City of Altoona
Blair County, Pennsylvania

Redevelopment Authority of Altoona
Garfield School Land Development

ADDENDUM NO. 1
April 30, 2026

This addenda material is hereby made a part of Redevelopment Authority of Altoona Garfield School Land Development project. Please note the changes, additions, deletions, information, and instructions contained herein, and submit bid and be otherwise governed accordingly. Bids will still be received and opened on the date and time as stated in the Advertisement for Bids.

Bidders shall acknowledge receipt of this addendum on their Bid Form. Failure to do so will result in rejection of bid.

Addendum No. 1 consists of 189 pages, including this cover page, the Summary of Changes, consisting of 1 page, and the following attachment(s):

- **Technical Specifications PDF copy (181 pages)**
- **Plan Drawings C-1.00, C-1.01, C-2.00, C-2.01, C-3.00 and C-5.00 (6 pages)**

City of Altoona
Blair County, Pennsylvania

Redevelopment Authority of Altoona
Garfield School Land Development

ADDENDUM NO. 1

SUMMARY OF CHANGES
April 30, 2026

Clarification

Technical specifications for site work are included.

Plan Drawings

Drawing C-1.00, C-1.01, C-2.00, C-2.01, C-3.00 and C-5.00, updated property lines and building square footage, relocated Driveway for House 1.

END OF ADDENDUM NO. 1

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SECTION 012000 - PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 UNIT PRICE SCHEDULE

A. General:
1. The items on the Bid Form for this Contract shall be measured and the payment made in accordance with this Section.
2. All payments will be made at the unit prices for each item listed in the Bid Form.
3. Any items not specifically listed on the Bid Form but are necessary to complete the work will be considered incidental to the related items listed on the Bid Form.

B. Contingent Items:
1. All items in the Bid Form which are designated as "Contingent" are for work not included in any of the other lump sum or unit price items of the Bid Form and are for work that may or may not be ordered by the Engineer to be used in the project depending on the Engineer's evaluation of actual field conditions encountered. Such work shall be performed only as, and when, ordered by the Engineer and the Contractor shall be aware that payment will be made under these items only for the quantities actually ordered by the Engineer.
2. When the term "as ordered by the Engineer" is used in describing the method of measurement or basis of payment, it shall be understood that the order from the Engineer to the Contractor will be either: 1) a written directive, or 2) a verbal directive to be followed by written directive within 24 hours from the Engineer to the Contractor to eliminate the possibility of a misunderstanding.
3. Quantities for contingent items listed on the Bid Form are estimated. The Engineer has the right to order that contingent items be used in smaller or larger quantities than is indicated in the Bid Form. The Contractor shall not have any right to demand payment for any costs associated with the items, including, but not limited to, overhead and/or profit due to the fact that these items were not used in the work or used in smaller quantities than that indicated in the Bid Form. Quantities ordered by the Engineer that exceed those indicated in the Bid Form will be paid for at the unit price provided therein.

C. Pay Items and Measurement Methods: Pay items are listed in the order they appear on the Bid Schedule and unless stated otherwise, the numbers correspond to the Pay Item Numbers on the Bid Schedule.

1. Mobilization / Demobilization / General Contract Provisions
   a. This price and payment shall constitute full compensation for providing Performance and Payment Bonds, insurance coverage and certificates, compliance with the General Conditions, Supplemental General Conditions, all Division I Specification Work and requirements except where specifically described and scheduled elsewhere, mobilization, demobilization, temporary facilities, trench backfill and pavement compaction testing and documentation, and compliance with requirements of permits and approvals (not measured and paid for elsewhere) required for the project by the Contract Documents.

b. Unit of Measurement: Lump Sum. Payment for this item will be made as follows: 50% of total will be paid on the 1st payment request; the remaining 50% will be paid on subsequent payment requests based on the percentage of Work completed.

2. Demolition
   a. This price and payment shall constitute full compensation for site demolition including saw cutting existing pavement and removal of existing pavement, removal of existing gravel, removal of concrete walks, clearing and grubbing, and all other demolition items necessary for a complete project.
   b. Unit of Measurement: Lump Sum. Payment for this item will be paid based on the percentage of Work completed.

3. House Construction
   a. This price shall constitute full compensation for the labor cost for house construction including excavation of building footprint, installation of full basement, installation of concrete driveway and house sidewalk, perimeter storm drain installation and conveyance to curb line, all utilities servicing the house, and the full house construction, as necessary for a complete installation.
   b. Price shall also include any labor cost to repair pavement, curb, or other restoration necessary for the home construction
   c. The RA will supply major building materials and work with selected developer to provide preferential building materials.
   d. Unit of Measurement: Lump Sum.

4. Cement Concrete Sidewalk, 5” depth:
   a. This price and payment shall include all items necessary to install 5” concrete sidewalk including excavation, concrete, welded wire mesh, all labor, all work, all materials and all equipment necessary for the complete installation of 5” concrete sidewalk.
   b. Full depth compacted coarse aggregate backfill (PennDOT 2A) from the top of the subbase to the bottom of the sidewalk shall be incidental to the pay item.
   c. Measurement will be made horizontally to the nearest whole square yard (1.0 SY).

5. Concrete Curb
   a. This price and payment shall include all items necessary to install concrete curb including concrete, rebar, all labor, all work, all materials, and all equipment necessary for a complete installation.
   b. Full depth compacted coarse aggregate backfill (PennDOT 2A) from the top of the subbase to the bottom of the curb shall be incidental to this pay item.
   c. Unit of Measurement: Linear Foot. Measurement will be made horizontally to the nearest linear foot (1.0 LF)

6. ADA Curb Ramp with Detectable Warning Surface
   a. This item includes all labor, equipment and materials necessary to furnish and install ADA ramps including but not limited to excavation, concrete cheek walls, detectable warning surface, all work, all labor, and all materials necessary for a complete ramp that is in compliance with ADA guidelines and PennDOT standards.
   b. Depressed curb for the ADA ramps shall be included in the Concrete Curb line item.
   c. 2A subbase and concrete for the ADA ramps shall be included in the cement concrete sidewalk line item.

7. Sanitary Sewer Main Extension
   a. This price and payment shall include all work, all labor, all equipment, and all materials necessary to furnish and install the sanitary main extension including all structures and the 6" piping for a complete installation.
   b. Incidental Items: Pipe connections, connections to manholes, trench dewatering and control diversion of water during construction, select backfill (AASHTO #57).
   c. Unit of Measurement: Lump Sum.

8. Seed/Much
   a. This price and payment shall include all labor, all equipment, and all materials necessary to furnish and install topsoil, seed and mulch on all disturbed lawn areas.
   b. Unit of Measurement: Lump Sum.

9. Erosion and Sedimentation Controls
   a. This price and payment shall include all work, all labor, all equipment, and all material necessary to install all erosion and sedimentation control measures as shown on the plans. Includes compost filter sock, concrete washout, and inlet protection.
   b. Unit of Measurement: Lump Sum.

10. As-Built Drawings
   a. This price and payment shall constitute full compensation for all items necessary to provide as-built drawings and information as required by the Contract Documents.
   b. Unit of Measurement: Lump Sum.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 012000

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance.

B. Product options.

C. Product substitution procedures.

1.2 QUALITY ASSURANCE

A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.

B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.

C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Owner.

1.3 PRODUCT OPTIONS

A. See Section 016000 - Product Requirements.

1.4 PRODUCT SUBSTITUTION PROCEDURES

A. Engineer will consider requests for substitutions only within 15 days after date of Owner-Contractor Agreement.

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
   1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.
   2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
   3. Reference to Article and Paragraph numbers in Specification Section.
   4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
   5. Changes required in other Work.
   6. Availability of maintenance service and source of replacement parts as applicable.
   7. Certified test data to show compliance with performance characteristics specified.
   8. Samples when applicable or requested.

9. Other information as necessary to assist Engineer's evaluation.

D. A request constitutes a representation that Contractor:
   1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
   2. Will provide same warranty for substitution as for specified product.
   3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
   6. Will reimburse Owner and Engineer for review or redesign services associated with reapproval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:
   1. Submit requests for substitutions on format approved by Engineer.
   2. Submit three copies of Request for Substitution for consideration. Limit each request to one proposed substitution.
   3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
   4. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION 012500

SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Coordination and Project conditions.

B. Preconstruction meeting.

C. Progress meetings.

D. Preinstallation meetings.

E. Closeout meeting.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.

1.3 PRECONSTRUCTION MEETING

A. Engineer will schedule and preside over meeting.

B. Attendance Required: Engineer, Owner, Resident Project Representative, appropriate governmental agency representatives, and Contractor.

C. Minimum Agenda:
1. Distribution of Contract Documents.
2. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule.
3. Designation of personnel representing parties in Contract, and Engineer.
4. Communication procedures. Include list of emergency (24 hours a day/ 7 days a week) contacts and phone numbers.
5. Procedures and processing of requests for interpretations, field decisions, field orders, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
6. Scheduling (Progress Meetings, Pay Application submission deadlines, etc.).
7. Critical Work sequencing.

D. The Engineer will prepare record minutes and distribute copies to participants within 5 days after meeting.

1.4 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Engineer will make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.

C. Attendance Required: Job superintendent, Contractors, Engineer, and Owner, as appropriate to agenda topics for each meeting.

D. Minimum Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems impeding planned progress.
   5. Review of submittal schedule and status of submittals.
   6. Review of off-Site fabrication and delivery schedules.
   7. Maintenance of Progress Schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Coordination of projected progress.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on Progress Schedule and coordination.
   13. Other business relating to Work.

E. Engineer will prepare record minutes and distribute copies to participants within 5 days after meeting.

1.5 PREINSTALLATION MEETINGS

A. When required in individual Specification Sections, convene preinstallation meetings at Project Site before starting Work of specific Section.
   1. Preinstallation meetings may be combined with or held before or after regular Progress Meetings for the convenience of all parties.

B. Require attendance of parties directly affecting, or affected by, Work of specific Section.

C. Notify Engineer 7 days in advance of meeting date.

D. Prepare agenda and preside over meeting:
   1. Review conditions of installation, preparation, and installation procedures.
   2. Review coordination with related Work.

E. Record minutes and distribute copies to participants within two days after meeting.

1.6 CLOSEOUT MEETING

A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.

B. Attendance Required: Contractor, Engineer, Owner, and others appropriate to agenda.

C. Notify Engineer 7 days in advance of meeting date.

D. Minimum Agenda:
   1. Start-up of facilities and systems.
   2. Operations and maintenance manuals.
   3. Testing, adjusting, and balancing.
   4. System demonstration and observation.
   5. Operation and maintenance instructions for Owner's personnel.
   6. Contractor's inspection of Work.
   7. Contractor's preparation of an initial "punch list."
   8. Procedure to request Engineer inspection to determine date of Substantial Completion.
   9. Completion time for correcting deficiencies.
   10. Inspections by authorities having jurisdiction.
   11. Certificate of Occupancy and transfer of insurance responsibilities.
   12. Partial release of retainage.
   13. Final cleaning.
   14. Preparation for final inspection.
   15. Closeout Submittals:
      a. Project record documents.
      b. Operating and maintenance documents.
      c. Operating and maintenance materials.
      d. Affidavits
   16. Final Application for Payment.
   17. Contractor's demobilization of Site.
   18. Maintenance

E. Engineer will prepare record minutes and distribute copies to participants within 5 days after meeting.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 013000

SECTION 013216 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Submittals

B. Bar chart schedules.

C. Review and evaluation.

D. Updating schedules.

E. Distribution

1.2 SUBMITTALS

A. Within 3 days after date of Owner-Contractor Agreement, submit proposed preliminary schedule defining planned operations for first 30 days of Work, with general outline for remainder of Work.

B. Participate in review of preliminary schedule jointly with Engineer.

C. Within 5 days after joint review of proposed preliminary schedule, submit complete schedule for review. Include written certification that major Subcontractors have reviewed and accepted proposed schedule.

D. Submit updated schedules with each Application for Payment.

E. Submit schedules under transmittal letter form specified in Section 013300 - Submittal Procedures.

F. Schedule Updates:
   1. Overall percent complete, projected and actual.
   2. Completion progress by listed activity and subactivity.
   3. Changes in Work scope and activities modified since submittal.
   4. Delays in submittals or resubmittals, deliveries, or Work.
   5. Adjusted or modified sequences of Work.
   6. Other identifiable changes.
   7. Revised projections of progress and completion.

G. Narrative Progress Report:
   1. Submit with each monthly submission of Progress Schedule.
   2. Summary of Work completed during the past period between reports.
   3. Work planned during the next period.
   4. Explanation of differences between summary of Work completed and Work planned in previously submitted report.

5. Current and anticipated delaying factors and estimated impact on other activities and completion milestones.
6. Corrective action taken or proposed.

1.3 BAR CHART SCHEDULES

A. Format: Bar chart Schedule, to include at least:
   1. Identification and listing in chronological order of those activities reasonably required to complete the Work, including:

      a. Subcontract Work.
      b. Major equipment design, fabrication, factory testing, and delivery dates including required lead times.
      c. Move-in and other preliminary activities.
      d. Equipment and equipment system test and startup activities.
      e. Project closeout and cleanup.
      f. Work sequences, constraints, and milestones.

   2. Listings identified by Specification Section number.
   3. Identification of the following:

      a. Horizontal time frame by year, month, and week.
      b. Duration, early start, and completion for each activity and subactivity.
      c. Critical activities and Project float.
      d. Subschedules to further define critical portions of Work.

1.4 REVIEW AND EVALUATION

A. Participate in joint review and evaluation of schedules with Engineer at each submittal.

B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.

C. After review, revise schedules incorporating results of review, and resubmit within 7 days.

1.5 UPDATING SCHEDULES

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update schedules to depict current status of Work.

C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

D. Upon approval of a Change Order, include the change in the next schedule submittal.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit sorts as required to support recommended changes.

G. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect.

1.6 DISTRIBUTION

A. Following joint review, distribute copies of updated schedules to Contractor's Project site file, to Subcontractors, suppliers, Engineer, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 013216

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Definitions

B. Submittal procedures.

C. Construction progress schedules.

D. Proposed product list.

E. Product data.

F. Shop Drawings.

G. Samples

H. Other submittals.

I. Design data.

J. Test reports.

K. Certificates

L. Manufacturer's instructions.

M. Manufacturer's field reports.

N. Erection Drawings.

O. Pre-construction photographs.

P. Contractor review.

Q. Engineer review.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with Engineer-accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.

D. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.

E. Schedule submittals to expedite Project and deliver to Engineer at business address or submit electronic submittals via email as PDF electronic files. Coordinate submission of related items.

F. For each submittal for review, allow 5 days excluding delivery time to and from Contractor.

G. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

H. Allow space on submittals for Contractor and Engineer review stamps.

I. When revised for resubmission, identify changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

K. Submittals not requested will not be recognized nor processed.

L. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Comply with Section 013216 - Construction Progress Schedule

1.5 PROPOSED PRODUCT LIST

A. Within 3 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.

B. Submit number of copies Contractor requires, plus 3 copies Engineer will retain or submit electronic submittals via email as PDF electronic files.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.7 SHOP DRAWINGS

A. Shop Drawings: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
   1. Include signed and sealed calculations to support design.
   2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
   3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Submit number of opaque reproductions Contractor requires, plus 3 copies Engineer will retain.

E. Submit electronic submittals via email as PDF electronic files.

F. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.8 SAMPLES

A. Samples: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.

B. Samples for Selection as Specified in Product Sections:
   1. Submit to Engineer for aesthetic, color, and finish selection.
   2. Submit Samples of finishes, textures, and patterns for Engineer selection.

C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.

D. Include identification on each Sample, with full Project information.

E. Submit number of Samples specified in individual Specification Sections; Engineer will retain one Sample.

F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.

G. Samples will not be used for testing purposes unless specifically stated in Specification Section.

H. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 - Execution and Closeout Requirements.

1.9 OTHER SUBMITTALS

A. Closeout Submittals: Comply with Section 017000 - Execution and Closeout Requirements.

B. Informational Submittal: Submit data for Engineer's knowledge as Contract administrator or for Owner.

C. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

1.10 TEST REPORTS

A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.

B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.11 CERTIFICATES

A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

1.12 MANUFACTURER'S INSTRUCTIONS

A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.

B. Submit printed instructions for delivery, storage, assembly, installation, adjusting, and finishing, to Engineer in quantities specified for Product Data.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.13 MANUFACTURER'S FIELD REPORTS

A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.

B. Submit report in duplicate within 5 days of observation to Engineer for information.

C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.14 ERECTION DRAWINGS

A. Informational Submittal: Submit Drawings for Engineer's knowledge as Contract administrator or for Owner.

B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.15 PRE-CONSTRUCTION PHOTOGRAPHS

A. Provide photographs of Site prior to the start of Work produced by photographer acceptable to Engineer.

B. Take photographs of sufficient quantity and detail and from different directions of work areas and adjacent areas to accurately document existing conditions and to properly show the full extent of the work area. Do not disturb or perform construction operations in areas where existing conditions were not recorded on photographs. Take photographs of the following:
   1. All roadways, pavements, driveways, sidewalks, and curbs.
   2. Drainage ditches and structures.
   3. Cross pipes.
   4. Adjacent private properties, structures, and improvements.
   5. Retaining walls.
   6. Lawns and vegetated areas.
   7. Any pre-existing damaged or deteriorated improvements, surfaces, or structures.

C. Provide supporting information to identify name of Project, orientation of view, date and time of view, name and address of photographer, and photographer's numbered identification of photographs.

D. Digital Images: Deliver 2 complete sets of color digital image electronic files on CD-ROM, USB portable storage device, or portable external hard drive to Engineer prior to start of work. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as sensor, uncropped.
   1. Digital Images: Uncompressed TIFF format, produced by digital camera with minimum sensor size of 4.0 megapixels, and image resolution of not less than 1600 by 1200 pixels.
   2. Date and Time: Include electronic date stamp on each image and date and time in filename for each image.
   3. Additional Information: Include additional comments such as orientation of view, work site designation, street names, or similar information to accurately define the location of the photograph provided such information does not obscure the image.
   4. Hardware / Software: Provide any special hardware or software to Engineer and Owner to view images.

E. Color Audio/Video Tapes and digital media containing recordings of similar content may be used to supplement still photographs but shall not be used as a substitute for still photographs.

1.16 CONTRACTOR REVIEW

A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer.

B. Contractor: Responsible for:
   1. Determination and verification of materials including manufacturer's catalog numbers.
   2. Determination and verification of field measurements and field construction criteria.
   3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
   4. Determination of accuracy and completeness of dimensions and quantities.
   5. Confirmation and coordination of dimensions and field conditions at Site.
   6. Construction means, techniques, sequences, and procedures.
   7. Safety precautions.
   8. Coordination and performance of Work of all trades.

C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.

D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

1.17 ENGINEER REVIEW

A. Engineer will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will attach an action stamp to each submittal and will mark stamp appropriately to indicate action, as follows:
   1. Approved
   2. Approved As Noted.
   3. Amend and Resubmit.
   4. Rejected – See Remarks.
   5. Review Not Required.

B. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 15 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time stated above will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.

C. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.

D. Submittals made by Contractor that are not required by Contract Documents may be returned without action.

E. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order, Field Order, or Work Change Directive.

F. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

G. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality control.

B. Tolerances

C. References

D. Labeling

E. Testing and inspection services.

1.2 QUALITY CONTROL

A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.

B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

C. Perform Work using persons qualified to produce required and specified quality.

D. Products, materials, and equipment may be subject to inspection by Engineer and Owner at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.

E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current as of date of Contract Documents except where specific date is established by code.

C. Obtain copies of standards and maintain on Site when required by product Specification Sections.

D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.5 LABELING

A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.

B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
   1. Model number.
   2. Serial number.
   3. Performance characteristics.

C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.6 TESTING AND INSPECTION SERVICES

A. Employ and pay for services of an independent testing agency or certified laboratory acceptable to Engineer and Owner to perform specified testing.
   1. Before starting Work, submit testing laboratory name, address, and telephone number, and names of full-time Professional Engineer or specialist and responsible officer.
   2. Submit copy of report of laboratory facilities' inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of deficiencies reported by inspection.

B. Independent firm will perform tests, inspections, and other services specified in individual Specification Sections and as required by Engineer or authorities having jurisdiction.
   1. Laboratory: Authorized to operate in State where project is located.
   2. Laboratory Staff: Maintain full-time Professional Engineer or specialist on staff to review services.
   3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to National Bureau of Standards or accepted values of natural physical constants.

C. Testing, inspections, and source quality control may occur on or off Project Site. Perform off-Site testing as required by Engineer or Owner.

D. Reports shall be submitted by independent firm to Engineer, Contractor, and authorities having jurisdiction, in duplicate, indicating observations and results of tests and compliance or noncompliance with Contract Documents.
   1. Submit final report indicating correction of Work previously reported as noncompliant.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
   1. Notify Engineer and independent firm 48 hours before expected time for operations requiring services.
   2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.

F. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.

G. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Engineer. Payment for retesting or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

H. Agency Responsibilities:
   1. Test Samples of mixes submitted by Contractor.
   2. Provide qualified personnel at Site. Cooperate with Engineer and Contractor in performance of services.
   3. Perform indicated sampling and testing of products according to specified standards.
   4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   5. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.
   6. Perform additional tests required by Engineer.
   7. Attend preconstruction meetings and progress meetings.

I. Agency Reports: After each test, promptly submit two copies of report to Engineer, Contractor, and authorities having jurisdiction. When requested by Engineer, provide interpretation of test results. Include the following:
   1. Date issued.
   2. Project title and number.
   3. Name of inspector.
   4. Date and time of sampling or inspection.
   5. Identification of product and Specification Section.
   6. Location in Project.
   7. Type of inspection or test.
   8. Date of test.
   9. Results of tests.
   10. Conformance with Contract Documents.

J. Limits on Testing Authority:

1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency or laboratory may not approve or accept any portion of the Work.
3. Agency or laboratory may not assume duties of Contractor.
4. Agency or laboratory has no authority to stop the Work.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities:
   1. Temporary electricity.
   2. Temporary lighting for construction purposes.
   3. Temporary heating.
   4. Temporary cooling.
   5. Temporary ventilation.
   6. Temporary water service.
   7. Temporary sanitary facilities.

B. Construction Facilities:
   1. Vehicular access.
   2. Parking
   3. Progress cleaning and waste removal.
   4. Traffic regulation.
   5. Fire-prevention facilities.

C. Temporary Controls:
   1. Barriers
   2. Security
   3. Water control.
   4. Dust control.
   5. Erosion and sediment control.
   6. Noise control.
   7. Pollution control.

D. Removal of utilities, facilities, and controls.

1.2 REFERENCES

A. Pennsylvania Department of Transportation (PennDOT)
   1. Publication 408 Highway Construction Specifications.
   2. Publication 212 Official Traffic Control Devices.
   3. Publication 213 Temporary Traffic Control Guidelines.

1.3 TEMPORARY ELECTRICITY

A. Provide and pay for power service required from Contractor – provided facilities and sources as needed for construction operation.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain lighting for construction operations as required.

1.5 TEMPORARY HEATING

A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.

1.6 TEMPORARY COOLING

A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.

1.7 TEMPORARY VENTILATION

A. Provide and pay for ventilation equipment as needed. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.8 TEMPORARY WATER SERVICE

A. Provide and pay for suitable quality water service as needed to maintain specified conditions for construction operations.

1.9 TEMPORARY SANITARY FACILITIES

A. Provide, pay for and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization.

1.10 VEHICULAR ACCESS

A. Construct temporary all-weather access roads within limits of construction easements from public thoroughfares to serve construction area, of width and load-bearing capacity to accommodate unimpeded traffic for construction purposes.

B. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

C. Extend and relocate vehicular access as Work progress requires and provide detours as necessary for unimpeded traffic flow.

D. Locate as indicated on Drawings or as approved by Engineer and Owner. Provide necessary approvals including private easement agreements and municipal approvals if not already obtained by the Owner.

E. Provide unimpeded access for emergency vehicles.

F. Provide and maintain access to fire hydrants and control valves free of obstructions.

G. Provide means of removing mud from vehicle wheels before entering streets.

H. Coordinate use of existing on-Site roads for construction traffic including maintenance and restoration requirements with Owner.

I. Restore all lands and rights-of-way utilized for temporary access roads to original or better than original condition.

1.11 PARKING

A. Provide temporary gravel surface parking areas to accommodate construction personnel.

B. Locate as indicated on Drawings or as approved by Engineer and Owner.

C. If Site space is not adequate, provide additional off-Site parking.

D. Tracked vehicles are not allowed on paved areas.

E. Do not allow heavy vehicles or construction equipment in parking areas.

F. Do not allow vehicle parking on existing pavement.

G. Permanent Pavements and Parking Facilities:
1. Bases for permanent roads and parking areas may be used for construction traffic.
2. Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.
3. Use of permanent parking structures is not permitted.

H. Maintenance:
1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.
2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.

I. Removal, Repair:
1. Remove temporary materials and construction at Substantial Completion.
2. Remove underground Work and compacted materials to depth of 2 feet; fill and grade Site as indicated.
3. Repair existing permanent facilities damaged by use, to original condition.

J. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.

1.12 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.

B. Collect and remove waste materials, debris, and rubbish from Site periodically and dispose of off-Site.

1.13 TRAFFIC REGULATION

A. Provide traffic control in accordance with PennDOT Publications 408, 212, and 213 and the approved Traffic Control Plan (if required) indicated on the Drawings.

B. Maintain access to public facilities, businesses, and private residential dwellings / properties.

C. Coordinate with Owner and media outlets to provide public notifications of work area locations and potential impacts to traffic.

D. Signs, Signals, and Devices:
   1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
   2. Traffic Control Signals: As approved by local jurisdictions.
   3. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
   4. Flag Person Equipment: As required by authorities having jurisdiction.

E. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

F. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

G. Haul Routes:
   1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.
   2. Confine construction traffic to designated haul routes.
   3. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.

H. Traffic Signs and Signals:
   1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
   2. Relocate signs and signals as Work progresses, to maintain effective traffic control.

I. Removal:
   1. Remove equipment and devices when no longer required.
   2. Repair damage caused by installation.
   3. Remove post settings to depth of 2 feet.

1.14 FIRE-PREVENTION FACILITIES

A. Prohibit smoking within buildings under construction. Designate area on Site where smoking is permitted. Provide approved ashtrays in designated smoking areas.

B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.

C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.
   1. Provide minimum of one fire extinguisher in every construction trailer and storage shed.

1.15 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide barriers, signage, and flashing warning lights around all exposed excavations at end of work day.

C. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing building.

D. Tree and Plant Protection: Preserve and protect existing trees and plants designated to remain.
   1. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
   2. Provide 6 -foot-high barriers around drip line, with access for maintenance.
   3. Replace trees and plants damaged by construction operations.

E. Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.

1.16 SECURITY

A. Security Program:
   1. Protect Work from theft, vandalism, and unauthorized entry.

1.17 WATER CONTROL

A. Grade Site to drain. Construct and maintain diversions or other methods to maintain excavations free of water and protect permanent work. Provide, operate, and maintain necessary pumping equipment to maintain excavations free of water. Prevent surface water from flowing into excavations and flooding project site. Do not allow water to accumulate in excavations.

B. Dispose of water to avoid public health nuisance or injury to property and in accordance with the approved Soil Erosion and Sedimentation Control Plan. Restore surfaces and drainage facilities damaged as a result of temporary diversions and pumping operations.

1.18 DUST CONTROL

A. Execute Work by methods that minimize raising dust from construction operations.

1.19 EROSION AND SEDIMENT CONTROL

A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.

F. Comply with approved Soil Erosion and Sedimentation Control Plan indicated on Drawings.

1.20 NOISE CONTROL

A. Provide methods, means, and facilities to minimize noise produced by construction operations.

B. Comply with local ordinances and OSHA requirements regarding noise pollution and operation of equipment.
   1. Equipment powered by internal combustion engines shall be fitted with a serviceable exhaust and muffler system.
   2. Power generators used for continuous operations (e.g., after normal work hours, 24 hours or more) shall be inside an enclosure fitted with acoustic insulation and exhaust silencers along with other measures to minimize noise.
   3. Operate construction equipment only during normal workday hours.

1.21 POLLUTION CONTROL

A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations in accordance with Federal, State, and Local requirements, rules and regulations.

B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

C. Maintain vehicles and equipment in a serviceable condition so that fuel, lubricants, and fluids are not being discharged to the environment.

1.22 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials before Final Application for Payment inspection.

B. Remove underground installations to minimum depth of 2 feet.

C. Clean and repair damage caused by installation or use of temporary Work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Products

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

1.2 PRODUCTS

A. At minimum, comply with specified requirements and reference standards.

B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.

C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.

D. For Steel Products: Comply with Pennsylvania Steel Products Procurement Act. Submit documentation for equipment and product manufacturers certifying compliance.

E. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.

F. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products according to manufacturer's instructions.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products according to manufacturer's instructions.

B. Store products with seals and labels intact and legible.

C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.

D. For exterior storage of fabricated products, place products on sloped supports aboveground.

E. Provide off-Site storage and protection when Site does not permit on-Site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 012500 - Substitution Procedures.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 016000

SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Field engineering.

B. Closeout procedures.

C. Project record documents.

D. Examination

E. Preparation

F. Execution

G. Cutting and patching.

H. Protecting installed construction.

I. Final cleaning.

1.2 FIELD ENGINEERING

A. Employ qualified personnel for the provision of construction stakeout. Submit qualifications to Engineer for review and approval.

B. Locate and protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.

C. Control datum for survey is indicated on Drawings.

D. Prior to beginning Work, verify and establish elevations of existing facilities to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.

E. Verify setbacks and easements; confirm Drawing dimensions and elevations.

F. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.

G. Maintain complete and accurate log of control and survey Work as Work progresses.

H. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.

I. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.

J. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.

1.3 CLOSEOUT PROCEDURES

A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
   1. Submit maintenance manuals, Project record documents, and other similar final record data in compliance with this Section.
   2. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
   3. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
   4. Perform final cleaning according to this Section.

B. Substantial Completion Inspection:
   1. When Contractor considers Work to be substantially complete, submit to Engineer:
      a. Written certificate that Work, or designated portion, is substantially complete.
      b. List of items to be completed or corrected (initial punch list).
   2. Within seven days after receipt of request for Substantial Completion, Engineer will make inspection to determine whether Work or designated portion is substantially complete.
   3. Should Engineer determine that Work is not substantially complete:
      a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
      b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
      c. Engineer will reinspect Work.
      d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.
   4. When Engineer finds that Work is substantially complete, Engineer will:
      a. Prepare Certificate of Substantial Completion accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
      b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
   5. After Work is substantially complete, Contractor shall:
      a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
      b. Complete Work listed for completion or correction within time period stipulated.

C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
   1. When Contractor considers Work to be complete, submit written certification that:
      a. Contract Documents have been reviewed.

b. Work has been examined for compliance with Contract Documents.
c. Work has been completed according to Contract Documents.
d. Work is completed and ready for final inspection.

2. Submittals: Submit following:
   a. Final punch list indicating all items have been completed or corrected.
   b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
   c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
   d. Accounting statement for final changes to Contract Sum.
   e. Contractor's affidavit of payment of debts and claims.
   f. Contractor affidavit of release of liens.
   g. Consent of surety to final payment.
3. Perform final cleaning for Contractor-soiled areas according to this Section.

D. Final Completion Inspection:
   1. Within seven days after receipt of request for final inspection, Engineer will make inspection to determine whether Work or designated portion is complete.
   2. Should Engineer consider Work to be incomplete or defective:
      a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
      b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.
      c. Engineer will reinspect Work.
      d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.

1.4 PROJECT RECORD DOCUMENTS

A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
   1. Drawings
   2. Specifications.
   3. Addenda
   4. Change Orders and other modifications to the Contract.
   5. Reviewed Shop Drawings, product data, and Samples.
   6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates used.
   3. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
   1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
   2. Include locations of concealed elements of the Work.
   3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
   4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
   5. Identify and locate existing buried or concealed items encountered during Project.
   6. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   7. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   8. Field changes of dimension and detail.
   9. Details not on original Drawings.

G. Submit marked-up paper copy documents to Engineer before Substantial Completion.

H. Submit PDF electronic files of marked-up documents to Engineer before Substantial Completion.

PART 2 - PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual Specification Sections.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.

3.4 CUTTING AND PATCHING

A. Employ skilled and experienced installers to perform cutting and patching.

B. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:
   1. Fit the several parts together, to integrate with other Work.
   2. Uncover Work to install or correct ill-timed Work.
   3. Remove and replace defective and nonconforming Work.
   4. Remove samples of installed Work for testing.

C. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.

D. Cut masonry and concrete materials using masonry saw or core drill.

E. Restore Work with new products according to requirements of Contract Documents.

F. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

3.5 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.

C. Prohibit traffic from landscaped areas.

3.6 FINAL CLEANING

A. Execute final cleaning prior to final Project assessment.

B. Clean Site; sweep paved areas, rake clean landscaped surfaces.

C. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION 017000

SECTION 036000 – GROUTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Portland cement grout.
2. Rapid curing epoxy grout.
3. Non-shrink cementitious grout.

B. Related Sections:
1. Section 330513.16 – Public Manholes and Structures
2. Section 333113 – Public Sanitary Utility Sewerage Piping
3. Section 334113 – Public Storm Utility Drainage Piping

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Grout:
1. Basis of Measurement: Unless specifically listed as a pay item in SECTION 012000 - PRICE AND PAYMENT, grout work will not be measured separately for payment.
2. Basis of Payment: Grout work will not be paid for as a separate item but is considered incidental to and will be paid for as part of the indicated price and payment item for the work or structure in which the grout is used.

1.3 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.

B. American Society of Testing and Materials:
1. ASTM C33 - Standard Specification for Concrete Aggregates.
2. ASTM C40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.
3. ASTM C150 - Standard Specification for Portland Cement.
4. ASTM C191 - Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
5. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.
6. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
7. ASTM C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacings and Polymer Concretes.
8. ASTM C827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
1. CRD C621 - Non-Shrink Grout.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit product data on grout and related materials.

C. Manufacturer's Installation Instructions: Submit manufacturer’s instructions for mixing, handling, surface preparation and placing epoxy type and non-shrink type grouts.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver grout in manufacturer's unopened containers with proper labels intact.

C. Inspection: Accept materials on Site in manufacturer’s original packaging and inspect for damage.

D. Store materials according to manufacturer instructions.

E. Protection:

1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
2. Provide additional protection according to manufacturer instructions.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

B. Do not perform grouting if temperatures exceed 100 degrees F or maximum temperature established by the manufacturer.

C. Maintain minimum temperature of 40 degrees F or minimum temperature established by the manufacturer before, during, and after grouting, until grout has set.

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I and II.

B. Water:
1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:

a. Corrosion of steel.
b. Volume change increasing shrinkage cracking.
c. Efflorescence.
d. Excess air entraining.

C. Fine Aggregate:
1. Washed natural sand.
2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:
1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 RAPID CURING EPOXY GROUT

A. Manufacturers:
1. Sika Corporation, Lyndhurst, NJ; BASF Corporation, Shakopee, MN; L & M Construction Chemicals, Inc., Omaha, NE; or approved equal.
2. Substitutions: Section 016000 - Product Requirements .

B. Rapid Curing Epoxy Grout: High strength, three component epoxy grout formulated with thermosetting resins and inert fillers. Rapid-curing, high adhesion, and resistant to ordinary chemicals, acids and alkalis.

Property	Test	Result
Compressive Strength	ASTM C579	12,000 psi at 7 days
Tensile Strength	ASTM C307	2,000 psi minimum
Coefficient of Expansion	ASTM C531	$30x10^{-6}$ in per degree F
Shrinkage	ASTM C827	None

2.3 NON-SHRINK CEMENTITIOUS GROUT

A. Manufacturers:
1. Sika Corporation, Lyndhurst, NJ; BASF Corporation, Shakopee, MN; L & M Construction Chemicals, Inc., Omaha, NE; or approved equal.
2. Substitutions: Section 016000 - Product Requirements .

B. Non-shrink Cementitious Grout: Pre-mixed ready for use formulation requiring only addition of water; non-shrink, non-corrosive, non-metallic, non-gas forming, no chlorides.

C. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621:

Property	Test	Time	Result
Setting Time	ASTM C191	Initial	2 hours (Approx)
		Final	3 hours (Approx)

Expansion			0.10% - 0.4% Maximum
Compressive Strength	CRD-C621	1 day	3,000 psi
		7 days	7,000 psi
		28 days	10,000 psi

2.4 FORMWORK

A. If required, build forms for grouting in accordance with manufacturer's instructions.

2.5 CURING

A. Cure grout in accordance with manufacturer's instructions. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or with use of wet burlap method.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify areas to receive grout. Notify Engineer of conditions that would adversely affect surface preparation or application.

3.2 PREPARATION

A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.

B. Rough concrete lightly, but not enough to interfere with placement of grout.

C. Remove foreign materials from metal surfaces in contact with grout.

D. Align, level and maintain final positioning of components to be grouted.

E. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

3.3 INSTALLATION - FORMWORK

A. Construct leakproof forms anchored and shored to withstand grout pressures.

B. Install formwork with clearances to permit proper placement of grout.

3.4 MIXING

A. Portland Cement Grout:

1. General Use: Use proportions of 2 parts sand and 1 part cement, measured by volume.
2. Abandoned Pipe and Structures: Use proportions of 4 parts sand and 1 part cement measured by volume.
3. Prepare grout with water to obtain consistency to permit placing and packing.
4. Mix water and grout in two steps; pre-mix using approximately 2/3 of water; after partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing 2 to 3 minutes.
5. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
6. Do not add additional water after grout has been mixed.

B. Mix and prepare rapid curing epoxy grout in accordance with manufacturer's instructions.

C. Mix and prepare non-shrink cementitious grout in accordance with manufacturer's instructions.

D. Mix grout components in proximity to work area and transport mixture quickly and in manner not permitting segregation of materials.

3.5 PLACING GROUT

A. Place grout material quickly and continuously.

B. Do not use pneumatic-pressure or dry-packing methods.

C. Apply grout from one side only to avoid entrapping air.

D. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.

E. Thoroughly compact final installation and eliminate air pockets.

F. Do not remove leveling shims for at least 48 hours after grout has been placed.

G. Do not use grout which has begun to set.

3.6 CURING

A. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or by using wet burlap method.

B. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.

C. After grout has attained its initial set, keep damp for minimum of 3 days.

END OF SECTION

SECTION 310513 - SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Subsoil materials.
   2. Topsoil materials.

B. Related Sections:
   1. Section 310516 - Aggregates for Earthwork.
   2. Section 312213 - Rough Grading.
   3. Section 312317 - Trenching
   4. Section 312323 - Fill.
   5. Section 320516 - Aggregates for Exterior Improvements.
   6. Section 329119 – Landscape Grading.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

C. Pennsylvania Department of Transportation (PennDOT):
   1. Publication 408 Specifications, latest edition.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials source.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each subsoil and topsoil material from single source throughout the Work.

B. The Geotechnical Engineer shall be on site during earthwork operations; refer to Section 312323.

C. Perform Work in accordance with Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

D. Maintain one copy or PennDOT Publication 408 on site.

PART 2 - PRODUCTS

2.1 SUBSOIL MATERIALS

A. On site or imported natural soils as approved by Architect and Geotechnical Engineer**.**

B. Load bearing is defined as earth fill or rock fill required for bearing loads imposed by structures or pavement subject to motor traffic and all earth materials necessary to raise the grade from an existing elevation or prepared foundation elevation to the finished elevation in a designated fill area which cannot tolerate settlement.

C. Classify soils to ASTM D2487 group symbols.

D. All load bearing fill and backfill shall be compacted to 95 percent of the standard proctor maximum dry density as determined by ASTM D698 or D1557 at the discretion of the Geotechnical Engineer.

E. Nonbearing fill shall be free of roots, rock larger than 4 inches in size and building debris, capable of minimum compaction of 90 percent standard proctor density at optimum moisture content established for the soil material by ASTM D698 or D1557 at the discretion of the Geotechnical Engineer.

2.2 MATERIALS FOR BACKFILLING, LOAD BEARING FILLS OR EMBANKMENTS

A. Well-graded soil aggregate mixture, consisting of inorganic on-site cut soils with rock fragments less than 3 inches nominal diameter and less than 20 percent by weight of the mass, less than 12 percent of particles finer than No. 200 sieve, liquid limits less than 50, and plasticity indices greater than 15.

2.3 TOPSOIL MATERIALS

A. Topsoil Requirements:
   1. Topsoil stripped from the site and stockpiled may be reused provided that material is corrected to the specified requirements.
   2. Imported borrow, as required by project conditions.
   3. Fertile friable loam.
   4. Reasonably free of roots, rocks larger than 1 inch, subsoil, debris, large weeds and foreign matter.
   5. Acidity range (pH) of 6.0 to 7.0 as determined by AASHTO T194.
   6. Containing minimum of 2 percent and maximum of 10 percent organic matter.
   7. Salvaged topsoil shall comply with the requirements of Section 801 of the Pennsylvania Department of Transportation Publication 408 Specifications and have a corrected pH of 6.0 to 7.0.

8. Furnished topsoil shall comply with the requirements of Section 802 of the Pennsylvania Department of Transportation Publication 408 Specifications.

2.4 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing and Inspection Services; testing and analysis of soil material.

B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698 or D1557 at the discretion of the Geotechnical Engineer.

C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698 or D1557 at the discretion of the Geotechnical Engineer.

D. When tests indicate materials do not meet specified requirements, change material and retest.
   1. Remove, replace and retest as many times as required to obtain specified density; at no additional cost to the Owner.

E. Furnish materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to full depth of topsoil in designated areas.

B. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.

C. Remove excess excavated materials, subsoil and topsoil not intended for reuse, from site.

D. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from site.

E. Excess Fill and Unsatisfactory Fill: Excess fill and unsatisfactory fill materials as designated by the Architect and Geotechnical Engineer shall be removed by the Contractor from the site at no additional cost to the Owner.

F. The topsoil is the property of the Owner and shall not be used as backfill; topsoil shall not be removed from the site unless otherwise authorized by Architect.

3.2 STOCKPILING

A. Stockpile materials on site at locations indicated on the approved Erosion and Sediment Pollution Control Plan.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Stockpile topsoil 8 feet high maximum.

E. Prevent intermixing of soil types or contamination.

F. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

G. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.
   1. When using local streets for hauling of excavated materials, obtain approval for trucking route (between building and disposal site) from local and other governing agencies.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 310513

SECTION 310516 - AGGREGATES FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Coarse aggregate materials.
   2. Fine aggregate materials.

B. Related Sections:
   1. Section 310513 - Soils for Earthwork: Fill and grading materials.
   2. Section 312213 - Rough Grading.
   3. Section 312317 – Trenching
   4. Section 312323 - Fill
   5. Section 321123 - Aggregate Base Courses.
   6. Section 329000 – Site Restoration.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

C. Pennsylvania Department of Transportation (PennDOT):
   1. Publication408 Specifications, latest edition.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with PennDOT Publication 408.

C. Maintain one copy of PennDOT Publication 408 document on site.

PART 2 - PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Compacted Stone Under Interior and Exterior Slab-on-Grade:
   1. Stone shall be a coarse aggregate material and shall comply with AASHTO #57 and Section 703.2(C) of the PennDOT Publication 408 Specifications.

B. Compacted Stone in Areas of Over-Excavation in Load Bearing Areas:
   1. Select granular material conforming to Select Granular Material (PennDOT 2RC), Section 703.3, Publication 408 Specifications.
   2. Coarse aggregate material conforming to PennDOT 2A Section 703.2 Publication 408 Standards.

C. Exterior Side of Foundation Walls, Retaining Walls and Over Foundation Perimeter Drainage**:** Stone shall be a coarse aggregate material and shall comply with AASHTO #57.

D. Pipe Bedding - General: AASHTO #8.

E. Pipe Bedding for Perforated Drainage Pipe: AASHTO #57.

F. Aggregate Base Course Under Bituminous Paving:
   1. Stone shall be coarse limestone aggregate material and shall comply with Section 350 of PennDOT Publication 408 Specifications.

G. Filter Aggregate: AASHTO #57.

H. Impervious Fill Material: Crushed stone or gravel aggregate conforming to PennDOT 2RC.

2.2 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing and inspection services.

B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557.

C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM D1557**.**

D. When tests indicate materials do not meet specified requirements, change material and retest.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Remove excess excavated materials not intended for reuse, from site.

3.2 STOCKPILING

A. Stockpile materials on site at locations indicated.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

E. Stockpile unsuitable materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 310516

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing surface debris.
   2. Removing designated paving and curbs.
   3. Clearing and grubbing (removing designated trees, shrubs, and other plant life).
   4. Removing abandoned utilities.
   5. Excavating topsoil.

B. Related Sections:
   1. Section 312213 - Rough Grading.
   2. Section 312318 - Rock Removal.

1.2 REFERENCES

A. Pennsylvania Underground Utility Line Protection Act of 1974, P.L. 852, No. 287, as amended by Act 181 of 2006.
   1. The General Contractor shall be responsible for scheduling a preconstruction meeting prior to the commencement of excavation or demolition work in accordance with Act 181.

1.3 DEFINITION

A. Clearing: The removing trees, brush, down timber, rotten wood, rubbish, other vegetation and objectionable material at or above original ground elevation not designated to be saved; clearing also includes removing fences, walls, guard posts, guard rail, signs and other obstructions interfering with the proposed Work.

B. Grubbing: Removing natural ground of stumps, roots and stubs, brush, organic materials and debris from below the surface of the ground.

1.4 PREINSTALLATION MEETINGS

A. Section 013100 – Project Management and Coordination specifies requirements for preinstallation meeting.

B. Convene minimum two weeks prior to commencing Work of this Section.

C. The General Contractor shall be responsible for scheduling a preconstruction meeting prior to the commencement of excavation or demolition work in accordance with Pennsylvania Underground Utility Line Protection Act of 1974, P.L. 852, No. 287, as amended by Act 181 of 2006.

1.5 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.

C. Permits for Disposal of Debris:
   1. Arrange for disposal of debris resulting from clearing and grubbing to locations outside the Owner's property and obtain written agreements with the owners of the property where the debris will be deposited.
   2. Submit two copies of the agreement with each property owner releasing the Owner from responsibility in connection with the disposal of the debris.

1.6 QUALITY ASSURANCE

A. Conform to applicable code for environmental requirements and disposal of debris.

B. Maintain one copy of each document on site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary Fencing: For use as protection around existing plant material and site improvements:
   1. Provide high density polyethylene (HDPE) fence system, including posts as manufactured by Carsonite International, or equal approved by the Architect; minimum 48 inch height; orange color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified.

3.2 PREPARATION

A. Call Local Utility Line Information service not less than five working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Notify utility companies, individuals and others owning or 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.

3.3 PROTECTION

A. Locate, identify, and protect utilities indicated to remain, from damage; temporarily support piping and conduits encountered that are not indicated to be removed; maintain temporary support until permanent support has been restored.

B. Protect bench marks, survey control points, and existing structures from damage or displacement.

C. Protect trees, plant growth, and features designated to remain, as final landscaping as specified in Section 015000 - Temporary Facilities and Controls.

D. Existing Trees:
   1. Protect trees indicated to remain from injury to their roots, trunks, and branches; maintain protection during the entire construction period.
   2. Do not store or pile material within 25 ft of the trunks of any tree indicated to remain.
   3. Do not store, spill or transfer gasoline, fuel oil, harmful chemical or harmful materials within 25 ft of the trunks of any tree indicated to remain.

3.4 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs within marked areas or as indicated.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Grubbing: Remove and dispose of all shrubs, stumps and roots larger than 1-1/2 inches in diameter to a depth of 20 inches in areas occupied by improvements; other areas to depth of 8 inches.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.
   1. Unless otherwise indicated, materials (debris, rock and extracted plant life) resulting from site clearing operations shall be the property of the Contractor, shall not be used in the Work and shall be promptly removed from the site.

B. Partially remove paving, and curbs as indicated on Drawings. Neatly saw cut edges at right angle to surface.

C. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.

D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.

E. Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, relandscaped, or regraded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile in area designated on site to depth not exceeding 8 feet and protect from erosion.

D. Excess Topsoil: Refer to Section 310513 - Soils for Earthwork Requirements for sustainable design submittals

3.7 RESTORATION

A. Repair 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 plant material designated to be saved, which have been permanently injured or have died during the duration of the Contract as a result of construction operations with like species acceptable to the Owner.

C. Remove protective fences, enclosures and guards upon the completion of the Project.

D. Restore guard posts, guardrail, signs and other features which have been damaged or temporarily removed, to the condition equal to that existing before construction operations.

END OF SECTION 311000

SECTION 312213 - ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating topsoil.
2. Excavating subsoil.
3. Cutting, grading, filling, rough contouring, and compacting site for site structures, and building pads.

B. Related Sections:
1. Section 310513 - Soils for Earthwork.
2. Section 310516 - Aggregates for Earthwork.
3. Section 311000 - Site Clearing.
4. Section 312316 - Excavation
5. Section 312317 - Trenching
6. Section 312318 - Rock Removal.
7. Section 312323 - Fill
8. Section 329000 - Site Restoration.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
6. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
7. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head).
8. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. Pennsylvania Underground Utility Line Protection Act of 1974, P.L. 852, No. 287, as amended by Act 181 of 2006.

1.3 PREINSTALLATION MEETINGS

A. Section 013100 - Project Management and Coordination specifies requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

C. The General Contractor shall be responsible for scheduling a preconstruction meeting prior to the commencement of excavation or demolition work in accordance with Pennsylvania Underground Utility Line Protection Act of 1974, P.L. 852, No. 287, as amended by Act 181 of 2006.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Materials Source: Submit name of imported materials suppliers.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Requirements for submittals.

B. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C136, ASTM D2419, and ASTM D2434.

B. The Geotechnical Engineer shall be on site during earthwork operations; refer to Section 312323.

C. Perform Work in accordance with Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

D. Maintain one copy of Publication 408 document on site.

1.7 PROJECT CONDITIONS

A. Excavation shall be performed on an unclassified basis with the removal of all kinds of materials, including rock.
   1. If rock or shale is encountered, remove as specified in Section 312318 – Rock Removal.
   2. Remove by mechanical means only, blasting is not permitted.

B. Dewatering:

1. Keep excavations, road and walk bases and stored materials free from excess water, either rain or subsurface water at all times.
2. Use pumps, site drainage or other approved methods.
3. Discharge water to acceptable drainage points.

C. Utilities Encountered:
1. Protect all existing active utility services and structures, which may be encountered.
2. If active utility lines are encountered, which are not indicated on the plans, protect these lines and request determination from the Architect.
3. Do not proceed without written directive, unless in an emergency requiring immediate protection.
4. Erect sheeting, shoring and bracing as necessary for protection of persons, improvements and excavations; refer to Section 312316 - Excavation for additional requirements.
5. Preserve, protect and maintain operable existing drainage ways, drains and sewers.

PART 2 PRODUCTS

2.1 MATERIALS

A. Topsoil: As specified in Section 310513.

B. Subsoil Fill: Type as specified in Section 310513.

C. Load Bearing Fill: As specified in Section 310513 and 310516.

D. Course Aggregate Fill: As specified in Section 310516.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.
1. Verify site conditions.

B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

A. Call Local Utility Line Information service not less than five working days before performing Work.
1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum.

C. Notify utility provider regarding work related to utilities.

D. Protect utilities indicated to remain from damage.

E. Protect plant life, lawns and other features remaining as portion of final landscaping.

F. Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 GENERAL CONDUCT OF THE WORK

A. Temporary Haul Roads:
   1. Locate in approved areas.
   2. Construct temporary haul roads to drain freely; maintain in good condition throughout the duration of the Contract.
   3. Implement acceptable measures to control excessive dust caused by truck traffic during dry periods.

B. Maintain and protect cut and filled areas until final completion and acceptance of the Work; repair and replace eroded areas in a satisfactory manner.
   1. Repair and replacement of eroded areas shall be performed at the Contractor's expense.
   2. The Contractor might be required to remove, at its own expense, any fill material placed outside the prescribed slope lines.

C. Remove debris of any kind, resulting from or related to the Work, from the project site; leave the premises in a condition satisfactory to the Owner.

D. Rough grade to prevent ponding of water in any area; install temporary swales as necessary for proper surface drainage.

3.4 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be further excavated, relandscaped, or regraded.

B. Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.

C. When excavating through roots, perform Work by hand and cut roots with sharp axe.

D. Remove excess subsoil not intended for reuse, from site.

E. Stockpile excavated material in area designated on site in accordance with Section 310513.

F. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed fill material to slope to provide firm bearing.

G. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

A. Fill areas to contours and elevations with unfrozen materials.

B. Areas indicating sponginess or instability during earth moving operations shall be excavated and prepared to receive acceptable fill materials as specified; material excavated due to unsuitability shall be removed from the site.

C. Place fill material in continuous layers and compact; in no case shall maximum lift thickness placed exceed the maximum limits specified by the earthwork equipment manufacturer's recommendations.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 1 percent slope for minimum distance of 10 ft, unless noted otherwise.

F. Make grade changes gradual. Blend slope into level areas.

G. Repair or replace items indicated to remain damaged by excavation or filling.

3.6 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Top Surface of Subgrade: Finish the site excavation and rough grading to 6 inches below plus or minus 1 inch from required finish grade.

3.7 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements and Section 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION 312213

SECTION 312316 – EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Soil densification.
2. Excavating for building foundations.
3. Excavating for paving, roads, and parking areas.
4. Excavating for slabs-on-grade.
5. Excavating for site structures.
6. Excavating for landscaping.

B. Related Sections:
1. Section 310513 - Soils for Earthwork.
2. Section 310516 - Aggregates for Earthwork.
3. Section 312213 - Rough Grading.
4. Section 312317 - Trenching
5. Section 312318 - Rock Removal.
6. Section 312323 - Fill
7. Section 331116 - Site Water Utility Distribution Piping.

C. Geotechnical Engineer shall be on site during earthwork operations; refer to Section 312323.

D. Excavation, fill or backfill required for Plumbing, HVAC and Electrical Contract Work will be performed by the respective separate Contractor.

1.2 PROJECT CONDITIONS

A. Cold Weather Protection: In cold, wet weather, the last 6 inches depth of excavations for footings, foundations shall be done prior to concreting Work in all soils other than rock.

B. Frost Protection: If concrete cannot be immediately deposited in excavations, protect bottoms of footings and foundations from frost by an approved covering until concreting operations resume.

C. Erect sheeting, shoring and bracing as necessary for protection of persons, improvements and excavations.

1.3 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

C. Shop Drawings: Indicate soil densification grid for each size and configuration footing requiring soils densification.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Commonwealth of Pennsylvania Department of Transportation's standard.

B. Maintain one copy of PennDOT Publication 408 standards on site.

1.6 QUALIFICATIONS

A. Prepare excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed in Commonwealth of Pennsylvania.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PREPARATION

A. Pennsylvania Underground Utility Line Protection Act of 1974, P.L. 852, No. 287, as amended by Act 181 of 2006.
   1. The General Contractor shall be responsible for scheduling a preconstruction meeting prior to the commencement of excavation or demolition work in accordance with Act 181.

B. Identify required lines, levels, contours, and datum.

C. Protect utilities indicated to remain from damage.

D. Protect plant life, lawns and other features remaining as portion of final landscaping.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.2 EXCAVATION

A. Excavate subsoil to accommodate building foundations, slabs-on-grade paving and site structures, and construction operations.

B. Excavate in sequence and stages, which will not subject permanent or temporary structures, installations or surfaces to unstable conditions.

C. Excavate to working elevation for piling work.

D. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity; perform compaction in accordance with Section 312323 and Section 312317.

E. Slope banks with machine to angle of repose or less until shored.

F. Do not disturb subsoil within 45 degree bearing splay of foundations.

G. Grade top perimeter of excavation to prevent surface water from draining into excavation.

H. The Contractor's failure to maintain dewatering operations for structure excavations shall not be a basis for payment for removal and replacement of unsuitable materials.

I. Trim excavation. Remove loose matter.

J. Notify Architect/Engineer of unexpected subsurface conditions.

K. Correct areas over excavated with structural fill specified in Section 312323.

L. Remove excess and unsuitable material from site.

M. Stockpile excavated material in area designated on site in accordance with Section 310513.

N. Repair or replace items indicated to remain damaged by excavation.

3.3 FOUNDATION PREPARATION OF NEW LOAD BEARING AREAS

A. A load bearing area is defined as an area supporting loads of a structure or pavement area subject to motor traffic.

B. After excavating to foundation subgrade elevation, the independent testing agency shall perform soil-bearing tests to confirm bearing capacity of the subgrade meets or exceeds the minimum safe bearing capacity noted in the Construction Documents. If the subgrade does not meet the minimum safe bearing capacity noted in the Construction Documents, the Architect will review and provide direction for change in the Work (changes resulting in additional cost or time will be addressed in accordance with the General Conditions, as amended).

C. The entire exposed natural soil of the load bearing area shall be proof-rolled with no less than 10 complete coverages of vibratory compaction equipment (minimum of (1) 10,000 lb. smooth drum roller capable of a combined active and passive pressure of 30,000 pounds); all soft spots or irregularities within the natural soil, disclosed as proof-rolling progresses, shall be excavated to sound material and then backfilled or leveled to grade as hereinafter specified; Architect and Geotechnical Engineer shall be so advised by Contractor that additional excavation is necessary to achieve satisfactory proof-rolling; suitable backfill to replace unacceptable soil in load bearing areas shall be select granular material.

3.4 EXCAVATING WITHIN LOAD BEARING AREAS

A. Dimensions: Excavate to elevations and dimensions indicated; allow for working space, forms, drains, dampproofing and inspection.

B. Grades Within Building Walls: Cut, fill, proofrolling and compaction operations shall be completed as specified before excavation for building foundations and site structures is commenced.

C. Workmanship:
   1. Bottoms of all excavations shall be properly leveled and footings placed on undisturbed earth; remove loose materials.
   2. Excavation shall extend at least 2 feet from the neat lines of structures to allow for working space and inspection, except where concrete is to be deposited directly against excavated surfaces.

D. Where the foundation excavation is carried below grade shown on plans due to error, freezing, removal of mud or other loose materials, the foundation bearing shall be restored to plan grade with concrete of same strength as that specified for the footing; no additional payment will be made for this Work.

E. If rock is exposed at design footing grades, the rock shall be overcut one foot and replaced with select granular material as specified in Section 310516 and Section 312323; no additional payment will be made for this Work.

F. Excavation Adjacent to Existing Buildings:
   1. Use the bench method, excavating only short sections for foundations at a time, then form; do concreting and backfill before starting next section.
   2. Provide necessary needling or shoring to prevent movement of adjoining construction, foundations.
   3. Protect exposed excavations from water infiltration until backfill is completed.

3.5 SHORING, SHEETING AND BRACING

A. Install shoring, sheeting and bracing to comply with federal, state and local code requirements.

B. Responsibility for the safety of the Work, personnel and structures rests solely with the Contractor.

C. Carry the bottom of the support system to depth below the main excavation, adequate to prevent ground movement.

D. Follow the excavation closely with sheeting and shoring placement.

E. Perform excavation for the installation of sheeting carefully to minimize the formation of voids.

F. If unsuitable material is encountered during excavation, take measures to contain it in place and prevent ground displacement.

G. Have sufficient quantity of material on hand at all times for sheeting, shoring, bracing and other operations for the protection of the Work and for use in case of accident or emergency.

H. Leave sheeting and shoring in place as long as possible, compatible with the placing and compacting of backfill.

3.6 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements and 017000 – Execution Requirements and Section 017700 Closeout Procedure: Field inspecting, testing, adjusting, and balancing.
   1. After completion of the fill placement and compaction specified, the independent testing agency will perform test to confirm soil densities in compliance with the Contract Documents; if they do not, compaction and lab tests must be redone.

B. Receive approval of the Architect and Geotechnical Engineer prior to footing excavation.

C. Request inspection of excavation and controlled fill operations in accordance with applicable code.

D. Request visual inspection of bearing surfaces by Geotechnical Engineer before installing subsequent work.
   1. Geotechnical Engineer shall inspect the footing excavations for the building foundations, and shall verify that specified compaction has been achieved to support the design and that no loose pockets exist beneath the bearing surfaces of the footing excavations.

E. Fill all openings and fractures in the excavation bottom and sides with cement grout to preclude potential development of soil piping and pinholes.

3.7 PROTECTION

A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION 312316

SECTION 312317 – TRENCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating trenches for utilities from 5 feet outside building to utility service.
2. Compacted fill from top of utility bedding to subgrade elevations.
3. Backfilling and compaction.

B. Related Sections:
1. Section 310513 - Soils for Earthwork.
2. Section 310516 - Aggregates for Earthwork.
3. Section 312213 - Rough Grading.
4. Section 312316 - Excavation
5. Section 312318 - Rock Removal.
6. Section 312323 - Fill
7. Section 329000 - Site Restoration.
8. Section 331116 - Site Water Utility Distribution Piping
9. Section 334100 - Storm Utility Drainage Piping**.**

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures.

B. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

C. Product Data: Submit data for geotextile fabric indicating fabric and construction.

D. Materials Source: Submit name of imported fill materials suppliers.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with Commonwealth of Pennsylvania Department of Transportation’s standard.

1.6 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.7 COORDINATION

A. Section 013100 – Project Management and Coordination: Coordination and project conditions.

B. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Provide materials as per the Construction Drawings and in accordance with PennDOT Publication 408, latest edition.
   1. Substitution: Section 016000 - Product Requirements.

2.2 ACCESSORIES

A. Provide materials as per the Construction Drawings and in accordance with PennDOT Publication 408, latest edition. Substitution:
   1. Section 016000 - Product Requirements

PART 3 - EXECUTION

3.1 LINES AND GRADES

A. Lay pipes to lines and grades indicated on Drawings.
   1. Architect/Engineer and Owner reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

3.2 PREPARATION

A. Call Local Utility Line Information service at 811 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life, lawns and other features remaining as portion of final landscaping.

D. Protect bench marks, existing structures, fences**,** sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Maintain and protect above and below grade utilities indicated to remain.

F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work.

3.3 TRENCHING

A. Excavate subsoil required for utilities.

B. Remove lumped subsoil, boulders, and rock up as specified in Section 312318.

C. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.

D. Do not advance open trench more than 200 feet ahead of installed pipe.

E. Cut trenches to width indicated on Drawings. Remove water or materials that interfere with Work.

F. Excavate bottom of trenches maximum 2 feet wider than outside diameter of pipe.

G. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and utilities.

H. Do not interfere with 45 degree bearing splay of foundations.

I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section.

J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Architect/Engineer until suitable material is encountered. Notify Architect/Engineer and request instructions.

K. Cut out soft areas of subgrade not capable of compaction in place. Backfill and compact to density equal to or greater than requirements for subsequent backfill material.

L. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

M. Correct areas over excavated areas with compacted backfill as specified for authorized excavation or replace with fill concrete as directed by Architect/Engineer.

N. Remove excess subsoil not intended for reuse, from site.

3.4 SHEETING AND SHORING

A. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

B. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

C. Design sheeting and shoring to be removed at completion of excavation work.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Place geotextile fabric prior to placing subsequent fill materials.

D. Place fill material in continuous layers and compact as per PennDOT 408 and as per the Construction Drawings.

E. Employ placement method that does not disturb or damage foundation perimeter drainage, utilities in trench and other on-site Work.

F. Maintain optimum moisture content of fill materials to attain required compaction density.

G. Do not leave more than 25 feet of trench open at end of working day.

H. Protect open trench to prevent danger to Owner and the public.

3.6 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1/2 inch from required elevations.

C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements.

B. Perform laboratory material tests in accordance with ASTM D1557.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D2922.
   2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

E. Frequency of Tests: As deemed necessary by Geotechnical Engineer.

3.8 PROTECTION OF FINISHED WORK

A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION 312317

SECTION 312318 - ROCK REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Removing identified and discovered rock during excavation.
   2. Expansive tools to assist rock removal.

B. Blasting will not be permitted.

C. Related Sections:
   1. Section 312213 - Rough Grading.
   2. Section 312316 – Excavation
   3. Section 312317 - Trenching
   4. Section 312323 - Fill

1.2 REFERENCES

1.3 DEFINITIONS

A. Rock: Solid mineral material in excess of 2 cubic yards that cannot be loosened, broken and removed by mechanical removal methods, using equipment such as an earth moving excavator with ripper.
   1. Rock classification shall not include boulders under 2 cubic yards, loose rock, masonry or any volume of concrete.

B. Blasting: Rock removal by explosive methods.

1.4 PROJECT CONDITIONS

A. Excavation shall be performed on an "unclassified basis" with the removal of all kinds of materials, including rock.

B. Comply with applicable codes and requirements of authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS - *Not Used.*

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Coordination and project conditions.

B. Verify site conditions and note subsurface irregularities affecting Work of this section.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. When rock is uncovered, notify Architect of area and selection of mechanical removal methods.

3.3 ROCK REMOVAL BY MECHANICAL METHOD

A. Excavate and remove rock by mechanical method.

B. Cut away rock at bottom of excavation to form level bearing.

C. Remove shaled layers to provide sound and unshattered base for footings and foundations.

D. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

E. Remove excavated materials from site.

F. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 312323.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements and 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Field inspecting, testing, adjusting, and balancing.

B. Request visual inspection of foundation bearing surfaces by Architect and inspection agency before installing subsequent work.

END OF SECTION 312318

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Dewatering system.
   2. Surface water control system.
   3. System operation and maintenance.
   4. Water disposal.

B. Related Sections:
   1. Section 312317 - Trenching: Trenching for utilities below ground water table.
   2. Section 312513 - Erosion and Sedimentation Controls: Surface water runoff control.

1.2 DEFINITIONS

A. Dewatering includes the following:
   1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations and trenches.
   2. Disposing of removed water.

B. Surface Water Control: Removal of surface water within the work area or disturbed area limits. Includes diversion of unpolluted or uncontaminated surface water from entering the work area.

1.3 SYSTEM DESCRIPTION

A. Provide dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.

1.4 PERFORMANCE REQUIREMENTS

A. Design dewatering systems to:
   1. Lower water table within areas of excavation to minimum 0.5 feet below bottom of excavation to permit Work to be completed on dry and stable subgrade.
   2. Relieve hydrostatic pressures in confined water bearing strata below excavation to eliminate risk of uplift or other instability of excavation.
   3. Prevent damage to adjacent properties, buildings, structures, utilities, and facilities from construction operations.
   4. Prevent loss of fines, quick condition, or softening of foundation subgrade.
   5. Maintain stability of sides and bottoms of excavations and trenches.

B. Design surface water control systems to:
   1. Collect and remove surface water and seepage entering excavation or trench.
   2. Divert uncontaminated surface water from entering the work area.

1.5 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
   1. Indicate dewatering system layout, well depths, well screen lengths, dewatering pump locations, pipe sizes and capacities, grades, filter sand gradations, surface water control devices, valves, and water disposal method and location.
   2. Indicate primary and standby power system location and capacity.
   3. Include detailed description of dewatering and monitoring system installation procedures and maintenance of equipment.
   4. Include description of emergency procedures to follow when problems arise.

C. Product Data: Submit data for each of the following:
   1. Dewatering Pumps: Indicate sizes, capacities, priming method, engine or motor characteristics.
   2. Pumping equipment for control of water within excavation or trench.

1.6 CLOSEOUT SUBMITTALS

A. Division 01 – General Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations and depths of capped wells and piping abandoned in place.

1.7 QUALITY ASSURANCE

A. Comply with authorities having jurisdiction for the following:
   1. Water discharge and disposal from pumping operations.

B. Perform work in accordance with National Pollutant Discharge Elimination System (NPDES) permit for storm water discharge from construction sites and/or approved Soil Erosion and Sedimentation Control Plan.

1.8 QUALIFICATIONS

A. Contractor shall be responsible for design, operation, and maintenance of dewatering system.
   1. Assume sole responsibility for dewatering and surface water control systems and for loss or damage resulting from partial or complete failure of protective measures and settlement or resultant damage caused by ground water control operations.

1.9 SEQUENCING

A. Sequence work to install and test dewatering and surface water control systems minimum 3 days before starting excavation or trenching.

1.10 COORDINATION

A. Division 01 – General Requirements: Requirements for coordination.

B. Coordinate work to permit the following construction operations to be completed on dry stable substrate.
   1. Trenching for utilities specified in Section 312317.

PART 2 - PRODUCTS

2.1 DEWATERING EQUIPMENT

A. Select dewatering equipment to meet specified performance requirements.

2.2 ACCESSORIES

A. Provide and maintain temporary facilities for the removal of sediment from dewatering operations. Temporary facilities includes but is not limited to:
   1. Pumped water filter bag.
   2. Filter bag inlet protection.
   3. Filter sock.
   4. Riprap outlet.
   5. Sediment traps or settling basins.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Division 01 – General Requirements: Verification of existing conditions before starting work.

B. Notify Pennsylvania One Call System, Inc. at 1-800-242-1776 or 8-1-1 not less than three working days before performing Work.
   1. Request underground utilities to be located and marked within and surrounding construction areas.
   2. Comply with the requirements of the State of Pennsylvania Underground Utility Line Protection Act (Act 287) latest edition.

3.2 PREPARATION

A. Protect existing adjacent buildings, structures, and improvements from damage caused by dewatering operations.

3.3 DEWATERING SYSTEM

A. Install dewatering system in accordance with shop drawings.

B. Locate system components to allow continuous dewatering operations without interfering with installation of permanent Work and existing public rights-of-way, sidewalks, and adjacent buildings, structures, and improvements.

3.4 SURFACE WATER CONTROL SYSTEM

A. Provide ditches, berms, and other devices to divert and drain surface water away from excavation or trenching area.

B. Divert surface water and seepage water within excavation areas into sumps and pump water into soil erosion and sedimentation control facilities in accordance with requirements of agencies having jurisdiction.

C. Control and remove unanticipated water seepage into excavation.

3.5 SYSTEM OPERATION AND MAINTENANCE

A. Operate dewatering system continuously until backfill is minimum 2 feet above normal ground water table elevation or until backfilling is complete.

B. Provide 24-hour supervision of dewatering system by personnel skilled in operation, maintenance, and replacement of system components.

C. Conduct daily observation of dewatering system and monitoring system. Make required repairs and perform scheduled maintenance.

D. When dewatering system cannot control water within excavation, notify Engineer and stop excavation or trenching work.
   1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation.
   2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.

E. Modify dewatering and surface water control systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.

F. Correct unanticipated pressure conditions affecting dewatering system performance.

G. Do not discontinue dewatering operations without Engineer’s approval.

3.6 WATER DISPOSAL

A. Discharge water into existing storm sewer system drainage channels settling basins or other suitable vegetated areas after removal of sediment. Comply with NPDES permit requirements or approved Soil Erosion and Sedimentation Control Plan. Do not pollute nearby surface waters with sediment discharge.

B. Do not discharge water into a sanitary sewer system or onto private property without property owner’s written permission.

3.7 SYSTEM REMOVAL

A. Remove dewatering and surface water control systems after dewatering operations are discontinued.

B. Repair damage caused by dewatering and surface water control systems or resulting from failure of systems to protect property.

3.8 FIELD QUALITY CONTROL

A. Section 014000 - Quality Control Requirements: Field inspecting, testing.

B. Maintain weekly monitoring / maintenance reports including the following:
   1. Maintenance records for dewatering and surface water control systems in accordance with approved Soil Erosion and Sedimentation Control Plan.

END OF SECTION 312319

SECTION 312323 – FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Backfilling building perimeter to subgrade elevations.
2. Backfilling site structures to subgrade elevations.
3. Fill under slabs-on-grade.
4. Fill under paving.
5. Fill for over-excavation.

B. Related Sections:
1. Section 310513 - Soils for Earthwork.
2. Section 310516 - Aggregates for Earthwork.
3. Section 312213 - Rough Grading.
4. Section 312316 - Excavation
5. Section 312317 - Trenching
6. Section 329000 - Site Restoration.
7. Section 331116 - Site Water Utility Distribution Piping.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for geotextile fabric indicating fabric and construction.

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

D. Materials Source: Submit name of imported fill materials suppliers.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Geotechnical Engineer:
   1. Geotechnical Engineer shall be an individual registered in the project state as a Professional Geotechnical Engineer or, if the project state has no such registration category, as a Professional Engineer trained and experienced in the application of earth sciences relating specifically to soils engineering.
   2. Geotechnical Engineer shall be employed full-time by the Contractor, shall be on site during site preparation, compaction and testing, and shall certify that all Work has been completed in accordance with the Specifications.

B. Perform Work in accordance with Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. Subsoil Fill: As specified in Section 310513.

B. Structural Fill: As specified in Section 310513 and 310516.

C. Granular Fill: As specified in Section 310516.

D. Concrete: Structural concrete as specified in Section 033000.

2.2 ACCESSORIES

A. Geotextile Fabric: Filter cloth placed over select granular materials, in areas of overexcavation (not including footing excavation), prior to placement of compacted stone under slab-on-grade.
   1. Product Selection: Non-biodegradable, woven; Geotex 315ST as manufactured by Propex Inc., as basis-of-design.
      a. Acceptable Manufacturers (prior to bidding):
         1) TC Mirafi; Mirafi HP270.
         2) Belton Industries, Inc.; Beltech Geotextile Style 982.
      b. Substitutions: Section 016000 - Product Requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Coordination and project conditions.

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.

D. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Compact subgrade to density requirements for subsequent backfill materials.

B. Refer to Section 312316 - Excavation for preparation of subgrade, including proof-rolling operation to identify and over-excavating soft spots.

C. At areas of over-excavation (not including footing excavation) place granular fill and compact to density equal to or greater than requirements for subsequent fill material; cover granular fill with specified geotextile fabric prior to placement of compacted stone under slab-on-grade.

D. Scarify subgrade surface to depth of 3 inch.

E. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Backfill areas to contours and elevations with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Place geotextile fabric over structural fill prior to placing next lift of fill.

D. Place fill material in continuous layers and compact as directed by the Geotechnical Engineer; in no case shall maximum lift thickness placed exceed the maximum limits specified by the earthwork equipment manufacturer’s recommendations.

E. Employ placement method that does not disturb or damage other work.

F. Maintain optimum moisture content of backfill materials to attain required compaction density.

G. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

H. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

I. Slope grade away from building minimum 1 percent slope for minimum distance of 10 ft, unless noted otherwise.

J. Make gradual grade changes. Blend slope into level areas.

K. Remove surplus backfill materials from site.

L. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Top Surface of Backfilling Within Building Areas: Plus or minus 1 inch from required elevations.

C. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

D. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 PLACEMENT OF STONE UNDER SLAB FOR STRUCTURES

A. In areas of over-excavation, install geotextile fabric over compacted select granular material fill prior to placement of stone material; install according to manufacturer’s instructions; no equipment shall drive directly on top of the geotextile material.

B. Grade stone material smooth and even, free of voids, compacted, and to required thickness and elevation; provide final grades within a tolerance of 1/2 inch when tested with a 10 ft straightedge.

C. Continue compacting until all compaction marks are eliminated and the course is thoroughly and properly compacted.

3.6 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements and 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with ASTM D1557 or ASTM D698 at discretion of Geotechnical Engineer.

C. Perform in place compaction tests in accordance with the following:
   1. Density Tests: ASTM D2922.
   2. Moisture Tests: ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest; the Contractor shall reimburse the Owner for the additional Geotechnical Engineer's time and expenses attributed to the rework.

E. Frequency of Tests:
   1. In-place density tests will be performed as often as the Geotechnical Engineer deems necessary to properly control the quality of the compaction Work.

F. Proof roll compacted fill surfaces under slabs-on-grade and paving.

3.7 PROTECTION OF FINISHED WORK

A. Section 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION 312323

SECTION 312500 – EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. All requirements for construction, operation, maintenance, repair, monitoring and removal of soil erosion and sedimentation control devices and systems as indicated on Drawings and in accordance with the Soil Erosion and Sedimentation Control Plan.

B. Related Sections:
   1. Section 310513 - Soils for Earthwork.
   2. Section 310516 - Aggregates for Earthwork.
   3. Section 311000 - Site Clearing.
   4. Section 312317 – Trenching.
   5. Section 321313 - Concrete Paving.
   6. Section 329119 - Landscape Grading.
   7. Section 329219 - Seeding.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. See SECTION 01 20 00 PRICE AND PAMENT for method of measurement and payment for the Work of this Section if Contract is performed under unit price payment method.

1.3 REFERENCES

A. Pennsylvania Department of Environmental Protection
   1. Erosion and Sediment Pollution Control Program Manual (Technical Guidance Number 363-2134-008), March 2012 or latest edition.

B. Pennsylvania Department of Transportation (PennDOT)
   1. Publication 408 Highway Construction Specifications.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Product Data: Submit data on geotextile, aggregates and rip-rap, pumped water filter bag, inlet filter, filter sock, silt fence, erosion control blankets, seed, fertilizer and soil supplements, mulch, and accessories needed for temporary controls.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual.

1.7 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.8 ENVIRONMENTAL REQUIREMENTS

A. If NPDES Permit for Stormwater Discharge from Construction Activity Permit has been issued for project:
   1. Prior to construction, execute Co-Permittee Agreement with Owner.
   2. Co-Permittee Agreement shall remain in effect until: permanent stabilization of earth disturbance activities is achieved; removal of all erosion and sediment control best management practices (BMPs) per the approved Erosion and Sediment Control Plan; implementation of post construction stormwater management (PCSM) BMPs per the approved PCSM plan; and Owner submits NPDES Permit Notice of Termination form to the Department of Environmental Protection or the County Conservation District.

PART 2 - PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

A. Furnish materials in accordance with State of Pennsylvania standards.
   1. Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual.
   2. PennDOT Publication 408.
   3. Approved Soil Erosion and Sedimentation Control Plan.

2.2 PLANTING MATERIALS

A. Seeding and Soil Supplements: as specified in Section 329219.

B. Mulch: as specified in Section 329219.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify compacted subgrade is acceptable and ready for final restoration and stabilization.

C. Verify gradients and elevations of base or foundation for other work are correct.

3.2 SITE STABILIZATION

A. Install erosion control devices indicated on the Drawings before beginning any site clearing or construction work.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 20 feet. Slope stockpile sides at 2:1 or flatter.

D. Temporarily stabilize all disturbed areas with mulch within 4 days of the disturbance.
   1. Temporarily stabilized rough graded areas and topsoil piles that will not be final graded and permanently seeded within 4 days from the time of original exposure / disturbance with annual ryegrass at the rate of 10 lbs per 1,000 square yards and mulch at the rate of 1,200 lbs per 1,000 square yards.

E. Comply with all requirements of the approved Soil Erosion and Sedimentation Control Plan.

3.3 FIELD QUALITY CONTROL

A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

3.4 CLEANING

A. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

B. Do not damage structure or device during cleaning operations.

C. Do not permit sediment to erode into construction or site areas or natural waterways.

D. Clean channels when depth of sediment reaches approximately one half channel depth.

3.5 REMOVAL OF TEMPORARY MEASURES

A. Remove all temporary erosion and sedimentation control devices when construction has been completed and permanent stabilization of earth disturbance activities is achieved.

B. Repair any damage done during removal of temporary measures. Re-grade, seed and mulch as needed.

C. Salvage, re-spread, seed, and mulch all sediment recovered from temporary erosion and sedimentation control devices.

END OF SECTION 312500

SECTION 312513 - EROSION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Diversion Channels.
   2. Rock Filter Inlet Protection.
   3. Inlet Filter Bags.
   4. Erosion Control Blanket.
   5. Compost Filter Socks.

B. Related Sections:
   1. Section 310513 - Soils for Earthwork.
   2. Section 310516 - Aggregates for Earthwork.
   3. Section 311000 - Site Clearing.
   4. Section 312316 - Excavation
   5. Section 312323 - Fill
   6. Section 329000 - Site Restoration.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and a 18-in. Drop.

B. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.

C. ASTM International:
   1. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

D. Precast/Prestressed Concrete Institute:
   1. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

E. PennDOT
   1. PennDOT Publication 408 Specifications, Latest Edition
   2. PennDOT Roadway Construction Standards, Latest Edition.

F. Pennsylvania Department of Environmental Protection
   1. Pennsylvania Department of Environmental Protection, Erosion and Sedimentation Control Manual, latest edition.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Product Data: Submit data on joint filler, joint sealer, admixtures, curing compounds and geotextile.

C. Submit proposed mix design of each class of concrete for review prior to commencement of Work.

D. Samples:
   1. Submit two samples or rock, minimum 5 tons each or one half total project quantity, whichever is smaller. Provide one sample in place at construction site and provide other sample at quarry. Construction site sample may be incorporated into the Work. Samples will be used as reference for judging size, and graduation of rock supplied and placed.

E. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.

F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Requirements for submittals.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with requirements of:
   1. Perform Work in accordance with PennDOT Publication 408, latest Edition.
   2. Pennsylvania Department of Environmental Protection, Erosion and Sedimentation Control Manual, latest edition.

B. Maintain one copy of each document on site.

1.6 PRE-INSTALLATION MEETINGS

A. Section 013100 – Project Management and Coordination: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

B. Do not place grout when air temperature is below freezing.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

1. Furnish materials in accordance with the Construction Documents, PennDOT Publication 408, latest Edition and the Pennsylvania Department of Environmental Protection, Erosion and Sedimentation Control Manual, latest edition.

2.2 PLANTING MATERIALS

A. Seeding and Soil Supplements: Furnish materials in accordance with the Construction Documents, PennDOT Publication 408, latest Edition and the Pennsylvania Department of Environmental Protection, Erosion and Sedimentation Control Manual, latest edition.

B. Mulch: Furnish materials in accordance with the Construction Documents, PennDOT Publication 408, latest Edition and the Pennsylvania Department of Environmental Protection, Erosion and Sedimentation Control Manual, latest edition.

2.3 PIPE MATERIALS

A. Pipe: Furnish materials in accordance with the Construction Documents, PennDOT Publication 408, latest Edition and the Pennsylvania Department of Environmental Protection, Erosion and Sedimentation Control Manual, latest edition.

2.4 SOURCE QUALITY CONTROL (AND TESTS)

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.

C. Test samples in accordance with ACI 301.

D. Make rock and other materials to be used on the project available for inspection at producer’s quarry prior to shipment. Notify Architect/Engineer at least seven days before inspection is allowed.

E. Allow witnessing of inspections and test at manufacturer’s test facility. Notify Architect/Engineer at least seven days before inspections and tests are scheduled.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify compacted subgrade, granular base, or stabilized soil is acceptable and ready to support devices and imposed loads.

C. Verify gradients and elevations of base or foundation for other work are correct.

3.2 DIVERSION CHANNELS

A. Windrow excavated material on low side of channel.

B. Compact to 95 percent maximum density.

C. On entire channel area, apply soil supplements and sow seed as specified in the construction documents.

D. Mulch seeded areas with hay as specified in the construction documents.

E. Install Work in accordance with:
   1. Perform Work in accordance with the Construction Documents, PennDOT Publication 408, latest Edition.
   2. Pennsylvania Department of Environmental Protection, Erosion and Sedimentation Control Manual, latest edition.

3.3 SITE STABILIZATION

A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time and as described in the construction documents.

B. Construct, stabilize and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2: 1 or flatter.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with the construction documents and approved erosion and sedimentation control plan.

E. Stabilize diversion channels and stockpiles immediately.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements, 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Field inspecting, testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

C. Compaction Testing: In accordance with ASTM D2922 and ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

E. Frequency of Compaction Testing: Two for each lift.

3.5 CLEANING

A. Section 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Requirements for cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one half channel depth.

3.6 PROTECTION

A. Section 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.

C. Do not permit construction traffic over paving 7 days minimum after finishing and until 75 percent design strength of concrete has been achieved.

D. Protect paving from elements, flowing water, or other disturbance until curing is completed.

3.7 SCHEDULES

A. Perform work in accordance with the Construction Documents and as per the approved Erosion and Sedimentation Control Plan.

END OF SECTION 312513

SECTION 314100 - EXCAVATION SUPPORT SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 – General Requirements Specification Section, apply to this Section.

1.2 SUMMARY

A. This Section includes, but is not limited to, the following:
   1. Shoring and bracing as may be necessary to protect existing buildings, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
   2. Maintenance of shoring and bracing.
   3. Removal of shoring and bracing, as required.

B. Types of shoring and bracing systems include, but are not limited, the following:
   1. Steel H-section (soldier) piles.
   2. Timber lagging.
   3. Steel sheet piles.
   4. Trench boxes.

1.3 QUALITY ASSURANCE

A. It is the responsibility of the contractor(s) to determine adequate materials and methods for shoring and bracing subject to compliance herein and in accordance with all codes, regulations and ordinances of governing authorities having jurisdiction.

1.4 JOB CONDITIONS

A. Before starting work, verify dimensions and elevations. Verify condition of building and site. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and Owner.

1.5 EXISTING UTILITIES

A. Protect existing active sewer, water, gas, electricity and other utility services and structures.

B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

1.6 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Signed and sealed by professional engineer.
   1. Indicate location and extent of sheet piling, details of top protection, tip reinforcement, splices, cut off method, corrosion protection.
   2. Include complete dimensions and details of sheet piling sections.
   3. Include sequence of driving and detailed drawings of templates or other temporary guide structures.
   4. Submit proposed procedures for removing driven sheet piling.
   5. Submit list and size of proposed equipment including cranes, barges, driving equipment, extractors, protection caps, and other installation and removal accessories.
   6. Submit detailed procedures and features for protection of existing structures or other installations.
   7. Include details of storage and handling procedures.

C. Product Data:
   1. Submit material certification, details of shoring.
   2. Include data for joint sealants.
   3. Include manufacturer's data sheets on cranes and driving equipment.

D. Design Data: Signed and sealed by professional engineer.
   1. Submit calculations to support Contractor's shoring design.

E. Submit Test Reports.

PART 2 - PRODUCTS

2.1 MATERIALS

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

B. Structural Steel: ASTM A 36.

C. Steel Sheet Piles: ASTM A 328.

D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick (minimum).

PART 3 - EXECUTION

3.1 SHORING

A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately installed and braced to resist earth and hydrostatic pressures.

B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work. Degradable materials may not be utilized in this situation.

3.2 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.

B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.

C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.

D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.

F. Repair or replace, as acceptable to Architect, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION 314100

SECTION 321123 - AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Aggregate subbase.
   2. Aggregate base course.

B. Related Sections:
   1. Section 312213 - Rough Grading.
   2. Section 312323 – Fill
   3. Section 321216 – Asphalt Paving.
   4. Section 321313 – Concrete Paving.
   5. Section 329000 – Site Restoration.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications.

B. ASTM International:
   1. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   2. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   4. ASTM D2940 - Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.
   5. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. Pennsylvania Department of Transportation (PennDOT):
   1. Publication 408 Specifications, latest edition.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data for geotextile fabric and herbicide.

C. Materials Source: Submit name of aggregate materials suppliers.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 PROJECT CONDITIONS

A. Do not place base course when ambient air or base surface temperature is less than 35 degrees F.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material from single source throughout the Work.

B. Perform Work in accordance with PennDOT Publication 408 Specifications.

C. Maintain one copy of PennDOT Publication 408 document on site.

PART 2 PRODUCTS

2.1 MATERIALS

A. Aggregate Base and Stone Paving Materials: As specified in Sections 703.2 and 7.3.5 of Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify compacted substrate is dry and ready to support paving and imposed loads.
   1. Proof roll substrate with as specified in Section 312316 to identify soft spots.
   2. Remove soft substrate and replace with compacted fill as specified in Section 312323.

C. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

A. Prepare subgrade in accordance with Section 210, Publication 408 Specifications.

B. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

C. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

A. Construct in accordance with the requirements of Section 350.3, Publication 408 Specifications, and to the lines, grades and thicknesses indicated on the Contract Drawings.

B. Spread aggregate over prepared substrate to a total compacted thickness as indicated on the Drawings.

C. Place aggregate in two layers and compact as specified.

D. Level and contour surfaces to elevations and gradients indicated.

E. Add small quantities of fine aggregate to coarse aggregate when required to assist compaction.

F. Maintain optimum moisture content of fill materials to attain specified compaction density.

G. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Maximum Variation From Flat Surface: 1/2 inch measured with 10 foot straight edge.

C. Maximum Variation From Thickness: 1/4 inch.

D. Maximum Variation From Elevation: 1/2 inch.

3.5 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements and 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Field inspecting, testing, adjusting, and balancing.

B. Compaction and density as required by Section 350.3 of Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END OF SECTION 321123

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Asphalt materials.
2. Aggregate materials.
3. Aggregate subbase.
4. Asphalt paving base course, binder course, and wearing course.
5. Asphalt paving overlay for existing paving.
6. Surface slurry.

B. Related Sections:
1. Section 312213 - Rough Grading
2. Section 312323 – Fill
3. Section 321123 - Aggregate Base Courses
4. Section 321723 - Pavement Markings
5. Section 330516 - Utility Structures

1.2 REFERENCES

A. Asphalt Institute:
1. AI SP-2 - Superpave Mix Design.

B. ASTM International:
1. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
2. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
3. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
4. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.

C. Pennsylvania Department of Transportation (PennDOT):
1. Publication 408 Specifications, latest edition.
2. Regulations Governing Occupancy of Highways by Utilities (67 PA Code, Chapter 469).
3. Publication 27 - Specification for Bituminous Materials (Bulletin 27).
4. Publication 37 - Specification for Bituminous Materials (Bulletin 25).
5. Publication 41 - List of Commercial Producers of Bituminous Mixtures (Bulletin 41).
6. Publication 203 - Work Zone Traffic Control.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit product information for asphalt and aggregate materials.
   2. Submit mix design with laboratory test results supporting design.

C. Submit batch tickets for each load of bituminous concrete delivered to the project site.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

E. Submit letters to authenticate installer's required experience.

1.4 QUALITY ASSURANCE

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

B. Obtain materials from same source throughout.

C. Perform Work in accordance with PennDOT Publication 408 Specifications and Borough of Berwick.

1.5 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Section 016000 - Product Requirements: Environmental conditions affecting products on site.

B. Do not place asphalt mixture when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

C. Place asphalt mixture when temperature is not more than 15 degrees F below bitumen supplier's bill of lading and not more than maximum specified temperature.

D. Take measures to control traffic to allow safe and expeditious movement of all traffic through the work area.

E. Employ traffic control measures in accordance with Publication 203, Work Zone Traffic Control.

F. Restore existing paving outside the limits of the Work, when damaged or in any way rendered defective by Contractor's operations or his movement of equipment, to its original condition at the expense of the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS AND MIX

A. Bituminous Concrete Base Course, Publication 408 - Section 305.

B. Superpave Bituminous Wearing Course, Publication 408 - Section 420.

C. Superpave Mixture Design, Publication 408 - Section 409.

D. Superpave Bituminous Binder Course, Publication 408 - Section 421.

E. ID-2 Bituminous Wearing Course, Publication 408 - Section 420.

F. ID-2 Bituminous Binder Course, Publication 408 - Section 421.

G. FJ-1 Bituminous Wearing Course (designated play areas), Publication 408 - Section 422.

H. Bituminous Tack Coat, Publication 408 - Section 460.

I. Bituminous Prime Coat, Publication 408 - Section 461.

J. Asphalt Joint and Crack Sealing, Publication 408 - Section 469.

K. Slurry Seal, Publication 408 - Section 482.

L. Milling of Bituminous Pavement Surfaces, Publication 408, Section 962.

M. Hot Thermoplastic Pavement Markings, Publication 408, Section 960.

N. Waterborne Pavement Markings, Publication 408, Section 962.

2.2 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.

C. Verify compacted aggregate subbase is dry and ready to support paving and imposed loads.

D. Verify gradients and elevations of base are correct.

E. Verify manhole frames and inlets are installed in correct position and elevation.

3.2 SUBBASE

A. Aggregate Subbase: Install as specified in Section 321123**.**

3.3 EXISTING WORK

A. Saw cut and notch existing paving as indicated on Drawings**.**

B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

C. Repair surface defects in existing paving to provide uniform surface to receive new paving.

3.4 PRIMER

A. Apply primer in accordance with Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

B. Use clean sand to blot excess primer.

3.5 TACK COAT

A. Apply tack coat in accordance with Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

B. Apply tack coat to contact surfaces of curbs.

C. Coat surfaces of manhole catch basin and inlet frames with oil to prevent bond with asphalt paving. Do not tack coat these surfaces.

3.6 PLACING ASPHALT PAVEMENT

A. Construct bituminous concrete paving to the lines, grades and thicknesses as shown on the Drawings and as specified in Section 401.3 of the Publication 408 Specifications, except as modified herein.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Place each course to required grade, cross-section, and compacted thickness.

D. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.

E. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

F. Place binder course to compacted thickness indicated on Drawings.

G. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.

H. Place wearing course to compacted thickness indicated on Drawings.

I. Construct joints to have same texture, density and smoothness as other sections of bituminous concrete course.

3.7 TIE-INS AND PATCHING OF PAVEMENT

A. Do the necessary patching of existing pavement, complete with crushed stone base course, using similar thickness and extent of pavement.

B. Clean contact surfaces and apply tack coat.

3.8 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

3.9 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements and 017000 – Execution Requirements and Section 017700 - Closeout Procedure**:** Field inspecting, testing, adjusting, and balancing.

B. Take samples and perform tests in accordance with Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

C. Asphalt Paving Mix Temperature: Measure temperature at time of placement.

D. Asphalt Paving Thickness: ASTM D3549; test one core sample from every 1000 square yards compacted paving.

E. Asphalt Paving Density: ASTM D2950 nuclear method; test one location for every 1000 square yards compacted paving.

3.10 PROTECTION OF FINISHED WORK

A. Section 017000 – Execution Requirements and Section 017700 - Closeout Procedure: Requirements for protecting finished Work.

B. Immediately after placement, protect paving from mechanical injury until surface temperature is less than 140 degrees F.

END OF SECTION 321216

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Painted markings applied to asphalt paving.
2. Painted markings applied to concrete surfaces.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to marking asphalt paving or concrete surfaces including, but not limited to, the following:

    a. Asphalt-paving or concrete-surface aging period before application of pavement markings.
    b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.

1. Pavement-marking paint, alkyd.
2. Pavement-marking paint, solvent-borne.
3. Pavement-marking paint, acrylic.
4. Pavement-marking paint, latex.
5. Glass beads.

B. Shop Drawings:

1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches (200 mm) square.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the City of Altoona for pavement-marking work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain pavement-marking paints from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design".

2.3 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint, Alkyd: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952F.

1. Color: As indicated.

B. Pavement-Marking Paint, Solvent-Borne: MPI #32, solvent-borne traffic-marking paint.

1. Color: As indicated.

C. Pavement-Marking Paint, Acrylic: Acrylic, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952F, Type II, with drying time of less than 45 minutes.

1. Color: As indicated.

D. Pavement-Marking Paint, Latex: MPI #97, latex traffic-marking paint.

1. Color: As indicated.

E. Glass Beads: AASHTO M 247, Type 1 or FS TT-B-1325D, Type 1.

1. Roundness: Minimum 80 percent true spheres by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal. (0.72 kg/L).

3.3 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

SECTION 329119 - LANDSCAPE GRADING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Final grade topsoil for finish landscaping.

B. Related Sections:
   1. Section 312213 - Rough Grading.
   2. Section 312317 - Trenching
   3. Section 312323 - Fill
   4. Section 329219 - Seeding

1.2 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures

B. Topsoil Test Reports:
   1. Prior to use or placement of topsoil, submit certified soil analyses from an approved laboratory, including laboratory's recommended soil supplement formulation, topsoil analysis - indicate pH, texture, organic content, and macro nutrients.
   2. A minimum of seven samples shall be taken.
   3. Submit reports for both on-site topsoil and for topsoil obtained off-site.
   4. A minimum of seven samples shall be taken.
   5. Application of fertilizer as specified in Section 329219.

C. Materials Source: Submit name of imported materials source.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.3 QUALITY ASSURANCE

A. Furnish each topsoil material from single source throughout the Work.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Topsoil: As specified in Section 310513.

B. Gravel Surfacing: As specified in Section 310516.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify building and trench backfilling have been inspected.

C. Verify substrate base has been contoured and compacted.

3.2 PREPARATION

A. Protect landscaping and other features remaining as final Work.

B. Protect existing structures, fences, sidewalks, utilities, paving, and curbs.

3.3 SUBSTRATE PREPARATION

A. Eliminate uneven areas and low spots.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove contaminated subsoil.

C. Scarify surface to depth of 3 inches where topsoil is scheduled. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.4 PLACING TOPSOIL

A. Do not spread topsoil until subgrade is prepared, underground utilities have been completed, and heavy hauling is finished.

B. Do not place topsoil when the subgrade is frozen, excessively wet or extremely dry; do not handle topsoil when it is in a frozen or muddy condition.

C. Place topsoil in areas where seeding and planting is required. Place topsoil during dry weather.

D. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.

E. Remove roots, weeds, rocks, and foreign material while spreading.

F. Manually spread topsoil close to plant material, building, curb and paving to prevent damage.

G. Roll placed topsoil.

H. Remove surplus subsoil and topsoil from site.

3.5 TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

B. Top of Topsoil: Plus or minus 1/2 inch.

3.6 PROTECTION OF INSTALLED WORK

A. Section 017000 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Prohibit construction traffic over topsoil.

3.7 SCHEDULES

A. Compacted topsoil thicknesses:
   1. Hydro Seeded Grass: 6 inches.

END OF SECTION 329119

SECTION 329219 – SEEDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fertilizing
   2. Seeding
   3. Hydroseeding
   4. Maintenance

B. Related Sections:
   1. Section 312213 - Rough Grading.
   2. Section 312317 - Trenching
   3. Section 329119 - Landscape Grading.
   4. Section 329300 – Athletic Field Fine Grading and Sodding.

1.2 REFERENCES

A. ASTM International:
   1. ASTM C602 - Standard Specification for Agricultural Liming Materials.

B. Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications, latest edition.

C. Pennsylvania Seed Act of 1965, Act 187, as amended.

D. Pennsylvania Soil Conditioner and Plant Growth Substance Law, Act of December 1, 1977, P.L. 258, No. 86 (3P.S.68.2), as amended.

E. Pennsylvania Agricultural Liming Materials Act of 1978, P.L. 15, No. 9 (3P.S.132-1), as amended.

F. Rules for Testing Seeds of the Association of Official Seed Analysts.

1.3 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

B. The lawn area shall be considered "satisfactory" when a close, practically weed-free stand of the grass specified is produced over the entire area during the Correction of Work period.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for seed mix, fertilizer, mulch and other accessories.

C. Submit invoices of seed and fertilizers to Architect showing adequate quantities are on hand.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Closeout procedures.

B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.6 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Seed shall be pure, recleaned seed of latest crop, labeled in accordance with provisions of the Pennsylvania Seed Act of 1965, except as follows:
   1. Labels must show the percentage by weight and all particulars of each ingredient in the mixture.
   2. Germination tests shall have been performed not more than nine months prior to delivery of the seed to the purchaser; all seed shall be furnished in sealed, standard containers, each of which carries the analysis label.
   3. Seed that has become wet, musty or otherwise damaged in transit or storage will not be acceptable.

C. Perform Work in accordance with Pennsylvania Department of Transportation (PennDOT) Publication 408 Specifications (latest edition).

D. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum five years' experience.

B. Installer: Company specializing in performing work of this section with minimum five years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Product storage and handling requirements.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

D. Dispose of seed that has become wet, moldy or otherwise damaged in transit or storage.

1.9 MAINTENANCE SERVICE

A. Section 017000 - Execution and Closeout Requirements: Requirements for maintenance service.

B. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition and uniform color over entire work area for three cuttings provided all areas are grassed and free from bare spots.

PART 2 - PRODUCTS

2.1 SEED MIXTURE

A. Fresh, clean, dated material from the last available crop and within the date period specified, with a date of test not more than 9 months prior to the date of sowing.

B. Percentage of pure seed present shall represent freedom from inert matter and from other seeds distinguishable by their appearance.

C. All seeds will be subject to analysis and testing.

D. Individual species shall be a combination of improved certified varieties with no one variety exceeding 50 percent of the component; individual species comprising 20 percent or less of the total seeding mixture may be of one variety.

E. Refer to Grass Seeds Table attached at the end of this Section, unless specified otherwise in the Sedimentation and Erosion Control Plan (as applicable).

2.2 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Basic Dry Formulation Fertilizer: Analysis 0-20-20 and as defined by the Pennsylvania Fertilizer Law.
   1. Starter Fertilizer: Analysis 10-6-4 or 12-6-6 and 10-20-10 or 18-24-10 as defined by the Pennsylvania Fertilizer Law.

C. Mulch Binders:
   1. Nonasphaltic Emulsion - Natural Vegetable Gum Blended with Gelling and Hardening Agents.
   2. Polyvinyl Acetate Emulsion Resin, Containing 60 percent (+1 percent) Total Solids by Weight.

D. Provide all lime in accordance with application rates shown on schedule or as recommended by the soil test laboratory; raw ground limestone conforming to Section 804.2(a), Publication 408 Specifications.

E. Inoculant:

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

F. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

G. Erosion Fabric:
1. Temporary matting shall be Curlex Blanket as manufactured by American Excelsior Company; equals by North American Green or Enkamat by Colbond Geosynthetics.
   a. Stake down with wood stakes.
   b. Remove plastic matting when vegetation is thick and soundly rooted.
2. Substitutions: Section 013300.

H. Stakes: Softwood lumber, chisel pointed.

I. String: Inorganic fiber.

2.3 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt content, organic matter content, and pH value.

C. Provide recommendation for fertilizer and lime application rates for specified seed mix as result of testing.

D. Testing is not required when recent tests and certificates are available for imported topsoil. Submit these test results to testing laboratory. Indicate, by test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify prepared soil base is ready to receive the Work of this section.

3.2 PREPARATION

A. All underground utility Work of whatever nature shall be installed, inspected and approved prior to start of seeding operations.

B. Equipment used to prepare seed bed, distribute fertilizers and seeding shall be approved by the Architect prior to start of Work.

C. Coordinate application of fertilizer with placement of topsoil; placement of topsoil shall be as specified in Section 329119.

3.3 FERTILIZING

A. Apply lime and fertilizer based on results of soil analysis and recommendations of approved soil testing laboratory.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. After seedbed areas have been brought to proper compacted elevation, thoroughly loosen to a minimum depth of 5 inches by discing, harrowing or other approved methods.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Liming:
1. Distribute limestone uniformly at the rate indicated by the soil test.
2. Thoroughly incorporate into the topsoil a minimum depth of 4 inches as a part of the tillage operation.

F. Basic Fertilizer:
1. Distribute basic fertilizer uniformly at the rate indicated by the soil test.
2. Incorporate into soil to depth of 4 inches by approved methods as part of tillage operation.

G. Remove unsuitable material larger than 1 inch in any direction.

H. Uniformly grade surface to the required contours without the formation of water pockets.

I. Spread soil conditioner by approved means at 125 cu yds per acre.

J. Distribute starter fertilizer and rake in lightly by acceptable means.

K. Incorporate starter fertilizer into the upper 1 inch of soil.

L. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

M. Variations: The Architect may vary the rates (provided within this Section) of fertilizers and soil conditioners as required by the soil analysis of the topsoil.

3.4 SEEDING

A. Apply seed evenly in two intersecting directions at rate scheduled in this Section. Rake in lightly.

B. Uniformly sow specified seed mix by use of approved hydraulic seeder, power-drawn drill, power-operated seeder or hand-operated seeder.

C. Do not seed areas in excess of that which can be mulched on same day.

D. Planting Season:
   1. Seeding will be permitted only between August 15 through October 1, and March 15 through May 15, unless otherwise approved by Architect.
   2. Seeding of Crown Vetch not to be done during the months of September and October.

E. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

F. Roll seeded area immediately after seeding (dry roll/dry ground) with roller not exceeding a maximum force of 65 lbs per foot width of roller.

G. Immediately following seeding, apply mulch. Maintain clear of shrubs and trees.
   1. Place straw mulch in a continuous blanket at a minimum rate of 1,200 lbs per 1,000 sq yds.
   2. Anchor straw mulch by use of twine, stakes, wire staples, plastic nets or chemical mulch binder; apply binders by the manufacturer's method and rate.
   3. Protect structures, pavements, curbs and walls to prevent staining.
   4. Do not spray chemical mulch binders onto any area within 100 feet of a stream or other body of water.

H. Apply water with fine spray immediately after each area has been mulched. Saturate to 4 inches of soil.

I. Maintain saturation point to a depth of 3 inches for ten days immediately following the seeding.

J. Grass areas must grow, and any which do not show a prompt catch of grass shall be reseeded; this operation shall be repeated until a complete coverage is obtained; when the area does not need to be reseeded, it shall be wet to a depth of **3** inches every time the surface shows evidence of drying out, and this shall continue through the entire period of maintenance.

3.5 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 320 lbs per 1000 sq ft evenly in one pass.

B. Include the medium in such quantities that when thoroughly mixed with the seed, lime and fertilizer and sprayed on the area to receive this mixture, it shall not be less than 1/4 inch thick.

C. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.6 SEED PROTECTION

A. Identify seeded areas with stakes and string around area periphery. Set string height to 30 inches. Space stakes at 48 inches.

B. Cover seeded slopes where grade is 4 inches per foot or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

C. On slopes 2:1 or steeper, omit mulching and apply erosion control fabric widths, rolled out from bottom to top of slope, held in place by heavy-duty wire staples at approximately 3 foot intervals,

in accordance with the instructions of the manufacturer; roll fabric onto slopes without stretching or pulling.

D. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

E. Secure outside edges and overlaps at 36 inch intervals with stakes.

F. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

G. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.7 TEMPORARY SEED COVER

A. Temporary seed mix shall be as specified within the Project Manual, unless specified otherwise in the Sedimentation and Erosion Control Plan (as applicable).

B. On disturbed areas, sow annual rye grass seed (Temporary Cover) on the prepared topsoil.

C. Sow and cover seed by method described for permanent seeding.

D. All conservation and erosion control areas, whether seeded with a drill, broadcasted or hydroseeded, should be mulched to reduce soil erosion and to aid seed germination and establishment of seedlings.

E. Apply mulch same as permanent seeding.

3.8 MAINTENANCE

A. Mow grass at regular intervals to maintain at maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

D. Water to prevent grass and soil from drying out.

E. Roll surface to remove minor depressions or irregularities.

F. Control growth of weeds.
   1. Apply herbicides. Remedy damage resulting from improper use of herbicides.
   2. Hand-weeding shall be required if chemical weeding does not produce a weed-free turf.

G. Immediately reseed areas showing bare spots.

H. Repair washouts or gullies.

1. Continue to repair washouts and reseed unsatisfactory areas during the Correction of Work period, as satisfactory to the Architect.

I. Protect seeded areas with warning signs during maintenance period.

J. Additional Protection:
   1. Where needed to prevent trespassing, provide a single strand of string stapled 15 inches above grade, stretched between 2 by 4 inch stakes, set 15 ft apart and driven 18 inches into ground.
   2. Hang from string at suitable intervals, "Keep Off the Grass" signs.
   3. Movement of equipment across lawn areas shall be done on planks and then only where approved by the Architect.

3.9 SCHEDULE

3.10 TABLE - GRASS SEEDS

Restoration Condition	Basic Fertilizer	Starter Fertilizer	Seed Mix and Sowing Rate (% by Weight)	Minimum Guaranteed Purity (Percent)	Maximum Weed Seed (Percent)	Minimum Guaranteed Germination (Percent)
Temporary Cover (*)	N/A	N/A	100 percent Annual Ryegrass Sow 45# per 1,000 Sq. Yds. Mar thru May/Aug thru Sept	98	0.15	90
Lawns (L)	0-20-20 12#/1,000 Sq. Ft.	10-20-10 @25# per 5,000 Sq. Ft. or 18-24-10 @ 20# per 5,000 Sq. Ft.	20 percent Perennial Ryegrass 30 percent Red Fescue 50 percent Kentucky Blue Grass Sow 36# per 1,000 Sq. Yds. Mar thru May/Aug thru Sept	98 98 98	0.15 0.15 0.20	90 85 80
Steep Slopes (W)	Refer to “Slope Cover” Article in this Section.					

*Unless otherwise specified in the Erosion and Sedimentation Control Plan

END OF SECTION 329219

SECTION 330130.13 – SEWER AND MANHOLE TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Testing of Gravity Sewer Piping:
      a. Low pressure air testing.
   2. Testing of pressure piping.
   3. Deflection testing of plastic sewer piping.
   4. Testing of Manholes:
      a. Vacuum testing.
      b. Infiltration inspection.

B. Related Requirements:
   1. Section 330130.72 - Relining Sewers: Relining of sanitary sewer piping and associated preparatory Work.
   2. Section 330513.16 – Public Manholes and Structures: Pre-cast and cast-in-place concrete manholes and structures and frames and covers for public sewerage piping.
   3. Section 333113 – Public Sanitary Utility Sewerage Piping: Pipe materials and accessories for public gravity sanitary sewers.

1.2 REFERENCE STANDARDS

A. ASTM International:
   1. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
   2. ASTM F1417 – Standard Practice for Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low-Pressure Air
   3. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

B. Uni-Bell PVC Pipe Association
   1. Handbook of PVC Pipe Design and Construction
   2. UNI-B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:
   1. Testing procedures.
   2. List of test equipment.
   3. Testing sequence schedule.
   4. Provisions for disposal of flushing and test water.
   5. Certification of test gage calibration.

6. Deflection mandrel drawings and calculations.

C. Test and Evaluation Reports: Indicate results of manhole and piping tests.

PART 2 - PRODUCTS

2.1 VACUUM TESTING

A. Equipment:
1. Vacuum pump.
2. Vacuum line.
3. Vacuum Tester Base:
   a. Compression band seal.
   b. Outlet port.
4. Shutoff valve.
5. Stopwatch.
6. Plugs.
7. Vacuum Gage: Calibrated to 0.1 in. Hg.

2.2 AIR TESTING

A. Equipment:
1. Air compressor.
2. Air supply line.
3. Shutoff valves.
4. Pressure regulator.
5. Pressure relief valve.
6. Stopwatch.
7. Plugs.
8. Pressure Gage: Calibrated to 0.1 psi.

2.3 DEFLECTION TESTING

A. Equipment:
1. "Go, no go" mandrels.
2. Pull/retrieval ropes.

2.4 HYDROSTATIC TESTING

A. Equipment:
1. Pump.
2. Make up water supply and tank.
3. Pressure Gage: Calibrated to 0.1 psi.
4. Flow meter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that manholes and piping are ready for testing.

C. Verify that trenches are backfilled.

D. Verify that pressure piping thrust restraint system is installed.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for preparation.

B. Lamping:
1. Lamp gravity piping after flushing and cleaning.
2. Perform lamping operation by shining light at one end of each pipe section between manholes.
3. Observe light at other end.
4. Pipe not installed with uniform line and grade will be rejected.
5. Remove and reinstall rejected pipe sections.
6. Reclean and lamp until pipe section is installed to uniform line and grade.

C. Plugs:
1. Plug outlets, wye branches, and laterals.
2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Testing of Gravity Sewer Piping:
1. Low Pressure Air Testing:
    a. Test each reach of gravity sewer piping between manholes in accordance with the Handbook of PVC Pipe Design and Construction, UNI-B-6, ASTM F1417 and the following.
    b. Provide pneumatic plugs designed to resist testing pressures at each end of pipe section to be tested.
    c. Introduce air pressure slowly to approximately 4 psig.
        1) Determine ground water elevation above spring line of piping.
        2) For every foot of ground water above spring line of piping, increase starting air test pressure by 0.43 psi.
        3) Do not increase pressure above 9 psig.
    d. Allow pressure to stabilize for at least five minutes.
    e. Adjust pressure to 3.5 psig or to increased test pressure as determined above when ground water is present.

f. Testing:
1) Determine test duration for reach of sewer with single pipe size from following table; do not make allowance for laterals.

MINIMUM TIME (Minutes:Seconds) REQUIRED FOR A 0.5 PSIG PRESSURE DROP

Pipe Dia. (Inches)	100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.
4	1:53	1:53	1:53	1:53	1:53	1:53	1:53
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	8:53	9:58	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	19:14	22:26	25:38
21	9:55	13:05	17:27	21:49	26:11	30:32	34:54
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

2) Record drop in pressure during testing period.
3) If air pressure drops more than 0.5 psi during testing period, piping has failed.
4) If 0.5 psi air pressure drop has not occurred during testing period, piping is acceptable; discontinue testing.
5) If piping fails, test reach of piping in incremental stages until leaks are isolated, repair leaks, and retest entire reach between manholes.

C. Deflection Testing of Plastic Sewer Piping:
1. Perform vertical ring deflection testing on PVC, HDPE, CIPP and acrylonitrile butadiene styrene sewer piping after backfilling has been in place for at least 30 days but not longer than 12 months.
2. Allowable maximum deflection for installed plastic sewer pipe is no greater than five percent of original vertical internal diameter.
3. Perform deflection testing using properly sized rigid ball or "go, no go" mandrel.
4. Furnish rigid ball or mandrel with diameter not less than 95 percent of base or average inside diameter of pipe, as determined by ASTM standard to which pipe is manufactured; measure pipe diameter in compliance with ASTM D2122.
5. Perform testing without mechanical pulling devices.
6. Locate, excavate, replace, and retest piping that exceeds allowable deflection.

D. Testing of Manholes:
1. Description:
a. Test prior to backfilling in order to more easily locate leaks.
b. Repair both outside and inside of joint to ensure permanent seal.
c. Test manholes with manhole frame set in place.
2. Vacuum test according to ASTM C1244 and following:
a. Patch lift holes with non-shrink grout.
b. Plug pipe openings; securely brace plugs and pipe.
c. Install test head on manhole in accordance with manufacturer’s recommendations.

d. Inflate compression band to create seal between vacuum base and structure.
e. Connect vacuum pump to outlet port with valve open, then draw vacuum to 10 in. Hg.
f. Close valve.
g. Testing:
1) Determine manhole testing duration using following table:

4 ft. diameter	60 seconds
5 ft. diameter	75 seconds
6 ft. diameter	90 seconds

2) Record vacuum drop during test period.
3) If vacuum drop is greater than 1 in. Hg during testing period, repair and retest manhole.
4) If vacuum drop of 1 in. Hg does not occur during test period, manhole is acceptable; discontinue testing.
5) If vacuum test fails to meet 1 in. Hg drop in specified time after repair, repair and retest manhole.

3. Manhole Infiltration Inspection
a. Inspect each manhole for infiltration of groundwater. If infiltration is observed, make necessary repairs to eliminate groundwater infiltration into manholes.

4. If unsatisfactory testing results are achieved, repair manhole and retest until result meets criteria.
5. Repair visible leaks regardless of quantity of leakage.

E. Hydrostatic Testing (Sewer Force Main)
1. Section 014000 - Quality Requirements: Requirements for inspecting and testing.
2. Pressure test ductile iron and PVC piping according to AWWA C600 and the following:
a. Test Pressure: Not less than 200 psig or 50 psi in excess of maximum static pressure, whichever is greater. In no case shall the test pressure exceed the design pressure limit for any pipe, thrust restraint, valve, fitting, or other appurtenance of the test section.
b. Conduct hydrostatic test for at least two hours.
c. Slowly fill section to be tested with water; expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
d. When hydrants are in the test section, the test shall be made against closed hydrant valves.
e. Observe joints, fittings, and valves under test. Remove and renew cracked pipes, joints, fittings, and valves showing visible leakage. Retest.
f. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate. Maintain pressure within plus or minus 5 psi of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
g. Compute maximum allowable leakage using following formula:

Q = LD x sqrt(P)/C
Q = testing allowance, gph
L = length of pipe tested, feet
D = nominal diameter of pipe, inches
P = average test pressure during hydrostatic test, psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

h. Leakage:
   1) If test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.
   2) Correct visible leaks regardless of quantity of leakage.

3. Perform pressure test on polyethylene piping according to ASTM F2164, Plastic Pipe Institute guidelines, manufacturer's instructions, and the following:
   a. Hydrostatic pressure leak tests of polyethylene pressure piping systems should be conducted using potable water.
   b. Restrain the pipeline test section against movement in the event of catastrophic failure. Joints may be exposed for examination provided that restraint is maintained.
   c. The testing equipment capacity and the pipeline test section should be such that the test section can be pressurized and examined for leaks within test duration time limits. Lower capacity testing and pressurizing equipment may require a shorter test section.
   d. Test equipment and the pipeline test section should be examined before pressure is applied to ensure that connections are tight, necessary restraints are in place and secure, and components that should be isolated or disconnected are isolated or disconnected. All low pressure filling lines and other items not subject to the test pressure should be disconnected or isolated.
   e. For pressure piping systems where test pressure limiting components or devices have been isolated, or removed, or are not present in the test section, the maximum allowable test pressure for a leak test duration of 8 hours or less is 1.5 times the system design pressure at the lowest elevation in the section under test. If lower pressure rated components cannot be removed or isolated from the test section, the maximum test pressure is the pressure rating of the lowest pressure rated component that cannot be isolated from the test section. Test pressure is temperature dependent and must be reduced at elevated temperatures.
   f. Procedure:
      1) The test section should be completely filled with the test liquid, taking care to bleed off any trapped air. Venting at high points may be required to purge air pockets while the test section is filling. Venting may be provided by bleed valves or equipment vents.
      2) The test procedure consists of initial expansion, and test phases.
         a) Initial Expansion Phase: Pressurize test section to test pressure and add make-up test liquid as required to maintain maximum test pressure for four (4) hours.
         b) Test Phase: Reduce test pressure by 10 psi and stop adding water. This is the target test pressure. If the pressure remains steady (within 5% of the target test pressure) for an hour, no leakage is indicated.
   g. If leaks are discovered, depressurize the test section before repairing leaks.
   h. Correctly made fusion joints do not leak. Leakage at a butt fusion joint may indicate imminent catastrophic rupture. Depressurize the test section immediately if butt fusion leakage is discovered. Leaks at fusion joints require the fusion joint to be cut out and redone.
   i. If the pressure leak test is not completed due to leakage, equipment failure, etc., the test section should be de-pressurized and repairs made.
   j. Allow the test section to remain depressurized for at least eight (8) hours before retesting.

END OF SECTION 330130.13

SECTION 330513.16 – PUBLIC MANHOLES AND STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Modular precast concrete manholes and structures with tongue-and-groove joints and transition to cover frame, covers, anchorage, and accessories.
   2. Doghouse manhole connections to existing sewer lines.
   3. Bedding and cover materials.

B. Related Requirements:
   1. Section 036000 - Grouting: Non-shrink grout.
   2. Section 310513 - Soils for Earthwork: Soils for backfill in trenches.
   3. Section 310516 - Aggregates for Earthwork: Aggregate for backfill in trenches.
   4. Section 312317 - Trenching: Excavating for manholes and structures.
   5. Section 330130.13 - Sewer and Manhole Testing: Testing requirements for manholes.
   6. Section 333113 - Public Sanitary Utility Sewerage Piping: Piping connections to manholes.
   7. Section 334113 - Public Storm Utility Drainage Piping: Piping connections to manholes and structures.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. See SECTION 012000 - PRICE AND PAYMENT PROCEDURES for method of measurement and payment of the work of this section if contract is performed under unit price payment method.

1.3 REFERENCE STANDARDS

A. American Association of State Highway Transportation Officials:
   1. AASHTO M306 - Standard Specification for Drainage, Sewer, Utility, and Related Castings.

B. ASTM International:
   1. ASTM A48 - Standard Specification for Gray Iron Castings.
   2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
   4. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
   5. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
   6. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
   7. ASTM C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals.

8. ASTM C990 – Standard Specification for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.

C. Federal Specifications
   1. SS-S210-A - Sealing Compound, Preformed Plastic, For Pipe Joints.

D. Pennsylvania Department of Transportation (PennDOT)
   1. Publication 408 Highway Construction Specifications.
   2. Publication 72M Roadway Construction Standards.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for manhole covers, component construction, features, configuration, dimensions, and accessories.

C. Shop Drawings:
   1. Indicate structure locations and elevations.
   2. Indicate sizes and elevations of piping and penetrations.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

G. Qualifications Statements:
   1. Submit qualifications for manufacturer and installer.
   2. Submit manufacturer's approval of installer.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum five years' documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer’s original packaging and inspect for damage.

C. Comply with precast concrete manufacturer's instructions and ASTM C913 for unloading, storing, and moving precast manholes and drainage structures.

D. Storage:
   1. Store precast concrete manholes and drainage structures to prevent damage to Owner's property or other public or private property.
   2. Repair property damaged from materials storage.

PART 2 - PRODUCTS

2.1 MANHOLES AND STRUCTURES

A. Manhole and Structure Sections:
   1. Description: Reinforced precast concrete conforming to ASTM C478 with gaskets conforming to ASTM C923.
   2. Joints for Precast Manholes and Structures:
      a. Conforming to ASTM C913.
      b. Maximum Leakage: 0.025 gal. per hour per foot of joint at 3 feet of head.
   3. Concrete Waterproofing System:
      a. Precast concrete manholes shall incorporate a crystalline type waterproofing additive that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete. The system shall cause the concrete to become sealed against the penetration of liquids from any direction and shall protect the concrete from deterioration due to harsh environmental conditions.
      b. Concrete waterproofing additive shall be provided in accordance with the manufacturer’s installation instructions.
      c. Concrete waterproofing additive shall be Xypex Admix C-1000 manufactured by Xypex Chemical Corporation, Penetron Admix SB manufactured by Penetron International, Ltd. , Masterlife 300D manufactured by BASF Corporation, or approved equal.
      d. Concrete waterproofing additive shall contain a red pigment in the admixture for a visual indication the precast element contains the admixture.
      e. The name of the concrete waterproofing additive used should be stenciled on all manhole sections to be used in the work. Stenciling shall be applied at the manufacturer’s factory. If manholes are not properly stenciled, they will be rejected for use in work. The stenciling should be included on shop drawings which are submitted to the Engineer for approval.

B. Shaft Construction and Eccentric Cone Top Section:
   1. Pipe Sections: Reinforced precast concrete.
   2. Joints:
      a. Lipped male/female.
   3. Sleeved to receive pipe sections.

C. Shape: Cylindrical.

D. Clear Inside Dimensions:
   1. As indicated on Drawings.

E. Design Depth:
   1. As indicated on Drawings.

F. Clear Cover Opening:
   1. As indicated on Drawings.

G. Pipe Entry:
   1. ASTM C923, ethylene propylene rubber (EPDM) flexible pipe to manhole connector with Series 300 stainless steel clamp and hardware for seal between connector and pipe.
   2. Furnish openings as required.

H. Structure Joint Gaskets:
   1. ASTM C990 and Federal Specification SS-S210-A
   2. Material: Preformed flexible / plastic joint sealant. ConSeal CS-102B Bituminous/ButylBend sealant for precast structures, Pro-Stik 1¼" High Performance Pre-Formed Butyl Joint Sealant, or approved equal.

I. Steps:
   1. Rungs: Formed copolymer polypropylene plastic with ½ inch Grade 60 steel reinforcement.
   2. Width:
      a. As indicated on Drawings.
   3. Spacing:
      a. As indicated on Drawings.

2.2 LINER SYSTEM (PUMP STATION WET WELL)

A. General
   1. Provide materials from a single manufacturer.
   2. Materials shall be compatible with the substrate and each other.

B. Manufacturers:
   1. CCI Spectrum, Inc. or approved equal.
   2. Substitutions: As specified in Section 016000 - Product Requirements.

C. Liner Material: SpectraShield Barrier Coat or equal. Two component 100% solid Silicone Modified Polyurea, spray applied.
   1. Minimum Tensile Strength ASTM D412: 2420 psi.
   2. Elongation ASTM D412: 350
   3. Tear Strength (PLI) ASTM D624: 550
   4. Hardness (Shore D) ASTM D2240: 45
   5. Flexibility (1/8" Mandrel) ASTM D522: Pass
   6. Flash Point (°F) Pensky-Martin: >200
   7. Taber Abrasion (mg loss) ASTM D4060: 25
   CS 17 Wheel, 1 kg per 1000 cycles
   8. Viscosity – B Side CPS: 300
   9. Viscosity – A Side CPS: 500
   10. Ratio – A/B PBV: 1:1

2.3 FRAMES AND COVERS

A. Manufacturers:
   1. Neenah Foundry Company, East Jordan Iron Works, or approved equal.
   2. Substitutions: As specified in Section 016000 - Product Requirements.

B. Description:
   1. Construction: ASTM A48, Class 35B Cast Iron construction.
   2. Lid:
      a. Machined flat bearing surfaces, non-rocking type.
      b. Removable.
      c. Two (2) concealed watertight pick holes.
   3. Cover Design: Solid top design
   4. Live Load Rating: Heavy duty designation.
   5. Self-sealing gasket in cover.
   6. Cover: Inscribed with words “STORM SEWER” or as indicated on Drawings.
   7. Nominal Size: As indicated on Drawings.
   8. Manufacturer and Model: Neenah catalog no. R-1753-A (R-1755-F2 Watertight) frame and cover as manufactured by Neenah Foundry Company; Model No. AZGS Cover, 1890Z1 Frame for standard assembly, and 1893G Cover, 1893Z1 Frame for a watertight assembly manufactured by East Jordan Iron Works OR approved equal.

2.4 RISER RINGS – GRADE ADJUSTMENT

A. Riser Rings:
   1. 4 Inches to 6 Inches Thick:
      a. Material: Precast concrete.
      b. Comply with ASTM C478.
   2. Less than 4 Inches Thick:
      a. Material: Precast Concrete or Rubber
   3. Riser rings shall be flat or tapered, thickness as required, with holes to allow manhole frame anchor bolts to pass through. Inside and outside diameter of rings shall be the same as the opening of the upper manhole section.
   4. Joint Sealant: Comply with ASTM C990.

B. Cast-In-Place Chemical Action Mortar:
   1. Material: One component, rapid setting, magnesium-phosphate based concrete patching and repair mortar.
   2. Manufacturer: Repair mortar shall be MasterEmaco T 545 and T 545HT as manufactured by BASF Corporation, Duracrete II as manufactured by Kaufmond Products, or approved equal.

2.5 MATERIALS

A. Cover and Bedding:
   1. Bedding: As specified in Section 310516 - Aggregates for Earthwork and as indicated on Drawings.
   2. Cover: As specified in Section 310516 - Aggregates for Earthwork and as indicated on Drawings.

3. Soil Backfill from Above Pipe to Finish Grade: As specified in Section 31 05 13 and as indicated on Drawings. No rocks over 6 inches in diameter, frozen earth, or foreign matter.

2.6 ACCESSORIES

A. Bituminous Manhole Coating:
   1. Manufacturers:
      a. Carboline Company; a subsidiary of RPM International – Bitumastic 300M or approved equal.
      b. Substitutions: As specified in Section 016000 - Product Requirements.

B. Concrete: Class C conforming to PennDOT Publication 408, Section 70 4. 1.

C. Grout: As specified in Section 036000 – Grouting.

D. Stainless Steel Bolts: ¾ inch diameter, comply with ASTM F593.

E. Manhole Encapsulation System:
   1. Wrap around, heat shrinkable sheet designed for protection of buried structures.
   2. Encapsulation system shall be the "WrapidSeal" as manufactured by Canusa-CPS or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that items provided by other Sections of Work are properly sized and located.

C. Verify that built-in items are in proper location and are ready for roughing into Work.

D. Verify correct size of manhole and structure excavation.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.

C. Coordinate placement of inlet and outlet pipe or duct sleeves required by other Sections.

D. Do not install manholes and structures where Site conditions induce loads exceeding structural capacity of manholes or structures.

E. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

3.3 INSTALLATION

A. Excavation and Backfill:
   1. Excavate for manholes and structures as specified in Section 312317 – Trenching and in indicated locations and depths.
   2. Provide clearance around sidewalls of manhole or structure for construction operations and granular backfill.
   3. If groundwater is encountered, prevent accumulation of water in excavations; place manhole or structure in dry trench.
   4. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation, as approved by Engineer.

B. Install manholes and structures supported at proper grade and alignment on crushed stone bedding as indicated on Drawings.

C. Backfill excavations for manholes and structures as specified in Section 312317 – Trenching.

D. Form and place manhole or structure cylinder plumb and level, to correct dimensions and elevations.

E. Provide concrete flow channel in base of manhole to achieve slope to exit piping. Trowel smooth and contour to form continuous drainage channel as indicated on Drawings.

F. Paint exterior with two coats of bituminous coating at rate of in accordance with manufacturer instructions to achieve minimum 20 mils dry film thickness.

G. Set frames and covers level to correct elevations without tipping.

H. Precast Concrete Manholes and Structures:
   1. Lift precast components at lifting points designated by manufacturer.
   2. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.
   3. Set precast structures, bearing firmly and fully on crushed stone bedding, compacted as specified in Section 312317 – Trenching or on other support system as indicated on Drawings.
   4. Assembly:
      a. Assemble multi-section manholes and structures by lowering each section into excavation.
      b. Install structure joint gasket between precast sections according to manufacturer's recommendations.
      c. Lower, set level, and firmly position base section before placing additional sections.
   5. Remove foreign materials from joint surfaces and verify sealing materials are placed properly.

6. Maintain alignment between sections by using guide devices affixed to lower section.
7. Verify that installed manholes and structures meet required alignment and grade.
8. Cut pipe flush with interior of structure.
9. Shape inverts through manhole and structures as indicated on Drawings.

I. Doghouse Manholes and Structures:
1. Stake out location and burial depth of existing sewer line in area of proposed manhole or structure.
2. Carefully excavate around existing sewer line to adequate depth for foundation slab installation.
3. Protect existing pipe from damage.
4. Cut out soft spots and replace with granular fill compacted to 95 percent maximum density.
5. Prepare crushed stone bedding or other support system, as indicated on Drawings, to receive foundation slab as specified for precast manholes and structures.
6. Install pre-cast concrete manhole or structure around existing pipe according to applicable Paragraphs in this Section.
7. Grout pipe entrances as specified in Section 036000 – Grouting.
8. Block upstream flow at existing manhole or structure with expandable plug.
9. Use hydraulic saw to cut existing pipe at manhole or structure entrance and exit and along pipe length at a point halfway up the outside diameter on each side of the pipe.
10. Bottom half of pipe to remain as manhole flow channel.
11. Saw cut to smooth finish with top half of pipe flush with interior of manhole or structure.
12. Provide concrete flow channel in base of manhole to achieve slope to exit piping. Trowel smooth and contour to form continuous drainage channel as indicated on Drawings.

J. Castings:
1. Set frames as indicated on Drawings.
    a. Install grade adjustment rings as required and in accordance with manufacturer's recommendations. Install preformed flexible / plastic structure joint gasket between frame and top section of manhole or precast concrete grade adjustment ring.
    b. Apply repair mortar for grade adjustment in accordance with manufacturer's instructions.
2. Bolt frame to top precast concrete section with four stainless steel bolts. Bolts shall extend through any grade adjustment riser rings. Top manhole section shall be drilled and fitted with multiple expanding stainless steel machine-bolt anchors for each bolt.
3. Set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow area to be graded away from cover.
4. Set frame and cover to match elevation and slope of finished surface within paved roadway areas.

K. Install manhole encapsulation system in accordance with manufacturer instructions. Cover joints between frame, grade adjustment rings (if any), and top precast concrete section. Overlap the joint between the frame and the top precast manhole section a minimum of 4 inches.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Test concrete manhole and structure sections as specified in Section 330130.13 - Sewer and Manhole Testing.

END OF SECTION 330513.16

SECTION 330516 - UTILITY STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes precast concrete utility structures:
   1. Drainage system inlets, outlet structure and endwalls.
   2. Sewerage and Drainage Manholes.
   3. Frames and covers.

B. Related Sections:
   1. Section 312316 - Excavation
   2. Section 312323 - Fill
   3. Section 331116 – Site Water Utility Distribution Piping.
   4. Section 333100 - Sanitary Utility Sewerage Piping.
   5. Section 334100 - Storm Utility Drainage Piping.

1.2 REFERENCES

A. American Association of State Highway Transportation Officials:
   1. AASHTO M306 - Drainage Structure Castings.
   2. AASHTO S99-HB - Standard Specifications for Highway Bridges.

B. American Concrete Institute:
   1. ACI 318 - Building Code Requirements for Structural Concrete.
   2. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
   3. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

C. ASTM International:
   1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
   2. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
   3. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   4. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   5. ASTM A185/A185M - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
   6. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
   7. ASTM A497/A497M - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   8. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   9. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   10. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.

11. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
12. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
13. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.
14. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
15. ASTM C33 - Standard Specification for Concrete Aggregates.
16. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
17. ASTM C138/C138M - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
18. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
19. ASTM C150 - Standard Specification for Portland Cement.
20. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
21. ASTM C192/C192M - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
22. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
23. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
24. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
25. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
26. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
27. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
28. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
29. ASTM C857 - Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
30. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Section Precast Concrete Water and Wastewater Structures.
31. ASTM C891 - Standard Practice for Installation of Underground Precast Concrete Utility Structures.
32. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
33. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
34. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
35. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
36. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
37. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test prior to Backfill.
38. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.

39. ASTM C1433 - Standard Specification for Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers.
40. ASTM C1504 - Standard Specification for Manufacture of Precast Reinforced Concrete Three-Sided Structures for Culverts, Storm Drains, and Sewers.

D. American Welding Society:
   1. AWS D1.1 - Structural Welding Code - Steel.
   2. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

E. National Precast Concrete Association:
   1. NPCA Quality Control Manual for Precast Plants.
   2. NPCA Plant Certification Program.

F. PennDOT
   1. PennDOT Publication 408 Specifications, Latest Edition
   2. PennDOT Roadway Construction Standards, Latest Edition.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
   1. Indicate structure locations, elevations, sections, equipment supports, piping, conduit, and sizes and elevations of penetrations.

   2. Indicate design, construction and installation details, typical reinforcement and additional reinforcement at openings and penetrations for each type, size and configuration of connections to existing manhole.

C. Product Data:
   1. Submit data for frames and covers, steps, component construction, features, configuration, dimensions and accessories.

D. Design Data:
   1. Submit concrete mix design for each different mix.
   2. Submit design calculations signed and sealed by professional engineer.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Obtain precast concrete utility structures from single source.

B. Perform structural design in accordance with ACI 318.

C. Perform Work in accordance with NPCA Quality Control Manual for Precast Plants.

D. Conform to the Construction Documents and Specifications.

E. Perform welding in accordance with the following:

1. Structural Steel: AWS D1.1.
2. Reinforcing Steel: AWS D1.4.

F. Perform Work in accordance with the PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition.

G. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

A. Manufacturer: Certified by NPCA Plant Certification Program prior to and during Work of this section.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Comply with precast concrete manufacturer's instructions for unloading, storing and moving precast structures. Lift structures from designated lifting points.

C. Do not deliver products until concrete has cured 5 days or attained minimum 75 percent of specified 28 day compressive strength.

D. Store precast concrete structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.

E. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE UTILITY STRUCTURES

A. Furnish materials in accordance with PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition.

2.2 CONCRETE MATERIALS, REINFORCEMENT AND ADMIXTURES

A. Furnish materials in accordance with PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition.

2.3 FRAMES AND COVERS

A. Furnish materials in accordance with PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition.

2.4 ACCESSORIES

A. Furnish materials in accordance with PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition.

2.5 CONCRETE MIX

A. Furnish materials in accordance with PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition.

2.6 FABRICATION

A. Fabricate precast concrete utility structures in accordance with ACI 318. and NPCA Quality Control Manual for Precast Plants.

B. Fabricate precast concrete utility structures to size, configuration, knock out panels, and openings as indicated on Construction Drawings and as per PennDOT Roadway Construction Standards, Latest Edition.

C. Construct forms to provide uniform precast concrete units with consistent dimensions.

D. Clean forms after each use.

E. Install reinforcing by tying or welding to form rigid assemblies. Position reinforcing to maintain minimum 1/2 inch cover. Secure reinforcement to prevent displacement when placing concrete.

F. Position and secure embedded items to prevent displacement when placing concrete.

G. Deposit concrete in forms. Consolidate concrete without segregating aggregate.

H. Provide initial curing by retaining moisture using one of the following methods:
   1. Cover with polyethylene sheets.
   2. Cover with burlap or other absorptive material and keep continually moist.
   3. Apply curing compound in accordance with manufacturer's instructions.

I. Provide final curing in accordance with manufacturer's standard.

J. Remove forms without damaging concrete.

2.7 CONCRETE FINISHES

A. Formed Surfaces Not Exposed to View: As formed.

B. Unformed Surfaces: Finish with vibrating screed or hand float.
   1. Permitted: Color variations, minor indentations, chips, and spalls.
   2. Not Permitted: Major imperfections, honeycomb, or other defects.

C. Exposed to View Finishes: In accordance with PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition.

2.8 SOURCE QUALITY CONTROL

A. Section 014000 - Quality Requirements: Testing, inspection and analysis requirements.

B. Perform the following tests: Test frequency to follow PennDOT Publication 408, Latest Edition with minimum one set of tests each week.
   1. Slump: ASTM C143/C143M.
   2. Compressive Strength: ASTM C31/C31M and ASTM C39/C39M.
   3. Air Content: ASTM C231 or ASTM C173/C173M.
   4. Unit Weight: ASTM C138/C138M.

C. Visually inspect completed precast structures for defects.
   1. Repair defects affecting exposed to view surfaces to achieve uniform appearance.
   2. Repair honeycomb by removing loose material and applying grout to produce smooth surface flush with adjacent surface.
   3. Repair major defects only when permitted by Architect/Engineer and Owner.

D. Make test results available to Architect/Engineer and Owner upon request.

E. Allow witnessing of factory inspections and test at manufacturer's test facility. Notify Architect/Engineer and Owner at least seven days before inspections and tests are scheduled.

2.9 FINISHING - STEEL

A. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify items provided by other sections of Work are properly sized and located.

C. Verify correct size and elevation of excavation.

D. Verify subgrade and bedding is properly prepared, compacted and ready to receive Work of this section.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect precast concrete structures immediately prior to placement in excavation to verify are internally clean and free from damage. Remove and replace damaged units.

3.3 INSTALLATION

A. Install underground precast utility structures in accordance with ASTM C891.

B. Lift precast concrete structures at lifting points designated by manufacturer.

C. When lowering structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

D. Install precast concrete base to elevation and alignment indicated on Drawings.

E. Install cast-in-place concrete foundation slab in accordance with Section 033000, trowel top surface level.

F. Install precast concrete utility structures to elevation and alignment indicated on Drawings.

G. Assemble multi-section structures by lowering each section into excavation.
   1. Clean joint surfaces.
   2. Install watertight joint seals in accordance with manufacturer's instructions using gasket joints, external sealing bands, preformed joint sealants, elastomeric joint sealants, or grout as per PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition

H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with grout.

I. Connect pipe to structure and seal watertight. Cut pipe flush with interior of structure.

J. Grout base or foundation slab to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel as indicated on Construction documents and PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition

K. Paint interior with 2 coats of bituminous interior coating at rate of 120 square feet per gallon for each coat.

L. Touch up damaged coatings.

M. Backfill excavations for structures in accordance with Section 312323.

N. Install Work in accordance with PennDOT Publication 408, Latest Edition and the PennDOT Roadway Construction Standards, Latest Edition.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements and Section 017700 - Closeout Procedures: Field inspecting, testing, adjusting, and balancing.

B. Perform the following tests and inspections for structures indicated to be watertight:
   1. Vacuum Test: ASTM C1244
   2. Hydrostatic Exfiltration Test: In accordance with manufacturer's instructions.

END OF SECTION 330516

SECTION 330526 – UTILITY IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Plastic ribbon tape for placement above direct-buried utility.
   2. Trace wire for placement above direct-buried and directional drilled utility.

B. Related Requirements:
   1. Section 312317 - Trenching: Backfilling considerations for installation of underground pipe markers.
   2. Section 331113 - Public Water Utility Distribution Piping: Piping, valves, and appurtenances requiring identification marking.
   3. Section 333113 - Public Sanitary Utility Sewerage Piping: Piping, valves, and appurtenances requiring identification marking.

1.2 REFERENCE STANDARDS

A. American Public Works Association (APWA)
   1. APWA Uniform Color Code for buried utilities.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer's catalog information for each product required.

C. Samples: Submit one, 10 feet of ribbon tape, and 10 feet of trace wire.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Qualifications Statement:
   1. Submit qualifications for manufacturer.

1.4 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of tagged valves.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.

PART 2 - PRODUCTS

2.1 RIBBON TAPE

A. Manufacturers:
   1. Kolbi Pipe Marker Co., Rhino Marking and Protection Systems, or approved equal.
   2. Substitutions: As specified in Section 016000 - Product Requirements.

B. Description:
   1. Material: Polyethylene.
   2. Detectable with solid aluminum foil core.
   3. Brightly colored in accordance with APWA Uniform Color Code, solid background with one-color imprint.
   4. Minimum Size: 6 inches wide by 5 mils thick for detectable tape with 0.35 mil aluminum core.
   5. Manufactured for direct burial service.
   6. Imprint: "CAUTION: BURIED SEWER LINE BELOW" in large letters.

2.2 TRACE WIRE

A. Manufacturers:
   1. Copperhead Industries, LLC, Pro-Line Safety Products, or approved equal.
   2. Substitutions: As specified in Section 016000 - Product Requirements.
   3. Description:
      a. Conductor: 12 AWG HS-CCS high strength copper clad steel.
      b. Covering:
         1) Insulation: 30 mil, high-density, high molecular weight polyethylene (HDPE).
      c. Rating: Direct burial use at 30 volts.
      d. Break Load: 380# minimum.
      e. Color: In accordance with APWA Uniform Color Code.
      f. Wire shall be suitable for trenchless utility installation applications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Ribbon Tape:
   1. Continuous buried 24 inches below finish grade, above piping.
   2. Coordinate with trench Work as specified in Section 312317 - Trenching.

B. Trace Wire:
   1. Continuous over top of pipe for sewer force main.
   2. Secure wire to pipe at five (5) foot intervals using duct tape.
      a. Do not lay wire loose in trench during backfilling operations to avoid damage when placing and moving coarse aggregate pipe bedding in trench.
   3. Coordinate with trench Work as specified in Section 312317 - Trenching and 330523 - Trenchless Utility Installation.

3.2 TESTING

A. Perform continuity test on all trace wire. If the trace wire is found to be not continuous, repair or replace failed segment of the wire.

END OF SECTION 330526

SECTION 331113 - PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for public potable water line and domestic fire water line.
2. Valves and fire hydrants.
3. Underground pipe markers.
4. Bedding and cover materials.

B. Related Requirements:
1. Section 310513 - Soils for Earthwork: Soils for backfill in trenches.
2. Section 310516 - Aggregates for Earthwork: Aggregate for backfill in trenches.
3. Section 312317 - Trenching: Execution requirements for trenching required by this Section.
4. Section 331213 - Water Service Connections.
5. Section 331216 - Water Utility Distribution Valves: Valves and valve boxes for fire hydrant and water main installation.
6. Section 331219 - Water Utility Distribution Fire Hydrants: Fire hydrants used in water main installations.
7. Section 331300 - Disinfecting of Water Utility Distribution: Disinfection of water piping.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. See Section 012000 - Price and Payment for method of measurement and payment for work of this section.

1.3 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

B. ASTM International:
1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
3. ASTM A242 - Standard Specification for High-Strength Low-Alloy Structural Steel.
4. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
5. ASTM A536 - Standard Specification for Ductile Iron Castings.
6. ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
7. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.

C. American Water Works Association:
   1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
   2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
   3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
   4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
   6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
   7. AWWA C153 - Ductile-Iron Compact Fittings.
   8. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
   9. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:
   1. MSS SP-60 - Connecting Flange Joints between Tapping Sleeves and Tapping Valves.

E. Pennsylvania Department of Transportation (PennDOT):
   1. Publication 408 Highway Construction Specifications.

F. Ductile Iron Pipe Research Association (DIPRA):
   1. Installation Guide for Ductile Iron Pipe.
   2. Polyethylene Encasement Installation Guide.

G. National Sanitation Foundation (NSF):
   1. NSF 60: Drinking Water Treatment Chemicals - Health Effects.
   2. NSF 61: Drinking Water System Components - Health Effects.
   3. NSF 372: Drinking Water System Components - Lead Content.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, valves, and accessories.

C. Shop Drawings: Indicate piping layout, including piping specialties.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Preconstruction Photographs:
   1. Submit photographs of Work areas and material storage areas as specified in Section 013300 - Submittal Procedures.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Record locations, size, and type of existing utilities encountered during installation.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver and store valves, hydrants, fittings, and other materials in shipping containers with manufacturer's labeling in place and inspect for damage.

C. Block individual and stockpiled pipe lengths to prevent moving.

D. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.

1.7 EXISTING CONDITIONS

A. Field Measurements:
   1. Verify field measurements prior to fabrication.
   2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 GENERAL

A. NSF Certification: All materials and chemicals used in the Work that may come in contact with or affect the quality of the water shall be certified for conformance with NSF 60, NSF 61, and NSF 372.

2.2 WATER PIPING

A. Ductile-Iron Pipe:
   1. Comply with AWWA C151.
   2. Bituminous Outside Coating: Comply with AWWA C151.
   3. Cement Mortar Lining:
      a. Comply with AWWA C104.
      b. Double thickness.
   4. Pipe Class:
      a. Comply with AWWA C151.
      b. Minimum Class 52 for typical installation with 4 feet of cover.
   5. Fittings:
      a. Material: Ductile iron, AWWA C110.
      b. Compact Fittings: Comply with AWWA C153.
      c. Minimum Rated Working Pressure: 350 psi (3" - 24" sizes); 250 psi (30" - 48" sizes).
      d. Coating and Lining:
         1) Bituminous Coating: Comply with AWWA C110.
         2) Cement Mortar Lining: Comply with AWWA C104, double thickness.

e. Fitting Joints: Mechanical joints comply with AWWA C111.

6. Pipe Joints:
   a. Mechanical and Push-on Joints: Comply with AWWA C111.
   b. Restrained Joints: Restrained joint gaskets meeting requirements of AWWA C111 with stainless steel locking elements. Gasket shall be compatible with push on joint ductile iron pipe provided.

2.3 MECHANICAL JOINT RESTRAINTS

A. Manufacturers:
   1. EBAA Iron, Inc., Ford Meter Box Company, or approved equal.
   2. Substitutions: As specified in Section 016000 - Product Requirements.

B. Description:
   1. Material: Ductile iron, comply with ASTM A536.
   2. Follower Gland: Replaces standard mechanical joint gland and compatible with standard mechanical joint conforming to AWWA C111 and C153.
   3. Actuating Screws: Ductile iron wedge actuating screw with the breakaway head design to ensure proper torque during installation.
   4. Minimum Pressure Rating: 350 psi (ductile iron pipe); minimum safety factor of 2:1.

2.4 BOLT THROUGH MECHANICAL JOINT RESTRAINT ADAPTER

A. Manufacturers:
   1. Infact Corporation Foster Adaptors, Star Pipe Products, or approved equal.
   2. Substitutions: As specified in Section 016000 - Product Requirements.

B. Description:
   1. Material: Ductile iron, comply with ASTM A536.
   2. Coating and Lining: Comply with AWWA C153, AWWA C110 and AWWA C104.
   3. Gaskets: AWWA C111, styrene butadiene rubber (SBR) for mechanical joints.
   4. Minimum Rated Working Pressure: 350 psi

2.5 MECHANICAL JOINT COUPLINGS (SOLID SLEEVES)

A. Ductile iron solid sleeve fittings with mechanical joints conforming to these specifications shall be used to connect plain ends of ductile iron and cast iron water lines.

2.6 COUPLINGS TO CONNECT DISSIMILAR PIPE

A. Manufacturers:
   1. Ford Meter Box Company, Romac Industries, Inc. or approved equal.
   2. Substitutions: As specified in Section 016000 - Product Requirements.

B. Description:
   1. Material: Ductile iron, comply with ASTM A536.
   2. Gaskets:
      a. Styrene Butadiene Rubber (SBR) compounded for water and sewer service in accordance with ASTM D2000.

b. Color coded for easy identification.

3. Bolts and Heavy Hex Nuts: High strength low alloy per ASTM A242 and AWWA C111.

2.7 VALVES AND FIRE HYDRANTS

A. Valves: As specified in Section 331216 - Water Utility Distribution Valves.

B. Fire Hydrants: As specified in Section 331219 - Water Utility Distribution Fire Hydrants.

2.8 UNDERGROUND PIPE MARKERS

A. Ribbon Tape: As specified in Section 330526 - Utility Identification.

2.9 VALVE BOXES

A. As specified in Section 331216 - Water Utility Distribution Valves.

2.10 CONCRETE ENCASEMENT AND CRADLES

A. Concrete:
1. Class A conforming to PennDOT Publication 408, Section 704.1.

2.11 MATERIALS

A. Bedding and Cover:
1. Bedding: as specified in Section 310516 - Aggregates for Earthwork and as indicated on Drawings.
2. Cover (Pipe Zone): as specified in Section 310516 - Aggregates for Earthwork and as indicated on Drawings.
a. In Borough streets – Provide full depth 2A coarse aggregate as specified in Section 310516 to top of aggregate base course
b. In lawn or vegetated areas (not to receive paving surface restoration) - Provide suitable excavated material to subgrade as specified in Section 310513 - Soils for Earthwork and as indicated on Drawings.

2.12 ACCESSORIES

A. Concrete for Thrust Restraints: Class A conforming to PennDOT Publication 408, Section 704.1.

B. Steel Rods, Bolt, Lugs, and Brackets:
1. Comply with ASTM A193 (stainless steel).
2. Type 304 or 316 stainless steel.

C. Protective Coating: Bituminous.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that existing utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Preconstruction Site Photos:
   1. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
   2. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
   3. Include Project description, date taken, and sequential number on back of each photograph.

C. Pipe Cutting:
   1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
   2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
   3. Grind edges smooth with beveled end for push-on connections.

D. Remove scale and dirt on inside and outside before assembly.

E. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Bedding:
   1. Excavation:
      a. Excavate pipe trench to the width shown on the Contract Drawings and as specified in Section 312317 - Trenching for Work of this Section.
      b. Hand trim excavation for accurate placement of pipe to elevations as indicated on Drawings.
   2. Dewater excavations to maintain dry conditions and to preserve final grades at bottom of excavation.
   3. Provide sheeting and shoring as specified in Section 312317 - Trenching.
   4. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth, and compact to 95 percent of maximum density.

B. Piping:
   1. Install ductile iron pipe according to AWWA C600 and applicable DIPRA and manufacturer's guidelines.
   2. Handle and assemble pipe according to manufacturer instructions and as indicated on Drawings.

3. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.
4. Center main in the trench as shown on prepared coarse aggregate bedding, uniformly supported its entire length. Excavate bell holes in bedding. Ensure no part of pipe touches trench wall or trench bottom or rock. Maintain clearance to trench wall and hand trim if needed. Fill pipe zone completely with coarse aggregate bedding and consolidate or compact using hand tools and non-mechanical methods until pipe zone cover is 12 inches as shown on Drawings. Install marker tape at the top of the pipe zone gravel centered on the pipe as shown.
5. Separation from Sewer and Drain Lines:
    a. Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer or drain lines. The distance shall be measured edge-to-edge.
    b. In cases where it is not practical to maintain a 10-foot separation, water mains may be installed closer to a sewer or drain. The water main shall be installed in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.
    c. Whenever water mains must cross building drains, storm drains, or sanitary sewers, the water main shall be laid at such an elevation that the bottom of the water main is 18 inches above the top of the drain or sewer. This vertical separation shall be maintained for the portion of the water main located within 10 feet horizontally of any sewer or drain it crosses. The 10 feet is to be measured as a perpendicular distance from the drain or sewer line to the water line.
    d. When it is impossible to obtain the proper horizontal and vertical separation, both the water main and sewer line shall be constructed of ductile iron or PVC pipe with mechanical joints or polyethylene pipe with fused joints. These shall be pressure-tested to assure water tightness before backfilling. Where water mains must cross under a sewer, additional protection shall be provided by:
        1) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water line;
        2) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line;
        3) The length of the water line being centered at the point of the crossing so that the joints shall be equidistant and as far as possible from the sewer.
6. Install ductile-iron piping and fittings according to AWWA C600.
    a. Wrap all mechanical joint fittings and mechanical pipe joints with polyethylene encasement to a minimum distance of one (1) foot (12 inches) on either side of the fitting or joint according to AWWA C105.
7. Flanged Joints: Not to be used in underground installations except within structures.
8. Route pipe in straight line; re-lay pipe that is out of alignment or grade.
9. High Points:
    a. Install pipe with no high points except where specifically shown on the Contract Drawings. Provide automatic combination air vent (release) valve at high point on Vineyard Street as shown.
    b. If unforeseen field conditions arise that necessitate additional high points, install manual air release valves as directed by Engineer.

10. Bearing:
    a. Install pipe to have bearing along entire length of pipe.
    b. Excavate bell holes to permit proper joint installation.
    c. Do not lay pipe in wet or frozen trench.
11. Prevent foreign material from entering pipe during placement.
12. Install pipe to allow for expansion and contraction without stressing pipe or joints.
13. Close pipe openings with watertight plugs during Work stoppages.
14. Install access fittings to permit disinfection of water system performed under Section 331300 - Disinfecting of Water Utility Distribution.
15. Cover:
    a. Establish elevations of buried piping with not less than four (4) feet of cover.
    b. Measure depth of cover from final surface grade to top of pipe barrel.
16. Pipe Markers:
    a. Install plastic ribbon tape continuous buried at the top of the pipe zone gravel, above piping as shown.
    b. Coordinate with trench Work as specified in Section 312317 - Trenching.

C. Valves and Hydrants:
1. Install valves as specified in Section 331216 - Water Utility Distribution Valves. Use bolt through mechanical joint restraint units to anchor /harness valves to mechanical joint tees, wyes and crosses.
2. Install hydrants as specified in Section 331219 - Water Utility Distribution Fire Hydrants.

D. Polyethylene Encasement at Fittings Only:
1. Encase fittings in polyethylene to prevent contact with surrounding concrete for thrust blocks.
2. Comply with AWWA C105.

E. Thrust Restraints:
1. Provide mechanical joint restraints for all valves, tees, bends, caps, plugs, sleeves, and fittings.
2. Provide concrete thrust blocks as shown. Protect mechanical joint hardware including bolts, nuts, glands and mechanical restraint hardware using polyethylene sheeting or wrap from concrete material.
3. Provide joint restraint gaskets for push on joint pipe as shown on drawings.
4. Install mechanical joint restraints in accordance with the manufacturer's instructions.
5. Construct concrete thrust blocks against undisturbed earth as shown on Standard Details.
6. Locate thrust blocks at each elbow or change of pipe direction to resist resultant force and to ensure that pipe and fitting joints will be accessible for repair.
7. Install tie rods, clamps, setscrew retainer glands, or restrained joints as required.
8. Protect metal-restrained joint components against corrosion by applying a bituminous coating.
9. Install thrust blocks, tie rods, and joint restraint at dead ends of water main.
10. Cap all existing water lines shown to be abandoned under this Contract.

F. Service Connections:
1. As specified in Section 331213 - Water Service Connections.

G. Backfilling: Backfill around sides and to top of pipe as specified in Section 312317 - Trenching.

H. Disinfection of Potable Water Piping System:
   1. As specified in Section 331300 - Disinfecting of Water Utility Distribution.

3.4 TOLERANCES

A. Section 014000 - Quality Requirements: Requirements for tolerances.

B. Install pipe to indicated elevation within tolerance of 1 inch (0.083 feet).

3.5 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Pressure test ductile iron piping according to AWWA C600 and the following:
   1. Test Pressure: Not less than 200 psig. In no case shall the test pressure exceed the design pressure limit for any pipe, thrust restraint, valve, fitting, or other appurtenance of the test section.
   2. Conduct hydrostatic test for at least two hours.
   3. Slowly fill section to be tested with water; expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
   4. When hydrants are in the test section, the test shall be made against closed hydrant valves.
   5. Observe joints, fittings, and valves under test. Remove and renew cracked pipes, joints, fittings, and valves showing visible leakage. Retest.
   6. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate. Maintain pressure within plus or minus 5 psi of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
   7. Compute maximum allowable leakage using following formula:

Q = LD x sqrt(P)/C
Q = testing allowance, gallons per hour
L = length of pipe tested, feet
D = nominal diameter of pipe, inches
P = average test pressure during hydrostatic test, psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.
Example only: For 1000 ft of 8 inch pipe, test pressure 200 psig, allowable leakage per hour = 0.76 gallons per hour. For 2 hour test, allowable leakage is therefore 1.53 gallons or less.

   8. Leakage:
      a. If test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.
      b. Correct visible leaks regardless of quantity of leakage.

END OF SECTION 331113

SECTION 331213 - WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe and fittings for water service lines.
2. Corporation stop assemblies.
3. Curb stop assemblies.
4. Underground pipe markers.
5. Bedding and cover materials.

B. Related Requirements:
1. Section 310513 - Soils for Earthwork: Backfill soil type.
2. Section 310516 - Aggregates for Earthwork: Bedding and cover material type.
3. Section 312317 - Trenching: Excavation of pipe trench.
4. Section 331113 - Public Water Utility Distribution Piping: Pipe, fittings, accessories, and installation requirements.
5. Section 331300 - Disinfecting of Water Utility Distribution: Flushing and disinfecting of water system.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. See SECTION 012000 PRICE AND PAYMENT PROCEDURES for method of measurement and payment of the work of this section if contract is performed under unit price payment method.

1.3 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

B. American Society of Sanitary Engineering:
1. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent.
2. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers.

C. ASTM International:
1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A48M - Standard Specification for Gray Iron Castings.
3. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
4. ASTM B88 - Standard Specification for Seamless Copper Water Tube.

5. ASTM B88M - Standard Specification for Seamless Copper Water Tube.
6. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
7. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
8. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
9. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
10. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
11. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
12. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
13. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

D. American Welding Society:
1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
2. AWS A5.8M - Specification for Filler Metals for Brazing and Braze Welding.

E. American Water Works Association:
1. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
2. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
3. AWWA C701 - Cold-Water Meters - Turbine Type, for Customer Service.
4. AWWA C702 - Cold-Water Meters - Compound Type.
5. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
6. AWWA C800 - Underground Service Line Valves and Fittings.
7. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
8. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

F. Pennsylvania Department of Transportation (PennDOT):
1. Publication 408 Highway Construction Specifications.

G. National Sanitation Foundation (NSF):
1. NSF 60: Drinking Water Treatment Chemicals - Health Effects.
2. NSF 61: Drinking Water System Components - Health Effects.
3. NSF 372: Drinking Water System Components - Lead Content.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, corporation stop assemblies, curb stop assemblies, service saddles, and accessories.

C. Shop Drawings: see Section 013300.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

G. Qualifications Statement:
1. Submit qualifications for manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, curb stops, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years' documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Store products and materials off ground and under protective coverings and away from walls.

D. Exercise care in handling precast concrete products to avoid chipping, cracking, and breakage.

PART 2 PRODUCTS

2.1 GENERAL

A. NSF Certification: All materials and chemicals used in the Work that may come in contact with or affect the quality of the water shall be certified for conformance with NSF 60, NSF 61, and NSF 372.

2.2 WATER PIPING AND FITTINGS

A. Polyethylene Pipe:
1. Materials: PE 4710 high density polyethylene meeting ASTM D3350, cell classification 445574C.
2. Water Service Pipe and Tubing (2" and smaller): AWWA C901 SDR 9, 250 psi; Comply with ASTM D2737 for outside diameter control Copper Tube Size (CTS); color coded "BLUE" for potable water service.
3. Fittings: "No Lead" Brass alloy conforming to AWWA Standard C800 (ASTM B584, UNS NO C89833); Copper Tube Size (CTS).
4. Joints: Compression (Quick Joint).
5. Insert Stiffeners: Solid tubular 304 stainless steel.

2.3 CORPORATION STOP ASSEMBLIES

A. Manufacturers:
1. Ford Meter Box Company, or approved equal.
2. Mueller Company, or approved equal.

B. Corporation Stops:
1. "No Lead" Brass conforming to AWWA Standard C800 (ASTM B584, UNS NO C89833).
2. Body: Brass alloy.
3. Inlet End: Threaded taper inlet for tapping according to AWWA C800.
4. Outlet End: Compression (Quick Joint) with Tracer Wire Terminal; Suitable for service pipe specified.
5. Provide type FB1000 Ballcorp as manufactured by Ford Meter Box Company, or approved equal.

C. Service Saddles:
1. PVC Pipe:
   a. Type: Double band; sized to fit C900 PVC pipe.
   b. Body: Brass conforming to AWWA C800.
   c. Band and Bolts: Stainless Steel.
   d. Gasket: EPDM rubber.
   e. Provide Style 202BS as manufactured by Ford Meter Box Company, or approved equal.
2. Ductile Iron Pipe:
   a. Type: Double band; sized to Ductile Iron Pipe.
   b. Body: Brass conforming to AWWA C800.
   c. Band and Bolts: Stainless steel.
   d. Gasket: EPDM rubber.
   e. Provide Style 202BSD as manufactured by Ford Meter Box Company, or approved equal.

2.4 CURB STOP ASSEMBLIES

A. Manufacturers:
1. Ford Meter Box Company, or approved equal.

B. Curb Stops:
1. Body: Brass alloy.
2. "No Lead" Brass conforming to AWWA Standard C800 (ASTM B584, UNS NO C89833).
3. Valve Type: Ball.
4. Joints: Compression (Quick Joint) with Tracer Wire Terminals; Suitable for service pipe specified.
5. Provide Ball Valve Curb Stops by Ford Meter Box Company, or approved equal.

C. Curb Boxes and Covers:
1. Body: Cast iron.
2. Base: Arch pattern.
3. Upper Section: 2 ½" diameter.
4. Lid:
   a. Inscription: "WATER".
   b. Screw (Buffalo) style design
   c. Bituminous / Concrete Areas: Two piece with brass pentagon bolt plug.
   d. Provide lids with tracer wire terminal.
5. Length / Depth: As required to accommodate water service line depth.
6. Provide curb box by A.Y. McDonald Mfg. Co., or approved equal.

2.5 UNDERGROUND PIPE MARKERS

A. As Specified in Section 330526 - Utility Identification.

2.6 MATERIALS

A. Bedding and Cover:

B. Bedding: As specified in Section 310516 - Aggregates for Earthwork.

C. Cover: As specified in Section 310516 - Aggregates for Earthwork.

D. Soil Backfill from Above Pipe to Finish Grade:
1. As specified in Section 310513 - Soils for Earthwork.

2.7 ACCESSORIES

A. Concrete for Thrust Restraints: Class A conforming to PennDOT Publication 408, Section 704.1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that building service connections and municipal utility water main sizes, locations, and inverts are as indicated on Drawings.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

C. Remove scale and dirt from inside and outside of piping before assembly.

D. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Corporation Stop Assemblies:
1. Make connection for each different kind of water main using suitable materials, equipment, and methods as approved by Engineer.
2. Provide service clamps for mains constructed of materials other than cast iron or ductile iron.
3. Location:
    a. Screw corporation stops directly into tapped and threaded iron main at 10 and 2 o'clock positions along main's circumference.
    b. Locate and stagger corporation stops at least 12 inches apart longitudinally.
4. Plastic Pipe Mains:
    a. Provide full support for service clamp for full circumference of pipe, with minimum 2 inches width of bearing area.
    b. Exercise care against crushing or causing other damage to mains at time of tapping or installation of service clamp or corporation stop.
5. Use proper seals or other devices such that no leaks are present in mains at points of tapping.
6. Do not backfill and cover service connections until installation is approved by Engineer.

B. Bedding:
1. Excavate pipe trench as specified in Section 312317 - Trenching.
2. Placement:
    a. Place bedding material at trench bottom.
    b. Level fill materials in one continuous layer not exceeding 6 inches compacted depth.
    c. Compact to 95 percent maximum density.
3. Backfill around sides and to top of pipe with cover fill, tamp in place, and compact to 95 percent maximum density.
4. Maintain optimum moisture content of fill material to attain required compaction density.

C. Pipe and Fittings:
1. Maintain separation of water main from sewer piping as specified in Section 331113 - Public Water Utility Distribution Piping.

2. Group piping with other Site piping Work whenever practical.
3. Route pipe in straight line.
4. Install pipe to allow for expansion and contraction without stressing pipe or joints.
5. Install access fittings to permit disinfection of water system performed under Section 331300 - Disinfecting of Water Utility Distribution.
6. Form and place concrete for thrust restraints at each elbow or change of direction of pipe.
7. Establish elevations of buried piping with not less than 4 feet of cover, or as outlined in the contract drawings.
8. Install plastic ribbon tape continuous, buried 12 to 24 inches below finish grade and above pipe line.
9. Install trace wire continuous on all non-metallic pipe attached to the top of the pipe every five (5) feet with duct tape.
    a. Extend trace wire to surface at all valve boxes. Loop 3 feet of wire inside box to provide slack for removal and use.
    b. Test wire for continuity upon completion of construction. Immediately repair any breaks in the wire.
10. Backfill trench as specified in Section 312317 - Trenching.

D. Curb Stop Assemblies:
1. Set curb stops on solid bearing.
2. Boxes:
    a. Center and plumb curb boxes over curb stops.
    b. Set box cover flush with finished grade.

E. Disinfection of Water Piping System:
1. Flush and disinfect system as specified in Section 331300 - Disinfecting of Water Utility Distribution.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Pressure test system according to AWWA C600 and following:
1. Test Pressure: Not less than 200 psig or 50 psi in excess of maximum static pressure, whichever is greater. In no case shall the test pressure exceed the design pressure limit for any pipe, thrust restraint, valve, fitting, or other appurtenance of the test section.
2. Conduct hydrostatic test for at least two hours.
3. Slowly fill with water section to be tested, and expel air from piping at high points.
4. Install corporation cocks at high points.
5. Close air vents and corporation cocks after air is expelled.
6. Raise pressure to specified test pressure.
7. Observe joints, fittings, and valves under test.
8. Remove and replace cracked pipes, joints, fittings, and valves that show visible leakage and retest.
9. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate, maintaining test pressure within plus or minus 5.0 psi.

10. Leakage is defined as quantity of water supplied to piping as necessary to maintain test pressure during testing period.

11. Compute maximum allowable leakage using following formula:

L = [**SD x sqrt(P)**]/C
L = testing allowance, gph
S = length of pipe tested, feet
D = nominal diameter of pipe, inches
P = average test pressure during hydrostatic test, psig
C = 148,000
If pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

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

C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

END OF SECTION 331213

SECTION 331216 - WATER UTILITY DISTRIBUTION VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Gate Valves.
   2. Valve boxes.
   3. Air release valves
   4. Bolt-Thru Mechanical Joint Restraints (Foster Adaptors)

B. Related Requirements:
   1. Section 331113 - Public Water Utility Distribution Piping: Piping trenching, backfilling, and compaction requirements.
   2. Section 331213 - Water Service Connections: Pipe materials, fittings, and service connection appurtenances and installation requirements.
   3. Section 331219 - Water Utility Distribution Fire Hydrants: Execution requirements for fire hydrants.
   4. Section 331300 - Disinfecting of Water Utility Distribution: Flushing and disinfection requirements.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. See Section 012000 - Price and Payment for method of measurement and payment for work of this section.

1.3 REFERENCE STANDARDS

A. ASTM International:
   1. ASTM D429 - Standard Test Methods for Rubber Property - Adhesion to Rigid Substrates.

B. American Water Works Association:
   1. AWWA C515 - Reduced Wall, Resilient-Seated Gate Valves for Water Supply Service.
   2. AWWA C550 - Protecting Interior Coatings for Valves and Hydrants.
   3. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.

C. NSF International:
   1. NSF 60 - Drinking Water Treatment Chemicals - Health Effects.
   2. NSF 61 - Drinking Water System Components - Health Effects.
   3. NSF 372 - Drinking Water System Components - Lead Content.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer's latest published literature. Include illustrations, installation and maintenance instructions, and parts lists.

C. Shop Drawings: Submit description of proposed installation.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of valves.

C. Operation and Maintenance Data: Submit information for valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Prepare valves and accessories for shipment according to applicable AWWA standards.

C. Seal valve and ends to prevent entry of foreign matter.

D. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

E. Storage:
1. Store materials in areas protected from weather, moisture, or other potential damage.
2. Do not store materials directly on ground.

F. Handle products carefully to prevent damage to interior or exterior surfaces.

PART 2 - PRODUCTS

2.1 GENERAL

A. NSF Certification: All materials and chemicals used in the Work that may come in contact with or affect the quality of the water shall be certified for conformance with NSF / ANSI 60, NSF / ANSI 61, and NSF 372.

2.2 RESILIENT WEDGE GATE VALVES

A. Manufacturers:
1. American Flow Control.

2. Substitutions: Mueller Company.

B. Description:
1. Comply with AWWA C 515.
2. Materials:
   a. Body: Ductile iron
   b. Bonnet and O-ring plate: Ductile Iron.
3. Seats: Resilient.
   a. Rubber shall be bonded to wedge in accordance with ASTM D429.
4. Stem:
   a. Type: Non-rising (NRS).
   b. Material: Bronze.
5. Operation:
   a. 2-inch square operating nut.
   b. Open counterclockwise (left) unless otherwise indicated. Operating nut shall include the word "OPEN" and arrow indicating direction.
6. End Connections: Mechanical joint.
7. Coatings:
   a. Comply with AWWA C550.
   b. Interior and exterior of valve body and bonnet.
8. Pressure Rating:
   a. 12-inch Diameter and Smaller: 250 psig.

C. Valves shall be American Flow Control's Series 2500 Resilient Wedge Gate Valve or Mueller 2300 Series Resilient Wedge Gate Valve.

2.3 VALVE BOXES

A. Manufacturers:
1. Tyler Pipe / Union Foundry Company.
2. Substitutions: Not permitted.

B. Description:
1. 12-inch Diameter Valves and Smaller:
   a. Material: Cast iron.
   b. Type: Two-piece, screw.
   c. Shaft: 5-1/4 inch.
   d. Length: As required to accommodate water line depth.
2. Lid Inscription: WATER.

C. Valve boxes shall be the 6850 Series as manufactured by Tyler Pipe / Union Foundry Company.

2.4 ACCESSORIES

A. Concrete for Thrust Restraints: Concrete type as specified in Section 331113 - Public Water Utility Distribution Piping.

2.5 BOLT-THRU MECHANICAL JOINT RESTRAINT (Sizes up to 12 Inch)

A. Mechanical joint valves and tee fittings shall be connected using a bolt-through positive restraint mechanism of ductile iron conforming to ASTM A 536 furnished with gaskets of styrene butadiene rubber per AWWA C111 and weathering steel (Corten) bolts per AWWA C111 and ASTM A242. Nuts shall be SAE Grade 2 steel with black oxide coating. The device shall be used with standard mechanical joint fittings AWWA C110 or C153 and valves. Device shall be Infact Corporation FOSTER ADAPTER or Flex Adaptor or equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Determine exact location and size of valves from Drawings.

C. Verify that invert elevations prior to excavation and installation of valves are as indicated on Drawings.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Conduct operations to not interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures, utilities, and landscape in immediate or adjacent areas.

C. Identify required lines, levels, contours, and datum locations.

D. Locate, identify, and protect from damage utilities to remain.

E. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.
   1. Notify Engineer and Owner not less than five (5) days in advance of proposed utility interruption.
   2. Do not proceed without written permission from Engineer and Owner.

3.3 INSTALLATION

A. Perform trench excavation, backfilling, and compaction as specified in Section 331113 - Public Water Utility Distribution Piping.

B. Install valves in conjunction with pipe laying.

C. Use bolt-thru mechanical joint restraint device to anchor each mj valve to its mj tee fitting. Observe precautions when using compact ductile iron mj fittings with the restraint device.

D. Set valves plumb.

E. Provide buried valves with valve boxes installed flush with finished grade.

F. Disinfection of Water Piping System:
   1. Flush and disinfect system as specified in Section 331300 - Disinfecting of Water Utility Distribution.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Pressure test water distribution system as specified in Section 331113 - Public Water Utility Distribution Piping.

END OF SECTION 331216

SECTION 331300 - DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Disinfection of potable water distribution and transmission system.
   2. Testing and reporting of results.

B. Related Requirements:
   1. Section 331113 - Public Water Utility Distribution Piping: Product and execution requirements for installation and testing of public water distribution piping.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. Disinfection of Water Utility Distribution:
   1. Basis of Measurement: Unless specifically listed as a pay item in SECTION 012000 - PRICE AND PAYMENT, Disinfection of Water Utility Distribution will not be measured separately for payment.
   2. Basis of Payment: Disinfection of Water Utility Distribution will not be paid for as a separate item but is considered incidental to and will be paid for as part of the indicated price and payment item for the work or structures disinfection is required for.

1.3 REFERENCE STANDARDS

A. American Water Works Association:
   1. AWWA B300 - Hypochlorites.
   2. AWWA C651 - Disinfecting Water Mains.
   3. AWWA C655 - Field Dechlorination

B. National Sanitation Foundation (NSF):
   1. NSF 60: Drinking Water Treatment Chemicals - Health Effects.
   2. NSF 61: Drinking Water System Components - Health Effects.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit procedures, proposed chemicals, and treatment levels.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Certify that water conforms or fails to conform to bacterial standards of authority having jurisdiction.

E. Certify that water conforms to quality standards of authority having jurisdiction.

F. Test and Evaluation Reports: Indicate testing results comparative to specified requirements.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Qualifications Statements:
   1. Submit qualifications for water treatment firm and testing firm.

1.5 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Disinfection Report:
   1. Type and form of disinfectant used.
   2. Date and time of disinfectant injection start and time of completion.
   3. Test locations.
   4. Name of person collecting samples.
   5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
   6. Date and time of flushing start and completion.
   7. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological Report:
   1. Date issued, project name, and testing laboratory name, address, and telephone number.
   2. Time and date of water sample collection.
   3. Name of person collecting samples.
   4. Test locations.
   5. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
   6. Coliform bacteria test results for each outlet tested.
   7. Submit bacteriologist's signature and authority associated with testing.

1.6 QUALITY ASSURANCE

A. Perform Work according to AWWA C651.

1.7 QUALIFICATIONS

A. Testing Firm: Company specializing in testing potable water systems, certified by Commonwealth of Pennsylvania.

PART 2 - PRODUCTS

2.1 GENERAL

A. NSF Certification: All materials and chemicals used in the Work that may come in contact with or affect the quality of the water shall be certified for conformance with NSF 60 and NSF 61.

2.2 DISINFECTION CHEMICALS

A. Chemicals:
   1. Sodium or Calcium Hypochlorite: Comply with AWWA B300.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that piping system has been cleaned, inspected, and pressure tested.

C. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.

3.2 INSTALLATION

A. Provide and attach required equipment to perform Work of this Section.
   1. Provide temporary combination blowoff and sampling taps during installation of the water main to facilitate disinfection and sampling.
   2. Remove temporary connections after samples have been collected and testing shows that the water is free from coliform bacteria.

B. Perform installation of water distribution system and conduct pressure testing as specified in Section 331113 - Public Water Utility Distribution Piping.
   1. Preventive and corrective measures during construction:
      a. Keep new pipe clean and dry. Protect interior of pipe, valves, fittings, etc. from contamination.
      b. Plug ends of pipe with watertight plugs when construction has stopped or for other reasons.
      c. Store and stage pipe and materials to minimize the entrance of foreign material.
      d. Coordinate the delivery of materials with construction operations to avoid excessive delays in installation of materials stored on site.
      e. Do not install pipe in trench with standing water. Keep watertight plugs in place until trench is free of standing water and mud that may enter the pipe.
      f. Do not use contaminated material or material capable of supporting the growth of microorganisms to seal joints. Handle sealing materials and gaskets in a manner that avoids contamination.
      g. Lubrication used to assemble pipe joints shall be approved for use in potable water and shall not contribute odors. Lubricant shall be delivered and stored in closed containers and shall be kept clean. Apply lubricant with dedicated, clean applicator brushes.
      h. If dirt has entered the pipe that cannot be removed by flushing, the interior of the pipe shall be cleaned using mechanical means such as a hydraulically propelled foam pig in conjunction with the application of a 1% hypochlorite disinfecting solution.
      i. If the pipe is flooded during construction, it shall be cleared of floodwater and flushed with potable water until it is clean. The section(s) exposed to floodwater shall be filled

with chlorinated water such that at the end of a 24 hour holding period the chlorine residual will not be less than 25 mg/L. The chlorinated water shall then be drained and flushed from the main. After construction is completed, the main shall be disinfected in accordance with AWWA C651 and this section.

C. Inject or introduce treatment disinfection chemical into piping system.

D. Maintain disinfectant in system for 24 hours.
   1. Heavily chlorinated water should not remain in prolonged contact with pipe in order to prevent damage or corrosion to the pipe and fittings.

E. Flush, circulate, and clean until required cleanliness is achieved using potable water.

F. Replace permanent system devices that were removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Disinfection, Flushing, and Sampling:
   1. Disinfect pipeline installation according to AWWA C651 and the following:
      a. Chlorinate the pipe using the tablet, continuous feed, or slug method.
         1) The tablet method gives an average chlorine dose of 25 mg/L.
         2) The continuous feed method gives a 24-hour chlorine residual of not less than 10 mg/L.
         3) The slug method gives a 3-hour exposure of not less than 50 mg/L free chlorine.
      b. Flush the source of potable water used for disinfection prior to use to ensure that contaminants or debris are not introduced into the new pipe.
      c. Provide adequate drainage and erosion controls for flushing operations.
      d. Keep valves that isolate the new pipe from the existing system closed during the disinfection process to prevent the unintentional release of elevated chlorine residual water into the system.
   2. Use of liquid chlorine is not permitted.
   3. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
   4. Disposal:
      a. Legally dispose of chlorinated water.
      b. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water to neutralize chlorine residual remaining in water in accordance with AWWA C655.
   5. Verification - Bacteriological Tests:
      a. After final flushing and before pipeline is connected to existing system or placed in service, employ an approved independent testing laboratory to sample, test, and certify that water quality meets quality standards of authority having jurisdiction.
      b. Collect two (2) consecutive sets of acceptable samples from the new main, taken at least 24 hours apart.

c. Collect samples from every 1,200 feet of the new water main plus at the end of the line and from each branch connection.
    1) If trench water or excessive quantities of dirt or debris have entered the new main, bacteriological samples shall be taken at intervals of approximately 200 feet. Samples shall be taken of water that has stood in the new main for at least 16 hours after final flushing has been completed.
    2) Collect samples in sterile bottles treated with sodium thiosulfate as required by Standard Methods for the Examination of Water and Wastewater.
    3) Do not collect samples from hoses attached to the water line.
    4) Well-flushed hydrants may be used with the understanding that they do not represent optimal sampling conditions.
d. Test samples for bacteriological (chemical and physical) quality in accordance with Standard Methods for the Examination of Water and Wastewater. Samples shall show the absence of coliform organisms and the presence of a chlorine residual.
e. If samples indicate the presence of coliform organisms, resume flushing the water line and repeat the sampling process.
f. If the check samples fail to produce acceptable results, rechlorinate the water main and repeat the disinfection, flushing, and sampling process until two (2) consecutive sets of acceptable samples taken 24 hours apart show the absence of coliform organisms.

END OF SECTION 331300

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Storm drainage piping.
2. Accessories
3. Underground pipe markers.
4. Catch basins and plant area drains.
5. Cleanouts
6. Bedding and cover materials.

B. Related Sections:
1. Section 310513 - Soils for Earthwork.
2. Section 310516 - Aggregates for Earthwork.
3. Section 312316 – Excavation.
4. Section 312317 – Trenching.
5. Section 312323 – Fill.

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in.Drop.

B. ASTM International:
1. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
2. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
3. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
4. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
5. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
6. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
7. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
8. ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
9. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
10. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
11. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
12. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

13. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
14. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
15. ASTM D2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
16. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
17. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
18. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
19. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
20. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. PennDOT
   1. PennDOT Publication 408 Specifications, Latest Edition.
   2. PennDOT Roadway Construction Standards, Latest Edition.

1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe, pipe accessories, and all associated connectors.

C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

A. Section 017700 - Closeout Procedures: Requirements for submittals.

B. Project Record Documents:
   1. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with the Construction Documents, PennDOT Publication 408 Specifications and PennDOT RC Standards latest editions.

B. Maintain one copy of each document on site.

1.6 PRE-INSTALLATION MEETINGS

A. Section 013100 – Project Management and Coordination: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.7 COORDINATION

A. Section 013100 – Project Management and Coordination: Coordination and project conditions.

B. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to all site utilities as indicated on the construction drawings.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE PIPING

A. High Density Polyethylene Corrugated Pipe (SLCPP) with smooth interior: shall be equal to N-12 by ADS, Hi-Q by Hancor: AASHTO M294 and PennDOT Publication 408 and construction documents; sized as per the construction drawings, pipe shall be perforated or solid as indicated.
   1. Fittings: Polyethylene with neoprene gaskets provided by manufacturer of SLCPP piping, conforming to same standards.
   2. Joints: All joints shall be gasketed and watertight.

B. Plastic Pipe: ASTM D2729, polyvinyl chloride (PVC) material; sized as per the construction documents, bell and spigot solvent sealed ends.
   1. Fittings: PVC.
   2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

C. Plastic Pipe: ASTM D3034, SDR 35, Poly (Vinyl Chloride) (PVC) material; sized per the construction documents, bell and spigot style rubber ring sealed gasket joint.
   1. Fittings: PVC.
   2. Joints: ASTM F477, elastomeric gaskets.

2.2 ACCESSORIES

A. Filter Fabric: Non-biodegradable, woven, as per PennDOT Publication 408 and Construction Documents.

B. Grout: Specified in Section 033000.

2.3 UNDERGROUND PIPE MARKERS

A. Manufacturers:
   1. As per PennDOT Publication 408 and Construction Documents.
   2. Substitutions: Section 016000 - Product Requirements.

B. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

2.4 CATCH BASINS AND PLANT AREA DRAINS

A. Catch Basin Lid and Frame Manufacturers:
   1. As per PennDOT Publication 408 and Construction Documents.
   2. Substitutions: Section 016000 - Product Requirements.

B. Catch Basin Lid and Frame:
   1. Construction: As per PennDOT Publication 408 and Construction Documents.
   2. Lid Design: As per PennDOT Publication 408 and Construction Documents.
   3. Nominal Lid and Frame Size: As per PennDOT Publication 408 and Construction Documents.

C. Shaft Construction and Cone Top Section: Reinforced precast Concrete pipe sections, lipped male/female joints, sized per the construction documents.

D. Base Pad: Cast-in-place concrete of type specified in Section 033000.

2.5 CLEANOUTS

A. Cleanout Lid and Frame Manufacturers:
   1. As per PennDOT Publication 408 and Construction Documents
   2. Substitutions: Section 016000 - Product Requirements

B. Cleanout Lid and Frame:
   1. Construction: As per PennDOT Publication 408 and Construction Documents
   2. Lid Design: As per PennDOT Publication 408 and Construction Documents
   3. Nominal Lid and Frame Size: As per PennDOT Publication 408 and Construction Documents

C. Shaft Construction and Cone Top Section: Reinforced precast Concrete pipe sections, lipped male/female joints, sized per the construction documents.

D. Base Pad: Cast-in-place concrete of type specified in Section 033000.

2.6 BEDDING AND COVER MATERIALS

A. Bedding: Fill Type as specified in Section 310516 and as per PennDOT Publication 408 and Construction Documents.

B. Cover: Fill Type as specified in Section 310516 and as per PennDOT Publication 408 and Construction Documents.

C. Soil Backfill from Above Pipe to Finish Grade as specified in Section 310513 and as per PennDOT Publication 408 and Construction Documents. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 013100 – Project Management and Coordination: Verification of existing conditions before starting work.

B. Verify trench cut or excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on construction drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with select granular material.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 312317 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ASTM D2321 Seal joints watertight.

B. Place pipe on minimum 6 inch deep bed of filter aggregate.

C. Lay pipe to slope gradients noted on drawings with maximum variation from indicated slope of 1/8 inch in 10 feet.

D. Install aggregate at sides and over top of pipe. Install top cover to minimum compacted thickness of 12 inches, compact to 95percent.

E. Refer to Section 312323 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

F. Refer to Section 330513 for manhole requirements.

G. Connect to storm drainage system.

H. Install trace wire continuous over top of pipe, buried 6 inches below finish grade, above pipe line; coordinate with Section 312317.

I. Connect to subdrainage tile system piping. Refer to Section 334600.

J. Install site storm drainage system piping to 5 feet of building. Connect to building storm drainage system. Refer to Section 221400.

K. Install Work in accordance with PennDOT Publication 408 Specifications and PennDOT RC Standards latest editions.

3.5 INSTALLATION - CATCH BASINS AND CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place Cast-In-Place Concrete base pad, with provision for storm sewer pipe end sections.

C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.

D. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.

E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

F. Install Work in accordance with PennDOT Publication 408 Specifications and PennDOT RC Standards latest editions.

3.6 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements and Section 017700 - Closeout Procedures: Field inspecting and inspecting services.

B. Request inspection prior to and immediately after placing aggregate cover over pipe.

C. Compaction Testing: In accordance with ASTM D698.

D. When tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Compaction Tests: 1 test per 50 linear feet.

F. Infiltration Test: Test in accordance with ASTM 969.

G. Deflection Test: Test as per PennDOT Publication 408 Specifications and PennDOT RC Standards latest editions.

H. Pressure Test: Test in accordance with ASTM C924 and ASTM C1103 depending on size of pipe.

3.7 PROTECTION OF FINISHED WORK

A. Section 017700 - Closeout Procedures: Protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
2. Repair or replace pipe that is damaged or displaced from construction operations.

END OF SECTION 334100

SECTION 334113 – PUBLIC STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Storm drainage piping.
2. Piping accessories.
3. Drainage structures.
4. Bedding and cover materials.
5. Pipe support systems.
6. Concrete encasement and cradles.

B. Related Requirements:
1. Section 036000 - Grouting: Nonshrink grout.
2. Section 310513 - Soils for Earthwork: Soils for backfill in trenches.
3. Section 310516 - Aggregates for Earthwork: Aggregate for backfill in trenches.
4. Section 312317 - Trenching: Execution requirements for trenching required by this Section.
5. Section 330130.13 - Sewer and Manhole Testing.
6. Section 330513.16 - Public Manholes and Structures: Concrete manholes, frames and grates for storm drainage.
7. Section 331113 - Public Water Utility Distribution Piping: Water line pipe, fittings, and accessories.
8. Section 330526 - Utility Identification: Pipe markers.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Section 012000 - Price and Payment Procedures: Contract Sum/Price modification procedures.

B. See Section 012000 - Price and Payment Procedures for method of measurement and payment for work of this section.

1.3 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials:
1. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe.
2. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter.

B. ASTM International:
1. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
3. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
4. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

C. Pennsylvania Department of Transportation (PennDOT)
   1. Publication 408 Highway Construction Specifications.
   2. Publication 72M Roadway Construction Standards.

1.4 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work of this Section with termination of storm sewer, trenching, connection to existing and proposed stormwater drainage facilities.

1.5 PREINSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.6 SUBMITTALS

A. Section 013300 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data indicating pipe, pipe accessories, and drainage structures.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Qualifications Statements:
   1. Submit qualifications for manufacturer and installer.

1.7 CLOSEOUT SUBMITTALS

A. Section 017000 - Execution and Closeout Requirements: Requirements for submittals.

B. Project Record Documents: Record actual locations of pipe runs, connections, manholes, inlets, catch basins, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum five years' documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 016000 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:
1. Store materials according to manufacturer instructions.
2. Block individual and stockpiled pipe lengths to prevent moving.
3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
4. Do not place pipe flat on ground; cradle to prevent point stress.

D. Protection:
1. Keep UV-sensitive materials out of direct sunlight.
2. Provide additional protection according to manufacturer instructions.

PART 2 - PRODUCTS

2.1 STORM DRAINAGE PIPING

A. Plastic Piping - HDPE Smooth Lined Corrugated Plastic Pipe (SLCPP):
1. Manufacturer:
a. ADS N-12 WT pipe by ADS, Inc. or approved equal.
b. Substitutions: Section 016000 - Product Requirements.
2. Pipe:
a. Material: High density polyethylene (HDPE).
b. Comply with AASHTO M252, Type S or M294, Type S.
c. Type: Smooth interior and annular exterior corrugations.
d. Inside Nominal Diameter: As indicated on Drawings.
3. Fittings: Polyethylene, conform to AASHTO M252 or M294.
4. Joints:
a. Comply with AASHTO M252 or M294.
b. Integral bell and spigot meeting water tight performance requirements of ASTM D3212.
c. Gaskets shall meet requirements of ASTM F477 and shall be factory installed by pipe manufacturer.
5. Manning's "n" value for use in design shall be 0.012.

B. Plastic Pipe - PVC:
1. ASTM D3034, SDR 35, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter of as shown on Drawings with integral bell and spigot style rubber ring sealed gasket joint in accordance with ASTM D3212.
a. Fittings: ASTM D3034 PVC.

b. Joints: ASTM F477, elastomeric gaskets.

2.2 DRAINAGE STRUCTURES

A. Description:
1. Materials: Precast concrete inlet boxes and tops with cast iron or structural steel grate and frame conforming to PennDOT Publication 408, Section 714 and PennDOT Publication 72M Standard Drawing No. RC45 - 46.
2. Manholes: As specified in Section 330513.16 - Public Manholes and Structures.
3. Inlets:
a. PennDOT standard size Type M, S, or C as required.
b. Grating:
1) Cast iron.
2) Bicycle safe.

2.3 CLEANOUT FRAME AND COVER

A. Manufacturers:
1. Neenah catalog no. R-1976 frame and cover by Neenah Foundry Company, or approved equal.
2. Substitutions: Section 016000 - Product Requirements.

B. Product Description: ASTM A48, Class 35B Cast Iron construction.
1. Lid: As-cast bearing surfaces, removable solid type lid bolted to frame, heavy duty designation, inscribed with word “STORM SEWER”.
2. Nominal Size: As indicated on Drawings.

2.4 CONCRETE ENCASEMENT AND CRADLES

A. Concrete:
1. Description: Class A concrete conforming to PennDOT Publication 408, Section 704.1.

2.5 MATERIALS

A. Bedding and Cover:
1. Bedding: As specified in Section 310516 - Aggregates for Earthwork and as indicated on Drawings.
2. Cover: As specified in Section 310516 - Aggregates for Earthwork and as indicated on Drawings.
3. Soil Backfill from above Pipe to Finish Grade: As specified in Section 310513 - Soils for Earthwork and as indicated on Drawings.

2.6 MIXES

A. Grout: As specified in Section 036000 - Grouting.

2.7 FINISHES

A. Steel:

B. Galvanizing:
   1. Comply with ASTM A123.
   2. Hot-dip galvanized after fabrication.

C. Galvanizing for Nuts, Bolts, and Washers: Comply with ASTM A153.

2.8 ACCESSORIES

A. Pipe Support Brackets: Galvanized structural steel coated with bituminous paint.

B. Pipe Markers: As specified in Section 330526 - Utility Identification.

C. Pipe Insulation for Existing Water Lines: As specified in Section 331113 - Public Water Utility Distribution Piping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify that trench cut is ready to receive Work.

C. Verify that excavations, dimensions, and elevations are as indicated on Drawings.

3.2 PREPARATION

A. Section 017000 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Correct over-excavation with coarse aggregate, concrete, or other suitable material as directed by the Engineer.

C. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

3.3 INSTALLATION

A. Excavation and Bedding:
   1. Excavate pipe trench as specified in Section 312317 - Trenching.
   2. Hand trim excavation for accurate placement of piping to indicated elevations.
   3. Dewater excavations to maintain dry conditions to preserve final grades at bottom of excavation.
   4. Provide sheeting and shoring as specified in Section 312317 - Trenching.
   5. Level materials in continuous layers not exceeding compacted depth of 4 inches.
   6. Maintain optimum moisture content of bedding material to attain required compaction density.

7. Install pipe on compacted subgrade meeting bedding requirements.
8. Cradle bottom 20 percent of diameter to avoid point load.
9. Compact according to requirements.

B. Piping:
1. Install pipe, fittings, and accessories according to ASTM D2321 and the manufacturer's instructions.
2. Seal joints watertight.
3. Place pipe on bedding or on compacted subgrade meeting bedding requirements.
4. Lay pipe to slope gradients as indicated on Drawings.
5. Connect piping to drainage structures.
6. Install aggregate at sides and over top of pipe.
7. Install top cover to minimum compacted thickness of 12 inches and compact to 95 percent maximum density.
8. Backfilling and Compaction:
   a. As specified in Section 312317 - Trenching.
   b. Do not displace or damage pipe while compacting.
9. Pipe Markers: As specified in Section 330526 - Utility Identification.

C. Drainage Structures:
1. Manholes: As specified in Section 330513.16 - Public Manholes and Structures.
2. Inlets and Catch Basins: As specified in PennDOT Publication 408, Section 714 and Publication 72M, Standard Drawing No. RC45 - 46.

D. Existing Water Lines:
1. Coordinate with and comply with rules and regulations of the local Water Authority during Work adjacent to existing water lines and related facilities.
2. Insulate existing water service lines encountered and exposed during construction before backfilling excavations. Install insulation in accordance with manufacturer's recommendations and instructions.
3. Block and support existing water lines exposed during construction with wood bedded on No. 2B coarse aggregate.

3.4 FIELD QUALITY CONTROL

A. Section 014000 - Quality Requirements: Requirements for inspecting and testing.

B. Request inspection by Engineer prior to and immediately after placing aggregate cover over pipe.

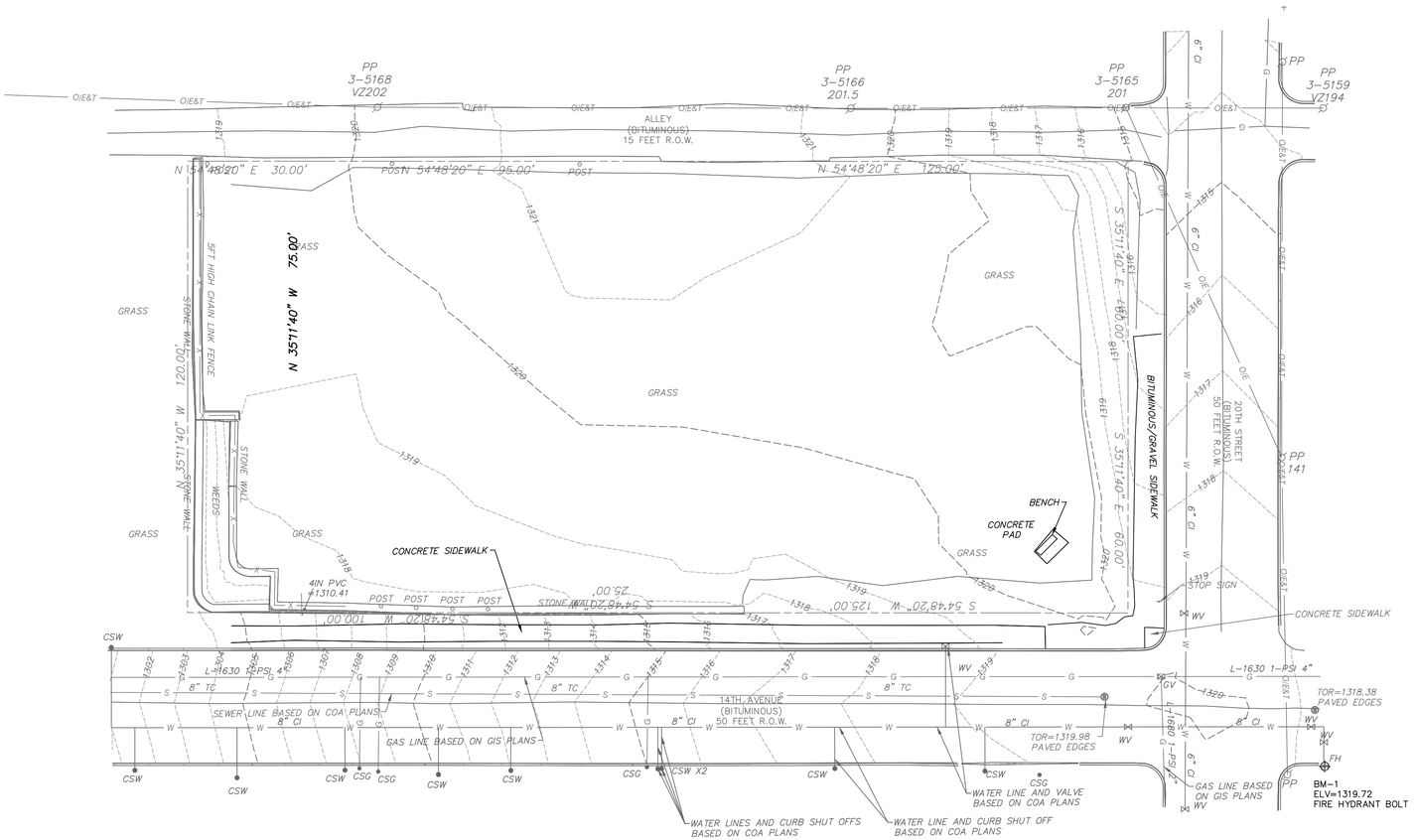
C. Testing:
1. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.
2. Compaction Tests:
   a. Comply with Section 312317 - Trenching.
3. Deflection Test:
   a. As specified in Section 330130.13 - Sewer and Manhole Testing.

3.5 PROTECTION

A. Section 017000 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION



SCALE: 1"=20'

20' 0' 20'

Seal

COMMONWEALTH OF PENNSYLVANIA
DANIEL JAMES BEYER
ENGINEER
No. PE091062

Date

No.	Sheet Revisions	Date
1	ADDENDUM 1	04/30/26

Scale AS NOTED
Date APRIL 2026
Drawn By BRB
Checked By DJB
Project No. 120-26-231
File No. 6695

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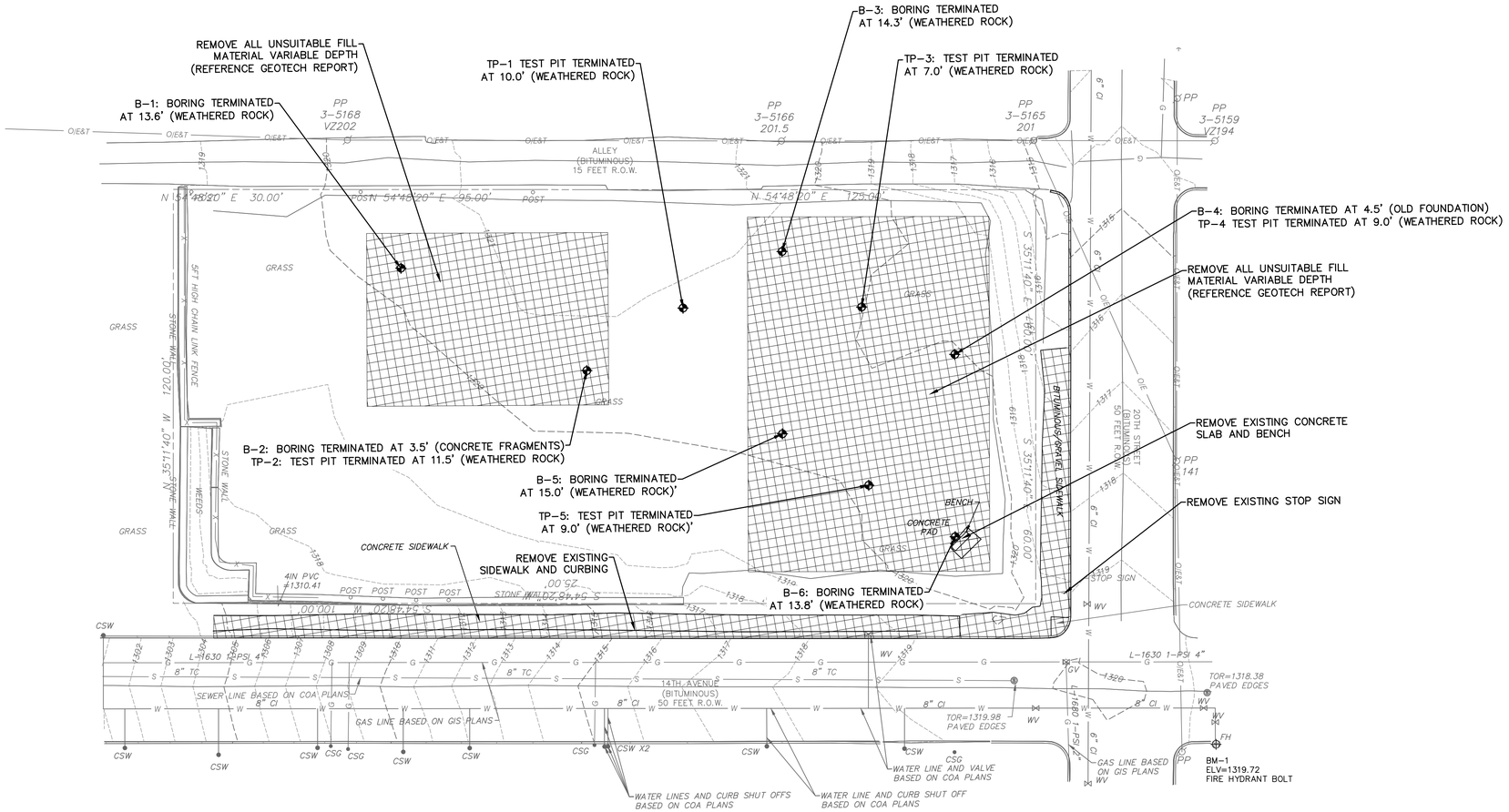
GARFIELD SCHOOL LAND DEVELOPMENT
FOR
ALTOONA REDEVELOPMENT AUTHORITY
CITY OF ALTOONA, BLAIR COUNTY, PA

EXISTING CONDITIONS

Drawing No.
C-1.00



DEMOLITION LEGEND

- ⊗ ITEM TO BE REMOVED
- ▨ ITEM TO BE REMOVED

SCALE: 1"=20'
20' 0' 20'

Seal

COMMONWEALTH OF PENNSYLVANIA
DANIEL JAMES BEYER
ENGINEER
No. PE091060

Date

No.	Sheet Revisions	Date
1	ADDENDUM 1	04/30/26

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GARFIELD SCHOOL LAND DEVELOPMENT
FOR
ALTOONA REDEVELOPMENT AUTHORITY
CITY OF ALTOONA, BLAIR COUNTY, PA

DEMOLITION

Drawing No.
C-1.01

ALLEY
(BITUMINOUS)
15 FEET R.O.W.

N 54°48'20" E 30.00'

POST

N 54°48'20" E 95.00'

POST

N 54°48'20" E 125.00'

15.0'

25.0'

CONC DRIVE

25' SETBACK

3' SETBACK

CONC DRIVE

25.0'

15.0'

5' WIDE CONC WALK

ADA RAMP

5' WIDE CONC WALK

5.0'

10'x12'
DECK

HOUSE 2
1167 SF SINGLE FAMILY
HOME

GRASS

20' SETBACK

5' SETBACK

N 35°11'40" W 75.00'

3' SETBACK

10'x14'
DECK

HOUSE 1
1147 SF SINGLE FAMILY
HOME

20' SETBACK

N 35°11'40" W 60.00'

PROVIDE TOPSOIL
RESTORATION IN ALL
DISTURBED LAWN AREAS

25' SETBACK

S 35°11'40" E 60.00'

FULL DEPTH
PAVEMENT
RESTORATION

6" CONC CURB

20TH STREET
(BITUMINOUS)
50 FEET R.O.W.

3' SETBACK

S 54°48'20" W 125.00'

N 54°48'20" E 125.00'

3' SETBACK

N 35°11'40" W 120.00'

STONE WALL

SFT HIGH CHAIN LINK FENCE

STONE WALL

WEEDS

S 54°48'20" W 70.00'

N 54°48'20" E 70.00'

S 35°11'40" E 120.00'

N 35°11'40" W 60.00'

20' SETBACK

25' SETBACK

HOUSE 3
1423 SF SINGLE FAMILY
HOME

20' SETBACK

5' WIDE CONC WALK

5.0'

S 35°11'40" E 60.00'

PROVIDE TOPSOIL
RESTORATION IN ALL
DISTURBED LAWN AREAS

GRASS

S 35°11'40" E 45.00'

N 35°11'40" W 45.00'

STONE RETAINING WALL,
TO REMAIN UNDISTURBED

POST

POST

POST

POST

STONE WALL

S 54°48'20" W 25.00'

GRASS

FULL DEPTH
PAVEMENT
RESTORATION

S 54°48'20" W 100.00'

6' SETBACK

15.0'

25.0'

S 54°48'20" W 125.00'

STOP SIGN

CONC DRIVE

5' WIDE CONC WALK

6" CONC CURB

15.0'
DEPRESSED CURB

5' WIDE CONC WALK

6" CONC CURB

ADA RAMP

14TH AVENUE
(BITUMINOUS)
50 FEET R.O.W.

FULL DEPTH
PAVEMENT
RESTORATION

SCALE: 1"=10'

10' 0' 10'

Seal

COMMONWEALTH OF PENNSYLVANIA
DANIEL JAMES BEYER
ENGINEER
No. PE091582

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GARFIELD SCHOOL
LAND DEVELOPMENT
FOR
ALTOONA REDEVELOPMENT AUTHORITY
CITY OF ALTOONA, BLAIR COUNTY, PA

SITE PLAN

Drawing No.
C-2.00

R:\6695 Redev Auth Altoona\26231 Garfield School Land Dev\06 CADD\80 Site Dev\C_2-00 SITE-GRADING PLAN.dwg, 4/30/2026 9:08:56 AM

ALLEY
(BITUMINOUS)
15 FEET R.O.W.

N 54°48'20" E 30.00'

N 54°48'20" E 95.00'

N 54°48'20" E 125.00'

POST

POST

3' SETBACK

PERIMETER DRAIN TO DAYLIGHT AT CURBLINE

25' SETBACK

10'x14' DECK

HOUSE 1
1147 SF SINGLE FAMILY HOME

10'x12' DECK

HOUSE 2
1167 SF SINGLE FAMILY HOME

GRASS

20' SETBACK

N 35°11'40" W 75.00'

3' SETBACK

N 35°11'40" W 60.00'

25' SETBACK

20' SETBACK

1.8%

S 54°48'20" W 125.00'

N 54°48'20" E 125.00'

3' SETBACK

S 54°48'20" W 70.00'

N 54°48'20" E 70.00'

N 35°11'40" W 120.00'

STONE WALL

WOOD

6FT CHAIN LINK FENCE

PERIMETER DRAIN TO DAYLIGHT AT CURBLINE

S 35°11'40" E 45.00'

S 35°11'40" E 60.00'

N 35°11'40" W 60.00'

S 35°11'40" E 120.00'

HOUSE 3
1423 SF SINGLE FAMILY HOME

20' SETBACK

25' SETBACK

6' SETBACK

S 54°48'20" W 25.00'

S 54°48'20" W 100.00'

S 54°48'20" W 125.00'

POST

POST

POST

POST

STONE WALL

STOP SIGN

1.8%

1.8%

1.8%

1.8%

14TH AVENUE
(BITUMINOUS)
50 FEET R.O.W.

20TH STREET
(BITUMINOUS)
50 FEET R.O.W.

SCALE: 1"=10'

10' 0' 10'

Seal

COMMONWEALTH OF PENNSYLVANIA
DANIEL JAMES BEYER
ENGINEER
No. PE091062

Date

No.	Sheet Revisions	Date
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LAND DEVELOPMENT
FOR
ALTOONA REDEVELOPMENT AUTHORITY
CITY OF ALTOONA, BLAIR COUNTY, PA

STORM / GRADING PLAN

Drawing No.
C-2.01

R:\6695 Redev Auth Altoona\26231 Garfield School Land Dev\06 CADD\80 Site Dev\C_2-00 SITE-GRADING PLAN.dwg, 4/30/2026 9:09:17 AM

ALLEY
(BITUMINOUS)
15 FEET R.O.W.

N 54°48'20" E 30.00'

POST

N 54°48'20" E 95.00'

POST

N 54°48'20" E 125.00'

5FT HIGH CHAIN LINK FENCE

STONE WALL

GRASS

25' SETBACK

3' SETBACK

10'x14' DECK

HOUSE 1
1147 SF SINGLE FAMILY HOME

N 35°11'40" W 75.00'

20' SETBACK

N 35°11'40" W 60.00'

3' SETBACK

25' SETBACK

10'x12' DECK

HOUSE 2
1167 SF SINGLE FAMILY HOME

20' SETBACK

¾" SADDLE AND CORP

CS

CURB STOP

¾" HDPE WATER LATERAL

4" PVC

S 54°48'20" W 125.00'

N 54°48'20" E 125.00'

3' SETBACK

25' SETBACK

HOUSE 3
1423 SF SINGLE FAMILY HOME

20' SETBACK

S 54°48'20" W 70.00'

N 54°48'20" E 70.00'

S 35°11'40" E 120.00'

N 35°11'40" W 120.00'

S 35°11'40" E 45.00'

N 35°11'40" W 60.00'

6" PVC

6" SETBACK

S 54°48'20" W 125.00'

S 54°48'20" W 100.00'

S 54°48'20" W 25.00'

S 35°11'40" E 60.00'

CURB STOP

¾" HDPE WATER LATERAL

¾" SADDLE AND CORP

STOP SIGN

WV

20TH STREET
(BITUMINOUS)
50 FEET R.O.W.

4IN PVC
=1310.41

STONE WALL

WEEDS

L-1630 1-PSI 4"

8" TC

8" CI

L-1630 1-PSI 2"

GV

PLACE PROPOSED MANHOLE OVER EXISTING 8" SANITARY SEWER LINE

14TH AVENUE
(BITUMINOUS)
50 FEET R.O.W.

GAS LINE BASED ON GIS PLANS

¾" SADDLE AND CORP

8" SEWER LINE BASED ON COA PLANS

TOR=1319.98
PAVED EDGES

GAS LINE BASED ON GIS

WATER LINE AND VALVE BASED ON COA PLANS

WATER LINES AND CURB SHUT OFFS BASED ON COA PLANS

WATER LINE AND CURB SHUT OFF BASED ON COA PLANS

CSW

CSG

CSW X2

UTILITY LEGEND

- W — WATERLINE
- S — SANITARY SEWER LINE
- ● — SANITARY SEWER MANHOLE

SCALE: 1"=10'

10' 0' 10'

Seal

COMMONWEALTH OF PENNSYLVANIA
DANIEL JAMES BEYER
ENGINEER
No. PE091052

Date

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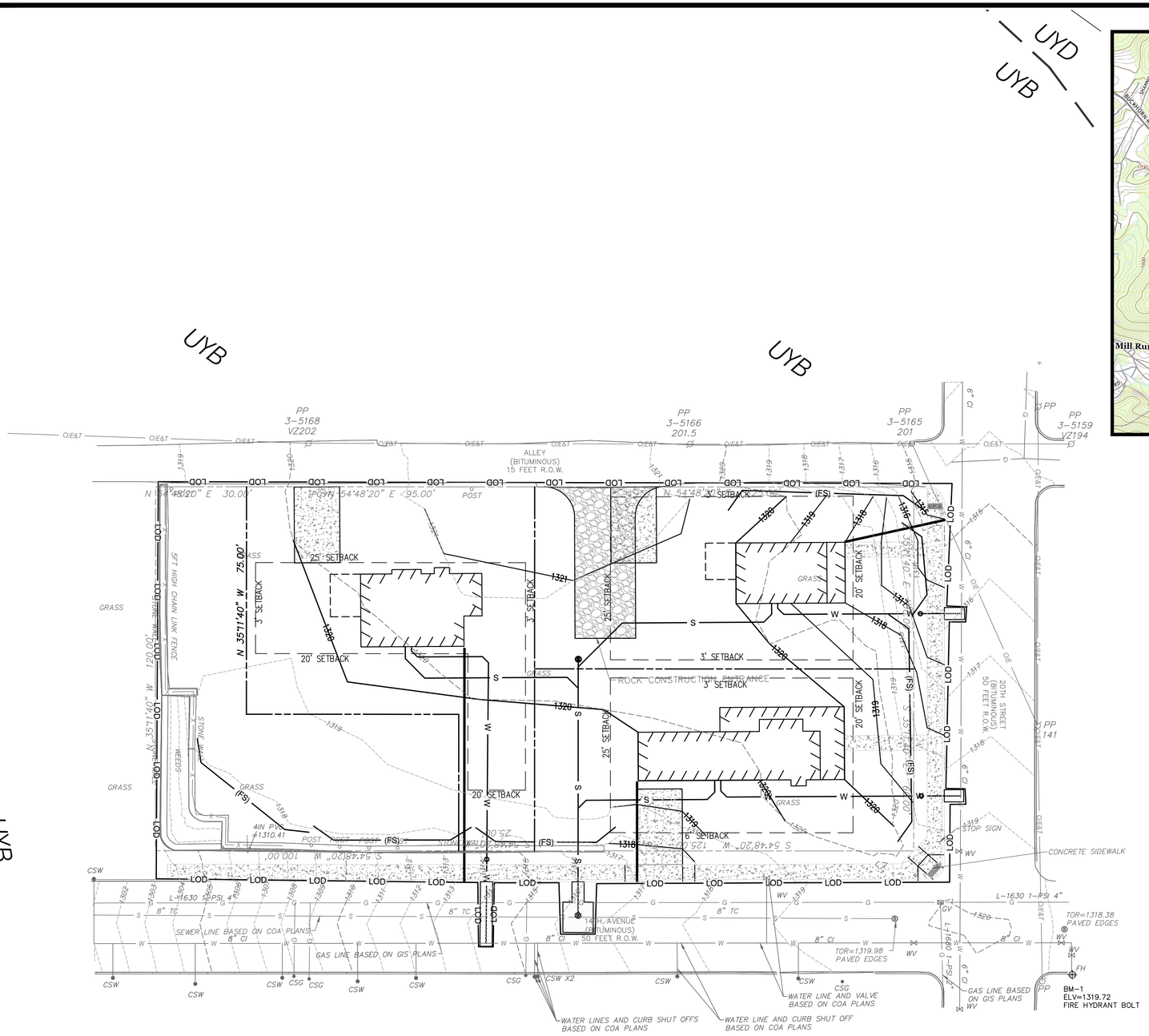
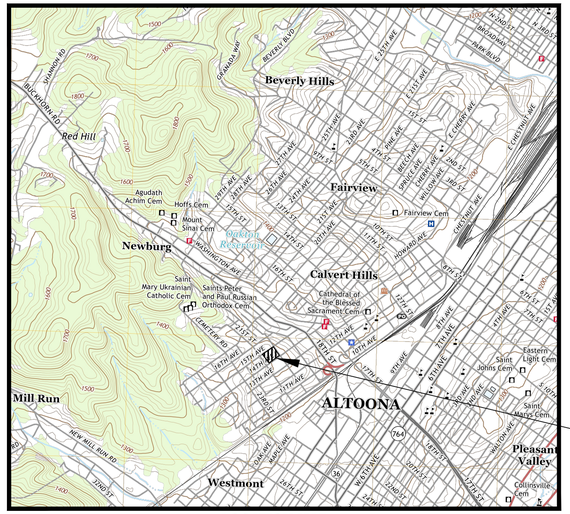
GARFIELD SCHOOL LAND DEVELOPMENT
FOR
ALTOONA REDEVELOPMENT AUTHORITY
CITY OF ALTOONA, BLAIR COUNTY, PA

UTILITIES PLAN

Drawing No.
C-3.00





LOCATION MAP
1 INCH=2000 FEET

NOTES

THE RECEIVING WATERS FOR THE PROJECT IS UNT OF MILL RUN (WWF,MF)

LIMIT OF DISTURBANCE = 0.80 ACRES

PROJECT AREA SOILS:
- UYB – URBAN LAND–BERKS COMPLEX, 8 TO 8 PERCENT SLOPES
- UYD – URBAN LAND–BERKS COMPLEX, 8 TO 25 PERCENT SLOPES

SOIL LIMITATIONS / RESOLUTIONS:
- CORROSIVE TO CONCRETE/STEEL;DEPTH TO SEASONAL HIGH WATER; LOW STRENGTH/LANDSLIDE PRONE; PIPING; FROST ACTION; SHRINK/SWELL – OBTAIN GEO–TECHNICAL STUDY TO DETERMINE APPROPRIATE RESOLUTIONS
- DROUGHTY; POOR SOURCE OF TOPSOIL – APPLY LIME AND FERTILIZER AS NEEDED, RECOMMEND SOIL TESTING, LANDSCAPE AREAS AND PCSM BMPs MAY REQUIRE IRRIGATION
- EASILY ERODIBLE – MINIMIZE DISTURBANCE, INSTALL STABILIZATION IMMEDIATELY AFTER GRADING, USE TEMPORARY STABILIZATION AS NEEDED
- FLOODING; HYDRIC/HYDRIC INCLUSIONS – WETLAND INVESTIGATION CONDUCTED, ANY WETLANDS HAVE BEEN DELINEATED ON THE PLAN, THERE WILL BE NO IMPACTS TO WETLAND RESOURCES.
- DEPTH TO HIGH WATER; SLOW PERCOLATION; PONDING; WETNESS – INFILTRATION TESTING HAS BEEN CONDUCTED IN AREA OF PCSM BMPs

A LOG SHOWING DATES THAT E&S BMPS WERE INSPECTED AS WELL AS ANY DEFICIENCIES FOUND AND THE DATE THEY WERE CORRECTED SHALL BE MAINTAINED ON THE SITE AND BE MADE AVAILABLE TO REGULATORY AGENCY OFFICIALS AT THE TIME OF INSPECTION.

THE CONTRACTOR IS RESPONSIBLE FOR KEEPING THE PUBLIC ROAD FREE OF ALL MUD FROM CONSTRUCTION AND DELIVERY VEHICLES. AFTER EACH VEHICLE LEAVES THE SITE, ALL SEDIMENT DEPOSITED ON PUBLIC ROADWAYS MUST BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE FOR DISPOSAL.

LEGEND

LOD	LIMIT OF DISTURBANCE
	SOIL BOUNDARY
UYB	SOIL DESIGNATION
(FS)	12" COMPOST FILTER SOCK

SCALE: 1"=20'
20' 0' 20'

Seal

COMMONWEALTH OF PENNSYLVANIA
DANIEL JAMES BEYER
ENGINEER
No. PE091050

Date

No.	Sheet Revisions	Date
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EROSION AND SEDIMENTATION CONTROL PLAN

Drawing No.
C-5.00

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