performance and payment bonds.
 10. Construction Photographs - Videos
- G. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment; this application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work. Administrative actions and submittals that shall proceed or coincide with this application include:
1. Warranties (guarantees) and maintenance agreements.
 2. Maintenance instructions.
 3. Final cleaning.
 4. Application for reduction of retainage, and consent of surety.
 5. Advice on shifting insurance coverages.
 6. Final progress photographs.
 7. List of incomplete Work, recognized as exceptions to Engineer's Certificate of Substantial Completion.
- H. Final Payment Application: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:
1. Completion of Project closeout requirements.
 2. Completion of items specified for completion after Substantial Completion.
 3. Assurance that unsettled claims will be settled.
 4. Assurance that Work not complete and accepted will be completed without undue delay.

5. Transmittal of required Project construction records to Owner.
6. Proof that taxes, fees and similar obligations have been paid.
7. Removal of temporary facilities and services.
8. Removal of surplus materials, rubbish and similar elements.
9. Submission of As-built drawings to Engineer.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01028 - MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

Measurement of each item of work under this contract will be made as indicated below. Payment for each item of work satisfactorily completed will be made at the contract unit or lump sum price which shall be full compensation for that item of work, and shall not include work or materials paid for under any other item of work. All required work elements not specifically addressed in this section and the Bid Schedule shall be incidental to the Contract and no additional payment shall be made.

- A. Sanitary Sewer Pipe

This item of work shall include the installation of all sanitary sewer pipe (size as shown on the bid schedule). Pipe utilized in stream crossings and borings are not considered a part of this item of work and shall be included in the lineal foot price for that item.

Sanitary sewer pipe length will be measured horizontally along the centerline of the pipe from inside of manhole, to inside of manhole and shall include: all plant, labor, material and equipment required to satisfactorily construct the sewers including pre-construction photographs and videos, mobilization, all soil and erosion and sedimentation control features, traffic control, clearing, grubbing, all excavation regardless of material encountered (including rock excavation), trenching, shoring trenches, safety equipment, dewatering, flood and washout risk, handling existing flows (by-pass pumping), bedding, furnishing, laying, joining, air and deflection testing of pipe, warning tape, backfill including protective cover, rock lining (except in stream crossings), protection or removal and replacement of trees and utilities, relocation of all utility service lines as needed, restoration of all damages from all operations, replacement of any drain lines, removing surplus and/or unsuitable material, abandonment or removal and disposal of existing sewer piping taken out of service by this contract, fittings, submission of As-Built Drawings, restoring disturbed surfaces and lawns to a condition equal to or better than the original and keeping surface of streets and ground in good condition during the

warranty period after final acceptance of work, and all else necessary and/or proper to install the sewers complete in place and accepted. This item shall include maintenance of existing sewer flow including the pumping of sewage around work areas. Sewage will not be permitted to be discharged to surface and must be contained within the sewer piping.

Design is based on available information pertaining to underground utilities and field location where possible. Should the Contractor encounter a situation where it is believed that an existing underground utility main will need to be relocated by the Contractor, he shall immediately notify the Engineer or his representative and a decision will be made within two (2) working days. Payment for relocation of existing underground utility mains shall be based on a negotiated lump sum price based on the size, type and length of utility to be relocated and a change order shall be issued. No additional payment shall be made for relocation of existing utility service lines or drains. For purposes of this Contract, all existing sewer systems shall be considered as utility service lines, however, no extra payment will be made to locate or protect the existing sewers.

Payment will be made at the contract price per lineal foot for the type and size at the various depths indicated in the proposal. Depth shall be determined by measuring the distance from the existing grade to the invert of the proposed pipe. The breaking point between depth classifications shall be determined graphically from the Drawings or from the actual field measurements along the length of the pipe. Measurements shall be taken at the centerline of the pipe from inside of manhole to inside of manhole.

All paved areas shall be re-paved (either temporary or permanent) within two (2) working days after backfilling. Temporary and permanent pavement replacements are to be paid under separate bid items.

All existing features disturbed during installation of the pipe shall be replaced to an equal to or better condition than existing at no additional cost.

Payment for "Special Backfill" and Pavement Replacement where required will be made at the applicable contract unit price. Seeding and mulching shall be considered incidental to this pay item and no additional payment shall be made.

The cost of bonding the posted roads for this project due to weight hauling restrictions as well as the costs for any associated repairs shall also be paid by the Contractor at no additional cost to the owner and shall be considered incidental under the unit price cost of this item

B. Concrete Manholes

This item of work shall include the installation of manholes and necessary appurtenances.

Payment for sanitary sewer manholes shall be broken down into four (4) manhole parts: the bottom four feet-zero inches as a complete manhole with base and cast-iron frame and cover with watertight inserts; the vertical feet of manhole barrel over the initial four feet-zero inches; the vertical feet of drop connections and additional cost for manholes in state road right-of-ways.

The unit price shall constitute full compensation for furnishing all labor, materials, and equipment required to complete the manholes including all excavation, concrete channels, frames, covers, accessways, steps, plastering, coating, additives, concrete, testing, backfilling, temporary paving (beyond pay limits), removal of surplus material, embankment and maintenance of ground around manholes and any repairs ordered by the Engineer during the warranty period, and all other items required to complete the manholes as more fully defined elsewhere in the Specifications, Details and/or shown on the Drawings. Watertight manhole inserts shall be provided for each manhole installed and shall be considered incidental to the payment under this item. Any pipe stubs with caps and air ventilation systems that are to be extended from manholes are considered incidental to the payment for the manhole.

Measurement and payment shall be:

1. A unit price for the lower four feet zero inches (or less if the complete manhole is less than four feet zero inches). This four feet zero inch shall include a complete manhole with base, flow channel, pipe connections, frame and standard cover and watertight insert.
2. A vertical foot (V.F.) unit price for the barrel which is the total vertical height less four feet zero inches for each sanitary sewer manhole. The vertical height is the distance from the top of the cast iron cover to the lower pipe invert channel in the manhole bottom and shall be measured to the nearest hundredth of a foot.
3. The vertical foot (V.F.) unit price for drop connections shall be measured as the distance between the upper and lower pipe inverts of a drop connection made inside the manhole. This includes the complete drop connection construction, concrete, forms, pipe, drop bowl, fittings, stainless steel straps and fasteners, and provisions for matching the flow channel in the manhole bottom.

4. The unit price for each sanitary sewer manhole in a state road right-of-way. This price shall be in addition to the unit price for manholes not located in state road right-of-ways.

C. Connection to Existing Sanitary Sewer Main

Payment for this item shall be at the contract unit price for each connection to an existing sanitary sewer main where shown on the Contract Drawings and Bid Schedule or as directed in the field.

The Contractor shall provide and install the connection to the existing sanitary sewer mains in accordance with the applicable provisions of these specifications and the Standard Details. The Contractor shall be required to cut and bevel the existing pipe at a point approximately two (2) feet from the new manhole. A coupling or adaptor shall then be installed to join the existing pipe to a new pipe stub extended from the manhole. This connection shall then be encased in concrete. The Contractor shall be responsible for making this a watertight connection. Information on the type of coupling or adaptor to be utilized shall be submitted for Engineer's approval prior to installation. The concrete encasement shall be considered incidental to this pay item. The couplings shall be considered incidental to this pay item.

H.

K. Replacement of Unsuitable Trench Subgrade

Payment shall be at the contract unit price per cubic yard of crushed aggregate satisfactorily placed. Such payment shall constitute full compensation for all plant, labor, equipment, materials, excavation and aggregate placed necessary to complete the work as herein specified. No payment will be made for over excavation beyond the trench width limits as depicted in the Contract Documents or beyond the depths as directed by the Engineer or his representative. The aggregate to be used shall be ASTM No. 57 limestone unless otherwise directed by the Engineer.

L. Special Backfill

Payment for this item shall be at the contract unit price for the actual number of cubic yards of "special backfill" aggregate complete in place and accepted within the strict limits as shown in the details and where required by the Drawings or Specifications or as ordered by the Engineer. Special Backfill shall be PennDOT 2A limestone aggregate. Placement of PennDOT 2A limestone within the Payment Limits indicated in the Standard Details, shall be payable under this item.

This payment shall constitute full compensation for furnishing all plant, labor, material, placement, equipment and all other items necessary to complete the placement in a satisfactory and acceptable manner. Pipe bedding is not included in this pay item. Temporary subbase placed for temporary paving shall not be included in this pay item since it is considered incidental to the temporary paving pay item.

N. Cut and Plug Existing Sewers

Payment shall be made at the contract unit price for each sewer or manhole cut and plugged where encountered and/or directed in the field and as shown in the Standard Details. This payment shall also be made for pipes to be plugged inside manholes, reforming of flow channels, where no cutting is necessary, as indicated on the Contract Drawings. Payment shall be full compensation for the work complete-in-place including all plant, labor, materials including mechanical plug, concrete and equipment and all other items incidental to the work. No additional payment shall be made for plugging laterals or building sewers. This work shall be considered incidental to the work being performed.

O. Abandonment or Removal of Existing Manholes

Payment for this item shall be at the Contract Unit Price for each existing manhole properly abandoned or removed. For abandoned manholes this price and payment shall include removal of the top of the manhole or top cone section, including frame and cover, to a point at least one (1) foot below the finished grade, plugging of all existing pipes entering the manhole base in a manner acceptable to the Engineer, filling the existing manhole with Class "C" Concrete to a point one (1) foot above the top of the existing pipe, and removal and disposal of any excess materials. In grass areas, the manhole may be then backfilled, after the concrete has set, with compacted native material and the area seeded and mulched, which shall be incidental to this pay item. In paved or stabilized areas, the manhole shall be filled, after the concrete is hardened, with special backfill and the surface restored as indicated in the standard details. Special backfill and pavement replacement shall be paid under separate pay items. The payment limit for special backfill and pavement replacement shall be no greater than a 7'-0" square centered on the manhole (i.e. maximum payment for pavement replacement shall be 5.44 S.Y. for each and for special backfill shall be 5.44 s.y. times the depth). Actual quantities shall be measured in the field. Manholes within state roadways shall be abandoned in accordance with the standard details and PennDOT requirements.

If it is necessary for the entire manhole to be removed, the contractor shall plug any pipes to remain, as shown in the standard details, at no additional cost to the owner. Payment for restoration shall remain as described above, including the payment limits for special backfill and pavement restoration.

This price and payment shall constitute full compensation for all plant, labor, material and equipment necessary to satisfactorily abandon the existing manholes, excluding manholes that must be removed to install the new sanitary sewer piping. Manholes that are removed/replaced during the installation of new sanitary sewer piping shall be incidental to the cost for sanitary sewer pay item and no additional payment shall be made for their removal or replacement. This item shall include any manholes in PennDOT Right-of-Way to be filled entirely with concrete as per Standard Detail.

R. Clay Trench Plugs

Payment for clay trench plugs shall be at the contract unit price per cubic yard of compacted clay installed within the limits shown on the detail, at locations as shown on the Contract Drawings and/or as directed in the field by the Engineer or his representative. This price and payment shall constitute full compensation for all plant, labor, material and equipment to construct the clay trench plug complete-in-place.

S. Exploratory Excavation

Payment for this item shall be at the contract unit price per cubic yard for any exploratory excavation shown on the drawings and/or requested by the Engineer.

This price and payment shall constitute full compensation for all plant, labor, materials and equipment required to perform exploratory excavation as requested and/or shown on the drawings including, but not limited to, location of existing utilities and confirmation of inverts of existing manholes.

T. Concrete Pipe Cradles and Encasement

Payment for concrete cradles and encasement shall be at the contract unit price per cubic yard of concrete placed within the limits shown on the drawings, or as directed in the field by the Engineer, excluding encasement included under other pay items. Measurement shall be based on the actual quantity of concrete complete-in-place and accepted, within the specified limits. Concrete used for stream crossings, connections to existing pipes,

abandoning manholes, deep cut laterals and plugging existing sewer mains is payable under other items.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01028

SECTION 01035 - MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division 1 Specification sections, apply to this section.

1.2 SUMMARY

- A. This section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 1 Section "Submittals" for requirements for the Contractor's Construction Schedule.
 - 2. Division 1 Section "Application for Payment" for administrative procedures governing applications for payment.

1.3 MINOR CHANGES IN THE WORK

- A. Supplemental instructions authorizing minor changes in the Work, not involving an adjustment to the Contract Sum or Contract Time, will be issued by the Engineer.

1.4 CHANGE ORDER PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time will be issued by the Engineer, with a detailed description of the proposed change(s) and supplemental or revised Drawings and Specifications, if necessary.
 - 1. Proposal requests issued by the Engineer are for information only. Do not consider them an instruction either to stop work in progress, or to execute the proposed change.
 - 2. Unless otherwise indicated in the proposal request, within 10 days of receipt of the proposal request, submit to the Engineer for the Owner's review an estimate of cost necessary to execute the proposed change.

- a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Indicate the effect of the proposed change on the Contract Sum.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.
- B. Contractor-Initiated Change Order Proposal Requests: When latent or other unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Engineer.
1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum, and Contract Time.
 2. Include a list of quantities of products to be purchased, labor costs, and unit costs along with the total amount of purchases to be made.
 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Engineer may issue a Construction Change Directive, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.6 CHANGE ORDER PROCEDURES

- A. Upon the Owner's approval of a Change Order Proposal Request, the Engineer will issue a Change Order for signatures of the Owner and Contractor on forms as provided for in the Conditions of the Contract.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01035

SECTION 01040 - PROJECT COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
 - 1. Coordination.
 - 2. Administrative and supervisory personnel.
 - 3. General installation provisions.
 - 4. Cleaning and protection.
- B. Requirements for the Contractor's Construction Schedule are included in Section "Submittals".

1.3 COORDINATION

- A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation.
 - 1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
 - 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 - 1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of schedules.
 - 2. Installation and removal of temporary facilities.
 - 3. Delivery and processing of submittals.
 - 4. Progress meetings.
 - 5. Project Close-out activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- B. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- C. Re-check measurements and dimensions, before starting each installation.
- D. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

END OF SECTION 01040

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:
 - 1. Construction Stakeout.
 - 2. Grade/Cut Sheets.

1.3 SUBMITTALS

- A. Grade/Cut Sheets: If the Contractor wishes to confirm existing grades and compute pay depths as compared to plan quantities, the actual cut or grade sheets shall be provided to the Engineer upon completion.

1.4 QUALITY ASSURANCE

- A. Surveyor: Engage a Registered Land Surveyor registered in Pennsylvania or a surveyor of equal qualifications and significant experience in construction stakeout and grade sheets compilation to perform any necessary surveying services.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. The Owner will identify manhole locations in the field with reference to existing manholes as shown on the plan. In addition to this, the owner will

provide benchmark(s) elevations located on each project as shown on the plan.

- B. Verify information shown on the Drawings, in relation to the topographic features and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
 - 1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.
 - 2. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.
- C. Any temporary benchmarks established on the site should be referenced to existing survey control points.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- D. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site-work, investigate and verify the existence and location of underground utilities and other construction.
 - 1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.

3.2 PERFORMANCE

- A. Working from lines and levels established by the Drawings establish benchmarks and markers to set lines and levels of the sanitary sewer. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
 - 1. As construction proceeds, check every major element for line, level and plumb.
- B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for the Owner's reference.

1. Record deviations from required lines and levels, and advise the Engineer when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
- C. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.

3.3 PRESERVATION OF PROPERTY CORNER SURVEY MARKERS

- A. The Contractor is to exercise caution to protect existing stakes, iron pins, and other property corner markers from removal or dislodgement and, if the construction involves an area where such a marker exists, the Contractor shall have a Registered Surveyor, licensed in Pennsylvania, reference the existing markers before they are disturbed and, after the construction is completed, the Registered Surveyor is to reset the markers in kind to their exact former location. All expenses involved in the preservation and/or restoration of the property corner markers is the responsibility of the Contractor with no additional expense to the Owner.

END OF SECTION 01050

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the General Conditions.
- B. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
- D. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in General and Supplementary Conditions.
- E. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."
- G. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

- H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and MASTERFORMAT numbering system.
- B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
 - 1. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the full context of the Contract Documents so indicates.
 - 2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
 - a. The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Where the date of issue of a referenced standard is not specified, comply with the standard in effect as of date of Contract Documents.
- C. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but

apparently equal, and uncertainties to the Engineer for a decision before proceeding.

1. **Minimum Quantity or Quality Levels:** The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for the context of the requirements. Refer uncertainties to the Engineer for a decision before proceeding.
- D. **Copies of Standards:** Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
 2. Although copies of standards needed for enforcement of requirements may be included as part of required submittals, the Engineer reserves the right to require the Contractor to submit additional copies as necessary for enforcement of requirements.
- E. **Abbreviations and Names:** Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the test provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries.

CE Corps of Engineers
 (U.S. Department of the Army)
 Chief of Engineers - Referral
 Washington, DC 20314 (202) 272-0660

CFR Code of Federal Regulations
 Available from the Government Office
 North Capitol St. between G & H Street, N.W.
 Washington, DC 20402 (202) 783-3238
 (Material is usually first published in the Federal Register)

DEP	Department of Environmental Protection 909 Elmerton Avenue Harrisburg, PA 17110	(717) 705-4700
EPA	Environmental Protection Agency 401 M. Street, SW Washington, DC 20460	(202) 382-2090
OSHA	Occupational Safety & Health Administration (U.S. Department of Labor) Government Printing Office Washington, DC 20402	(202) 523-6091
PennDOT	Pennsylvania Department of Transportation Engineering District 9-0 1620 N. Juniata Street Hollidaysburg, PA 16648	(814) 696-7250

1.5 GOVERNING REGULATIONS/AUTHORITIES

- A. The Engineer has contacted authorities having jurisdiction where necessary to obtain information necessary for preparation of Contract Documents; that information may or may not be of significance to the Contractor. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.
- B. Copies of Regulations: Obtain copies of the regulations and retain at the Project Site, available for reference by parties who have a reasonable need for such reference.

1.6 SUBMITTALS

- A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01095

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project meetings including but not limited to:
 - 1. Pre-Construction Conference.
 - 2. Progress Meetings.
- B. Construction schedules are specified in another Division-1 Section.

1.3 PRE-CONSTRUCTION CONFERENCE

- A. Schedule a pre-construction conference and organizational meeting at the Project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: The Owner, Engineer, the Contractor and its superintendent, major subcontractors and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
- C. Agenda: Discuss items of significance that could affect progress including such topics as:
 - 1. Tentative construction schedule.
 - 2. Critical Work sequencing.
 - 3. Designation of responsible personnel.
 - 4. Procedures for processing field decisions and Change Orders.
 - 5. Procedures for processing Applications for Payment.
 - 6. Distribution of Contract Documents.
 - 7. Submittal of Shop Drawings, Product Data and Samples (if not previous to this meeting).

8. Preparation of record documents.
9. Use of the premises.
10. Office, Work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
14. Security.
15. Working hours.

1.4 PROGRESS MEETINGS

- A. Conduct progress meetings at the Project site at regularly scheduled intervals. Notify the Owner and Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: In addition to representatives of the Owner and Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project.
 1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 2. Review the present and future needs of each entity present, including such items as:
 - (a) Time.
 - (b) Sequences.
 - (c) Deliveries.
 - (d) Access.
 - (e) Site utilization.
 - (f) Hours of Work.
 - (g) Hazards and risks.
 - (h) Quality and Work standards.

- (i) Change Orders.
 - (j) Documentation of information for payment requests.
- D. Reporting: No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
- 1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including;
 - 1. Contractor's construction schedule.
 - 2. Weekly construction reports.
 - 3. Shop Drawings.
 - 4. Product Data.
 - 5. Samples.
- B. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
 - 1. Permits.
 - 2. Applications for payment.
 - 3. Performance and payment bonds.
 - 4. Insurance certificates.
 - 5. List of Subcontractors.
- C. Inspection and test reports are included in Section "Quality Control Services."

1.3 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.

2. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.
 - a. Allow two weeks for initial review.
 - b. Allow two weeks for reprocessing each submittal.
 - c. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
 2. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart type Contractor's construction schedule. Submit within 15 days of execution of the agreement.

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.
 2. Within each time bar indicate estimated completion percentage in 25 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
 3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
 4. Coordinate the Contractor's construction schedule with progress reports, payment requests and other schedules.
 5. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Engineer's procedures necessary for certification of Substantial Completion.
- B. Schedule Updating: Revise the schedule after each meeting or activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.5 WEEKLY CONSTRUCTION REPORTS

- A. Prepare a weekly construction report, recording the following information concerning events at the site; and submit duplicate copies to the Engineer at weekly intervals:
1. List of subcontractors at the site.
 2. Approximate count of personnel at the site.
 3. High and low temperatures, general weather conditions.
 4. Accidents and unusual events.
 5. Meetings and significant decisions.
 6. Stoppages, delays, shortages, losses.
 7. Emergency procedures.
 8. Orders and requests of governing authorities.
 9. Change Orders received, implemented.
 10. Services connected, disconnected.
 11. Substantial Completions authorized.

1.6 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis

of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.

- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
1. Dimensions.
 2. Identification of products and materials included.
 3. Compliance with specified standards.
 4. Sheet Size: Except for templates, patterns and similar full- size Drawings, submit Shop Drawings on sheets at least 8-1/2" x 11" but no larger than 36" x 48".
 5. Submittal: Submit 4 blue- or black-line prints; 3 prints will be retained; the remainder will be returned.

1.7 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions and catalog cuts. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."
1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendations.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 2. Submittals: Submit 4 copies of each required submittal; The Engineer will retain three, and will return the other marked with action taken and corrections or modifications required.
 - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
 3. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators and others required for performance of construction activities. Show distribution on transmittal forms.

1.8 ENGINEER'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return promptly.
 - 1. Compliance with specified characteristics is the Contractor's responsibility.

- B. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:
 - 1. Final Unrestricted Release: Where submittals are marked "No Exception Taken," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
 - 2. Final-But-Restricted Release: When submittals are marked "Make Corrections as Noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
 - 3. Returned for Resubmittal: When submittal is marked "Amend and Resubmit or Rejected", do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked "Rejected" or "Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.
 - 4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required".

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01300

SECTION 01380 - CONSTRUCTION PHOTOGRAPHS AND VIDEOS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Details and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for construction photographs.
- B. Prior to the start of any construction, photographs and videos will be taken to document "existing" conditions where construction activity will occur. Photographs and videos will clearly show:
 - 1. Roadways, driveways or parking areas.
 - 2. Roadway shoulders.
 - 3. Lawn, shrubs, and trees.
 - 4. Stream crossings.
 - 5. Existing structures.
 - 6. Existing eroded areas.
 - 7. Interior of structure prior to start of any repair work required for structure.
 - 8. Any unusual field conditions.
 - 9. Existing drainage or runoff areas.

1.03 SUBMITTALS

- A. Photographs
 - 1. General: Submit three (3) prints of each view directly to the Engineer within five (5) days of taking photographs, and prior to start of construction. The Engineer will distribute prints as follows:
 - a. One print to the Contractor shall be retained in the field office at the Project site and available at all times for reference.
 - b. One print to the Owner as the Owner's permanent record.
 - c. One print shall be retained in the Engineer's files.
 - 2. Digital Files: With each submittal, include one (1) digital copy of photos identified by date photographs were taken. Files and photos be ready for transmittal to the Owner and for the Owner's unrestricted use.

- B. Videos
 - 1. General: Furnish two (2) copies of videos to the Engineer prior to the start of construction.

1.04 QUALITY ASSURANCE

- A. Photographs and videos will be taken by an independent third-party firm actively engaged, experienced and knowledgeable in photographing and videoing jobsite conditions.

PART 2 – PRODUCTS

2.01 PHOTOGRAPHS

- A. Provide 3 1/2" by 5" or 4" x 6" smooth surface glossy color prints.
- B. Each photograph will contain an identifying number and the date taken.
- C. Each photograph will be bound in clear vinyl pages (8-3/8" x 11-3/16") following in numerical order and all bound in "D" ring type binders.
- D. Each binder will contain an index coordinating each photograph to its specific location and/or map number.
- E. Each binder will contain a statement of verification as to whom and on what dates the photographs were taken.
- F. Digital photography shall also be provided on CD.

2.02 VIDEOS

- A. Each video will be DVD format.
- B. Each video will contain an identifying number and the date taken on the label.
- C. Each video will have appropriate audio describing specific areas shown.
- D. Both still photos and videos will be required.

PART 3 – EXECUTION

3.01 PRE-CONSTRUCTION PHOTOGRAPHS AND VIDEOS

- A. Before starting construction, take photographs of the site and surrounding properties from different points of view as selected by the Engineer.

1. Preferably, take photographs every 100 feet in both directions along proposed utility line alignment and videos along the entire alignment in both directions. When video recording, extra care shall be taken to pan both left and right of the proposed construction to cover all areas of proposed disturbance, including proposed sewer lateral alignments.
2. Take photographs and videos of existing surface features in sufficient detail to record accurately the physical conditions at the start of construction.
3. Photography and video recording shall be performed only during periods of clear visibility with no snow covering the zones of influence.
4. Photography and video recording shall be performed on any roads that the Contractor intends to use for hauling of materials.

END OF SECTION 01380

SECTION 01400 - QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Details and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Engineer.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - 1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
 - 2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for the Contractor to provide quality control services required by the Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

- A. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities. Costs for these services shall be included in the Contract Sum.
1. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
 - a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

1.4 SUBMITTALS

- A. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Engineer, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
 2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
 - a. Date of issue.
 - b. Project title and number.
 - c. Name, address and telephone number of testing agency.
 - d. Dates and locations of samples and tests or inspections.
 - e. Names of individuals making the inspection or test.
 - f. Designation of the Work and test method.
 - g. Identification of product and Specification Section.
 - h. Complete inspection or test data.
 - i. Test results and an interpretation of test results.
 - j. Ambient conditions at the time of sample-taking and testing.
 - k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
 - l. Name and signature of laboratory inspector.

- m. Recommendations on retesting.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample-taking and similar services, and repair damaged construction.
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01400

SECTION 01500 - TEMPORARY FACILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions of Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. The work in this section includes, but is not limited to:
 - 1. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water, and sanitary facilities.
 - 2. Temporary Controls: Barriers, enclosures and fencing protection of work, and water control.
 - 3. Construction Facilities: Access roads, parking, progress cleaning, project signs, and temporary buildings.
- B. At completion of work, remove temporary utilities, temporary controls and construction facilities.
- C. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Project Closeout Section 01700

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with requirements of Federal, State and local codes and regulations.

1.4 TEMPORARY UTILITIES

- A. Temporary Electricity
 - 1. Provide and pay for power service required from power source.
 - 2. Provide power outlets for construction operations, with branch wiring and distribution boxes. Provide flexible power cords as required.

B. Temporary Lighting

1. Provide and maintain lighting for construction operations.
2. Maintain lighting and provide routine repairs.

C. Temporary Heat

1. Provide and pay for heat devices and heat as required to maintain specified conditions for construction operation.

D. Temporary Ventilation

1. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gasses.

E. Temporary Water Service

1. Provide, maintain and pay for suitable quality water service required for construction operations.

F. Temporary Sanitary Facilities

1. Provide and maintain required facilities and enclosures.

1.5 TEMPORARY CONTROLS

A. Barriers

1. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
2. Provide protection for plant life designated to remain. Replace damaged plant life.
3. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

B. Fencing

1. Construction - Contractor's option

C. Water Control

1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
2. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Protection of Installed Work

1. Protect installed work and provide special protection where specified in individual specification Sections.
2. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
3. Prohibit traffic from landscaped areas.

E. Security

1. Provide security and facilities to protect Work and Owner's operations from unauthorized entry, vandalism, or theft.

1.6 CONSTRUCTION FACILITIES

A. Access Roads

1. Construct and maintain temporary roads accessing public thoroughfares to serve construction area.
2. Provide means of removing mud from vehicle wheels before entering streets.

B. Parking

1. Provide temporary surface parking areas to accommodate construction personnel.
2. When site space is not adequate, provide additional off-site parking.

C. Progress Cleaning

1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
2. Remove waste materials, debris, and rubbish from site weekly and dispose off-site.

D. Field Offices and Sheds

1. Construction

- a. Structurally sound, weather-tight, with floors raised above ground.
- b. Temperature transmission resistance: Compatible with occupancy and storage requirements.
- c. At Contractor's option, portable or mobile buildings may be used.

- 1. Mobile homes, when used, shall be modified for office use.

2. Contractor's Office and Facilities

- a. Contractor shall provide all facilities necessary to meet his own requirements as to field office, tools, materials and equipment storage, pipe bending and threading shop, toilets, etc.

3. Storage Sheds

- a. To requirements of various trades.
- b. Dimensions: Adequate for storage and handling products.
- c. Ventilation: Comply with specified and code requirement for the products stored.
- d. Heating and Cooling: Adequate to maintain temperatures specified in the respective Sections for the products stored.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT, AND FURNISHING

- A. May be new or used, but must be serviceable, adequate for the required purpose, and must not violate applicable codes or regulations.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Fill and grade sites for temporary structures to provide surface drainage.

3.2 INSTALLATION

- A. Construct temporary field offices and storage sheds on proper foundations and provide connections to utility services.
 - 1. Secure portable or mobile buildings when used.
 - 2. Provide steps and landings at entrance doors.
- B. Mount a thermometer at convenient location – not in direct sunlight.
- C. Locate Engineer's field office within the project area.

3.3 MAINTENANCE AND CLEANING

- A. Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment, and service.

3.4 REMOVAL

- A. Remove temporary field offices, contents, and services at a time they are no longer needed, upon approval of the Engineer.
- B. Remove storage sheds when they are no longer needed, upon approval of the Engineer.
- C. Remove foundations and debris: grade the site to required elevations and clean the areas.

END OF SECTION 01500

SECTION 01631 - PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings, Details and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section "Submittals."
- C. Standards: Refer to Section "Definitions and Standards" for applicability of industry standards to products specified.

1.3 DEFINITIONS

- A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:
 - 1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
 - 2. Revisions to Contract Documents requested by the Owner or Engineer.
 - 3. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

- A. Substitution Request Submittal: Requests for substitution will be considered if received within 30 days after commencement of the Work. Requests received more than 30 days after commencement of the Work may be considered or rejected at the discretion of the Engineer.
1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.
 2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
 - b. Samples, where applicable or requested.
 - c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
 - d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, that will become necessary to accommodate the proposed substitution.
 - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
 - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
 - g. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time, that may subsequently become necessary because of the failure of the substitution to perform adequately.

3. Engineer's Action: Within one week of receipt of the request for substitution, the Engineer will request additional information or documentation necessary for evaluation of the request. Within 2 weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, the Engineer will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance will be in the form of Change Order.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Conditions: The Contractor's substitution request will be received and considered by the Engineer when one or more of the following conditions are satisfied, as determined by the Engineer; otherwise requests will be returned without action except to record noncompliance with these requirements.
 1. Extensive revisions to Contract Documents are not required.
 2. Proposed changes are in keeping with the general intent of Contract Documents.
 3. The request is timely, fully documented and properly submitted.
 4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
 5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
 6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 7. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.
 8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the

Contractor certifies that the substitution will overcome the incompatibility.

9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
 10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.
- B. The Contractor's submittal and Engineer's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01631

SECTION 01700 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
 - 1. Inspection procedures.
 - 2. Project record document submittal.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions-2 through -16.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
 - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
 - a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
 - 2. Submit record drawings and maintenance manuals.
 - 3. Deliver tools, spare parts, extra stock, and similar items.
 - 4. Complete final clean up requirements.
- B. Inspection Procedures: On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfilled requirements. The Engineer will prepare the Certificate of Substantial

Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Engineer will repeat inspection when requested and assured that the Work has been substantially completed.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit a certified copy of the Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion, or when the Owner took possession of and responsibility for corresponding elements of the Work.
5. Submit a final liquidated damages settlement statement.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: The Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer.

1. Upon completion of reinspection, the Engineer will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, reinspection will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
 2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
 3. Note related Change Order numbers where applicable.
 4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
 5. Upon completion of the work, submit record Drawings to the Engineer.
- C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and Product Data.
1. Upon completion of the Work, submit record Specifications to the Engineer for the Owner's records.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

PROJECT CLOSEOUT

01700 - 3

3.1 FINAL CLEANING

- A. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
- B. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
 - 1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION 01700

SECTION 02100 - CLEARING AND GRUBBING

PART I - GENERAL

1.1 DESCRIPTION

- A. The work of this Section includes, but is not limited to:
1. Clearing
 2. Grubbing
 3. Stripping and stockpiling topsoil
 4. Debris disposal
- B. Related Work Specified Elsewhere:
1. Trenching, Backfilling & Compacting: Section 02221
 2. Finish Grading, Seeding and Sodding: Section 02485
- C. Definitions:
1. Clearing is defined as the removal of trees, brush, down timber, rotten wood, rubbish, any other vegetation and objectionable material at or above original ground elevation not designated to be saved. Clearing also includes removal of fences, walls, guide posts, guide rail, signs and other obstructions interfering with the proposed work.
 2. Grubbing is defined as the removal from below the surface of the natural ground of stumps, roots and stubs, brush, organic materials and debris.

1.2 JOB CONDITIONS

- A. Traffic: Conduct site clearing operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
1. Protect improvements on adjoining properties and on Owner's property.
 2. Restore damaged improvements to their original condition, as acceptable to property owners.

- C. Protection of Existing Trees and Vegetation: Protect existing trees and other vegetation against unnecessary cutting, breaking or skinning of roots, skinning or bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.
1. Water trees and other vegetation to remain within limits of contract work as required to maintain their health during course of construction operations.
 2. Provide protection for roots over 1-1/2 inch diameter that are cut during construction operations. Coat cut faces with an emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
 3. Repair or replace trees and vegetation which are damaged by construction operations, in a manner acceptable to Engineer. Employ a licensed arborist to repair damages to trees and shrubs.
- D. Salvable Improvements: Carefully remove items indicated to be salvaged, and store on Owner's premises where indicated or directed.

1.3 SUBMITTALS

- A. Burning Permits:
1. Submit two copies of each on-site burning permit if such permits are required by local jurisdictional authorities.
- B. Disposal of Debris:
1. Contractor shall be responsible for suitability removing and disposing debris removed during the clearing and grubbing process.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Temporary Fencing:
1. Undamaged picket snow fence, 4' high, formed of wooden slats, tightly woven with wire cable.
 2. Soil-set fence posts, studded "T" type, 6' high.

- B. Tree Wound Dressing:
 - 1. Antiseptic and waterproof, asphalt base.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Notify the Engineer at least 48 hours prior to beginning any clearing work.
- B. Protect benchmarks, utilities, existing trees, shrubs and other landscape features adjacent to the work with temporary fencing or barricades satisfactory to the Engineer.
- C. When a private enclosure fence encroaches on the work area, notify the property owner at least five days in advance of the clearing/grubbing operations to permit the owner to remove it, construct a supplemental fence, or make such other arrangements as may be necessary for security purposes. Upon failure of the property owner to reasonably proceed with the work required to secure his property, carefully remove the fence, in whole or in part, and neatly pile the materials onto the owner's property.

3.2 UTILITY RELOCATIONS

- A. Inform all companies, individuals and others owning of controlling facilities or structures within the limits of the work which have to be relocated, adjusted or reconstructed in sufficient time for the utility to organize and perform such work in conjunction with or in advance of the Contractor's operations.
- B. Comply with the provisions of PA Legislature Act 38 (12-12-91) or as amended.

3.3 CLEARING

- A. Confine clearing to within the limits of the right-of-way or easement.
- B. Fell trees in a manner that will avoid damage to trees, shrubs and other installations which are to be retained.

3.4 GRUBBING

- A. Grub areas within the construction limits to remove roots and other objectionable material to a minimum depth of 8".
- B. Remove all stumps within the cleared areas unless otherwise authorized by the Engineer.

3.5 STRIPPING AND STOCKPILING TOPSOIL

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

3.6 DEBRIS DISPOSAL

- A. Trees, logs, branches, brush, stumps and other debris resulting from clearing and grubbing operations shall be disposed by the Contractor.
- B. Do not deposit or bury on the project site debris resulting from the clearing and grubbing work.
- C. Debris may be burned on-site if local ordinances allow open-air burning, if required permits are obtained, and if burning operations are conducted in compliance with local ordinances and regulations.

3.7 RESTORATION

- A. Repair all injuries to bark, trunk, limbs and roots of remaining plants by properly dressing, cutting, tracing and painting, using approved arboricultural practices and materials.
- B. Replace trees, shrubs and plants designated to be saved which are permanently injured or die during the life of the Contract as a result of construction operations with like species acceptable to the project Owner.
- C. Remove protective fences, enclosures and guards upon the completion of the project.

- D. Restore guide posts, guide rail, signs, mail boxes, fences, and other interferences to the condition equal to that existing before construction operations.

END OF SECTION 02100

SECTION 02140 - DEWATERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. Dewatering consists of performing work necessary to lower and control groundwater levels and hydrostatic pressures to permit excavation and construction to be performed in near-dry conditions.
- B. Control of surface and sub-surface water, ice and snow are part of dewatering requirements.

1.3 QUALITY ASSURANCE

- A. Maintain adequate supervision and control to ensure that stability of excavated and constructed slopes are not adversely affected by water; erosion is controlled or flooding of excavation does not occur.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION

3.1 DEWATERING

- A. Provide an adequate system to lower and control groundwater in order to permit excavation and placement of pipe under dry conditions.
- B. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner to avoid inconvenience to others engaged in work about site. Provide sumps, sedimentation tanks, and other flow control devices as required by governing authorities.
- C. There will be no additional payment for any over excavation required as a result of improper dewatering.

END OF SECTION 02140

SECTION 02150 - SHORING AND BRACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. Extent of shoring and bracing work includes, but is not limited to, the following:
 - 1. Shoring and bracing necessary to protect excavation against loss of ground or caving embankments.

1.3 QUALITY ASSURANCE

- A. Regulations: Comply with local codes and ordinances of governing authorities (including OSHA) having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide suitable shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 02150

SECTION 02221 - TRENCHING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.1 DESCRIPTION

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

1. Cutting paved surfaces
2. Blasting
3. Trench excavation, backfill and compaction
4. Support of excavation
5. Pipe bedding requirements
6. Control of excavated material
7. Rough grading
8. Restoration of unpaved surfaces
9. Traffic Control

B. Related Sections: The following sections contain requirements that relate to this section:

- | | |
|---|---------------|
| 1. Clearing and Grubbing: | Section 02100 |
| 2. Finish Grading, Seeding and Sodding: | Section 02485 |
| 3. Paving and Resurfacing: | Section 02575 |

C. Definitions:

1. Subgrade: Trench or excavation bottom prepared as specified herein to receive pipe bedding, concrete cradle or encasement or structures.
2. Unclassified Excavation: Excavation of all material encountered including soil, shale, rock, boulders, fill or other material on-site.
3. Rock Excavation: Excavation of solid mineral rock greater than one-half cubic yard in volume requiring, with the Engineer's approval, drilling, blasting and wedging for its removal. No extra payment shall be made for rock excavation.
4. Pipe Bedding: Placement of ASTM No. 57 crushed limestone for full trench width from the subgrade a minimum of four (4) inches or one-eighth the outside diameter of the pipe, whichever is greater up to a maximum of six (6) inches.
5. Pipe Embedment: Placement of ASTM No. 57 crushed limestone for full trench width from the top of the pipe bedding (halfway up pipe) to a point a minimum of twelve (12) inches above the pipe.

6. Backfill: Placement of material as specified herein for full width of excavation from the top of the pipe embedment to the ground surface or, in the case of paved area, to the bottom of replacement base course or paving.

1.2 QUALITY ASSURANCE

A. Testing Agency:

1. Compaction testing if requested by the Engineer, shall be performed by a Soils Testing Laboratory engaged and paid for by the Contractor and approved by the Engineer.

B. Reference Standards:

1. Pennsylvania Department of Transportation:

Regulations Governing Occupancy of Highways by Utilities (67 PA Code, Chapter 459)
 Publication 408 Specifications
 Pennsylvania Test Method, PTM 106
 Pennsylvania Test Method, PTM 402
 Publications 212 and 213, Work Zone Traffic Control

2. American Society for Testing and Materials (ASTM):

ASTM C33	Specifications for Concrete Aggregates
ASTM D698	Tests for Moisture-Density Relations of Soils
ASTM D2922	Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods

C. Compaction Testing:

1. Conduct compaction tests at locations as directed by the Engineer during backfilling operations.
2. Determine compaction in state highways and shoulders by the testing procedure contained in Pennsylvania Test Method, PTM 106, Method B or PTM 402.
3. Determine compaction in areas other than state highways and shoulders by the testing procedure contained in ASTM D698 or ASTM D2922.

1.3 SUBMITTALS

A. Certificates:

1. Submit certification attesting that the composition analysis of pipe bedding and select material stone backfill materials meet specification requirements.
2. Submit certified compaction testing results from the soils testing laboratory.

B. Compaction Equipment List:

1. Submit a list of all equipment to be utilized for compacting, including manufacturers' lift thickness limitations.

1.4 JOB CONDITIONS

A. Classification of Excavation:

1. All excavation work performed under this contract is UNCLASSIFIED, and includes excavation and removal of all soil, shale, rock, boulders, fill and all other materials encountered of whatever nature.

B. Control of Traffic:

1. Employ traffic control measures in accordance with Pennsylvania Department of Transportation Publications 212 and 213, "Work Zone Traffic Control".

C. Protection of Existing Utilities and Structures:

1. Take all precautions and utilize all facilities required to protect existing utilities and structures. In compliance with Act No. 38 (12-12-91) of the General Assembly of Pennsylvania, advise each Utility at least three (3) working days in advance of intent to excavate, do demolition work or use explosives and give the location of the job site. Request cooperative steps of the Utility and suggestions for procedures to avoid damage to its lines.
2. Advise each person in physical control of powered equipment or explosives used in excavation or demolition work of the type and location of utility lines at the job site, the Utility assistance to expect and procedures to follow to prevent damage.

3. Immediately report to the Utility and the Engineer any break, leak or other damage to the lines or protective coatings made or discovered during the work and immediately alert the occupants of premises of any emergency created or discovered.
4. Allow free access to Utility personnel at all times for purposes of maintenance, repair and inspection.
5. The Contractor shall be held liable for any damage done by reason of breaking of water, sewer, gas, telephone, electrical or other utility service. If, during the course of his work, he shall damage any of the aforementioned utilities, he shall immediately begin to repair the same and send notice to the proper authorities. Whenever the Contractor, during the progress of the excavation shall uncover service pipes or lines, which because of age or injury, are in poor condition, he shall immediately notify the proper Authority in order that steps may be taken for replacement or repair. To prevent dispute with property owners as to cause of damages, the Contractor shall notify his foreman to carefully note and properly report such damage. The decision of the Engineer as to the responsibility for any damage occurring in either an old or a new service or structure shall be final and binding to the Contractor.
6. Keep all fire hydrants, water valves, gas valves, fire alarm boxes and mail boxes accessible for use.

PART 2 - PRODUCTS

2.1 PIPE BEDDING MATERIAL

A. Standard Pipe Bedding:

1. ASTM No. 57 crushed limestone aggregate, Table C, Section 703.2, Publication 408 Specifications. Do not use slag or cinders. (See details for impervious material for clay trench plugs and areas in wetlands.)

2.2 BACKFILL MATERIAL

A. Native Backfill:

1. Material excavated from the site if free of stones larger than 8" in size and free of wet, frozen and organic materials and refuse.

B. Special Backfill:

1. "Special Backfill" Material shall be PennDOT No. 2A limestone aggregate meeting the minimum requirements as set forth in Section 703 of the Pennsylvania Department of Transportation Publication 408. Slag or cinders will not be allowed. If requested by the OWNER or the ENGINEER, the CONTRACTOR shall furnish ASTM #57 limestone aggregate at no additional cost to the OWNER.

PART 3 - EXECUTION

3.1 MAINTENANCE AND PROTECTION OF TRAFFIC

- A. Coordinate the work to insure the least inconvenience to traffic and maintain traffic in one or more unobstructed lanes unless closing the roadway is authorized.
- B. Maintain access to all streets and private drives.
- C. Provide and maintain signs, flashing warning lights, barricades, markers and other protective devices as required to conform with construction operations and to keep traffic flowing with minimum restrictions.
- D. Comply with state and local codes, permits and regulations.

3.2 CUTTING PAVED SURFACES

- A. Where installation of pipelines, miscellaneous structures and appurtenances necessitate breaking a paved surface, make saw cuts in a neat uniform fashion forming straight lines parallel with the centerline of the trench. Saw cut offsets at right angles to the centerline of the trench.
- B. Before any excavation takes place, the Contractor shall neatly cut all surface and base courses of the streets, to the widths indicated in the specifications governing the acceptable trench widths, or as required by the Engineer. In no case shall the Contractor proceed without first cutting the trench outline to preclude extensive tearing of the surface. Cutting of existing pavement will include cutting any bituminous, concrete, or brick pavement as necessary for construction.

- C. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges and re-cut as necessary prior to pavement replacement to provide bearing on undisturbed earth as indicated on the Standard Details.

3.3. BLASTING

- A. No blasting will be permitted on the project.

3.4 TRENCH EXCAVATION

A. Depth of Excavation:

1. Gravity Pipelines:

- a. Excavate trenches to the depth and grade shown on the profile drawings for the invert of the pipe plus that excavation necessary for placement of pipe bedding material.
 - b. Excavation for laterals shall provide a straight uniform grade from the main pipeline or riser stack to the elevation at the right-of-way line, plus that excavation necessary for placement of pipe bedding material.
- 2. Where unsuitable bearing material is encountered in the trench bottom, continue excavation until the unsuitable material is removed, solid bearing is obtained or can be established, or concrete cradle can be placed. If no concrete cradle is to be installed, refill the trench to required pipeline grade with pipe bedding material.
 - 3. Where the Contractor, by error or intent, excavates beyond the minimum required depth, backfill the trench to the required pipeline grade with bedding material.

B. Width of Excavation:

- 1. Excavate trenches, including laterals, to a width necessary for placement and jointing of the pipe, and for placing and compacting pipe bedding and trench backfill around the pipe, but not less than 16" plus the pipe outside diameter.
- 2. Shape trench walls completely vertical from trench bottom to at least 2' above the top of the pipe.

C. Length of Open Trench:

- 1. Do not advance trenching operations more than 100' ahead of completed pipeline.

2. If the work is stopped or any part of the trench and the same is left open for an unreasonable length of time in advance of the construction of the pipe line, the Contractor shall, when directed, refill trench and shall not again open the trench or part thereof until he is ready to proceed with construction of the pipe line. If the Contractor shall neglect or fail to completely refill such trench and temporarily repave and seed where not originally paved, over the same within 48 hours after written notice to do so, the OWNER shall be authorized to refill and temporarily repave such trench and costs and expense thereof shall be charged to the Contractor and may be retained by the OWNER from any money due or to become due the Contractor.

3.5 SUPPORT OF EXCAVATION

- A. Support excavations with sheathing, shoring and bracing or a "trench box" as required to comply with Federal and State laws and codes.
- B. Install adequate excavation supports to prevent ground movement or settlement to adjacent structures, pipelines or utilities. Damage due to settlement because of failure to provide support or through negligence or fault of the Contractor in any other manner, shall be repaired at the Contractor's expense.
- C. Withdraw shoring, bracing and sheathing as backfilling proceeds unless otherwise directed by the Engineer.

3.6 CONTROL OF EXCAVATED MATERIAL

- A. Keep the ground surface, within a minimum of 2' of both sides of the excavation free of excavated material.
- B. Provide temporary barricades to prevent excavated material from encroaching on private property, walks, gutters and storm drains.
- C. Maintain accessibility to all fire hydrants, valve pit covers, valve boxes, curb boxes, fire and police call boxes and other utility controls at all times. Keep gutters clear or provide other satisfactory facilities for street drainage. Do not obstruct natural water courses. Where necessary, provide temporary channels to allow the flow of water either along or across the site of the work.
- D. In areas where pipelines parallel or cross streams, ensure that no material slides, is washed or dumped into the stream course. Remove cofferdams immediately upon completion of pipeline construction.

3.7 DEWATERING

- A. Keep excavations dry and free of water. Dispose of precipitation and subsurface water clear of the work.
- B. Maintain pipe trenches dry until pipe has been jointed, inspected and backfilled and concrete work has been completed.
Prevent trench water from entering pipelines under construction.
- C. Intercept and divert surface drainage away from excavations. Design surface drainage systems so that they do not cause erosion on or off the site, or cause unwanted flow of water.
- D. Comply with Federal and State requirements for dewatering to any watercourse, prevention of stream degradation and erosion and sediment control.

3.8 PIPE BEDDING AND EMBEDMENT

- A. Flexible Wall Pipe (PVC)
 - 1. Prepare trench bottom as shown on Standard Detail.
 - 2. Place and compact Standard Pipe Bedding with ASTM No. 57 limestone aggregate in accordance with Standard Detail.
 - 3. Shape bedding recesses for joints and bells to assure pipe is supported on barrel for entire length.
 - 4. Lay pipe as specified in Section 02730 of these Specifications.

3.9 PIPE LAYING

- A. Provide required pipe bedding placed in accordance with the Standard Details.
- B. Lay pipe as specified in the appropriate Section of these Specifications for pipeline construction.

3.10 BACKFILLING TRENCHES

- A. After pipe installation and inspection, backfill trenches from trench bottom or from the top of pipe bedding material, whichever is greater, to 12" above the crown of the pipe with specified backfill material hand placed and carefully compacted with hand-operated mechanical tampers in layers of suitable thickness to provide specified compaction around and under the haunches of

the pipe. Backfill and compact the remainder of the trench with specified backfill material. Refer to Contract Drawings and Details for trench backfill material and requirements.

B. Lift Thickness Limitations:

1. Submit a list of the compaction equipment to be utilized on the project, the recommendations of the equipment manufacturer as to the maximum lift thickness which can be placed, and the method of compaction to be used with this equipment to achieve the required compaction. In no case shall maximum lift thickness placed exceed the maximum limits specified by the manufacturer's recommendations. However, if the equipment manufacturer's lift thickness recommendation is followed and the specified compaction is not obtained, the Contractor shall, at his own expense, remove, replace and retest as many times as required to obtain the specified compaction. If this information is not submitted or not approved by the Engineer, the Contractor shall place lifts as shown on the details.
2. Lift thickness limitations specified for state highways, shoulders or embankments govern over this compaction equipment manufacturer's recommendations.

C. Compaction: Compact backfill materials to not less than 95% of maximum density in accordance with ASTM D-1557.

D. Field Quality Control: Perform field density tests in accordance with ASTM D-1556 (Sand Cone Method) or with ASTM D-2922 (nuclear method).

E. Unsuitable Backfill Material:

1. Where Engineer deems backfill material to be unsuitable and rejects all or part thereof due to conditions prevailing at the time of construction not caused by the Contractor, remove the unsuitable material and replace with stone backfill to be paid under the contract unit price per C.Y. installed or suitable foreign backfill material at the appropriate unit price per C.Y. installed.

3.11 DISPOSAL OF EXCAVATED MATERIAL

- A. Excavated material remaining after completion of backfilling shall remain the property of the Contractor, removed from the construction area and legally disposed of.

3.12 ROUGH GRADING

- A. Rough grade areas disturbed by construction to a uniform finish form.
- B. Grade areas to be paved to depths required for placing subbase and paving materials.
- C. Rough grade areas to be topsoiled and seeded to 3" below indicated finish contours.

3.13 RESTORATION OF UNPAVED SURFACES

- A. Restore unpaved surfaces disturbed by construction to equal the surface condition prior to construction.
- B. Restore grassed areas in accordance with Section 02485, Finish Grading, Seeding and Sodding.

3.14 REGULATIONS OF DEPARTMENT OF ENVIRONMENTAL PROTECTION

- A. All regulations prescribed from time to time by the Department of Environmental Protection to prevent erosion and sedimentation shall be followed:
 - 1. For Sewer Work
 - a. All sewer trenches shall be opened, pipe laid, and trench backfilled on the same day. If a section is opened but pipe is not laid, that section shall be backfilled that day and reopened the next day.
 - b. Excavated material shall be stacked neatly on the sides to prevent rain water entering the trench and causing erosion.
 - c. When a sewer parallels a stream and less than 10 feet of natural vegetation exists between the stream and sewer line, appropriate BMP's shall be placed on the stream side of the trench to trap any soil which may flow to the stream. The BMP's shall be cleaned when they become 50 percent ineffective and maintained until the backfilled material is sufficiently compact to prevent any erosion.
 - d. After pipe is laid and jointed, backfill shall be laid in 6-inch layers and tamped as described elsewhere. Backfill shall then be mounded to prevent surface water from flowing down or across the backfilled trench.
 - e. Mounded backfill shall be seeded and mulched at once to prevent erosion.

- f. Material excavated for manhole shall be spread around and compacted to prevent erosion.
- g. Any surplus excavated materials left on the ground shall be hauled away immediately to prevent them being carried away by surface waters. Site of deposition shall be approved by Engineer, and materials shall be compacted immediately to prevent them from being carried away.

3.15 SOIL EROSION AND SEDIMENTATION CONTROL

The Contractor shall at all times protect against soil erosion and sedimentation of streams. Disturbed areas, particularly the waste sites, shall be stabilized as soon as possible upon completion of the work to prevent erosion and sedimentation. Areas near streams and/or on steep slopes may require the staking of hay bales or jute matting to hold earth in place until stabilization by vegetation can be accomplished. The Contractor shall also perform all construction meeting the requirements of the Soil Erosion and Sedimentation Control Plan incorporated in these Contract Documents. This item is incidental to the Contract, and no additional payment will be made.

3.16 TRENCHING ALONG OR ACROSS STATE, COUNTY OR BOROUGH ROADS

- A. At several locations the sewer line shall be laid along or across paved roads. Lines may be laid by open-cut method wherever permissible. Where open cut is impractical, tunneling, drilling or jacking may have to be done separately.
- B. Contractor shall cooperate with Pennsylvania Department of Transportation. Owner shall provide all permits necessary for work on state or township highways, private rights-of-way and stream crossings.
- C. Contractor shall familiarize himself with regulations governing the work done in PennDOT right-of-way and cooperate with officials of PennDOT during the operations. All such work shall be performed so as not to obstruct traffic on the highways.
- D. Contractor shall cooperate with municipal officials in maintaining safe and passable conditions on all roads, streets and alleys affected by the work. Detours may be established only with written approval of the officials having jurisdiction. A copy of such approval must be submitted to Engineer and approved by him before becoming effective.

3.17 TRENCHING ACROSS PRIVATE PROPERTY

- A. Where pipe lines cross private property as shown on the Contract Drawing, all rights-of-way will be secured by Owner without expense to Contractor. In opening trenches across such private property, Contractor shall use every means to protect from injury and damage all property, including trees, shrubbery, fences, buildings, walls, roads, lawns, water courses, natural features or any improvements thereto which may exist.
- B. All damages done to any part of the property shall be repaired without charge to the satisfaction of Engineer. Contractor shall confine all his operations to a net width of the right-of-way secured by Owner. All claims for property damage, trespass, occupations, etc., for ground outside of this strip shall be borne by Contractor.
- C. When Contractor must trench across private driveways, he shall notify the property resident one day in advance and shall not block any driveway for more than eight (8) hours.

END OF SECTION 02221

SECTION 02485 - FINISH GRADING, SEEDING AND SODDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this section.

1.2 SUMMARY

- A. The work of this section includes, but is not limited to:
 - 1. Placing topsoil
 - 2. Soil conditioning
 - 3. Finish grading
 - 4. Seeding
 - 5. Sodding
 - 6. Maintenance
- B. Restore unpaved surfaces to a condition similar to that prior to excavation as specified and indicated on the Drawings.
- C. The "Seeding Restoration Tables" at the end of this section list specific seeding restoration requirements. Refer to Drawings and Special Conditions for seeding restoration requirements at each specific location of Work.
- D. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Clearing and Grubbing Section 02100
 - 2. Trenching, Backfilling & Compacting Section 02221

1.3 QUALITY ASSURANCE

- A. Testing Agency:
 - 1. The Contractor has the option to use soil testing to justify decreasing lime and fertilizer rates. When soil testing is selected by the Contractor, the soil and soil supplement testing shall be performed by a Soils Testing Laboratory engaged and paid for by the Contractor and approved by the Engineer.
 - a. Collect soil samples under the direction of the Engineer.

B. Reference Standards:

1. Pennsylvania Department of Transportation
Publication 408 Specifications
2. Pennsylvania Seed Act of 1965, Act 187, as amended.
3. Agricultural Liming Material Act of 1978, P.L. 15, No. 9 (3 P.S. 132-1), as amended.
4. Pennsylvania Soil Conditioner and Plant Growth Substance Law, Act of December 1, 1977, P.L. 258, No. 86 (3 P.S. 68.2), as amended.
5. Rules for Testing Seeds of the Association of Official Seed Analysts.

1.4 SUBMITTALS

A. Samples:

1. When directed, furnish three strips of sod, 4 1/2 feet long by 12" wide, laid on 3" of topsoil and tamped in place. The samples shall be representative of the sod and workmanship to be provided.
2. Advise the Engineer of the location of the field, and area within the field, from which the sod is to be taken for approval.

B. Certificates:

1. Prior to use or placement of material, submit certifications of material composition of the following for approval:
 - a. Topsoil analysis
 - b. Fertilizer
 - c. Lime
 - d. Seed Mixture(s)
2. If soil tests are performed to justify decreased liming and fertilizer rates, submit certified soil sample analyses, including laboratory's recommended soil supplement formulation.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Seed:

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

B. Sod:

1. Mow sod in the field to a height of not more than 2 1/2" within five days prior to lifting.
2. Cut sod to a depth equal to the growth of the fibrous roots, but in no case less than 1 1/2" exclusive of grass and thatch. Do not cut sod when the ground temperature is below 32° F.
3. Deliver sod to the project site within 24 hours after being cut and place sod within 36 hours after being cut. Do not deliver small, irregular or broken pieces of sod.
4. During wet weather, allow sod to dry sufficiently to prevent tearing during handling and placing. During dry weather, moisten sod to ensure its vitality and to prevent dropping of the soil during handling. Sod which dries out will be rejected.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Having a pH of between 6.0 and 7.0; containing not less than 2% nor more than 10% organic matter as determined by AASHTO T194.
- B. Fertile friable loam, sand loam, or clay loam which will hold a ball when squeezed with the hand, but which will crumble shortly after being released.
- C. Free of clods, grass, roots or other debris harmful to plant growth.
- D. Free of pests, pest larvae and matter toxic to plants.

2.2 FERTILIZER

- A. Basic Dry Formulation Fertilizer:
 1. Analysis 0-20-20 and as defined by the Pennsylvania Soil Conditioner and Plant Growth Substance Law.
- B. Starter Fertilizer:
 1. Analysis 10-5-5 or 12-6-6 and as defined by the Pennsylvania Soil Conditioner and Plant Growth Substance Law.

2.3 LIME

- A. Raw ground limestone conforming to Section 804.2(a), Publication 408 Specifications.

2.4 SEED

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

TABLE 1 - GRASS AND AGRICULTURAL SEEDS

Species	Minimum Guaranteed Purity (Percent)	Maximum Weed Seed (Percent)	Minimum Guaranteed Germination (Percent)
Kentucky Bluegrass (<i>Poa pratensis</i>) Domestic origin; min. 21 lb. per bushel	90	0.20	80
Perennial Ryegrass (<i>Lolium Perenn</i> , var. Pennfine)	95	0.15	90
Kentucky 31 Fescue (<i>Festuca elatior arundinacea</i>)	98	0.25	85
Crownvetch (<i>Coronilla varia</i> , var. Penngift)	99	0.10	70
Pennlawn Red Rescue (<i>Festuca rubra</i> , var. Pennlawn)	98	0.25	90
Annual Rye Grass (<i>Lolium multiflorum</i>)	95	0.15	90
Timothy (<i>Phleum pratense</i>)	98	0.25	95

2.5 SEED MIXTURES

- A. See "Seeding Restoration Table" at end of this Section.

2.6 INOCULANT

- A. Inoculate leguminous seed before seeding with nitrogen fixing bacteria culture prepared specifically for the species.
- B. Do not use inoculant later than the date indicated by the manufacturer.
- C. Protect inoculated seed from prolonged exposure to sunlight prior to sowing.
- D. Reinoculate seed not sown within 24 hours following initial inoculation.

2.7 MULCHING MATERIALS

- A. Mulches for seeded areas shall be one, or a combination of, the following:
 - 1. Straw:
 - a. Cured to less than 20% moisture content by weight.
 - b. Contain no stems of tobacco, soybeans or other coarse or woody material.
 - c. Wheat or oat straw.
 - 2. Wood Cellulose:
 - a. No growth or germination inhibiting substances.
 - b. Green, air dried. Packages not exceeding 100 pounds.
 - c. Requirements:
 - Moisture content: $12\% \pm 3\%$
 - Organic Matter: $98.6\% \pm 0.2\%$ on the over dry basis.
 - Ash Content: $1.4\% \pm 0.2\%$
 - Minimum Water-Holding Capacity: 1,000%
 - 3. Mushroom Manure:
 - a. Organic origin, free of foreign material larger than 2" and substances toxic to plant growth.
 - b. Organic Matter: 20% minimum
 - c. Water-holding Capacity: 120% minimum
 - d. pH: 6.0

2.8 SOD

- A. At least three year old, well-rooted Kentucky Bluegrass (*Poa pratensis*) sod containing a growth of not more than 10% of other grasses and clovers.
- B. Free from noxious weeds such as bermuda grass, wild mustard, crab grass and kindred grasses.

PART 3 - EXECUTION

3.1 TIME OF OPERATIONS

A. Spring Seeding:

1. Preliminary operations for seed bed preparation may commence as soon after February 15 as ground conditions permit.

B. Fall Seeding:

1. Preliminary operations for seed bed preparation may commence after July 15.

3.2 PREPARATION OF SUBGRADE

A. "Hard Pan" or heavy shale:

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

B. Loose loam, sandy loam or light clay:

1. Loosen and grade by harrowing, dicing or dragging.
2. Hand rake subgrade. Remove stones over 2" in diameter and other debris.

3.3 PLACING TOPSOIL

- A. Replace topsoil and spread over the prepared subgrade to obtain the required depth and grade elevation. Final compacted thickness of topsoil not less than 4".
- B. Hand rake topsoil and remove all materials unsuitable or harmful to plant growth.
- C. Do not place topsoil when the subgrade is frozen, excessively wet or extremely dry.
- D. Do not handle topsoil when frozen or muddy.

3.4 TILLAGE

- A. After seed bed areas have been brought to proper compact elevation, thoroughly loosen to a minimum depth of 5" by dicing, harrowing or other approved methods. Do not work topsoiled areas when frozen or excessively wet.
- B. Liming:
 - 1. Distribute limestone uniformly at a rate of 100 pounds per 1,000 square feet.
 - 2. Thoroughly incorporate into the topsoil to a minimum depth of 4".
 - 3. Incorporate as a part of the tillage operation.
- C. Basic Fertilizer:
 - 1. Distribute basic fertilizer uniformly at a rate of 50 pounds per 1,000 square feet.
 - 2. Incorporate into soil to depth of 4" by approved methods.
 - 3. Incorporate as part of tillage operation.
- D. Liming and Fertilizer rates may be decreased if lesser rates are indicated by soil tests provided by the Contractor.

3.5 FINISH GRADING

- A. Remove unsuitable material larger than 2" in any dimension.
- B. Uniformly grade surface to the required contours without the formation of water pockets.
- C. Rework areas which puddle by the addition of topsoil and fertilizer. Re-rake.
- D. Distribute starter fertilizer at the following rates:
 - 10-5-5: 50 pounds per 1,000 square feet.
 - 12-6-6: 33 pounds per 1,000 square feet.
- E. Incorporate starter fertilizer into the upper 1" of soil.

3.6 SEEDING

- A. Uniformly sow specified seed mix by use of approved hydraulic seed, power-drawn drill, power-operated seeder, or hand-operated seeder or by hand. Do not seed when winds are over 15 mph.
- B. Upon completion of sowing, cover seed to an average depth of 1/4" by hand raking or approved mechanical methods.

3.7 MULCHING

- A. Mulch within 48 hours of seeding.
- B. Place hay and straw mulch in a continuous blanket at a minimum rate of 1,200 pounds per 1,000 square yards.
 - 1. Anchor hay or straw mulch by use of twine, stakes, wire staples, paper or plastic nets.
 - 2. Emulsified asphalt may be used for anchorage provided it is applied uniformly at a rate not less than 31 gallons per 1,000 square yards.
 - 3. Apply approved chemical mulch binders at the manufacturer's recommended rate.
- C. Chemical mulch binders or a light covering of topsoil may be used for anchorage when the size of the area precludes the use of mechanical equipment.
- D. Apply wood cellulose fiber hydraulically at a rate of 320 pounds per 1,000 square yards.
 - 1. Incorporate as an integral part of the slurry after seed and soil supplements have been thoroughly mixed.
- E. Spread mushroom manure uniformly to a minimum of depth of 1/2" or to the depth indicated on the drawings.
- F. When mulch is applied to grass areas by blowing equipment, the use of cutters in the equipment will be permitted to the extent that a minimum of 95% of the mulch is 6" or more in length.

For cut mulches applied by the blowing method, achieve a loose depth in place of not less than 2".

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

3.8 SODDING

- A. Prior to sod placement, complete soil preparation or topsoiling.
- B. Apply lime and fertilizer as specified. Work into the soil a minimum of 2".
- C. Do not place sod when the temperature is lower than 32° F.
- D. Place sod by hand with tight joints and no overlap. Transverse joints shall be broken or staggered.
- E. Place sod so that the top of the sod is flush with the surrounding grade.
- F. Use of tools which damage the sod or dumping of sod from vehicles will not be permitted.
- G. Water sod to the saturation point immediately after placement.
- H. After watering, tamp with an approved tamper to close all joints and insure close contact between sod and sod bed. After tamping, the sod shall present a smooth, even surface free from bumps and depressions. If so directed, use a light roller, weighing not more than 65 pounds per foot of roller width to complete firming and smoothing the sod.
- I. When placing sod in ditches, place the strip with the long dimension at right angles to the flow of water. At any point, where water will start flowing over a sodded area, the upper edge of the sod strips shall be turned into the soil below the adjacent area and a layer of compacted earth placed over this juncture to conduct the water over the edge of the sod.
- J. In ditches and on slope areas, stake each strip of sod securely with at least one wood stake for each two square feet of sod. Stakes shall be 1/2" by 1" with a

length of 8" to 12". Drive stakes flush with the top of the sod, with the long face parallel to the slope contour.

3.9 MAINTENANCE

- A. Maintenance includes watering, weeding, cleanup, edging and repair of depressions, washouts or gullies.
- B. Those areas which do not show a prompt catch or grass within 14 days of seeding or sodding shall be reseeded or resodded until complete grass catch occurs.

SEEDING RESTORATION TABLE

<u>RESTORATION CONDITION</u>	<u>TOPSOIL</u>	<u>LIME*</u>	<u>BASIC FERTILIZER</u>	<u>STARTER FERTILIZER</u>	<u>SEED MIX & SOWING RATE (% BY WEIGHT)</u>
Temporary Cover (**)	N/A	N/A	N/A	N/A	100% Annual Ryegrass Sow 9# per 1,000 Sq. Yd. Mar. thru May/Aug. thru Sept.
Roadside; Non-mowed	Yes	100# per 1,000 S.F.	No	10-5-5 @ 50# per 1,000 S.F. <u>or</u> 12-6-6 @ 33# per 1,000 S.F.	80% Kentucky 31, Fescue 20% Pennlawn Red Fescue Sow 21# per 1,000 S.Y. Mar. thru May/Aug thru Sept.
Roadside; Mowed	Yes	100# per 1,000 S.F.	No	10-5-5 @ 50# per 1,000 S.F. <u>or</u> 12-6-6 @ 33# per 1,000 S.F.	50% Kentucky Bluegrass 30% Pennlawn Red Fescue 20% Perennial Ryegrass Sow 21# per 1,000 S.Y. Mar. thru May/Aug thru Sept.
Bank Areas Mowed	Yes	100# per 1,000 S.F.	No	10-5-5 @ 50# per 1,000 S.F. <u>or</u> 12-6-6 @ 33# per 1,000 S.F.	45% Crownvetch 55% Annual Ryegrass Sow 9# per 1,000 S.Y. Anytime except Sept. & Oct.
Lawns	Yes	100# per 1,000 S.F.	0-20-20 @ 50# per 1,000 S.F.	10-5-5 @ 50# per 1,000 S.F. <u>or</u> 12-6-6 @ 33# per 1,000 S.F.	50% Kentucky Bluegrass 30% Pennlawn Red Fescue 20% Perennial Ryegrass Sow 21# per 1,000 S.Y. Mar. thru May/Aug. thru Sept

SEEDING RESTORATION TABLE

<u>RESTORATION CONDITION</u>	<u>TOPSOIL</u>	<u>LIME*</u>	<u>BASIC FERTILIZER</u>	<u>STARTER FERTILIZER</u>	<u>SEED MIX & SOWING RATE (% BY WEIGHT)</u>
Open Fields; Non-cultiva- ted, Pasture	No	No	No	10-5-5 @ 50# per 1,000 S.F. <u>or</u> 12-6-6 @ 33# per 1,000 S.F.	100% Timothy Sow 9# per 1,000 S.Y. Sow 21# per 1,000 S.Y. Mar. thru May/Aug. thru Sept
Open Fields; Cultivated	No	No	No	10-5-5 @ 50# per 1,000 S.F. <u>or</u> 12-6-6 @ 33# per 1,000 S.F.	100% Annual Ryegrass Sow 9# per 1,000 S.Y. Mar. thru May/Aug. thru Sept.
Woods; Sparse	No	No	No	10-5-5 @ 50# per 1,000 S.F. <u>or</u> 12-6-6 @ 33# per 1,000 S.F.	100% Red Fescue Sow 36# per 1,000 S.Y. Mar. thru May/Aug thru Sept.

* Unless lesser rate indicated by soils tests

** Unless otherwise specified in the Erosion and Sedimentation Control Plan.

Notes: Refer to Drawings and Special Conditions for seeding restoration requirements at each specific location of work.

Hay mulch will not be used in Lawns.

SECTION 02730 - SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes sanitary sewerage system piping and appurtenances.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - 1. Division 2 Section "Trenching, Backfilling & Compacting" for excavation and backfill required for sanitary sewerage system piping and structures.
 - 2. Division 2 Section 03301 "Concrete Manhole Additive".

1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
 - 1. Certificates:
 - a. Submit certification from material suppliers attesting that materials meet or exceed specification requirements.
 - 2. Shop Drawings:
 - a. Submit detail shop drawings of manhole sections and precast bases if used.
 - b. Submit detail shop drawings of manhole frames and covers, including rubbings of inscription.
 - c. Submit detail shop drawings of manhole steps.
 - d. Submit manufacturers' description literature for the pipe to manhole flexible connections.
 - e. Submit product data for all pipe and fittings to be utilized.

1.4 QUALITY ASSURANCE

- A. Environmental Compliance: Comply with applicable portions of local environmental agency regulations pertaining to sanitary sewerage systems.
- B. Utility Compliance: Comply with local utility regulations and standards pertaining to sanitary sewerage systems.

1.5 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
 - 1. Locate existing sanitary sewerage system piping and structures that are to be utilized.

1.6 SEQUENCING AND SCHEDULING

- A. Coordinate connection to public sewer with Owner.
- B. Coordinate work with other utilities involved.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery and Handling:
 - 1. Do not place materials on private property without written permission of the property owner.
 - 2. During loading, transportation and unloading, exercise care to prevent damage to materials.
 - 3. Do not drop pipe or fittings. Avoid shock or damage at all times.
- B. Storage:
 - 1. Pipe may be strung along alignment where approved by the Engineer.
 - 2. Do not stack pipe higher than recommended by the pipe manufacturer.
 - 3. Store gaskets for mechanical and push-on joints in a cool, dry location out of direct sunlight and not in contact with petroleum products.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. General: Provide pipe and pipe fitting materials compatible with each other. Where more than one type of material or product is indicated, selection is Installer's option.
- B. Gravity Sewer
 - 1. For Pipe Sizes 15 inches and smaller: PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM D 3034, SDR 35, elastomeric gasket joints.
 - A. Gaskets: ASTM F 477, elastomeric seal.
 - 2. For Pipe Sizes 18" to 36": PVC (Polyvinyl Chloride) Sewer Pipe and Fittings: ASTM F 679, T-1 wall thickness, bell and spigot, elastomeric gasket joints.
 - A. Gaskets: ASTM F 477, elastomeric seal.
 - 3. Couplings: Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub, and adjoining pipe outside diameter.
 - A. Gaskets: ASTM F 477, elastomeric seal, compatible with pipe materials being joined.

2.2 MANHOLES

- A. Precast Concrete Manholes: ASTM C 478, precast reinforced concrete, of depth indicated. All manholes within state road right-of-ways shall be in accordance with Pennsylvania Department of Transportation Publication #72 (Standards for Roadway Construction), Series RC-38M.
 - 1. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and having a separate base slab or base section with integral floor. Manholes are to be made with the base slab integral with the base section (monolithically poured).
 - 2. Riser Sections: 5-inch minimum thickness; 48-inch diameter, (unless otherwise indicated) and lengths to provide depth indicated.

3. Top Section: Eccentric cone type, unless flat-slab-top type is indicated. Top of cone to match grade rings. A minimum 27" diameter opening shall be provided at the top of cone. Wall thickness should increase from 5" at the bottom to 8" at the top of the cone.
 4. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6 to 9 inches total thickness and match 27-inch diameter frame and cover. High density polyethylene grade rings may be substituted for concrete rings where approved by the Engineer. Concrete bricks with non-shrink grout shall be utilized to super elevate castings, as determined by Engineer.
 5. Joint Sealant: Flexible Butyl Resin Sealant, Federal Specification SS-S-00210, performed, flexible, self adhering, cold applied. Apply joint sealant to upper 360° of spigot and lower 360° of bell. Allow sufficient overlap of sealant to form a joined seal.
 6. Steps: Cast into base, riser, and top sections sidewall at 12-inch intervals.
 7. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
 8. Flow Channel: Type II Cement Concrete.
 9. See Section 03301 "Concrete Manhole Additive" for waterproofing.
- B. Concrete: Portland cement mix, 3000 psi.
1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- C. Manhole Steps: Wide enough for a man to place both feet on one step and designed to prevent lateral slippage off the step.
1. Material: Steel-reinforced plastic, ductile iron or cast aluminum.
- D. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, heavy-duty, ductile iron, or ASTM A48-83, Class 35 B, Gray Iron, 27-inch inside diameter by 7- to 9-inch riser with 4-inch minimum width flange, and 28 3/4-inch-diameter cover, indented top design, with lettering "SANITARY SEWER" cast into cover. Frames and covers shall be machined to be suitable for installation of watertight insert.
- Manholes with Watertight Inserts shall be:
1. East Jordan Ironworks - Standard Frame: 1890; Cover: 1890A2.
 2. Neenah Foundry Co. - Standard Frame R-1753A Series.
 3. Or Equal

Manholes with Watertight Frame and Cover shall be:

1. East Jordan Ironworks – Model No. 1893.
2. Neenah Foundry Co. – Model No. R-1755-F2.
3. Or Equal

- E. Watertight Manhole Frame Inserts - Provide watertight inserts for all new manholes or as directed in the field. The inserts shall meet the following requirements:
1. Manufactured from High Density Polyethylene, meeting the requirements of ASTM D-1248, Class A, Category 5.
 2. Finished thickness of 1/8".
 3. Ventilation method to be no valve method.
 4. Nylon strap shall be factory installed to facilitate removal. No special tools shall be required to remove inserts from the manhole.
 5. Factory-installed gaskets shall be provided on insert.

2.3 CONCRETE ENCASUREMENT AND PIPE CRADLES

- A. Where concrete encasement or pipe cradles are specified on the plans. Class "C" concrete meeting the requirements of PennDOT Publication 408 shall be used.

PART 3 - EXECUTION

3.1 PREPARATION OF FOUNDATION FOR BURIED SANITARY SEWERAGE SYSTEMS

- A. Grade trench bottom to provide a smooth, firm, stable, and rock-free foundation, throughout the length of the pipe.
- B. Replacement of Unsuitable Trench Subgrade: Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid, and backfill ASTM No. 57 Limestone Aggregate as specified by the Engineer.
- C. Shape Aggregate to fit bottom of pipe. Fill unevenness with tamped fine aggregate. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.

3.2 PIPE APPLICATIONS FOR UNDERGROUND SANITARY SEWERS

- A. Pipe Sizes 18 to 36 Inches: PVC Sewer pipe, ASTM F 679, T-1 wall thickness.

- B. Pipe Sizes 15 inches and smaller: PVC Gasket joint sewer pipe and fittings, ASTM D 3034, SDR 35.

3.3 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawings (plans and details) indicate the general location and arrangement of the underground sanitary sewerage system piping. Location and arrangement of piping layout take into account many design considerations. Install the piping as indicated, to the extent practical.
- B. Attention of Contractor is called particularly to the fact that only existing manholes were located for the preparation of the Contract Documents and Drawings. Where existing sanitary sewer is shown on the Contract Drawings, it is for informational purposes only, and it is not to be implied as the exact location of existing sewer piping. Payment for installation of new sanitary sewer piping shall be based on the unit prices presented on the bid schedule.
- C. Install piping beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install pipe and gaskets in accordance with manufacturer's recommendations for use of lubricants, and other installation requirements.
- D. Install manholes as indicated in the Contract Drawings.
- E. Install piping pitched down in direction of flow, at slopes indicated on the Contract Documents.
- F. Where concrete encasement is required, sufficient time shall be permitted for concrete to harden prior to backfilling. The Engineer or his representative shall decide if the concrete is adequately set.
- G. Where installation of the new sanitary sewer conflicts with the location of the existing sewer, the contractor shall be responsible for providing a temporary connection of the existing sewers until all houses tributary to that particular sewer are tied into the new sanitary sewer piping, at no additional cost to the Owner.

3.4 PIPING

A. PREPARATION

- 1. Perform trench excavation to the line and grade indicated on the Contract Drawings and as specified in Section 02221.

2. Unless otherwise indicated on the drawings, provide for a minimum cover of four (4) feet above the top of piping laid in trenches.
3. Provide pipe bedding as specified in Section 02221 for each type of pipe used. Place aggregate in a manner to avoid segregation and compact to the maximum practical density so that the pipe can be laid to the required tolerances.

B. LAYING PIPE IN TRENCHES

1. Give ample notice to the Engineer in advance of pipe laying operations.
2. Use only laser alignment instruments.
3. Lower pipe into trench using handling equipment designed for the purpose to assure safety of personnel and to avoid damage to pipe. Do not drop pipe.
4. Lay pipe proceeding up-grade with the bell pointing upstream.
5. Lay pipe to a true uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings and appurtenances. Do not subject pipe to a blow or shock to achieve solid bearing or grade.
6. Lay each section of pipe in such a manner as to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
7. Clean and inspect each section of pipe before joining. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction and ground movement. Use lubricant recommended by the pipe or fitting manufacturer for making joints. If unusual joining resistance is encountered or if the pipe cannot be fully inserted into the bell, disassemble joint, inspect for damage, re-clean joint components and reassemble joint.
8. Assemble joints in accordance with recommendations of the manufacturer.
 - a. Push-on Joints:
 1. Clean the inside of the bell and the outside of the spigot. Insert rubber gasket into the bell recess.
 2. Apply a thin film of gasket lubricant to either the inside of the gasket or the spigot end of the pipe or both.
 3. Insert the spigot end of the pipe into the socket using care to keep the joint from contacting the ground. Complete the joint by forcing the plain end to the bottom of the socket. Mark pipe that is not furnished with a depth mark before assembly to assure that the spigot is fully inserted.
9. Disassemble and remake improperly assembled joints using a new gasket.

10. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. A deviation from the designed grade as shown on the contract drawings, or deflection of pipe joints, will be cause for rejection.
11. Place sufficient compacted backfill in each section of pipe, as it is laid, to hold firmly in place.
12. Clean interior of the pipe as work progresses. Where cleaning after laying is difficult because of small pipe size, use a suitable swab or drag in the pipe and pull forward past each joint immediately after the jointing has been completed.
13. Keep trenches and excavations free of water during construction.
14. When the work is not in progress, and at the end of each work day, securely plug open ends of pipe and fittings to prevent trench water, earth or other substances from entering the pipes or fittings.
15. Except for short runs which may be permitted by the Engineer, pipes shall be laid uphill on grades exceeding 10 percent. Pipe which is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement. All fittings shall be properly installed as specified or shown on the Drawings.
16. Pipe shall not be installed upon a foundation containing ice or exhibiting frost penetration, nor shall installation take place at any time that there is a danger of ice formation or frost penetration at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.
17. Care shall be taken to avoid contact between pipe and compaction equipment. Compaction of backfill shall be performed such that impact type compaction equipment is not used directly above the pipe until sufficient backfill has been placed to ensure that such equipment will not damage the pipe in any manner.
18. Adequate protection and maintenance shall be provided for all existing underground and surface utility structures, such as conduits, ducts, water and sewer lines and drainage piping, which are encountered during the progress of the work. Furthermore, where the grade or alignment of pipe is obstructed by existing utility structures, the obstruction shall be supported permanently, relocated, removed entirely or in part, or reconstructed by the Contractor, as required by the Owners of such utility structures and the Engineer.
19. Take necessary precautions to prevent the floating of the pipe line by the accumulation of the water in the trench, or the collapse of the pipe line from any cause. Should floating or collapse occur renewal and/or restoration shall be at the Contractor's expense.
20. Where necessary to adjust the location or depth of pipe due to an unforeseen obstruction or other causes, the Engineer may change the

alignment and/or the grade. However, in no case shall the deflection in the joint exceed the maximum deflection recommended by the pipe manufacturer. No joint shall be assembled in a manner that will be detrimental to the strength and water tightness of the finished joint. For gravity sewers, such change shall be made by revising the depths and/or location of manholes to maintain a consistent grade between manholes.

C. HANDLING OF EXISTING SEWAGE FLOWS

1. The Contractor shall be required to satisfactorily handle and control existing sewage flows at all locations where required for the construction of the proposed facilities. The Contractor shall convey or pump via closed conduits such existing sewage flows back into the existing sanitary sewer system. The Contractor shall not permit the backup of sewage in any sewer lateral or sanitary sewer still in use. The Contractor shall develop a plan for handling of sewage flows in conjunction with his construction schedule and gain its approval by the Engineer prior to initiating work. Any temporary wyes, piping, coupling, etc. shall be incidental to this item.

D. CONCRETE ENCASUREMENT AND PIPE CRADLES

1. Where concrete encasement or pipe cradles are required, they shall be installed as shown on the Details.

3.5 MANHOLES

A. GENERAL

1. Install manholes complete with accessories as indicated. Form continuous concrete channels and benches between inlets and outlet. Set tops of frames and covers flush with finish surface where manholes occur in pavements. Elsewhere, set tops 1 inch above finish surface and grade surface away from cover, unless otherwise indicated.
2. Place precast concrete manhole sections as indicated, and install in accordance with ASTM C 891.
3. Apply 2 application of bituminous mastic sealant at joints of sections as approved by Engineer or according to the Standard Details.
4. Place a minimum of 4" of gravel backfill below the manhole. Manhole shall be placed with caution to insure its plumbness and proper alignment.
5. Install watertight inserts for all new manholes and/or where directed by the Engineer or his representative.

B. EXCAVATION

1. Perform excavation to the line and grade shown on the Contract Drawings and as specified in Section 02221.
2. Location and depth of manholes as shown on the Contract Drawings.

C. CONSTRUCTION

1. Construct watertight manholes of precast concrete sections and of the type shown in the Details.
2. Construct drop connections of the required type as shown on Standard Details. Encase drop connections in concrete.
3. Install a minimum of 4" of crushed stone subbase.
4. Provide precast concrete monolithic base sections.
 - a. Install precast bases as shown on Standard Details.
 1. Set the precast base on a crushed stone subbase.
 2. Provide a sealed, flexible resilient connection between pipe and precast base section.
5. Form flow channels in manhole bases as shown on the Standard Details. Slope channels uniformly from influent invert to effluent invert. Construct bends of the largest possible radius. Form channel sides and invert smooth and uniform; free of cracks, holes or protrusions.
6. Do not permit pipe to project more than 2" into the manhole.
7. Seal joints between precast concrete manhole sections with two applications of bitumastic joint sealant compound.
 - a. Place joint sealant compound on lower section to be squeezed by the weight of the upper section.
8. Install manhole sections with steps in proper vertical alignment.
9. Use precast manhole rings to achieve elevation shown for frame and cover. Do not adjust elevations more than nine inches with precast rings.
10. Install manhole frames and covers.
 - a. Anchor manhole covers as indicated on Standard Details.
 - b. Seal joint between manhole frame and manhole with two applications of bitumastic joint sealant compound.
11. Outside of manhole sections shall be waterproofed as specified in Section 03301 "Concrete Manhole Additive".

D. BACKFILLING

1. Backfill only after examination of the manhole by the Engineer.
2. Perform backfilling as specified in Section 02221.

3.6 CLOSING ABANDONED SEWERS

- A. Abandoned Piping: Close open ends of abandoned underground piping that remains in place. Provide mechanical wing nut plugs and concrete strong enough to withstand hydrostatic or earth pressure that may result after ends of abandoned utilities have been closed.
- B. The Contractor shall be required to plug the end (or ends) of each existing sewer and each existing sewer lateral that are to be abandoned as per Standard Details. It is the intent to plug the end of each abandoned line to prevent the entry of earth or backfill materials into the abandoned line. The entry of earth or backfill materials into the abandoned pipe could eventually cause a "surface depression" above it. Payment for sewer mainline plugs shall be made at the contract unit price for each pipe end plugged.

Payment for each lateral or building sewer plug shall be considered incidental to the lateral or building sewer pipe item.

- C. Removal of Existing Pipe: Contractor shall be responsible for removal of proper disposal of the existing sanitary sewer and manhole that are located within the trench for the new sanitary sewer. This work shall be performed at no additional cost to the Owner.

3.7 CONNECTION INTO EXISTING SANITARY SEWER MAIN

- A. The Contractor shall provide and install the connection to the existing sanitary sewer mains in accordance with the applicable provisions of these specifications. The Contractor shall be required to cut and bevel the existing pipe at a point approximately two (2) feet from the new manhole. A coupling or adaptor shall then be installed to joint the existing pipe to a new pipe stub extended from the manhole. This connection shall then be encased in concrete. The Contractor shall be responsible for making this a watertight connection. Information on the type of coupling or adaptor to be utilized shall be submitted for Engineer's approval prior to installation.

3.8 FIELD QUALITY CONTROL - GRAVITY SEWERS

- A. Testing: Perform testing of completed piping in accordance with local authorities having jurisdiction.
- B. Perform the following tests:
 - 1. ALIGNMENT TEST

Perform alignment testing on pipe after backfilling.

Conduct test throughout the entire collection system.

Test to be conducted between two consecutive manholes.

Place source of light at center of pipe in one manhole at end of pipe length to be tested.

A full circle of light must be seen at the pipe in the manhole opposite the end where the light source is placed.

- a. If alignment test does not pass, make adequate repairs and retest.
- b. All repairs and retesting required is to be performed at the contractor's expense.

2. DEFLECTION TEST

Perform deflection testing of pipe at least 30 days after backfilling.

Conduct test throughout the entire collection system.

Perform test using rigid balls or mandrels with diameters equal to 95 percent of the inside diameter of the pipe.

Mechanical pulling devices cannot be used.

Maximum pipe deflection: Five percent.

All repairs and retesting required is to be performed at the contractor's expense.

3. PIPE LEAKAGE TEST

Perform leakage testing of all pipe after it has been installed and has been plugged adequately and braced to withstand the test pressure, and the trenches have been backfilled for seven days as to generate a reasonable portion of the ultimate trench load upon the pipe.

Conduct test throughout entire collection system and building sewers.

Testing to be conducted between two consecutive manholes.

Two pneumatic plugs shall be placed in line at each manhole and also at each inspection port of each lateral and inflated to 25 psig. Low pressure air shall be introduced into sealed line until internal pressure reaches 4 psig greater than average back pressure of any ground water that may be over the pipe. At least two minutes shall be allowed for air pressure to stabilize. After stabilization period, pressure in pipe shall be adjusted to a minimum of 5.0 psig and air supply disconnected. Portion of line being tested shall decrease from 5.0 psig to 4.5 psig (0.5 psig greater than average back pressure of any ground water that may be over pipe) is not less than time stated in the following table. If line fails to meet this requirement, Contractor shall, at his own expense, determine source of leakage. He shall then repair or replace all defective material and/or workmanship and retest line. If test is carried out after backfilling, rectifications shall include re-excavation and backfill after repairs and/or replacement.

**TIME REQUIRED IN MINUTES AND SECONDS FOR AIR PRESSURE
TO DROP FROM 5.0 PSIG TO 4.5 PSIG**

LENGTH BETWEEN MANHOLES

Pipe Dia.	100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.
6	2.50	2.50	2.50	2.50	2.50	2.50	2.51
8	3.47	3.47	3.47	3.47	3.48	4.26	5.04
10	4.43	4.43	4.43	4.57	5.56	6.55	7.54
12	5.40	5.40	5.42	7.08	8.33	9.48	11.24
15	7.05	7.05	8.54	11.08	13.21	15.35	17.48
18	8.30	9.37	12.49	16.01	19.41	22.41	25.38
21	9.55	13.05	17.27	21.49	25.11	30.32	35.54
24	11.24	17.57	22.48	28.30	34.11	39.53	45.35
27	14.25	21.38	28.51	36.04	43.16	50.30	57.42
30	17.48	26.48	35.37	44.31	53.25	62.19	71.13
33	21.33	32.19	43.56	53.52	64.38	75.24	86.10
36	25.39	38.28	51.17	64.06	76.55	89.44	102.34

4. MANHOLE LEAKAGE TEST

- a. The seal between the manhole components shall be in accordance with ASTM C923.
- b. Plug and brace pipe openings in manhole.
- c. Set vacuum tester in frame.
- d. Connect vacuum pump to outlet of vacuum tester with valve open.
- e. Draw a vacuum to 10 inches of mercury and close valve.
- f. If the vacuum drops below 9 inches of mercury in one minute the manhole will not pass the test.
 - 1) Make repairs.
 - 2) Retest.

3.9 CLEANING

- A. Clear interior of piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed.
 1. Place plugs in ends of uncompleted pipe at end of day or whenever work stops.

3.10 AS BUILT DRAWINGS

- A. The Contractor will be required to submit to the Engineer detailed As-Built Drawings reflecting any deviations from the Construction Drawings that have occurred during the course of construction and to note the exact location of all changes. The Contractor will be furnished an additional set of printed drawings to use for this purpose.
 1. Contractor to show top of pipe elevations where pipe crosses Township, Borough or State roadways.
 2. Contractor to show swing ties to bends, cleanouts, observation stacks, end caps and any other items that may require location at future dates.

END OF SECTION 02730

SECTION 03300 - CONCRETE FOR UTILITY CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Special Conditions and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. The Work of this Section includes, but is not limited to:
 - 1. Cast-in-place cement concrete construction
 - 2. Reaction and support blocking
 - 3. Cradles and encasement
- B. Related Work Specified Elsewhere:
 - 1. Trenching, Backfilling and Compaction: Section 02221
- C. Applicable Standard Details.

1.3 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. Pennsylvania Department of Transportation:
Publication 408 Specifications
 - 2. American Society for Testing and Materials (ASTM):
 - C31 Making and Curing Concrete Test Specimens in the Field
 - C39 Test for Compressive Strength of Cylindrical Concrete Specimens
 - C42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - C172 Sampling Fresh Concrete

1.4 SUBMITTALS

- A. Certificates:

1. Submit certification from the concrete producer attesting that the cement concrete conforms to Section 704, Publication 408 Specifications for the class of concrete being used.
 2. Submit certified results of compressive strength tests performed by an independent testing laboratory.
- B. Shop Drawings:
1. Submit detailed shop drawings of reinforcing steel.

PART 2 - PRODUCTS

2.1 CEMENT CONCRETE

- A. Ready-mixed, conforming to Section 704, Publication 408 Specifications.
1. Requirements for State approved batch plants, design computations and plant inspection shall not apply. The acceptability of concrete will be based on conformance with the Cement Concrete Criteria specified below and the results of the specified tests.
- B. Cement Concrete Criteria:
1. Class A
 - a. 28-day compressive strength: 3300 psi
 - b. Slump: one to three inches
 2. Class C
 - a. 28-day compressive strength: 2000 psi
 - b. Slump: two to six inches
 3. High Early Strength
 - a. Three-day compressive strength: 3000 psi
 - b. Slump: one to three inches
 4. Cement Factor and Maximum Water-Cement Ratio conforming to Table A, Section 704.1(b), Publication Specifications.

2.2 REINFORCEMENT STEEL

- A. Reinforcement Bars:

1. New billet-steel conforming to Section 709.1, Publication 408 Specifications.
 2. Deformed, Grade 40
- B. Steel Wire Fabric:
1. Conforming to Section 709.3, Publication 408 Specifications.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Comply with Section 1001, Publication 408 Specifications for construction requirements including formwork, curing, protection and finishing of cement concrete.
- B. Excavate and shape trench bottoms and sides to accommodate thrust block forms, encasement, cradles, manhole bases, inlets and vaults.
- C. Support pipe, valves and fittings at the required elevation with brick or concrete block. Do not use earth, rock, wood or organic materials as supports.
- D. Construct manhole bases, reaction and support blocking, cradles, encasements and miscellaneous mass concrete of Class C concrete.
- E. Construct cast-in-place vaults, inlets, endwalls, curbs, sidewalks and miscellaneous reinforced structures of Class A concrete.
- F. Provide spacers, chairs, bolsters, ties and other devices for properly placing, spacing, supporting and fastening reinforcement in place.
- G. Place concrete utilizing all possible care to prevent displacement of pipe or fittings. Return displaced pipe or fittings to line and grade immediately.
- H. Insure tie rods, nuts, bolts and flanges are free and clear of concrete.
- I. Do not backfill structures until concrete has achieved its initial set, forms are removed and concrete work is inspected by the Engineer.
- J. Perform backfilling and compaction as specified in Section 02221.

3.2 FIELD TESTS OF CONCRETE DURING CONSTRUCTION

- A. Test each 50 cubic yards or fraction thereof of each class of concrete for compressive strength. Retain an independent testing laboratory to test cylinders.
 - 1. Sample concrete in accordance with ASTM C172.
 - 2. Prepare and cure two test cylinders in accordance with ASTM C31.
 - 3. Test cylinders in accordance with ASTM C39.

- B. If test cylinders fail to meet strength requirements, the Engineer may require additional core tests in accordance with ASTM C42 at the expense of the Contractor.

END OF SECTION 03300

SECTION 03301 - CONCRETE MANHOLE ADDITIVE

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes: Furnishing of all labor, materials, services and equipment necessary for the supply and installation of crystalline waterproofing additive to concrete as indicated on the drawings and as specified herein.
- B. Related Sections:
 - 1. Section 02730 – Sanitary Sewerage
 - 2. Section 03300 - Concrete for Utility Construction

1.2 REFERENCES

- A. Applicable Standards: The following standards are referenced herein.
 - 1. American Society for Testing and Materials (ASTM)
 - 2. Army Corps of Engineers (CRD)
 - 3. American Concrete Institute (ACI)
 - 4. American National Standards Institute (ANSI)
 - 5. NSF International
 - 6. Drinking Water Inspectorate (DWI)

1.3 SYSTEM DESCRIPTION

- A. Crystalline Waterproofing Additive: Concrete waterproofing and protection system shall be of the crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure within the pores and capillary tracts of the concrete. This crystalline system causes the concrete to become sealed against the penetration of liquids from any direction, and protects the concrete from deterioration due to harsh environmental conditions. The system is used for above or below-grade walls and slabs, including liquid retaining structures and where enhanced chemical resistance is required.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

- A. Testing Requirements: Crystalline waterproofing system shall have been tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.

- B. Independent Laboratory: Testing shall have been performed by an accredited independent laboratory meeting the requirements of ASTM E 329 or other applicable international standard for certification of testing laboratories. Testing laboratory shall have obtained all control and treated concrete samples.
- C. Crystalline Formation: Crystallizing capability of waterproofing system shall be evidenced by independent SEM (Scanning Electron Microscope) photographs showing crystalline formations within the concrete matrix.
- D. Permeability 1: Independent testing shall be performed according to a U.S. Army Corps of Engineers CRD-C48 (Mod.) "Permeability of Concrete". Concrete samples shall be pressure tested to 150 psi (350 foot head of water) or 1.05 MPa (106 m head of water). After 5 days the untreated samples shall leak and the treated samples shall exhibit no measurable leakage.
- E. Permeability 2: Independent testing shall be performed according to EN 12390-8. Treated samples shall be exposed to water with a pressure of 0.5 MPa for 72 hours. Treated samples must exhibit a reduction in permeability coefficient of at least 80% when compared to control concrete. Control samples must have a depth of penetration of at least 50 mm.
- F. Sulfuric Acid Resistance: Independent testing shall be performed to determine "Sulfuric Acid Resistance of Concrete Specimens". Treated concrete samples dosed at 3% shall be tested against untreated control samples. All samples shall be immersed in 7% sulfuric acid and weighed daily until a control sample reaches a mass loss of 50%. On final weighing the percentage mass loss of the treated samples shall be significantly lower than the control samples.
- G. Sulfate Resistance: Independent testing shall be performed to determine "Sulfate Resistance of Concrete Specimens" treated with integral crystalline admixture. Treated and untreated samples shall be immersed in a concentrated sulfate solution for at least 4 months. On final weighing the percentage mass loss of the treated samples shall be significantly lower than the control samples.
- H. Compressive Strength: Concrete samples containing the crystalline waterproofing additive shall be tested against an untreated control sample of the same mix. At 28 days, the treated samples shall exhibit equal or increased compressive strength over the control sample.
- I. Potable Water Approval: Waterproof material shall have a current, valid approval certificate from NSF (NSF 61), DWI, or other recognized certification agency.

1.5 SUBMITTALS

- A. General: Submit listed submittals in accordance with conditions of the Contract and with Division 1 Submittal Procedures Section.
- B. Product Data: Submit product data, including manufacturer's specifications, installation instructions, and general recommendations for waterproofing applications.
- C. Test Reports: Submit, for acceptance, complete test reports from approved independent testing laboratories certifying that waterproofing system conforms to performance characteristics and testing requirements specified herein.
- D. Manufacturer's Certification: Provide document signed by manufacturer or manufacturer's representative certifying that the materials to be installed comply with the requirements of this specification.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer to be ISO 9001 registered, and to have no less than 10 years' experience in manufacturing the crystalline waterproofing additive for the required work. Manufacturer must be capable of providing field service representation during construction phase. Manufacturers who cannot provide ongoing field support or who cannot provide the performance test data specified herein will not be considered for the project.
- B. Installer: Ready-mix supplier and/or installer of crystalline waterproofing additive shall be approved by the manufacturer or manufacturer's representative in writing.
- C. Pre-Installation Conference: Prior to installation of waterproofing system, conduct meeting with Architect/Engineer, owner's representative, concrete supplier, concrete placer and waterproofing manufacturer's representative to verify and review the following:
 - 1. Project requirements for waterproofing as set out in Contract Documents.
 - 2. Manufacturer's product data including mixing and installation instructions.
- D. Technical Consultation: The waterproofing manufacturer's representative shall provide technical consultation on waterproofing applications and shall provide on-site support as needed.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery: Deliver packaged waterproofing materials to project site in original undamaged containers, with manufacturer's labels and seals intact.
- C. Storage: Store waterproofing materials in dry, enclosed location, at a minimum temperature of 45 °F (7 °C).

1.8 WARRANTY

- A. Project Warranty: Refer to conditions of the Contract for project warranty provisions.
- B. Manufacturer's Warranty: Manufacturer shall provide standard product warranty executed by authorized company official.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Product: Crystalline waterproofing admixture which generates a non-soluble crystalline structure throughout the capillary voids of the concrete.
 - 1. Performance requirements as tested and certified by the British Board of Agrément:
 - a. Water Permeability: Less than $2 \times 10^{-13} \text{ ms}^{-1}$.
 - b. Water vapour Permeability: Less than $450 \times 10^{-12} \text{ gm(NS)}^{-1}$
 - 2. Admixture shall have a **red oxide pigment** to clearly identify treated concrete.
 - 3. Waterproofing admixture manufacturer shall also produce proprietary crystalline repair products compatible with waterproofing admixture.
- B. Source Quality: Obtain all proprietary crystalline waterproofing products from a single manufacturer.

2.2 DOSAGE

- A. General: Admix must be added to concrete mix at time of batching.

- B. Dosage Rate: Under normal conditions, the crystalline waterproofing powder shall be added to the concrete mix at the following rates:

1. Admix 3% – 3.5% by weight of cement content

Note: For enhanced chemical protection or for meeting specific project requirements or where the concrete mix design contains higher than 25% type F fly ash content or includes a portland cement/slag cement/type C fly ash blend, consult with manufacturer or its authorized representative to determine appropriate dosage rates.

PART 3 – EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data regarding installation, including technical bulletins, product catalogue, installation instructions and product packaging labels.

3.2 PROJECT CONDITIONS

- A. Crack Control: All reinforcement shall be in accordance with applicable standards. Concrete elements shall be designed and constructed to minimize and control cracking.
- B. Setting Time and Strength: Some delay of set may occur when using Admix products. The amount of set delay will depend upon the concrete mix design, the Admix product used, dosage rate of the Admix, temperature of the concrete and climatic conditions. Concrete containing an Admix product may develop higher ultimate strengths than plain concrete. Conduct trial mixes under project conditions to determine setting time and strength of the concrete. Consult with manufacturer or manufacturer's representative regarding concrete mix design, project conditions and proper dosage rate.
- C. Weather Conditions: For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow concrete practices such as those referred to in ACI 305R (Hot Weather Concreting) and ACI 306R (Cold Weather Concreting) or other applicable standards.

3.3 APPLICATION

- A. General: Admix is added to the concrete at the time of batching. It is important to obtain a homogeneous mixture of Admix with the concrete. Do not add dry

Admix powder directly to wet mixed concrete as this could cause clumping and thorough dispersion may not occur.

- B. Concrete Batching & Mixing: Procedures for addition of Admix will vary according to type of batch plant operation and equipment.
1. Addition to Coarse Aggregate Belt: Add Admix powder directly to the coarse aggregate conveyor belt manually or through computer controlled mass batching system. Account for worker health and safety issues relating to moving belts and wind-blown dust.
 2. Addition to Ready Mixed Truck at Plant: Add Admix in bulk powder or soluble bag form to the drum of the ready-mix truck immediately prior to driving the truck under the batch plant. Then add the balance of the materials or the premixed concrete in accordance with standard concrete batching practices. Take measures to ensure that soluble bags are dispersed properly. Such measures can include: a) adding the bags as far forward in the drum as possible, b) adding a small amount of batch water along with the bags, and c) spinning the drum prior to adding remaining components. Avoid delays in adding other components and utilize high speed mixing to ensure homogeneity of mix. Where there may be insufficient water for thorough dispersion of the bulk powder, mix the Admix powder with water to form a slurry and add to the truck mixer drum prior to batching. Account for added water in the mix design and slump.
 3. Addition to Central Mixer: Load the Admix in bulk powder form or in soluble bags along with the other components. Mix in accordance with standard batching practices to ensure thorough dispersion and a homogeneous mixture. Account for worker safety issues when accessing the equipment.
 4. Precast Batch Plant - Pan Type Mixer: Add Admix to the rock and sand, then mix thoroughly for 2-3 minutes before adding the cement and water. The total concrete mass shall be blended using standard practices.

Note 1: Although addition on site in powder form is not normally recommended, it may be necessary. In such a case, add Admix to truck in slurry form (e.g. 3 parts powder to 2 parts water by volume). Mix concrete for a minimum of 5 minutes on high speed or until thoroughly dispersed. Account for added water in the mix design and slump.

Note 2: Consult with local Admix Technical Services Representative concerning additional procedures for addition and mixing.

3.4 PLACING

- A. Concrete Placement: Concrete placement shall be in accordance with "309R: Guide for Consolidation of Concrete" or other applicable standard. Special attention is to be given to consolidation at joints, penetrations and other potential leakage locations.

3.5 CURING

- A. General: Concrete containing Admix shall be moist cured in accordance with ACI 308, "Standard Practice for Curing Concrete" or other applicable standard.
- B. Curing Compounds: Curing compounds may be used in the event that project requirements or conditions prevent moist curing. Curing compounds shall comply with ASTM C-309 or other applicable standard.

3.6 PROTECTION

- A. Protection: Protect installed product and finished surfaces from damage during construction.

3.7 FIELD QUALITY CONTROL

- A. Examination for Defects: Do not conceal Admix treated concrete before it has been observed by Architect/Engineer, waterproofing manufacturer's representative or other designated entities. Concrete shall be examined for structural defects such as honeycombing, rock pockets, tie holes, faulty construction joints, cold joints and cracks larger than 1/64" (0.4 mm). Such defects to be repaired in accordance with manufacturer's repair procedures as noted above.

3.8 INTERACTION WITH OTHER MATERIALS

- A. Backfilling: Normal backfilling procedures may be used after concrete has been cured.
- B. Paint, Epoxy, Grout, Cement Parge Coat, Plaster or Stucco: Admix treatment of concrete does not adversely affect the bond of subsequently applied materials. Follow surface preparation and other relevant directions of the coating or parge material manufacturer.
- C. Responsibility to Ensure Compatibility: Admix products need to be compatible with most admixtures used in the production of quality concrete. It shall be the responsibility of the concrete contractor to take whatever measures are

necessary, including testing, to ensure compatibility of the Admix with other additives or admixtures being used in the concrete mix.

END OF SECTION 03301