

SECTION 01 10 00

SUMMARY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Contract description.
- B. Contractor's use of site and premises.
- C. Work sequence.
- D. Owner occupancy.
- E. Specification Conventions.
- F. Steel Products Procurement Act

1.2 CONTRACT DESCRIPTION

- A. The sanitary sewer portion of the project consists of the Cured In Place Pipe (CIPP) trenchless rehabilitation of approximately 1,120 feet of sanitary sewer pipes, open cut removal and replacement of 643 lf of existing 12" clay sewer pipe with new 12-Inch SDR-35 PVC pipe, the replacement of 3 existing sanitary sewer manholes, the open cut replacement of 37 PVC sewer laterals, trenchless reinstatement of 9 PVC laterals. The storm sewer portion of the project consists of the removal and replacement of 6 storm inlets, installation of 2 new inlets and 280 feet of 18" storm sewer. Surface restoration of the work site is also required.
- B. The Contractor shall leave the existing sanitary sewage collection system active before, during, and after construction.

1.3 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow:
  - 1. Owner occupancy as lateral connections are made.
  - 2. Renter access and occupancy as lateral connections are made.
- B. Access to Site: Limited to the public right of way.
- C. Construction equipment shall be stored offsite, unless permitted in writing by the Property Owner. Coordinate storage of equipment and materials with the City of Reading.
- D. Construction Operations: Limited to areas noted on Drawings.
- E. The Contractor shall vacate the site within 10 days of written notice of Final Completion.

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- F. Utility Outages and Shutdown: No property owner or renter using the existing sewer system shall be without access to sewage disposal for a period of more than eight (8) hours.

1.4 WORK SEQUENCE

- A. Construct Work in stages or phases in order to connect existing sewer customers in a timely manner as the Work progresses.
- B. Coordinate construction schedule and operations with Owner and Engineer. A tentative construction sequence may generally consist of the following:
  - 1. Phase 1: Establish erosion and sedimentation controls.
  - 2. Phase 2: Perform all surface video, television inspection of lines, and line cleaning.
  - 3. Phase 3: Perform all open cut work on the sanitary system.
  - 4. Phase 4: Replace existing sanitary manholes
  - 5. Phase 5: Replace sanitary laterals and cleanouts.
  - 6. Phase 6: CIPP line sanitary sewers indicated.
  - 7. Phase 7: Rehabilitate manholes
  - 8. Phase 8: Replace existing storm inlets
  - 9. Phase 9: Perform all open cut new storm sewer installations (pipes and inlets)
  - 10. Phase 10: Restore surface.
  - 11. Phase 11: Post construction television and final submission.

1.5 OWNER OCCUPANCY

- A. The Owner will occupy the site during the entire period of construction and shall continuously provide sewer service to the existing customers, as well as conducting normal operations.
- B. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.6 SPECIFICATION CONVENTIONS

- A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

1.7 STEEL PRODUCTS PROCUREMENT ACT

- A. In accordance with the Steel Products Procurement Act (73 P.S. 1881 et seq.) Act No. 3 of the 1978 General Assembly of the Commonwealth of Pennsylvania, approved march 3, 1978, if any steel products are to be used or supplied in the performance of the contract, only steel products produced in accordance with the Act as defined therein shall be used or supplied in the performance of the contract by any and all contractors and subcontractors there under.

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PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mobilization/Demobilization
- B. Pre and Post Construction Surface Video
- C. Erosion and Sedimentation Controls
- D. Testing and inspection.
- E. Applications for payment.
- F. Change procedures.
- G. Defect assessment.
- H. Unit price pay items.

1.2 MOBILIZATION/DEMOBILIZATION

- A. Mobilization/Demobilization shall cover all costs associated with administrative management of the project, submittals, shop drawings, insurance, bonds, permits, utility location, and the delivery/removal of equipment to and from the project site.
- B. The Contractor shall perform a pre and post construction video of the entire sanitary sewer alignment (surface only), including lateral locations or anticipated open cut locations depicted on the plan.
- C. The pre construction video shall be performed prior to initialization of any work on the site.
- D. The post construction video shall be performed upon mobilization off the site and prior to final payment is made.
- E. The videos shall be submitted in DVD format to both the Owner and the Engineer for review. The preconstruction video shall be submitted and approved under the submission process prior to the initialization of any work.
- F. Costs associated with the pre and post construction video are incidental to the project.
- G. The Contractor shall perform erosion and sedimentation controls under mobilization.
- H. Costs associated with furnishing, installation and management of Erosion and Sedimentation controls are incidental to the Project.

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- I. Costs Included in Testing: Cost of engaging testing and inspecting agency; execution of tests and inspecting; and reporting results shall be the responsibility of the Contractor.
- J. The Owner shall be responsible for inspection services provided by Code Inspection, and any rail road entity. All other inspection services shall be the financial responsibility of the Contractor.
- K. Costs Included in Testing, which are the responsibility of the Contractor, are:
  - 1. Costs of incidental labor and facilities required to assist testing or inspecting agency.
  - 2. Costs of testing services used by Contractor separate from Contract Document requirements.
  - 3. Costs of retesting upon failure of previous tests as determined by Engineer.

1.3 APPLICATIONS FOR PAYMENT

- A. Submit five (5) copies of an application for payment.
- B. Content and Format: Utilize Bid Form for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Once a month.
- E. Submit with transmittal letter as specified for Submittals in Section 01 33 00 - Submittal Procedures.
- F. Substantiating Data: Engineer requires the following substantiating information and data be submitted, justifying dollar amounts in question. Include the following with Application for Payment:
  - 1. Current construction photographs.
  - 2. Partial release of liens from major subcontractors and vendors.
  - 3. Record documents for review by Owner, which will be returned to Contractor.
  - 4. Affidavits attesting to off-site stored products.
  - 5. Construction progress schedules revised and current.

1.4 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. The Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions.
- C. The Engineer may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change, and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within 5 business days.

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- D. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work. Document requested substitutions in accordance with Section 01 60 00 - Product Requirements.
- E. Construction Change Directive: Engineer may issue directive, signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
- F. The engineer may request supporting data for all Change Orders.
- G. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- H. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.
- I. Change Order Forms: As approved by the Owner, Engineer and/or Funding Agency.
- J. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- K. Correlation Of Contractor Submittals:
  - 1. Promptly revise Schedule of Values (if applicable) and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
  - 2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
  - 3. Promptly enter changes in Project Record Documents.

1.5 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Engineer will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but unit sum/price will be reduced 50 percent at discretion of Engineer. Where possible, defective Work shall be repaired to instructions of Engineer, and unit sum/price for the repaired portions of Work will be reduced 25 percent at discretion of Engineer.
- D. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
- E. Authority of Engineer to assess defects and identify payment adjustments is final.
- F. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:

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1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from transporting vehicle.
4. Products placed beyond lines and levels of required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected products.

1.6 UNIT PRICES

- A. Authority: Measurement methods are delineated in this specification section.
- B. Measurement methods delineated in individual specification sections complement criteria of this section. In event of conflict, requirements of this specification section govern.
- C. Take measurements and compute quantities. Engineer will verify measurements and quantities.
- D. Unit Quantities: Quantities and measurements indicated in Bid Form are for contract purposes only. Actual quantities provided shall determine payment.
  1. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at unit sum/prices contracted.
  2. When actual Work requires 25 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim for Contract Price adjustment.
- E. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application or installation of item of the Work; testing; overhead and profit.
- F. Payment for Permits: Includes the cost of all required permits to complete the proposed Work covered under this contract. This also includes all filing fees as no separate or extra payments will be made for this. The Owner shall be responsible for the payment of any PADOT inspection and Building Code fees. The Contractor shall be responsible for all other inspection fees including but not limited to municipal, authority, etc.
- G. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by Engineer multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
- H. Measurement Of Quantities:
  1. Weigh Scales: Inspected, tested and certified by applicable Pennsylvania Weights and Measures department within past year.
  2. Platform Scales: Of sufficient size and capacity to accommodate conveying vehicle.
  3. Metering Devices: Inspected, tested and certified by applicable Pennsylvania department within past year or other means as approved by the Engineer.
  4. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.
  5. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

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6. Measurement by Area: Measured by square dimension using mean length and width or radius.
7. Linear Measurement: Measured by linear dimension, at item centerline or mean chord, other than discussed below.
8. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as completed item or unit of the Work.
9. Measurement of new lateral pipe installation shall be from the outside face of the manhole or the end of the sewer main wye fitting to the nearest end of the tee fitting for the new cleanout.
10. Measurement for sewer main line shall be from the inside face of the manhole to the inside face of the next manhole. Field measurement of sewer mains shall be performed from the surface with a roller tape and may not match lengths depicted on the plan sheets.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

PART 4 DESCRIPTION OF UNIT PRICE PAY ITEMS

4.1 ITEM 1 - MOBILIZATION - see above

4.2 ITEM 2 – Open Cut SDR 35 LATERALS

- A. Furnish and install 6-inch diameter SDR-35 PVC sanitary sewer laterals, complete in place, at the existing depths at the locations as depicted in the plans. The work shall include all labor and equipment to perform exploration, line location, dye testing, surveying, utility coordination, utility support, televising, pavement saw cutting, trench excavation, test pits, pipe bedding, pipe embedment, trench plugs, pipe materials, incidental and transitional fittings (wyes, double wyes, sanitary tees, 90s, 45s, 22.5s, transition fittings, etc.), marking tape, aggregate backfill up to subbase elevation for improved areas, select soil backfill up to topsoil elevation for unpaved areas, flowable backfill, bypass pumping, soil backfill, traffic control, compaction, location stakes, and all required quality control and testing (including compaction testing and pressure testing).
- B. For the CIPP Sections - the work shall also include the work associated with cutting the and splicing the existing sewer main, inserting the transitional 8-inch piping, incorporating a new 8 x 6 inch cast iron wye, hard backed stainless steel transition couplings, concrete cap block, 8-inch main sections, disposal of the existing pipe, etc.
- C. Furnish and install the subsurface sewer lateral cleanout located near the curb/right-of-way/property line - complete in place. Item shall include all labor, equipment, and materials to perform location determination, test pits, utility coordination, utility support, surveying, saw cutting, dewatering, bypass pumping, SDR 35 PVC pipe, cast iron cleanout cover and frame, concrete cleanout base, PVC double flow tee, plastic fittings, transition fittings and couplings, bedding, embedment, select aggregate, backfill, marking tape, end caps, threaded/plain end transition pipe, concrete or concrete cap blocks and testing. Base course bituminous and concrete



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material for surface restoration shall be incidental to this item. Surface restoration shall also include the temporary removal and replacement of any surface features, including but not limited to mailboxes, landscaping, fencing, hardscapes, etc. The Contractor shall not be reimbursed for surface restoration for incorrectly located sewer laterals. The Contractor shall be responsible for protecting their work until final acceptance.

D. Asphalt restoration of 2” temporary hot mix for April through October and 4” mix during winter months is incidental to the cost of the pipe unit cost.

4.3 ITEM 3 - 12-INCH SDR 35 PVR MAIN

A. Furnish and install 12-inch main SDR-35 PVC, complete in place, at the design depths at the locations as depicted in the plans. The work shall include all labor and equipment to perform exploration, line location, dye testing, surveying, utility coordination, utility support, televising, pavement saw cutting, trench excavation, test pits, pipe bedding, pipe embedment, pipe materials, incidental and transitional fittings (shear resistant transition couplings, wyes, double tees, sanitary tees, 90s, 45s, 22.5s, transition fittings, etc.), marking tape, aggregate backfill up to subbase elevation for improved areas, select soil backfill up to topsoil elevation for unpaved areas, concrete encasement, trench plugs, bypass pumping, traffic control signs, flagging, compaction, location stakes, and all required quality control and testing (including compaction testing and pressure testing).

B. Support and protection of existing utilities shall be incidental to these items, as well as notifications to private property owners.

C. Measurement for sewer main line shall be from the inside face of the manhole to the inside face of the next manhole. Field measurement of sewer mains shall be performed from the surface with a roller tape and may not match lengths depicted on the plan sheets.

D. Reinstatement of the (9) existing sanitary laterals to sewer main within Miltimore Street which are to remain in service, are incidental to the unit cost of the pipeline

E. The Contractor shall not be reimbursed for surface restoration for incorrectly located sewer laterals. The Contractor shall be responsible for protecting their work until final acceptance.

F. Removal of the existing 12” sanitary sewer main being replaced is incidental to the unit cost of the pipeline.

G. Asphalt restoration of 2” temporary hot mix for April through October and 4” mix during winter months is incidental to the cost of the pipe unit cost.

4.4 ITEM 4 – GROUTING FOR MANHOLE REHABILITATION

A. Item includes all materials, labor, and equipment to perform grouting on existing sanitary sewer manholes for rehabilitation as indicated on the plan sheets. Work shall include design calculations, manhole power cleaning, chemical spray, bypass tube, safety equipment and traffic control.

B. Payment shall be made per manhole.

4.5 ITEM 5 – CONNECTION TO EXISTING SANITARY MANHOLES

- A. Provide a cost including all labor, equipment, and materials to connect the 12-inch SDR 35 PVC pipeline to each manhole. This will include, but not be limited to, measuring, surveying, concrete coring, concrete patching, pipe sealing, grouting, hydraulic cement around the pipe, leak stoppage around the pipe penetration, grouting a new channel, plugging the retired main penetration.
- B. Payment will be made upon successful installation of the new PVC pipe into each manhole.

4.6 ITEM 6 and ITEM 7 - CIPP INSTALLATION OF PIPELINE

- A. The project is bid on a “price per lineal foot” basis, measured considering pipe slope. The distance stated on the Bid Form and Drawings is the Owner’s best estimate and shall be checked by the Contractor and confirmed by the Engineer. The Contractor shall field verify the diameter of the sewer pipes prior to fabrication of the liner. The Owner will verify Contractor’s measurement and payment based on the bid cost per lineal foot based on verified distance measured with a roller tape. The Work shall include the cost to furnish and install a cured-in-place-pipe (CIPP) liner system, including all labor, materials, equipment, tools, sewer bypass pumping, traffic control, pipe cleaning/flushing, remote removal of any protruding portions of any protruding portions of sewer laterals, wire brushing of the lateral reinstatement, disposal of materials resulting from cleaning, pressure testing of the lined sewer main, material testing of the liner samples, and any other associated quality control/quality assurance work to accomplish a fully functional, infiltration free installation. Pre-installation television inspection videos, reports, inspection logs, etc. shall be incidental to this item. The Contractor shall also be responsible for reinstating the sewer lateral by cutting the liner at the known sewer lateral location with a specialized trenchless cutting tool.
- B. Heavy cleaning of the pipe will be incidental, including all specialized cleaning tools, water, labor, traffic control, cleaning and disposal of sediments. The Contractor can expect as much as approximately 1/4 pipe full of sediment.

4.7 ITEM 8 - POST CONSTRUCTION VIDEO INSPECTION

- A. Provide a unit cost including all labor, equipment, materials, and portable media (DVDs) required for closed circuit television inspection of the sewer construction. Upon completion of sewer construction and trench backfilling in accordance with the plans, the Contractor shall perform a closed circuit television inspection of the completed sewer sections inclusive to the project. The Contractor shall provide a DVD copy to each the Owner and the Engineer for review. Payment for this item shall be lineal feet of sewer main inspected via closed circuit television.

4.8 ITEM 9 – 18-INCH SLCPP STORM WATER PIPE

- A. Furnish and install 18-inch diameter smooth lined corrugated plastic stormwater pipe complete in place, including all labor, equipment and materials to perform trench excavation, test pits, bedding, select aggregate, and backfill up to subbase elevation. Surface restoration shall be incidental to this item, whether inside or outside of state/municipal roadways and/or private roadways/driveways. This shall include but not be limited to pavement sealing and restoration of pavement, sidewalk, curb, driveways, and turf.

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- B. Payment shall be based on lineal feet of pipe installed, complete in place.
- C. Asphalt restoration of 2" temporary hot mix for April through October and 4" mix during winter months is incidental to the cost of the pipe unit cost.

4.9 ITEM 10 - PRECAST TYPE C INLET

- A. Furnish and install precast PennDOT Type C inlet with standard box complete in place, including all labor, equipment and materials to perform surveying, excavation, installation of the aggregate subbase, and inlet box.
- B. Payment shall be made per inlet, this shall include but not be limited to, precast concrete base, riser walls, frame and cover assemblies, fully installed.
- C. Traffic control associated with inlet installation is incidental to the cost of the inlet.

4.10 ITEM 11 - PRECAST TYPE D-H LEVEL INLET

- A. Furnish and install precast PennDOT Type D-H Level inlet with standard box complete in place, replace existing inlets at each location, including all labor, equipment and materials to perform surveying, excavation, installation of the aggregate subbase, and inlet box.
- B. Payment shall be made per inlet, this shall include but not be limited to, precast concrete base, riser walls, frame and cover assemblies, fully installed.
- C. Traffic control associated with inlet installation is incidental to the cost of the inlet.
- D. Removal of the existing storm sewer inlet being replaced is incidental to the unit cost of the inlet.

4.11 ITEM 12 – REMOVE/FILL EXISTING STORM MANHOLE

- A. Removal of the existing manhole cover, and cone unit, sealing all openings in manhole and filling said manhole with stone up to the limits of the roadway subbase, cut out a 5'x5' section of roadway and patch roadway utilizing the requirements indicated on the temporary pavement restoration detail indicated on the plan as indicated on the plan, including all labor, equipment, and materials to perform surveying, excavation, installation of the aggregate.
- B. Payment will be made upon successful completion of the work.
- C. Removal of the existing manhole components, backfilling and sealing of manhole openings are incidental to the unit cost of the work
- D. Asphalt restoration of 2" temporary hot mix for April through October and 4" mix during winter months is incidental to the cost of the pipe unit cost.

4.12 ITEM 13 – CONSTRUCTION ALLOWANCE-FLOWABLE FILL BACKFILL

- A. Furnishing, transporting and placing of flowable fill backfill for miscellaneous drainage, sump, springs, wells, and sink holes, as are encountered in the field.
- B. Payment shall be made per CY bid price for the quantity measured in the field.

4.13 ITEM 14 – CONSTRUCTION ALLOWANCE -STONE BACKFILL

- A. Furnishing and placing of stone backfill for miscellaneous drainage, sump, springs, wells, and sink holes, as are encountered in the field.
- B. Payment shall be made per CY bid price for the quantity measured in the field.

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Cutting and patching.
- G. Special procedures.

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. Verify utility requirements are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service.
- C. Follow routing shown for pipes as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Coordinate locations of fixtures and plumbing outlets with sewer pipes.
- E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.
- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

### 1.3 FIELD ENGINEERING

- A. Locate and protect property pins, survey control and reference points. Promptly notify Engineer of discrepancies discovered. Employ Land Surveyor registered in State of Pennsylvania and acceptable to Engineer to reset property pins, survey control and reference points.
- B. Control datum for survey is that established by Owner provided survey and shown on Drawings.
- C. Verify set-backs and easements; confirm drawing dimensions and elevations.
- D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- E. Submit copy of site drawing certifying elevations and locations of the Work are in conformance with Contract Documents.
- F. Maintain complete and accurate log of control and survey work as Work progresses.
- G. On completion of major site improvements, prepare survey illustrating dimensions, locations, angles, and elevations of construction and site work.
- 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.

### 1.4 PRECONSTRUCTION MEETING

- A. Engineer will schedule preconstruction meeting after City receives signed contract including all bonds and insurance certificates.
- B. Attendance Required: Owner, Engineer, Funding Agency(ies), Utility Companies, and Contractor.
- C. Preconstruction Meeting Agenda:
  - 1. Execution of Owner-Contractor Agreement.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Distribution of Contract Documents.
  - 4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
  - 5. Designation of personnel representing parties in Contract, other representative organizations, and Engineer.
  - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.

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- D. Engineer shall record minutes and distribute draft copies electronically within five (5) business days after meeting to participants and those affected by decisions made. Upon receipt of all comments, Engineer shall issue one final copy of the minutes and distribute hard copies to the participants.

1.5 SITE MOBILIZATION MEETING

- A. The site Mobilization meeting shall be held the same time as the Preconstruction Meeting.

- B. Attendance Required: Owner, Engineer, significant/major property owner(s), Contractor, Contractor's Superintendent, and major Subcontractors.

- C. Agenda:

1. Use of premises by Owner and Contractor.
2. Owner's requirements and partial occupancy.
3. Construction controls provided by Owner.
4. Survey layout.
5. Security and housekeeping procedures.
6. Schedules.
7. Application for payment procedures.
8. Procedures for testing.
9. Procedures for maintaining record documents.
10. Inspection and acceptance of Work put into service during construction period.
11. Property Owner's requirements to vacate the site within 10 days of completion.

- D. Engineer shall record minutes and distribute draft copies electronically within five (5) business days after meeting to participants and those affected by decisions made. Upon receipt of all comments, Engineer shall issue one final copy of the minutes and distribute hard copies to the participants.

1.6 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 at meetings.

- C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Engineer, as appropriate to agenda topics for each meeting.

- D. 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's schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.

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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 shall record minutes and distribute draft copies electronically within five (5) business days after meeting to participants and those affected by decisions made. Upon receipt of all comments, Engineer shall issue one final copy of the minutes and distribute hard copies to the participants.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting:
  1. Structural integrity of element.
  2. Integrity of weather-exposed or moisture-resistant elements.
  3. Efficiency, maintenance, or safety of element.
  4. Visual qualities of sight exposed elements.
  5. Work of separate contractor.
- C. 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 non-conforming Work.
  4. Remove samples of installed Work for testing.
  5. Provide openings in elements of Work.
- D. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry, concrete materials and bituminous paving using masonry saw or core drill.
- F. Restore Work with new products in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- H. Maintain integrity of construction; completely seal voids.
- I. Refinish surfaces to match adjacent finishes.



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

### 3.2 SPECIAL PROCEDURES

- A. Materials: As specified in product sections; match existing with new products for patching and extending work.
- B. Employ skilled and experienced installer to perform alteration work.
- C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.
- D. Remove unsuitable material, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.
- E. Remove debris and abandoned items from area and from concealed spaces.
- F. Prepare surface and remove surface finishes to permit installation of new work and finishes.
- G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- H. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original or specified condition.
- I. Where new Work abuts or aligns with existing, provide smooth and even transition.
- J. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- K. Finish surfaces as specified in individual product sections.

END OF SECTION

SECTION 01 32 16  
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. References.
- B. Quality assurance.
- C. Format.
- D. Schedules.
- E. Submittals.
- F. Review and evaluation.
- G. Updating schedules.
- H. Distribution.

1.2 REFERENCES

- A. Use a construction schedule format acceptable to the Engineer.

1.3 QUALITY ASSURANCE

- A. Scheduler: Contractor's personnel specializing in scheduling construction work of complexity comparable to this Project and having use of computer facilities capable of delivering detailed graphic printout.

1.4 FORMAT

- A. Listings: Reading from left to right, in ascending order for each activity. Identify each activity with applicable specification section number.
- B. Diagram Sheet Size: As necessary.
- C. Scale and Spacing: To allow for notations and revisions.

1.5 SCHEDULES

- A. Prepare diagrams and supporting analyses using critical paths.

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- B. Illustrate order and interdependence of activities and sequence of work; how start of given activity depends on completion of preceding activities, and how completion of activity may restrain start of subsequent activities.
- C. Illustrate complete sequence of construction by activity, identifying work of separate stages and phases. Indicate dates for submittals and return of submittals; dates for procurement and delivery of critical products; and dates for installation and provision for testing. Include legend for symbols and abbreviations used.
- D. Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
  - 1. Preceding and following event numbers.
  - 2. Activity description.
  - 3. Estimated duration of activity.
  - 4. Earliest start date.
  - 5. Earliest finish date.
  - 6. Actual start date.
  - 7. Actual finish date.
  - 8. Latest start date.
  - 9. Latest finish date.
  - 10. Total and free float; accrue float time to Owner and to Owner's benefit.
  - 11. Monetary value of activity, keyed to Schedule of Values.
  - 12. Percentage of activity completed.
  - 13. Responsibility.
- E. Prepare sub-schedules for each stage of Work identified in Section 01 10 00 - Summary.

1.6 SUBMITTALS

- A. Within 10 days after date of Owner-Contractor Agreement or as established in Notice to Proceed, whichever occurs last, submit proposed preliminary network diagram defining planned operations for first 60 days of Work, with general outline for remainder of Work.
- B. Participate in review of preliminary and complete schedules jointly with Engineer.
- C. Within 20 days after joint review of proposed preliminary schedule, submit draft of proposed final schedule for review.
- D. Within 10 days after joint review, submit final schedule for distribution by Contractor.
- E. Submit updated schedules with each Application for Payment every month.
- F. Submit number of reproductions Contractor requires, plus two copies for the Engineer to retain. Submit additional copies to all other requesting parties.
- G. Submit under transmittal letter form specified in Section 01 33 00 - Submittal Procedures.

1.7 REVIEW AND EVALUATION

- A. Participate in joint review and evaluation of schedule with Engineer at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise schedule incorporating results of review, and resubmit within 10 days.

1.8 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 schedule diagram to graphically depict current status of Work.
- C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
- D. Indicate changes required to maintain Date of Substantial Completion.
- E. Submit recommended changes.
- F. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect.

1.9 DISTRIBUTION

- A. Following joint review, distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Engineer, Owner, Funding Agency(ies), Regulatory Agency(ies), and other concerned parties (including Utility Owners).
- 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

SECTION 01 33 00  
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Proposed products list.
- C. Product data.
- D. Shop drawings.
- E. Samples.
- F. Design data.
- G. Test reports.
- H. Certificates.
- I. Manufacturer's instructions.
- J. Manufacturer's field reports.
- K. Construction photographs.

1.2 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form. Provide six copies with cover sheet referencing the contractors review and specification section. Electronic PDF copies may be acceptable.
- B. Each individual submission will have a cover sheet identifying the following:
  - 1. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
  - 2. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
  - 3. 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 in accordance with requirements of the Work and Contract Documents.
- C. Schedule submittals to expedite Project and deliver to Engineer. Coordinate submission of related items.

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- D. For each submittal for review, allow 15 days, excluding delivery time to and from Contractor.
- E. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.
- F. Allow space on submittals for Contractor and Engineer review stamps.
- G. When revised for resubmission, identify changes made since previous submission.
- H. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- I. Submittals not requested will not be recognized or processed.

1.3 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of the Owner-Contractor Agreement or the Notice to Proceed – whichever is the latter, 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, give manufacturer, trade name, model or catalog designation, and reference standards.

1.4 PRODUCT DATA

- A. Product Data: Submit to Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit number of copies Contractor requires, plus two copies Engineer will retain.
- 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. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.5 SHOP DRAWINGS

- A. Shop Drawings: Submit to Engineer for review for limited purpose of checking for 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 professional engineer responsible for designing components shown on shop drawings.
  - 1. Include signed and sealed calculations to support design.

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2. Submit 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. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01 70 00 - Execution and Closeout Requirements.

1.6 SAMPLES

- A. Samples: Submit to Engineer for review for limited purpose of checking for 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, or finish selection.
  2. Submit samples of finishes from full range of manufacturers' standard colors, 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, which 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 duplicates and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents purposes described in Section 01 70 00 - Execution and Closeout Requirements.

1.7 DESIGN DATA

- A. Submit for Engineer's knowledge as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.8 TEST REPORTS

- A. Submit for Engineer's knowledge as contract administrator or for Owner.
- B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.9 CERTIFICATES

- A. When specified in individual specification sections, 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.

#### 1.10 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

#### 1.11 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Engineer's benefit as contract administrator or for Owner.
- B. Submit report in duplicate within 5 days of observation to Engineer for information.
- C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.12 CONSTRUCTION PHOTOGRAPHS AND VIDEOS

- A. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, acceptable to Engineer.
- B. Each month submit photographs with Application for Payment.
- C. Photographs: Two prints; color, glossy; 4 x 6 inch size; soft card stock, with left edge binding margin for three hole punch.
- D. Take two site photographs from differing directions and five photographs indicating relative progress of the Work for each phase, task or segment, 10 days maximum prior to submitting.
- E. Take photographs as evidence of existing project conditions.
- F. Identify each print on front. Identify name of Project, contract number, phase/task/segment, orientation of view, date and time of view, name and address of photographer, and photographer's numbered identification of exposure.



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- G. Deliver negatives or copy of electronic files to Owner with project record documents. Catalog and index negatives in chronological sequence; include typed table of contents.
- H. Submit videos and corresponding electronic file of pre- and post-construction conditions of all potential areas of Work. Number of copies shall be one for the Owner, one for the Engineer, and any other copies required by other parties or regulatory agencies.
- I. Submit closed circuit videos and corresponding electronic file of post-construction pipe conditions of all areas of Work. Number of copies shall be two for the Owner, one for the Engineer, and any other copies required by other parties or regulatory agencies.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00  
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality control and control of installation.
- B. Tolerances.
- C. References.
- D. Testing and inspection services.
- E. Manufacturers' field services.
- F. Examination.
- G. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

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

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- B. Comply with manufacturers' tolerances. When manufacturers' 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 on date of Contract Documents, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Neither contractual relationships, duties, or responsibilities of parties in Contract or those of Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.5 TESTING AND INSPECTION SERVICES

- A. Owner will pay for inspection services.
- B. Contractor shall employ and pay for services of an independent testing agency or laboratory acceptable to Owner to perform specified testing.
  - 1. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full time specialist.
  - 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.
- C. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by Engineer or the Authority having jurisdiction.
  - 1. Laboratory: Authorized to operate in Pennsylvania.
  - 2. Laboratory Staff: Maintain full time 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.
- D. Testing, inspections and source quality control may occur on or off project site. Perform off-site testing as required by Engineer or Owner.
- E. Reports will be submitted by independent firm to Engineer, Contractor, and authority having jurisdiction, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

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1. Submit final report indicating correction of Work previously reported as non-compliant.
- F. 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 at least 24 hours prior to expected time for operations requiring services.
  2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- G. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- H. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same independent firm on instructions by Engineer. Payment for re-testing or re-inspection shall be the responsibility of the Contractor and will be charged to Contractor by deducting testing charges from Contract Sum/Price if necessary.
- I. 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 specified sampling and testing of products in accordance with specified standards.
  4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  5. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
  6. Perform additional tests required by Engineer.
  7. Attend preconstruction meetings and progress meetings.
- J. Agency Reports: After each test, promptly submit two copies of report to Engineer, Contractor, and authority 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 specifications section.
  6. Location in Project.
  7. Type of inspection or test.
  8. Date of test.
  9. Results of tests.
  10. Conformance with Contract Documents.
- K. 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.

## 1.6 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations. Observer subject to approval of Engineer.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Refer to Section 01 33 00 - Submittal Procedures.

## PART 2 PRODUCTS - Not Used

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify 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.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

### 3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- 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.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities.
- B. Construction Facilities.
- C. Temporary Controls.
- D. Removal of utilities, facilities, and controls.

1.2 TEMPORARY ELECTRICITY

- A. Provide for electricity as needed for construction.

1.3 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain portable lighting for construction operations to achieve minimum lighting level of 2 watt/sq ft.
- B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
- C. Maintain lighting and provide routine repairs.

1.4 TEMPORARY WATER SERVICE

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

1.5 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide facilities at time of project mobilization.

1.6 FIELD OFFICES AND SHEDS

- A. NONE REQUIRED FOR OWNER OR ENGINEER.
- B. Space for Project meetings will be provided off site by the Owner.

### 1.7 VEHICULAR ACCESS

- A. Construct temporary, all-weather access roads from public and private thoroughfares to serve construction area, of width and load bearing capacity to accommodate unimpeded traffic for construction purposes.
- B. Construct temporary culverts to allow unimpeded drainage.
- C. Extend and relocate vehicular access as Work progress requires, provide detours as necessary for unimpeded traffic flow.
- D. Provide unimpeded access for emergency vehicles. Maintain 20 feet wide driveways.
- E. Provide and maintain access to fire hydrants and control valves free of obstructions.
- F. Provide means of removing mud from vehicle wheels before entering streets.
- G. Do not use existing on-site roads for construction traffic unless agreed to by private property owners.

### 1.8 PARKING

- A. Arrange for and construct (if necessary) temporary gravel surface parking areas to accommodate construction personnel.
- B. Locate as approved by Engineer.
- C. When site space is not adequate, secure additional off-site parking.
- D. Use of existing on-site streets and driveways for construction traffic is not permitted. Tracked vehicles not allowed on paved areas.
- E. Use of existing parking facilities by construction personnel is not permitted.
- F. Do not allow heavy vehicles or construction equipment in parking areas.
- G. Where parking restrictions are required, contact the Reading Parking Authority, 610-655-6166, in advance to make arrangements. Erect and maintain required temporary “**NO PARKING**” signs. Remove signs when no longer required.
- H. Do not allow vehicle parking on existing pavement.
- I. Maintenance:
  - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
  - 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, or specified, condition.

- J. Removal, Repair:
  - 1. Remove temporary materials and construction before Substantial Completion.
  - 2. Remove underground work and compacted materials; fill and grade site as specified.
  - 3. Repair existing facilities damaged by use, to original condition.
- K. Mud From Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

#### 1.9 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
- B. Remove debris and rubbish from pipe excavations and other closed spaces, prior to enclosing spaces.
- C. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.

#### 1.10 TRAFFIC REGULATION

- A. Signs, Signals, And Devices:
  - 1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: As approved by authority having jurisdiction.
  - 2. Traffic Control Signals: As approved by local jurisdictions.
  - 3. Traffic Cones and Drums, Flares and Lights: As approved by authority having jurisdiction.
  - 4. Flag person Equipment: As required by authority having jurisdiction.
- B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
- C. Flares And Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- D. Haul Routes:
  - 1. Consult with authority having jurisdiction, 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, to minimize interference with public traffic.
- E. 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 as Work progresses, to maintain effective traffic control.
- F. 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.

#### 1.11 FIRE PREVENTION FACILITIES

- A. Prohibit smoking on site.
- B. Portable Fire Extinguishers: NFPA 10; 10 pound capacity, 4A-60B: C UL rating.
  1. Provide one fire extinguisher for each major piece of heavy construction equipment.
  2. Provide minimum one fire extinguisher in every construction trailer and storage shed.

#### 1.12 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 barricades and walkways for public rights-of-way and for public access to existing buildings.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

#### 1.13 ENCLOSURES AND FENCING

- A. Construction: Plastic construction netting.

#### 1.14 SECURITY

- A. Security Program:
  1. Protect Work from theft, vandalism, and unauthorized entry.
  2. Initiate program at project mobilization.
  3. Maintain program throughout construction period until Owner acceptance precludes need for Contractor security.
- B. Entry Control:
  1. Restrict entrance of persons and vehicles into Project site.
  2. Allow entrance only to authorized persons with proper identification.
  3. Owner will have persons and vehicles related to Owner's operations on site throughout the construction project.
  4. Coordinate access of Owner's personnel to site in coordination with Contractor.

#### 1.15 WATER CONTROL

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

1.16 DUST CONTROL

- A. Execute Work by methods to minimize raising dust from construction operations.
- B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.17 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, and drains, and other devices to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

1.18 NOISE CONTROL

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

1.19 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.
- B. Comply with pollution and environmental control requirements.

1.20 RODENT CONTROL

- A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.21 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, etc. prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

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PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 60 00  
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.

1.2 PRODUCTS

- A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with 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 by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- D. For exterior storage of fabricated products, place on sloped supports above ground.
- 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.

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- H. Provide equipment and personnel to store products by 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.

PART 2 PRODUCTS – Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Protecting installed construction.
- D. Project record documents.

1.2 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.
- B. Provide submittals to Engineer required by authorities having jurisdiction.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. Owner may occupy portions of the Project prior to final closeout.

1.3 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean pipe and manholes in order to prevent rocks, debris and soil from entering other portions of the collection or conveyance system.
- C. Clean debris from the work area.
- D. Clean site; sweep paved areas, and rake clean landscaped surfaces.
- E. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.4 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections.

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- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Prohibit traffic from landscaped areas.

1.5 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 utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings: Legibly mark each item to record actual construction including:
  - 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 3. Field changes of dimension and detail.
  - 4. Details not on original Contract drawings.
- G. Provide two (2) copies of the record drawings and final sewer videos to the Owner and one (1) copy of the record drawings and final sewer video to the Engineer in both paper and electronic format (PDF).
- H. Prior to final payment application, Contractor shall submit original signed copy of Maintenance Bond.
- I. Submit documents to Engineer with claim for final Application for Payment.

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PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION



SECTION 03 60 00

GROUTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Non-shrink cementitious grout.

1.2 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 Surfacing.
  6. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
  7. ASTM C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacing 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.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit product data on grout.
- 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.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with PADOT's standards.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver grout in manufacturer's unopened containers with proper labels intact.
- C. Store grout in a dry shelter, protect from moisture.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Maintain minimum temperature of 55 degrees F before, during, and after grouting, until grout has set.

PART 2 PRODUCTS

2.1 NON-SHRINK CEMENTITIOUS GROUT

- A. 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.
- B. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621, for Type D non-shrink grout:

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	4,000 psi
		7 days	7,000 psi
		28 days	10,000 psi to 10,800 psi

2.2 CURING

- A. 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 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.

- B. Verify areas to receive grout.

### 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. Direct and coordinate placement of metal anchors and base plates.
- B. Construct leakproof forms anchored and shored to withstand grout pressures.
- C. Install formwork with clearances to permit proper placement of grout.
- D. Provide safety end caps for exposed ends of vertical reinforcement.

### 3.4 MIXING

- A. Mix and prepare non-shrink cementitious grout in accordance with manufacturer's instructions.
  - 1. Capable of developing minimum compressive strength of 2400 psi in 48 hours and 7000 psi in 28 days.
- B. 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.

3.6 CLEANING

- A. Remove excess grout and grout smears as work progresses
- B. Clean soiled or stained masonry and concrete surfaces with an Engineer approved cleaning solution.

3.7 CURING

- A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. After grout has attained its initial set, keep damp for minimum of 3 days.

3.8 PROTECTION

- A. Protect exposed grout surfaces from weather, sun, and rain.

3.9 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements
- B. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- C. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01 40 00 - Quality Requirements.
- D. Seek the services of an Engineer approved independent inspection and testing laboratory at the Contractor's expense to collect, test, review, and report each class of masonry grout prior to commencement of Work
- E. Tests of grout components may be performed to ensure conformance with specified requirements.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Removing surface debris.
  - 2. Removing designated paving, curbs, and walkways.
  - 3. Removing designated trees, shrubs, and other plant life.
  - 4. Removing abandoned utilities.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

1.3 QUALITY ASSURANCE

- A. Conform to applicable regulations for environmental requirements, disposal of debris, burning debris on site, and use of herbicides.
- B. Perform Work in accordance with PADOT's standard.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.
- C. Verify existing structures, mailboxes, retaining walls, fencing, and yard ornaments to remain are identified.

3.2 PREPARATION

- A. Call Local Utility Line Information service and PA One Call at 1-800-242-1776 not less than three working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.

### 3.3 PROTECTION

- A. Locate, identify, and protect utilities and other items to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect existing private property, such as mail boxes, lawn ornament, fencing, and retaining walls.
- D. Protect bench marks, survey control points, and existing structures from damage or displacement.

### 3.4 CLEARING

- A. Clear areas required for access to site and execution of Work. Minimize the extent of clearing.
- B. Remove trees and shrubs as necessary and with permission from the private property owner or the Owner. Remove stumps, roots, and surface rock.
- C. Clear undergrowth and deadwood, without disturbing subsoil.

### 3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from site.
- B. Remove paving, curbs, channels, and walkways as necessary.
- C. Neatly saw cut all edges at right angle to surface.
- D. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- E. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- F. Do not burn or bury materials on site. Leave site in clean condition.

END OF SECTION

SECTION 31 23 17

TRENCHING

PART 1 GENERAL

1.1 SUMMARY

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

1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 2. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 3. 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 01 33 00 - 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.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with PADOT's Publication 408.

1.6 QUALIFICATIONS

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

1.7 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

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1.8 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: 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. Subsoil Fill: As specified in Section 31 05 13.
- B. Structural Fill: As specified in Section 31 05 13 and 31 05 16.
- C. Granular Fill: As specified in Section 31 05 16.

PART 3 EXECUTION

3.1 LINES AND GRADES

- A. Lay pipes to lines and grades indicated on Drawings.
  - 1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
- B. Use laser-beam instrument with qualified operator to establish lines and grades.

3.2 PREPARATION

- A. Call Local Utility Line Information service at PA One Call 1-800-242-1776 not less than three working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.
  - 2. Meet with City Engineer, City Department of Public Works to review site water lines.
  - 3. Meet with MetEd, Verizon, Comcast, Engineer, and property owner to review other utility lines.
- 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 that are greater than 6 inches in diameter.
- C. Perform excavation within 24 inches of existing utility service in accordance with utility's requirements.
- D. Do not advance open trench more than 20 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 pipe.
- H. Do not interfere with 45 degree bearing splay of foundations.
- I. Provide sheeting and shoring to protect excavation.
- J. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by Engineer until suitable material is encountered. Notify Engineer and request instructions.
- K. Cut out soft areas of subgrade not capable of compaction in place. Backfill with select aggregate 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 over excavated areas with select aggregate backfill and compacted as specified.
- 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.

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- 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.
- F. No additional compensation will be granted the contractor for surface restoration due to movement of excavation walls.

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 fill material in continuous layers and compact.
- D. Employ placement method that does not disturb or damage foundation perimeter drainage, utilities in trench, and nearby utilities.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Do not leave any trench open at end of working day.
- G. Protect work area to prevent danger to Owner and the public.
- H. Compact soils as directed in the project Details sheets.

3.6 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 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 01 40 00 - Quality Requirements
- B. Section 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- C. Perform laboratory material tests in accordance with ASTM D698.
- D. Perform in place compaction tests in accordance with the following:
  - 1. Density Tests: ASTM D2922.
  - 2. Moisture Tests: ASTM D3017.

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- E. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.
- F. Frequency of Tests: For every pipe run conduct on QC test for every 50 cubic yards of pipe backfill; minimum two tests per day.

3.8 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.
- B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

SECTION 31 23 19

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.

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 trenches.
  - 2. Reducing piezometric pressure within strata to prevent failure or heaving of trenches.
  - 3. Disposing of removed water.
- B. Surface Water Control: Removal of surface water within open excavations.

1.3 SYSTEM DESCRIPTION

- A. Provide dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.
  - 1. Install sump pits to dewater and relieve hydrostatic pressure.
- B. Furnish standby equipment stored at Project site and ready for immediate use upon failure of dewatering equipment. Provide the following standby equipment, but not less than one of each type:
  - 1. Dewatering Pumps: 50 percent.
  - 2. Portable Electric Generators: 50 percent.

1.4 PERFORMANCE REQUIREMENTS

- A. Design dewatering systems to:
  - 1. Lower water table within areas of excavation to minimum 2 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. Maintain stability of trenches.
- B. Design surface water control systems to:

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1. Collect and remove surface water and seepage entering excavation.

#### 1.5 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
  1. Indicate primary and standby power system location and capacity.
  2. Include detailed description of dewatering system installation procedures and maintenance of equipment.
  3. 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, and engine/motor characteristics.
  2. Pumping equipment for control of surface water within excavation.
- D. Design Data:
  1. Indicate design values, analyses, and calculations to support design.
- E. Field Reports: Test and monitoring reports as specified in Field Quality Control article.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout 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.
  2. Conform to regulatory standards for pumped water filter requirements.
  3. Do not discharge pumped water directly to inlets or streams without proper filtration as approved by the regulating authority.

#### 1.8 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate work to permit the following construction operations to be completed on dry stable substrate.
  1. Trenching for utilities.
  2. Erosion and sedimentation controls.

## PART 2 PRODUCTS

### 2.1 DEWATERING EQUIPMENT

- A. Contractor to select dewatering equipment to meet necessary performance requirements.

### 2.2 ACCESSORIES

- A. Valves and Fittings: Furnish valves and fittings to isolate each well from header pipe and to prevent loss of pump prime.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Call Local Utility Line Information service at PA One Call 1-800-242-1776 not less than three working days before performing Work.
  - 1. Request underground utilities to be located and marked within and surrounding construction areas.

### 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 approved 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.
- C. Install pumps in accordance with manufacturer's instructions.
- D. Connect pumps to discharge header. Install valves to permit pump isolation.

### 3.4 SURFACE WATER CONTROL SYSTEM

- A. Provide ditches, berms, and other devices to divert and drain surface water from excavation area as specified in Section 31 25 13.
- B. Divert surface water and seepage water within excavation areas into sumps and pump water into filtration systems in accordance with regulatory requirements for proper erosion and sedimentation control.

- C. Control and remove unanticipated water seepage into excavation.

### 3.5 SYSTEM OPERATION AND MAINTENANCE

- A. Operate dewatering system continuously 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. Fill fuel tanks before tanks reach 25 percent capacity.
- E. Start emergency generators at least twice each week to check operating condition.
- F. When dewatering system cannot control water within excavation, notify Engineer and stop excavation 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.
- G. 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.
- H. Correct unanticipated pressure conditions affecting dewatering system performance.
- I. Do not discontinue dewatering operations without Engineer's approval.

### 3.6 WATER DISPOSAL

- A. Discharge water into pump water filter bags or other approved facility as authorized by the Engineer or the regulatory agency having jurisdiction.

### 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.

END OF SECTION

SECTION 31 23 23

FILL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Backfilling site structures to subgrade elevations.
  2. Fill under paving and driveways.
  3. Fill under drainage channels and pipes.
  4. Fill for over-excavation.

1.2 REFERENCES

- A. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  2. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  3. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with PADOT Publication 408 and applicable RC Standards.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Structural Fill: directly beneath slabs and pavements, as indicated on the project details.
- B. Granular Fill: as indicated in the project details.

PART 3 EXECUTION

3.1 PREPARATION

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



- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with granular fill and compact to density equal to or greater than requirements for subsequent fill material.

### 3.2 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 fill material in continuous layers and compact.
- D. Place fill material in continuous layers and compact in continuous layers having a maximum compacted depth of 6 inches unless otherwise noted on the Drawings.
- 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. Make gradual grade changes. Blend slope into level areas.
- H. Remove surplus backfill materials from site.
- I. Leave fill material stockpile areas free of excess fill materials.

### 3.3 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.
- C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

### 3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Perform laboratory material tests in accordance with ASTM D698. See project details for compaction requirements.
- 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.
- E. Frequency of Tests: Frequency of Tests: For every pipe run conduct on QC test for every 50 cubic yards of pipe backfill; minimum two tests per day.

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F. Proof roll compacted fill surfaces under paving.

3.5 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

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

3.6 SCHEDULE

A. Fill and compact in accordance with the Details and Drawings.

B. If not specified in accordance with the Details and Drawings, compact uniformly to 100 percent of maximum density of the standard Proctor ASTM D 698.

END OF SECTION

SECTION 31 25 13  
EROSION CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. E&S BMPs
2. Site Stabilization
3. Compaction Testing

1.2 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T88 - Standard Specification for Particle Size Analysis of Soils.

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/ft<sup>3</sup> (600 kN-m/m<sup>3- 3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- 4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).</sup>

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data: Product Data: Submit data for all physical BMPs proposed for the E&S plan.

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

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

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

### 1.5 QUALITY ASSURANCE

- A. Perform work in accordance to the approved Erosion and Sedimentation Control Plan.

### 1.6 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Pumped water filter bag.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: 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 are correct.
- D. Furnish, install, and maintain structural and non-structural Best Management Practices in accordance with the approved Erosion and Sedimentation Control plan.

### 3.2 PUMPED WATER FILTER BAG

- A. Filter bags may be used to filter water pumped from disturbed areas.
- B. Pump rates will vary depending on the size of the filter bag, and the type and amount of sediment discharged to the bag.
- C. Filter bags should be installed according to the pumped water filter bag detail.
- D. Filter bags shall be made from non-woven geotextile material sewn with high strength, double stitched "J" type seams. They shall be capable of trapping particles larger than 150 microns.
- E. A suitable means of accessing the bag with machinery required for disposal purposes must be provided. Filter bags shall be replaced when they become one-half (1/2) full. Spare bags shall be kept available for replacement of those that have failed or are filled.

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- F. Bags shall be located in well-vegetated (grassy) areas and discharge onto stable, erosion resistant areas. Where this is not possible, refer to pumped water filter bag straw filter description and detail.
- G. Bags shall not be placed on slopes greater than five percent (5%).
- H. The pump discharge hose shall be inserted into the bags in the manner specified by the manufacturer and securely clamped.
- I. The pumping rate shall be no greater than 750 gpm or one-half (1/2) the maximum specified by the manufacturer, whichever is less. Pump intakes should be floating and screened.
- J. Filter bags should be inspected daily. If any problem is detected, pumping shall cease immediately and not resume until the problem is corrected.

### 3.3 STREET SWEEPING

- A. The Contractor shall be responsible for monitoring the cleanliness of the streets due to fines being tracked onto the private roads and public rights of way by construction vehicles during earth moving activities and other work.
- B. The Contractor shall be responsible for sweeping the roadways on a daily basis or on an as required basis. The roadways will be inspected several times a day during the construction phase.
- C. Soils cleaned from the roadway surface shall be deposited in an Owner approved location.

### 3.4 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.
- 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 8 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 Section 32 92 19 at 100 percent of permanent application rate with no topsoil.
  - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 permanent seeding specifications.
- E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

### 3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: 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 D698, 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: 1 test per lift per 500 feet (or fraction thereof) in open areas and 1 test per lift per 100 feet (or fraction thereof) in paved/gravel areas.

### 3.6 CLEANING

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. When sediment accumulation in sedimentation structures has reached a point one-half 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.

### 3.7 PROTECTION

- A. Section 01 70 00 - Execution and Closeout Requirements.

END OF SECTION

SECTION 32 01 16

ASPHALT PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Placing of asphaltic concrete.
2. Subbase aggregate placement and compaction.

1.2 REFERENCES

A. ASTM International:

1. ASTM D242 - Standard Specification for Mineral Filler For Bituminous Paving Mixtures.
2. ASTM D692 - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
3. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
4. ASTM D977 - Standard Specification for Emulsified Asphalt.
5. ASTM D1073 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
6. ASTM D1188 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
7. ASTM D2726 - Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
8. ASTM D2950 - Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
9. ASTM D3381 - Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
10. ASTM D3515 - Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
11. ASTM D3549 - Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
12. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

B. Pennsylvania Department of Transportation (PADOT)

1. Publication 408
  - a. Section 309 – Superpave Asphalt Mixture Design – HMA Base Course – Job Mix Formula PG 64-22
  - b. Section 409 – Superpave Asphalt Mixture Design – HMA Wearing Course – Job Mix Formula PG 64-22
  - c. Section 491 – Milling of Asphalt Pavement Surface
  - d. Section 703 – Aggregate

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1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on asphalt mix, tack agent, and seal coat.
- C. Mix Design: Submit mix designs proposed.
- D. Equipment: Submit list of equipment intended for use on the Work.
- E. Procedures: Submit schedule of intended removal, placing, and rolling procedures.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with PADOT's standards.
- B. Obtain materials from same source throughout.

1.5 QUALIFICATIONS

- A. Paving: Company specializing in performing the Work of this section with minimum 5 years documented experience.

1.6 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing Work of this section.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not perform Work when weather conditions will not permit successful completion of the Work.
- B. When ambient air temperature is below 50 degrees F, obtain Engineer's approval prior to proceeding with the Work.
- C. Do not place asphalt when the surfaces are wet, have frost, or are frozen.
- D. Place asphalt mixture when temperature is not more than 15 degrees F less than initial mixing temperature.
- E. The Contractor shall terminate permanent paving activities between October 15<sup>th</sup> and April 1<sup>st</sup> unless otherwise permitted by PADOT and/or the Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Virgin Mix Materials: Furnish in accordance with PADOT's standards.



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B. Asphalt Cement: PG 64-22 Superpave Asphalt Cement conforming to PADOT Bulletin 25.

C. Temporary Paving: 2" temporary hot mix, no cold mix). Type 2-P Bituminous Stockpile Patching materials conforming to PADOT Bulletin 27, Latest Revision.

D. Primer: AC-20 Asphalt Cement.

E. Tack Coat: Class E-1 emulsified asphalt conforming to PADOT Publication 408.

F. Sealant: ASTM D6690, Type III; hot applied type.

## 2.2 EQUIPMENT

A. Milling Unit: Type for intended purpose as follows:

1. Self-propelled; wheel base sufficient to maximize leveling action.
2. Capable of loosening pavement material to 2 inch depth.

B. Compactor: Pneumatic tired roller for initial compaction; steel wheeled rollers required for additional compaction and smoothness. Oscillating screeds or tampers are not acceptable.

C. Curb: Utilize an acceptable, self-propelled, extruding curb paver.

## PART 3 EXECUTION

### 3.1 PREPARATION

A. Mechanically sweep pavement surfaces immediately prior to commencement of Work. Clean pavement surfaces of loose foreign matter. Verify surfaces are dry.

B. Protect existing improvements, overhanging trees, and plant life from heat damage by individual shielding.

C. Remove and store manhole covers, manhole frames, catch basin covers, and catch basin frames.

D. Verify that compacted aggregate base is dry and ready for paving.

E. Verify that the gradients and elevations are correct.

F. Proof roll subbase in minimum two perpendicular passes to identify soft spots. Remove soft subbase and replace with compacted aggregate.

G. Aggregate Subbase: Install as specified in accordance with PADOT's standards or Section 32 11 23.

H. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.

I. Repair surface defects in existing paving to provide uniform surface to receive new paving.

### 3.2 REMOVAL

- A. Do not disfigure adjacent Work.
- B. Execute removal to specified depth at each point across full width of surface without detrimental aggregate degradation.
- C. Cut paving with a walk behind pavement saw. Ensure that the saw lines are neat and equidistant from the centerline of the trench.
- D. Remove paving to a width equal to the specified maximum trench width which is defined as 1 foot on each side of the trench as excavated. Contractor shall not be reimbursed for any paving outside of the defined limits, and such paving may be incidental to restoration.
- E. Remove temporary paving prior to the placement of the permanent paving at no additional cost to the Owner.
- F. Street markings shall be inlaid plastic pavement markings that conform to PADOT Publication 408. Stop bars, crosswalks, arrows and legends shall be 3M 420 Series tape. Long lines and stop lines shall be 3M 380 Series tape. The tape shall be applied while the new paving is cooling and then rolled into the surface during the final rolling procedure. Alternate tapes, including reflective marking paint, may be acceptable if approved by the Engineer.

### 3.3 PLACING

- A. Apply tack coat in accordance with PADOT Publication 408. Tack coat shall be applied to existing bituminous surfaces, curbs, and gutters. Do not apply the tack coat after sunset or to wet surfaces.
- B. Apply tack coat on asphalt and concrete surfaces over subgrade surface at uniform rate.
  - 1. New Surfaces: 1/3 gal/sq yd.
  - 2. Existing Surfaces: 1/3 gal/sq yd.
- C. Coat surfaces of manholes, utility boxes, catch basin frames, etc. with oil to prevent these surfaces from bonding with the asphalt pavement. Do not tack coat these surfaces.
- D. Discharge paving material by heated vibratory precompactor.
- E. Spread material in windrow for profiling and precompaction.
- F. Compact by heated vibratory screed to uniform cross sectional thickness. For areas that are inaccessible to rolling equipment, hand compact.
- G. Place mixed material to thicknesses indicated on the detail sheets.
- H. Place the wearing course within 48 hours of placing and compacting the base course.
- I. Ensure that manhole frames, utility boxes, catch basins, etc. are in the correct position and at the proper elevation prior to paving. Do not pave over these structures.

### 3.4 ROLLING AND COMPACTING

- A. Roll and compact pavement materials to elevations existing before commencing the Work or as indicated.
- B. Complete compaction process within 5 minutes of placement.
- C. Compact pavement by rolling. Do not displace or extrude pavement from position.
- D. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- E. Reinstall manhole covers, manhole frames, catch basin covers, and catch basin frames.
- F. Seal all pavement joints.
- G. Road markings shall match the pre-existing markings.

### 3.5 TEMPORARY AND PERMANENT PAVING

- A. All roads shall have temporary paving installed where the original paving has been removed. The temporary paving shall be installed at a depth of 2" inches after compaction. The top surface of the temporary paving shall be flush with the adjacent pavement.
- B. If approved by the Engineer, municipal and private roads may have 2A base material used as a temporary surface for up to 30 days. Maintenance of the trench to prevent rutting, potholes and other undesirable driving conditions shall be the responsibility of the Contractor. At the expiration of 30 days, the trench shall be restored using a temporary pavement mix.

### 3.6 TOLERANCES

- A. Flatness: Maximum variation of one quarter of an inch measured with a 10 foot straightedge.
- B. Compacted Thickness: Within ¼-inch of specified thickness.
- C. Variation from True Elevation: Within ½-inch.
- D. Final paving shall be properly sloped and drain freely. Low spots, puddles, and non-movement of water shall be rectified at the Contractor's expense.
- E. Deviation from the paving tolerances indicated shall be corrected by the paving contractor at his own expense.

### 3.7 FIELD QUALITY CONTROL

- A. Take samples and perform tests, including mat density tests in accordance with PADOT's standards.
- B. Asphalt Paving Mix Temperature: Measure temperature at time of placement.

C. Asphalt Paving Thickness: ASTM D3549; test one core sample from every 1000 square yards compacted paving.

D. Engineer shall determine which asphalt paving density test or tests shall be used, which may include ASTM D1188/ASTM D2726 (core sample testing) or ASTM D2950 (nuclear method testing) by testing one location for every 1000 square yards compacted paving.

### 3.8 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting finished work.

B. Do not permit traffic over surface for 2 hours.

C. Immediately after placement, protect paving from mechanical injury for 4 hours or until surface temperature is less than 140 degrees F.

D. Protect all existing and new paving surfaces outside of the trench excavation limits. If paving is damaged, the Contractor shall repair the damage at no additional cost to the Owner. If the magnitude and/or extent of the damage are excessive, the Contractor may be responsible for overlaying the street or road at his expense.

E. The Contractor is responsible for using all means to protect and maintain all paving surfaces before, during and after the Work activities.

END OF SECTION

SECTION 32 11 23

AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Aggregate subbase.

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 D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 2. ASTM D2940 - Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports.
  - 3. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Samples: Submit, in air-tight containers, 10 lb sample of each type of aggregate fill to testing laboratory.
- C. Materials Source: Submit name of aggregate materials suppliers.
- D. Manufacturer's Certificate: Bulletin 14 certification.

1.4 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.
- B. Perform Work in accordance with PADOT Publication 408.

PART 2 PRODUCTS

2.1 AGGREGATE MATERIALS

- A. Use aggregate as noted on the Details and Drawings.

- B. Pavement subbase material shall be PADOT 2A.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: 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 10 ton (minimum) compactor in minimum two perpendicular passes to identify soft spots. Weight of compactor or type of machine may be modified with Engineer's approval.
  - 2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.
- C. Verify substrate has been inspected, gradients and elevations are correct.

#### 3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

#### 3.3 AGGREGATE PLACEMENT

- A. Place aggregate over prepared substrate in equal thickness layers to total compacted thickness indicated on Drawings.
  - 1. Maximum Layer Compacted Thickness: 6 inches.
  - 2. Minimum Layer Compacted Thickness: 3 inches.
- B. Level and contour surfaces to elevations, profiles, and gradients indicated.
- C. Maintain optimum moisture content of fill materials to attain specified compaction density.
- D. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

#### 3.4 TOLERANCES

- A. Section 01 40 00 - Quality Requirements: Tolerances.
- B. Maximum Variation From Flat Surface: 1/4 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 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Compaction testing will be performed in accordance with ASTM D698, ASTM D2922, and ASTM D3017.
- C. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- D. Frequency of Tests: One test for every 100 square yards of each layer compacted aggregate.

3.6 COMPACTION

- A. Compact materials to 100 percent of maximum density as indicated by the standard Proctor (ASTM 698).

END OF SECTION

SECTION 33 01 32

SEWER AND MANHOLE TESTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Testing Manholes:
    - a. Vacuum Test
    - b. Air Test.
    - c. Exfiltration Test.
  - 2. Testing Gravity Sewer Piping:
    - a. Low-pressure Air Test.
    - b. Infiltration Test.

1.2 REFERENCES

- 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 D2122 - Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit the following 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 gauge calibration.
  - 6. Deflection mandrel drawings and calculations.
- C. Test Reports: Indicate results of manhole and piping tests.

PART 2 PRODUCTS

2.1 VACUUM TESTING EQUIPMENT

- A. Vacuum pump.
- B. Vacuum line.



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- C. Vacuum tester base with compression band seal and outlet port.
- D. Shut-off valve.
- E. Stop watch.
- F. Plugs.
- G. Vacuum gauge, calibrated to 0.1 inch Hg.

2.2 AIR TEST EQUIPMENT

- A. Air compressor.
- B. Air supply line.
- C. Shut-off valves.
- D. Pressure regulator.
- E. Pressure relief valve.
- F. Stop watch.
- G. Plugs.
- H. Pressure gauge, calibrated to 0.1 psi.

2.3 INFILTRATION TEST EQUIPMENT

- A. Weirs.

2.4 HYDROSTATIC TEST EQUIPMENT

- A. Hydro pump.
- B. Pressure hose.
- C. Water meter.
- D. Test connections.
- E. Pressure relief valve.
- F. Pressure gauge, calibrated to 0.1 psi.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify manholes and piping are ready for testing.
- C. Verify trenches are backfilled.
- D. Verify pressure piping concrete reaction support blocking or mechanical restraint system is installed.

#### 3.2 PIPING PREPARATION

- A. 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; observe light at other end; reject pipe not installed with uniform line and grade; remove and reinstall rejected pipe sections; re-clean and lamp until pipe section achieves uniform line and grade.
- B. Plug outlets, wye-branches and laterals; brace plugs to resist test pressures.

#### 3.3 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Testing Gravity Sewer Piping:
  - 1. Low-pressure Air Test:
    - a. Test each section of gravity sewer piping between manholes, including laterals.
    - b. Introduce air pressure slowly to approximately 4 psig.
      - 1) Determine ground water elevation above spring line of pipe for every foot of ground water above spring line of pipe, increase starting air test pressure by 0.43 psig; do not increase pressure above 10 psig.
    - c. Allow pressure to stabilize for at least five minutes. Adjust pressure to 3.5 psig or increased test pressure as determined above when ground water is present. Start test.
    - d. Test:
      - 1) Determine test duration for sewer section with single pipe size from the following table. Do not make allowance for laterals.

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Nominal Pipe Size, inches	Minimum Test Time, min/ 100 feet
3	0.2
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8
33	5.4
36	6.0

- 2) Record drop in pressure during test period; when air pressure has dropped more than 1.0 psig during test period, piping has failed; when 1.0 psig air pressure drop has not occurred during test period, discontinue test and piping is accepted.
  - 3) When piping fails, determine source of air leakage, make corrections and retest; test section in incremental stages until leaks are isolated; after leaks are repaired, retest entire section between manholes.
2. Infiltration Test:
- a. Use only when gravity piping is submerged in ground water minimum of 4 feet above crown of pipe for entire length being tested.
  - b. Maximum Allowable Infiltration: 100 gallons per inch of pipe diameter for each mile per day for section under test, include allowances for leakage from manholes. Perform test with minimum positive head of 2 feet.
3. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.
- C. Testing Manholes:
1. General: Test using air whenever possible prior to backfilling to assist in locating leaks. Make joint repairs on both outside and inside of joint to ensure permanent seal. Test manholes with manhole frame set in place.
  2. Vacuum test in accordance with ASTM C1244 and as follows:
    - a. Plug pipe openings; securely brace plugs and pipe.
    - b. Inflate compression band to effect seal between vacuum base and structure; connect vacuum pump to outlet port with valve open; draw vacuum to 10 inches of Hg; close valve; start test.
    - c. Test:

- 1) Determine test duration for manhole from the following table:

<b>Manhole Diameter</b>	<b>Test Period</b>
4 feet	60 seconds
5 feet	75 seconds
6 feet	90 seconds

- 2) Record vacuum drop during test period; when vacuum drop is greater than 1 inch of Hg during test period, repair and retest manhole; when vacuum drop of 1 inch of Hg does not occur during test period, discontinue test and accept manhole.
  - 3) When vacuum test fails to meet 1 inch Hg drop in specified time after repair, repair and retest manhole.
3. When unsatisfactory test results are achieved, repair manhole and retest until result meets criteria; repair visible leaks regardless of quantity of leakage.

END OF SECTION

SECTION 33 01 33

TV INSPECTION OF SEWER PIPELINES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Pipeline flushing and cleaning.
  - 2. TV inspection of sewer pipelines.
  - 3. Audio-video taping of pipeline interior.

1.2 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Submit completed DVDs, identified by number, project name, street name, right-of-way property name, and manhole numbers.
- C. DVDs become property of the Owner.
- D. Submit cleaning and television inspection logs for each section of sewer line to be rehabilitated and three copies of color DVDs for work performed. Include the following as minimum information: stationing and location of lateral services, wyes or tees, clock references, pipe joints, infiltration/inflow defects, cracks, leaks, offset joints, and other information required to assess condition of sewer.
- E. Submit a written report summarizing the television inspection. Report shall note the following:
  - 1. Date
  - 2. Time
  - 3. Weather
  - 4. Upstream and downstream manholes
  - 5. Pipe material
  - 6. Surface material
  - 7. Pipe length
  - 8. Notes on laterals, manholes, roots, grease, cracks, leaks, and/or other observations affecting the structure or conveyance of the pipe, with all noted offsets.
- F. Submit a specific detailed description of proposed bypass pumping system to include written description of plan and addressing quantity, capacity, and location of pumping equipment. Submit spill plan to address any spills that might occur.

1.3 QUALITY ASSURANCE

- A. Perform Work in accordance with PennDOT safety standards.

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- B. Use cameras with video output capable of producing minimum of 600 lines of horizontal resolution at center; optimum imagery with minimum illumination; and meet requirements of EIA Standard Video Signal.

1.4 QUALIFICATIONS

- A. Applicator: Company specializing in performing work of this section with minimum 10 years documented experience.

1.5 SCHEDULING

- A. Schedule work to coincide with pre-construction activities and post CIPP lining.

1.6 COORDINATION

- A. Coordinate work with Owner.

PART 2 PRODUCTS

2.1 Copies of Inspection

- A. Provide video inspection in digital format
- B. Audio track containing simultaneously recorded narrative commentary and evaluations of electrographer describing in detail condition of pipeline interior.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify location of sewer pipelines to be inspected.

3.2 PREPARATION

- A. Flush and clean pipeline interiors to remove sludge, dirt, sand, stone, grease, and other materials from pipe to ensure clear view of interior conditions.
- B. Intercept flushed debris at next downstream manhole by use of weir or screening device, remove, and dispose of debris off site.
- C. Furnish materials, labor, equipment, power, maintenance, to implement a temporary bypass pumping system around work area for time required to complete TV inspection.

3.3 APPLICATION

- A. Closed-circuit TV Camera System:

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1. Utilize cameras specifically designed and constructed for closed-circuit sewer line inspection. Utilize camera equipment with pan and tilt capability to view each lateral connection at multiple angles.
2. Utilize camera capable of moving both upstream and downstream; minimum 1,000 feet horizontal distance with one setup; direct reading cable position meter.

3.4 FIELD QUALITY CONTROL

A. Pipeline Inspection:

1. Audio-video tape sections of sewer pipeline between manholes designated.
2. Identify and record locations of flat grades, dips, deflected joints, open joints, broken pipe, protrusions into pipeline, and points of infiltration.
3. Locate and record service connections.
4. Record locations of pipeline defects and connection horizontal distance, in feet, and direction from manholes.
5. Video with pipe section plugged as to view 100 percent of inside pipe diameter, use flow control methods as specified for bypass pumping system, to eliminate surcharging and reduce flow.

END OF SECTION

**SECTION 33 01 36**

**CURED-IN-PLACE-PIPE (CIPP)**

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quality Controls
2. Felt / Hot Water Cure CIPP
3. Fiberglass / UV Cure CIPP

1.2 REFERENCES

A. Comply with applicable provisions and recommendations of the following:

1. ASTM C581 - Standard Practice for Determining Chemical Resistance of thermosetting resins used in glass fiber reinforced structures, intended for liquid service.
2. ASTM D543 – Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
3. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
4. ISO 178 – Determination of Flexural Properties.
5. ASTM D2990 – Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
6. DIN 761 – Glass Reinforced Thermosetting Plastics (GRP) pipes.
7. ASTM D3567 – Standard Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings.
8. DIN EN 13566-4 – Plastics piping systems for renovation of underground non-pressure drainage and sewerage networks.
9. ASTM F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
10. ASTM F2019 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP).
11. ASTM F1743-96 - Rehabilitation of existing pipelines and conduits by pulled-in-place installation of cured-in-place thermo-setting resin pipe (CIPP).
12. Water tightness standard for cured-in-place thermo-setting resin pipe/Porosity Test protocol.



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1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Resins, tube, curing application, and product approval certifications.
- C. Contractor shall provide the following information on product data:
  - 1. Thickness of each segment of pipe lined. Attach ASTM 1216 wall thickness formula calculations.
  - 2. Type of resin to be used.
  - 3. Attach 3rd party test results for chemical corrosion resistance testing.
  - 4. Attach statement that resin is approved to be used in the proposed CIPP system.
  - 5. Initial (laminate design) modulus of elasticity used on this project (250,000 psi minimum). Attach 3rd party test results conducted in the last three (3) years
  - 6. Initial (laminate design) flexural strength used on this project (4,500 psi minimum). Attach 3rd party test results conducted in the last three (3) years.
  - 7. Long-Term Reduction Factor. Attach 3rd party test results conducted in the last three (3) years.
  - 8. Type of Inner liner and Outer liner to be used. Attach manufacturer's or 3rd party certification for both the inner and outer liners stating styrene gas barrier status.
  - 9. Certificate of "direct sizing" – for fiberglass products only.
  - 10. 3rd party test results stating the strength of the seam – for felt products only.
  - 11. Boiler Truck Operator Certification (OSHA) – for thermal cure products only.
- D. Video Tapes: Submit or make available video tape recordings of sewer mains after cleaning (prior to lining) and after relining work is complete and lateral connections have been reestablished. See section 33 01 33.
- E. Completion and submission of post construction CCTV video is mandatory for all CIPP lined pipe sections.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with PADOT's standards.
- B. "Fold-n-Form" or other similar products/technologies are not acceptable.
- C. The Contractor may use a steam cure or a hot water cure. The Engineer will evaluate this technique, process, and products and determine if it is acceptable.

1.5 DESIGN REQUIREMENTS

- A. Design lining material to have sufficient structural strength to support dead loads, live loads and groundwater load imposed assuming existing pipe cannot share loading or contribute to structural integrity of the liner.

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- B. Design shall assume that the host pipe is fully deteriorated and submerged.
- C. Design liner to the least possible thickness to minimize decreasing the inside pipe diameter.
- D. Design liner material to provide jointless and continuous structurally sound construction able to withstand imposed static, dynamic and hydrostatic loads on a long-term basis.
- E. Identify design provisions for shrinkage control to prevent future misalignment of service reconnections.

## 1.6 QUALIFICATIONS

- A. The Contractor shall have successfully managed and completed CIPP rehabilitation projects on lines ranging in size from the smallest line on the project to the largest line on the project within the last three years previous to bid date and installed 15,000 linear feet of shop wet-out liner installation.
- B. Because of the uniqueness of individual systems, installers, and products, the Owner reserves the sole right to determine approval/disapproval of a system or product for any/all reasons.

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

## 1.8 COORDINATION

- A. Coordinate Work with the users connected to the system.
- B. Notify connected properties at least 48 hours in advance of both cleaning and lining work. Notification shall be made in writing. Provide property owner written notice as to what measures should be taken prior to using high pressure equipment for cleaning or installation.
- C. Minimize disruption of sewer service to individual properties for a maximum of eight (8) hours. If sewer service cannot be restored within an 8 hour period, Contractor shall be fully responsible for providing alternate means of sewer service, which may even involve the Contractor paying for meals and lodging for the affected properties.

## PART 2 PRODUCTS

### 2.1 RESINS

- A. Resin Definitions and Physical Characteristics
  - 1. The liquid thermosetting resin used in this rehabilitation project shall produce a properly cured tube which will be resistant to abrasion caused by solids, grit, and/or sand.

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2. The cured-in-place pipe system shall utilize thermosetting resins which will withstand the corrosive effect of the existing residential, commercial, and industrial effluents, liquids and/or gases.

B. Acceptable Corrosion Resistant Resin Types

1. Polyester npg
2. Orthothalic
3. Vinylester

C. Resin System

1. The resin system shall be manufactured by an approved company.
2. Documentation of approved status is a pre-contract requirement.
3. The chemical corrosion resistance of the actual resin system used by the Contractor shall be tested by the resin manufacturer in accordance with ASTM F1216, D-543 or C-581 as applicable.
4. Exposure to the chemical solutions listed below shall result in a loss of not more than twenty percent (20%) of the initial physical properties when tested in accordance with ASTM C-581-87.

Chemical Solution	Concentration (%)
Tap Water (pH 6-9)	100
Nitric Acid	5
Phosphoric Acid	10
Sulfuric Acid	10
Gasoline	100
Vegetable Oil	100
Detergent	0.1
Soap	0.1

2.2 TUBE

- A. Acceptable materials consist of fiberglass cured or a wet out resin impregnated tube.

B. Tube Definitions and Physical Characteristics

1. The cured tube shall also be resistant to corrosion due to acids and gases such as sulfuric acid, carbonic acid, hydrogen sulfide, methane, and carbon monoxide.

C. Tube Characteristics and Standards

1. At the time of manufacture, each lot of glass fiber or felt tube liner shall be inspected for defects and tested in accordance with applicable ASTM standards. At the time of delivery, the liner shall be homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters, and deleterious faults.
2. For testing purposes, a production lot shall consist of all liner having the same marking number. It shall include any and all items produced during any given work shift and must be so identified as opposed to previous or ensuing production.

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3. The Engineer may at any time direct the manufacturer to obtain compound samples and prepare test specimens in accordance with applicable ASTM standards.
4. An "inner liner" and "outer liner" film must be used for resin control (to prevent resin migration and contamination). The "inner film" and "outer film" must both be certified styrene gas barriers. The "inner liner" film must be removed during the installation process unless it is a permanent part of the system and is made an integral part of the carrier tube by bonding or fusing to the carrier tube.
5. The material shall be manufactured in such a manner as to result in a tight-fitting, continuous liner after installation. There shall be no measurable annular space. The liner shall have a snug fit at manhole terminations as shall be evidenced by flares.

### 2.3 FELT TUBE – HOT WATER CURING APPLICATION

- A. The tube shall consist of one or more layers of absorbent felt fabric and meet the requirements of ASTM F1216 or ASTM F1743, Section 5.
- B. For work performed under this specification, the following felt-based carrier tube materials may be used: Non-woven polyester felt and Non-woven fiberglass filament reinforced polyester felt.
- C. The tube shall be constructed to withstand installation pressures and have sufficient strength to bridge missing pipe while meeting or exceeding the design wall thickness at all pipe locations during installation conditions and pressures.
- D. The tube shall be sized such that when installed, it will tightly fit the internal circumference and length of the original pipe. Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be utilized.
- E. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured liner (CIPP). No dry or unsaturated layers shall be evident.
- F. The wall color of the interior pipe surface of CIPP after installation shall be light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
- G. Seams in the felt tube shall be allowed, because non-seamed felt tubes are not currently available, but the seams must be stronger than the non-seamed felt. Third-party test data documenting the strength of the seam is required.
- H. The manufacturer will test the raw materials and liner materials at various stages of manufacturing on every liner, including taking samples of every finished liner and conducting tests for modulus, tensile, wall thickness and porosity.

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- I. The outside of the tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 feet. Such markings shall include the manufacturer’s name or identifying symbol.

2.4 DESIGN CHARACTERISTICS

- A. The newly installed liner shall be **designed for a minimum fifty-year service life** under continuous loading conditions.
- B. The design shall assume no bonding to the original pipe wall. The liner shall be designed to withstand all imposed loads. **Assume total host pipe deterioration.**
- C. Wall thickness design calculations for each pipe to be rehabilitated via the CIPP method must be submitted with all qualified bids, along with supporting formulas that document that version of formula used.
- D. Additionally, product-specific strength values, including the short term flexural modulus and the long term flexural modulus reduction factor, must be substantiated by third-party testing which will be submitted with all qualified bids. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus and long term reduction factor used in Design.

<b>Parameter</b>	<b>C.I.P.P. System</b>
1. Pipe Condition	Fully deteriorated
2. Soil Type	Saturated/unsaturated
3. Design Thickness	Fiberglass: ASTM 1216 Design Formula, rounded up to nearest 0.7 mm manufacturing increment Felt: ASTM 1216 Design Formula plus 10% (in consideration of product stretch), rounded up to nearest 1.5 mm manufacturing increment
4. Ovality of Pipe	2% of circumference, unless measured and stated otherwise by Engineer in writing
5. Soil Load	120 lbs./ft <sup>3</sup>
6. Traffic Loads	Per AASHTO-HS-20-44 Highway Loading
7. Modulus of Soil	1000 psi
8. Maximum Deflection	5%
9. Minimum Safety Factor	2.0
10. Resin Migration	Not Allowed
11. Soil Cover	Maximum distance in feet measured between the crown of the pipe and the highest point of soil cover over the length of the pipe
12. Water Cover	Same as soil cover unless stated otherwise by the Engineer, in writing, for specific lines

## 2.5 PHYSICAL PROPERTIES

- A. The cured pipe shall conform to the minimum structural standards, as follows:
  - 1. Tensile Stress: ASTM D-638 3,000 psi
  - 2. Flexural Stress: ASTM D-790 4,500 psi
  - 3. Modulus of Elasticity: ASTM D-790 250,000 psi
  - 4. Porosity/Water Tightness Test: Tight
- B. Liner Thickness
  - 1. To be determined by manufacturer and approved by the Owner for total host pipe deteriorated conditions.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify connection size, location, and invert elevations are in accordance with Drawings.
- C. Inspect each lot of liner for defects and test in accordance with Manufacturer's recommendations, as approved by the Engineer. Verify that the liner is homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters, or deleterious faults.

### 3.2 GENERAL CONDITIONS

- A. This method includes cleaning and video-inspection of the designated line, identification of existing live taps, removing of protruding taps by remote methods, performing point repairs, installation of a resin-impregnated tube into the existing pipe, followed by steam or hot water curing as specified by the resin manufacturer, reopening service taps into the line, sampling and testing, and clean-up. Before final acceptance of each line segment, a post-rehabilitation video inspection and sample testing must be conducted and approved. Rehabilitation must be completed for the full length from manhole to manhole, resulting in a sound, tight-fitting water-tight liner with a smooth interior surface.
- B. Clean the existing sewer pipe of debris, sedimentation and mineral deposits with high velocity cleaner, bucket and scraper, root cutting devices, or rolling/ball units.
- C. The Contractor, or the sub-contractor, shall not change any material, design values or procedural matters stated or approved herein, without informing the Owner and receiving written approval of the change. Such changes constitute a breach of contract and shall result in rejection and removal of work done with the unapproved materials or processes at no cost to the Owner.

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- D. Removal and replacement of fences, damage repair to yards, lawns, sidewalks, driveways, and other public or private property, due to actions or processes related to the work being performed shall be included in the cost of the project.
- E. Traffic control, confined space entry, and work site protection shall be the responsibility of the Contractor and costs of these items are incidental to the project. The Contractor shall notify Police, Fire and Ambulance agencies in advance of any and all road closures. The Contractor shall comply with applicable OSHA trench safety rules.
- F. Containment of sewage and site cleanliness is the responsibility of the Contractor. Fines levied by State and Federal agencies in the event of a spill or unapproved discharge shall be paid by the Contractor. Spill cleanup as well as site cleanup shall be conducted by and paid for by the Contractor. All cleanup and costs are part of acceptance of the project, without which final payment will not be made.

### 3.3 PRE-INSTALLATION

- A. Installation of the impregnated liner may be by inversion or insertion as specified by the manufacturer. All equipment, labor, materials, and processes required to complete the work must be ready on-site before installation begins. The first segment shall be lined, completed and accepted to become the “job standard” against which all subsequent work is judged.
- B. Prior to installation, the diversion pumping system, including back-up pumps, shall be tested and running.
- C. Conduct closed circuit video inspection. Determine condition of existing piping, degree of offset of joints, crushed walls, and obstructions. Determine location and sizes of service connections. Clear obstructions and protrusions.
- D. Prior to installation of the liner, the following activities are required.
  - 1. Receipt and approval of pre-installation submittals.
  - 2. Verification of line condition and any obstructions by video inspection.
  - 3. Verification of existing taps in service by flowing water, dye test, or visually with a pan and tilt head camera or other means.
  - 4. Installation of new wye splices within pipe alignment.
  - 5. Cleaning of line (recorded on video tape).
  - 6. Construct and complete any and all point repairs deemed necessary. Contractor shall receive Owner approval before reworking the lines and the liner is installed.

### 3.4 SET-UP

- A. The installation area/equipment shall be securely protected and all damaged yards, driveways, walks, etc., shall be repaired at no cost to the Owner.
- B. Plastic sheeting will be used to cover the work area around the manholes and/or access points to eliminate the opportunity of environmental contamination to the above-ground setting during the installation process.

### 3.5 PRELINER / OUTER FILM / OUTER LINER

- A. At all locations where the CIPP liner is inverted or inserted into the host pipe, a preliner tube shall be used to control resin loss, liner thickness, a reduction in physical properties, contamination of the resin by water or other contaminants, and prevent blocked or plugged services and laterals.
- B. The preliner tube shall be reinforced plastic sheet formed into a tube sized to fit the host pipe being lined and shall be continuous from manhole to manhole.
- C. The preliner tube shall be made of a styrene barrier material which is approved by the Owner or Engineer.
- D. Installation of the preliner tube shall be witnessed by the Owner or Engineer.
- E. Failure to install the required preliner tube or installation of preliner tube over only part of the segment shall result in the completed C.I.P.P. for that segment being rejected (regardless of physical tests and thickness test results).
- F. During thickness testing, the preliner tube shall be removed from the thickness test core sample along with the inner liner film used. If there is any damage to the preliner tube, it should be repaired immediately with styrene-proof tape.

### 3.6 TUBE INSERTION / INVERSION FOR FELT / HOT WATER CURED PRODUCTS

- A. A slip sheet shall be installed on the bottom half of the pipe prior to liner insertion, for the purpose of smoothing out the bottom of the liner to increase flow characteristics.
- B. The preliner tube, or outer film, must be inserted into the pipe prior to inserting the liner.
- C. The wet out felt tube shall be inserted, or inverted, through an existing manhole or other approved access. Liner installation head pressures (minimum and maximum for hot and cold conditions) shall not be exceeded, regardless of which method of installation (stand pipe, pressure unit, etc.) is used.
- D. Using the "Inversion Procedure," the tube end shall initially be turned inside out and attached to a platform ring, standpipe, or as approved. The addition of water will be adjusted to sufficient height/pressure to cause the impregnated tube to invert from manhole to manhole, and hold the tube tight against the existing pipe wall.
- E. Using the "Insertion Procedure," the tube is winched into position according to manufacturer's recommendations. The addition of water will be adjusted to sufficient height/pressure to cause the calibration hose to invert from manhole to manhole and hold the tube tight against the existing pipe wall.
- F. Liner restraints should be used in manholes.
- G. After the installation of the liner is completed, the Contractor shall use a hot water system capable of providing the required amount of heat uniformly throughout the



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section for a complete cure of the resin. Boiler truck operators must be fully certified by an approved certifying agency approved by the Engineer. Certification documentation of at least two certified boiler-truck operators is a pre-contract requirement. Only fully-certified boiler-truck operators can operate boiler-trucks.

- H. If approved by Owner, all water obtained from a municipal fire hydrant shall be metered and paid for by the Contractor. An air gap shall be provided between pipes-hoses connected to a fire hydrant and a storage tank/equipment used by the Contractor. The cost of said water shall be included in the cost of the project.
- I. The curing temperature and schedules shall be as recommended by the resin/catalyst system manufacturer. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing heat supply. Additionally, the Contractor is required to utilize a remote temperature sensing method to ensure adequate curing for every foot of the liner in the pipe, considering the possibility of heat sinks. Temperatures monitored at the manholes do not guarantee an adequate representation of the temperature for every foot of liner. Temperatures from each remote sensing device shall be recorded by a strip-chart recorder on a continuous tape. Graphs of the tape shall reflect readings from start of cure to completion of cure/draining of line. Tapes for each segment shall be submitted upon completion of each section. Initial cure may be considered completed when the remote sensing device (s) reflects the cure temperature, as recommended by the resin/catalyst system manufacturer, has been achieved. Curing temperatures and schedule shall comply with submitted data and shall include an adequate "cool down" as recommended by the resin manufacturer.
- J. Cool-Down - The Contractor shall cool the hardened pipe to a temperature below 100 degrees Fahrenheit, in accordance with the resin manufacturer's recommendation, before relieving the water column or pressure. Cool water may be added to a water column while maintaining circulation as water is drained from a small hole at the opposite end of the cured-in-place-pipe, so that a constant water column height is maintained until cool-down is completed. Care shall be taken in the release of the water column so that a vacuum will not develop that could damage the newly installed pipe. Coupon samples shall be obtained for testing.
- K. Since styrene is considered a volatile organic compound and a carcinogen, care must be taken to insure that styrene levels are below EPA standards for airborne, surface and water contamination. The EPA has set the maximum contaminant level at 0.1 ppm for drinking water and other water sources that impact drinking water. For sanitary sewer flow, styrene contamination must be kept below 2.1 ppm.
- L. Effluent from the curing process must be disposed of by the Contractor at the bid cost and be responsible for hauling and proper disposal.
- M. If EPA or wastewater treatment levels are exceeded on the surface of the liner for sanitary sewer pipes, the Contractor should flush the line until styrene levels in flush-water are brought within the appropriate standard. The responsibility for disposal of flush-water and contaminated water is the sole responsibility of the Contractor.

### 3.7 POST-INSTALLATION

- A. During the warranty period, which shall be defined as **twenty-four (24) calendar** months after acceptance by the Owner, any defects which will affect the integrity or strength of the liner pipe or hydraulic capacity shall be repaired at the Contractor's expense, in a manner mutually agreed to by the Owner and Contractor.
- B. Service Reconnection: After the cured-in-place process is completed, the Contractor shall reconnect the existing line service connections. These services shall be reconnected by internal remote controlled cutting method. External excavation is not permissible unless pre-authorized by the Engineer.
- C. Service taps or branches reconnected internally shall be fully reopened to at least 95% service line size (minimum) and trimmed to a neat, clean, circular opening concentric with the service line pipe, free of jagged edges, "sawteeth", resin plugs or resin shelves. This work may be performed by either the Contractor or an approved Sub-Contractor.
- D. Sealing at Manholes: The cured-in-place CIPP shall make a tight seal at the manhole opening with no annular gaps. Under all circumstances, the liner shall be sealed to the manhole and host pipe if no flair is present.
- E. Finished Pipe - The finished new cured-in-place liner shall be continuous over the entire length of each section lined, and be free from visual defects such as foreign inclusions, dry spots, pinholes, leaks and delamination.
- F. Hazardous Waste Disposal: After completing the lining process and re-establishing the service lateral connections, the sewer pipe shall be flushed and cleaned. All water or condensate needs to be disposed of in acceptance with all Federal, State and local regulations as approved by the Engineer or Owner.

### 3.8 REQUIREMENTS AND TESTING

- A. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occurs during testing of field samples, new samples will be cut from the work. Any reoccurrence may cause rejection of the Work.
- B. Testing of the completed, installed liner consists of:
  - 1. Field Testing
  - 2. Laboratory testing
  - 3. Long term testing
- C. The Contractor will pay for all initial testing described herein. Retests of failed samples shall be paid for by the Contractor.
- D. Regardless of the resin/carrier tube system used, the completed liner shall meet or exceed:
  - 1. the initial modulus of elasticity (ASTM D-790) (as stated in design calculations),

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2. initial flexural strength (ASTM D-790),
  3. APS Porosity Standard (tight or non-porous result), and
  4. wall thickness values stated on each liner design sheet.
- E. Values for the four parameters above which are under the minimum values stated on the Contract Documents are not acceptable. An under thickness liner may be brought into compliance at no additional cost to the Owner by (1) removal and replacement of the undersized liner, or (2) addition of a second liner with the full wall thickness as stated on the liner design submittal (and after acceptable preparation of the undersized liner interior). Option (2) will be considered by the Owner on a case by case basis considering the resulting loss of flow capacity, and can be refused by the Owner for that reason. The addition of a thin liner that makes up the amount of undersizing is not an acceptable remedy because the structural properties of CIPP liners are not additive if they are not cured simultaneously and therefore are bonded together to act as a single liner.
- F. In the event of a liner failure of either/both the flexural strength and the modulus tests, another flat plate sample shall be tested. Should the second sample fail, the liner shall be brought into satisfactory compliance by the above methods.

### 3.9 SAMPLE REQUIREMENTS

- A. The following sample shall be taken for each section of sewer lined.
1. 1 core of 12" diameter minimum taken from the inside of the pipe or an 18" full hoop sample as a restrained sample in the manhole equal to the exact ID of the lined pipe (field test).

### 3.10 FIELD TEST (THICKNESS)

- A. Remove the C.I.P.P. liner material from the host pipe core samples. Remove any inner liner film, preliner and resin that is not contained within the felt tube. Measure the liner thickness at three spots on each sample. The resulting six measurements will be averaged.
- B. The average thickness shall be equal to or greater than the required thickness for the particular section stated in the Contract Documents.
- C. No undersize allowance is permitted. In accordance with D 790-03, referenced in ASTM 1216, the calculated wall thickness refers only to the part of the liner that consists of a saturated felt tube. Elements that are not part of the saturated felt tube do not contribute to the structural integrity of the liner. Therefore, portions of the felt tube that are not fully saturated or portions of resin without the felt tube carrier shall be excluded.
- D. If the Contractor takes his sample from inside the line, he must repair the spot with a method approved by the Engineer.

### 3.11 "NO DIG" OPTION

- A. At Owner's option, in lieu of excavation for core samples, the liner shall be run through 18" long section of line-sized pipe, or an appropriate restraint, to act as a

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    mold for the liner and cured. One such sample shall be taken from liner at starting manhole and one at the ending manhole of the section being lined.

3.12 LABORATORY TESTING

- A. Samples obtained for these tests will be sent by the Contractor to an approved laboratory for testing. The Contractor will pay for testing.

END OF SECTION

**SECTION 33 01 37**  
**SEWER LINE CLEANING**

**PART 1: GENERAL**

**1.1 SECTION INCLUDES**

- A. Types of equipment to be used.
- B. Cleaning procedures.
- C. Disposal of debris.
- D. Acceptance of work.

**1.2 SUBMITTALS**

- A. Submit detailed work schedule, which sequences the order in which the sewer sections are to be cleaned.
- B. Submit in accordance with specifications Section 01300 - Submittals.

**1.3 REGULATORY REQUIREMENTS**

- A. Give adequate notification prior to commencement of work to proper authorities.

**1.4 PROJECT RECORD DOCUMENTS**

- A. Accurately log sewer lines completed through the duration of the work.

**1.5 SEQUENCING**

- A. Proceed with the cleaning of the system in the order specified in the Work Schedule.

**1.6 SCOPE**

- A. This specification shall govern all work, materials and equipment required to clean the sewer line.
- B. The contractor is responsible at his own expense to locate and expose any manholes not visible.

## **PART 2: PRODUCTS**

### **2.1 CLEANING EQUIPMENT**

- A. Collapsible Hydraulically Propelled Equipment: Movable dam type constructed so that a portion of dam may be collapsed at any time during cleaning to protect against flooding of sewer. Dam size to be equal in diameter to pipe being cleaned with a flexible scrapper around the outer periphery to remove grease.
- B. Noncollapsible Hydraulically Propelled Equipment: Sewer cleaning balls of a diameter equal to the internal diameter of the sewer.
- C. High-Velocity Jetting Equipment: Equipment with its own water tank, auxiliary engines, pumps, hydraulically driven hose reel and a minimum of two (2) nozzles each capable of producing scouring action from 15 to 45 degrees in all size lines designated for cleaning. Equipment to include a high velocity gun for washing and scouring manhole walls and floor, which is capable of producing flows from a fine spray to a solid stream.
- D. Equipment used should be capable of removing dirt, grease, rocks, sand and other materials and obstructions from the lines, manholes and catch basins. The equipment shall be selected by the Contractor to prevent damage to the pipe. Cleaning equipment capable of cleaning lengths with up to 1,000 feet shall be provided. Equipment must be able to clean this length with vehicular access to one structure only.
- E. Mechanically Powered Bucket Machine: Employed in pairs with sufficient power to perform work efficiently and not damage pipe. Machine to be either belt operated or have an overload device.
- F. Mechanically powered Rodding Machine: Sectional or continuous rod type capable of holding a minimum of 750 feet of rod. Rod to be composed of heat-treated steel. Machine to be fully enclosed with an automatic safety clutch or relief valve. Buckets, scrapers, scooters, porcupines, brushes and other mechanical equipment may also be utilized. All equipment and devices shall be operated by experienced personnel so that sewer lines are not damaged in the process of cleaning.

## **PART 3: EXECUTION**

### **3.1 EXAMINATION**

- A. Inspect sewer line section immediately prior to initiation of cleaning on that section.
- B. Notify all potentially impacted property owners and take all necessary precautions to avoid any personal and/or property damage. Any damage to personal, private and/or public property shall be rectified and the financial responsibility of the Contractor.

### **3.2 PREPARATION**

- A. Select cleaning equipment to be used based on the line conditions at the time of cleaning with acceptance by the Engineer.
- B. Set up cleaning equipment to be used in accordance with equipment manufacturer's instructions.

- C. If, in opinion of the Engineer, preparatory cleaning of sewer produces a satisfactorily clean sewer, the Contractor shall proceed with the internal color television inspection of the sewer.
- D. However, should the Engineer determine the preparatory cleaning of the sewer has failed to satisfactorily clean the sewer line section in question, the Engineer shall then direct the Contractor to remove any remaining debris via heavy cleaning. The Contractor shall then proceed with internal color television inspection of sewer.

### 3.3 PERFORMANCE OF WORK

- A. Light Cleaning: Where it has been determined through visual inspections that only small deposits of debris exist within the sewer line and cleaning would require not more than three (3) passes through the line with high-pressure water jetting equipment.
- B. Heavy Cleaning: Where it has been determined that large deposits of debris or root growth exist within the sewer lines and cleaning would require more than three (3) passes through the line with high pressure water jetting equipment, then heavy equipment will be used to facilitate the removal of such deposits. Bucket machines, scrapers, augers and 120 gpm and higher jetting equipment can be utilized in this heavy duty cleaning. Where bucket machines and buckets are to be used, caution should be taken that the proper sized flexible cable to be used so that breakage will not occur hanging the cleaning equipment up within the sewer lines.
- C. When necessary, Contractor shall remove protruding lateral connections via the use of internal cutting devices that are capable of providing a smooth lateral cut at its internal connection to the sewer. Prior to lining, laterals will have been replaced via open cut methods; therefore, there will not be any protruding laterals.
- D. Clean the entire section of sewer line from one (1) manhole unless specific site conditions warrant otherwise. Then reset cleaning equipment at opposite manhole and attempt to clean the entire sewer line run again. If cleaning of an entire sewer section cannot be successfully performed from one manhole, equipment shall be set up on the other manhole and cleaning again attempted. No additional payment allowance shall be made for reverse set-ups. If on reverse set-up successful cleaning also cannot be performed or equipment fails to traverse entire sewer section, it shall be assumed that a major blockage or defect exists and cleaning effort shall be abandoned. If successful cleaning cannot be performed throughout the entire run of sewer from one manhole, assume that a major blockage exists and immediately notify the Engineer.
- E. The Contractor shall determine the location of major blockages(s) by measuring length of hose or rod inserted from manholes at each end and immediately report location of blockage(s) to Engineer and Contractor shall note these conditions in its field log.
- F. Contractor shall recognize that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where damages could result if cleaning were attempted or continued. Engineer shall be immediately notified by Contractor of any and all conditions which, in the opinion of Contractor, warrant termination of cleaning activities. If Contractor's cleaning equipment becomes lodged in a sewer, it shall be removed by Contractor at his expense. This shall include excavation and repair of the sewer, underground utilities, backfilling, and surface restoration.

### **3.4 FIELD QUALITY CONTROL**

- A. Assure that water pressure from hydraulically propelled cleaning equipment does not damage pipe or cause flooding of public or private property.
- B. Assure that any equipment used to block or retard flow in the sewer does not cause flooding on public or private property.
- C. Do not obstruct the potential use of a fire hydrant by the Fire Department.
- D. Sewer relining contractor is to provide written certification that the cleaning of the line is satisfactory to begin his work.

### **3.5 DISPOSAL OF DEBRIS**

- A. All dirt, debris, roots, and other material removed from the sewer shall be hauled away by the Contractor to an approved dumpsite at the expense of the Contractor. All regulations by the state and environmental regulating agencies shall be followed.
- B. Remove all material at the downstream manhole of the section being cleaned. Material is not allowed to be passed from manhole to manhole in the cleaning operation. Remove all debris collected at the end of each workday.
- C. All sludge, dirt, sand, rocks, grease, roots, and other solid or semi solid material resulting from the cleaning operation shall be removed at the downstream structure of the section being cleaned.

### **3.6 ACCEPTANCE OF WORK**

- A. Acceptance of system cleaning to be to the satisfaction of Engineer.
- B. Re-clean any line indicated to be unsatisfactory.

**END OF SECTION**



**SECTION 33 01 38**  
**TEMPORARY SEWER BYPASS SYSTEMS**

**PART 1 SUMMARY**

**1.1 SECTIONS INCLUDES**

- A. Design, submittals, labor, equipment and material for installation, operation, and restoration of temporary bypass facilities.
- B. Requirement for Contractor to use temporary pumping when required to maintain existing sewer service.
- C. Flow handling may consist of pumping systems and other temporary systems, such as temporary internal diversion pipes bulkheaded and braced between the inlet and outlet points of structures or manholes, diversions by piping or sand bags, gravity diversions, or other proposed methods by the Contractor and approved by the Engineer.

**1.2 SUBMITTALS**

- A. Prior to installation of any bypass equipment, Contractor shall submit to the Engineer the following:
  - 1. Locations of staging areas for pumps and generators.
  - 2. Sewer plugging method and types of plugs.
  - 3. Location, size, material, method of installation, and number of installations of pumping suction piping.
  - 4. Location, size, material, method of installation, and number of installations of pumping discharge piping. Describe how piping lines will be protected.
  - 5. Bypass pump size, capacity, number of each size to be on site, and power requirement. Size of sewer being bypassed and expected peak flow calculations.
  - 6. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted).
  - 7. Power sources for all equipment to be used and stand-by power generator size.
  - 8. Downstream discharge plan.
  - 9. Method of protecting discharge manholes or structures from erosion and damage.
  - 10. Thrust and restraint block sizes and locations.
  - 11. Sections showing suction and discharge pipe depth, embedment, select fill, and special backfill.
  - 12. Method of noise control for each pump and/or generator.
  - 13. Any temporary pipe supports and anchoring required.
  - 14. Design plans and computation for access and bypass pumping.
  - 15. Methods for after hour's maintenance of system.
  - 16. Contingency plan to deal with unexpected system failures.
  - 17. Traffic control plan including details for crossing locations.
  - 18. 24-hour emergency telephone number at which the Contractor may be reached.

### **1.3 REGULATORY REQUIREMENTS**

- A. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

### **1.4 QUALITY ASSURANCE**

- A. Power supply, pumps, plugs, pipe hose, and other materials shall meet the requirements of the Engineer and shall be in good or new condition.
- B. Bypass line shall be fully adequate to withstand at least two (2) times the expected pressure generated by the proposed system.
- C. Noise prevention measures shall limit noise to 80 dBA at seven feet or 60 dBA at the nearest residence or business, and comply with all local noise ordinance requirements.
- D. The entire system shall be inspected prior to implementation of the bypass.
- E. Bypass materials and equipment shall be maintained continuously during the operation.
- F. The system shall be designed to bypass a minimum of 25 gpm for both sites.

## **PART 2 PRODUCTS – NOT USED**

## **PART 3 EXECUTION**

### **3.1 STIPULATIONS**

- A. Sewer service must be maintained for the duration of the construction. This specification shall be used by the Contractor whenever temporary pumping is needed to maintain this service.
- B. The design, installation, and operation of the temporary pumping system shall be the Contractor's responsibility.
- C. The Contractor is required to furnish all materials, labor, equipment, maintenance, etc., to implement a temporary pumping system for the purpose of diverting the existing flow around the work area for the duration of the project.
- D. The Contractor shall employ the services of an approved vendor of bypass pump systems or who demonstrates his own ability to meet these specifications.
- E. The Contractor/vendor shall provide at least five references of projects of similar size and complexity, which have been performed by his firm within the past three years.
- F. The Contractor/vendor shall demonstrate the bypass pumping equipment is automated and capable of functioning without the assistance of an operator.
- G. The Contractor/vendor shall demonstrate that the bypass pumping equipment can operate completely dry for 24 hours without repairs.
- H. The Contractor/vendor shall demonstrate sufficient inventory to perform normal rentals, including this project and maintain at least 100% reserve equipment for this project for immediate delivery.
- I. The Contractor/vendor shall demonstrate sufficient service and repair parts in stock to fulfill any service or repair of any rental equipment within three hours of a service call.
- J. The Contractor/vendor shall demonstrate sufficient service staff and mobile trucks to repair or service equipment (24 hours per day, seven days per week) and within one hour of a service call.

- K. The Contractor/vendor shall provide a list of phone and pager numbers to call for 24-hour service.
- L. The bypass pumping system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

### **3.2 REQUIRMENTS**

- A. The Contractor shall prepare a detailed description of the proposed pumping system and submit it for approval.
- B. The submittal shall include a written description of the Plan and shall address the quantity, capacity and location of all pumping equipment. All pumping equipment submitted shall include the manufacturer's performance curves, including size, type, and routing of all suction and discharge pipes. The means of connecting the system shall also be included.
- C. It is required under this section that the Contractor provides all necessary means to safely convey the normal flows past the work area. It will not be permitted to stop or impede the main or sideline flows under any circumstances.
- D. The pumps may be electric or diesel powered.
- E. Hydraulic submersible-type pumps are not permitted.
- F. All pumps must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows.
- G. In order to prevent the accidental spillage of flows, all discharge systems must be constructed of rigid pipe with positive type CH and leak-proof connections. A discharge hose will only be allowed by specific permission of the Engineer.
- H. The Contractor shall provide the necessary start and stop controls for each pump.
- I. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.
- J. The Contractor shall insure that the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.
- K. The Contractor's bid price shall include one stand-by pump of each size to be maintained on site. In addition, spare pipe and fittings shall also be provided.
- L. The Contractor shall remove all components if the temporary pumping system. The Contractor shall perform all restoration work to the satisfaction of the Engineer.
- M. The Contractor shall be responsible for all temporary power associated with bypass pumping.

### **3.3 POST-BYPASS PUMPING**

- A. Upon completion of flow diversion or bypass pumping, Contractor shall clean up all areas disturbed by these operations.
- B. Restore all areas to equal or better than condition which existed prior to the start of the Work.
- C. In the event that the Contractor's bypass system results in damage to public or private property, the Contractor shall repair the damage, including the cleaning of basements and replacement of contents, if sewage has backed up, and pavement restoration as required by the Owner at the Contractor's expense.
- D. Contractor shall make minor modifications in the Work relating to existing structures as may be necessary without additional compensation. The Contractor shall have no claims for additional compensation by reason of delay or inconvenience in adapting its operations to the need for maintaining existing sewage flows.

END OF SECTION

SECTION 33 05 14

PUBLIC MANHOLES AND STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Precast concrete manholes and structures with tongue-and-groove joints with transition to cover frame, covers, anchorage, and accessories.
2. Bedding and cover materials.

1.2 REFERENCES

A. ASTM International:

1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
4. ASTM C497 - Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
5. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
6. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate structure locations, elevations, piping, sizes and elevations of penetrations.

C. Product Data: Submit manhole covers, component construction, features, configuration, and dimensions.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with PADOT's standards.

B. Verify manhole depths prior to ordering materials.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.

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- B. Manufacturer shall be PADOT approved.
- C. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Comply with precast concrete manufacturer's instructions and ASTM C913 for unloading, storing and moving precast manholes.
- C. Store precast concrete manholes to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.
- D. 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.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.1 MANHOLES AND STRUCTURES

- A. Furnish materials in accordance with PADOT's bulletin approvals and standards.
- B. Manhole and Structure Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923.
- C. Sleeves for pipe openings shall be factory cast and shall be resilient gasket-type.
- D. Joints for Precast Manholes and Structures: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.
- E. All manhole sections shall be coated with a bitumastic waterproofing compound or other approved coating.

2.2 FRAMES AND COVERS

- A. Furnish materials in accordance with PADOT's standards.
- B. Product Description: ASTM A48/A48M, Class 30B Cast iron construction.

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1. Lid: Machined flat bearing surface, removable boltable lid, live load rating of H-20 highway loads; sealing gasket; cover molded with two-inch raised letters identifying "Sanitary Sewer".
2. Nominal Lid Size: 30 inch clear manway opening.

### 2.3 COMPONENTS

- A. Manhole and Structure Steps: Formed polypropylene rungs; 3/4 inch diameter. Formed integral with manhole sections.
- B. Anchor bolts shall be 3/4-inch diameter by 6-inches long stainless steel to ASTM A123.
- C. Four bolt slots or inserts shall be cast into the manhole top, positioned at 90 degree intervals.
- D. Two (2) rings (one half inch diameter each) of butyl rubber sealing compound shall be set between the bottom of the frame and the top of the concrete section or grade ring.
- E. Two (2) rings (one half inch diameter each) of butyl rubber sealant shall be set between each concrete manhole section.
- F. Coat the exterior with standard black bitumastic.

### 2.4 CONFIGURATION

- A. Shaft Construction and Concentric Cone Top Section: Reinforced precast Concrete pipe sections, lipped male/female dry joints, sleeved to receive pipe.
- B. Shape: Cylindrical.
- C. Clear Inside Dimensions: 48 inch diameter unless otherwise indicated on Drawings.
- D. Design Depth: As indicated on Drawings.
- E. Clear Cover Opening: 30 inches diameter.
- F. Pipe Entry: Furnish openings as indicated on Drawings.
- G. Structure Joint Gaskets: ASTM C361; rubber.
- H. Steps: 12 inches wide, 16 inches on center vertically, set into structure wall.

### 2.5 ACCESSORIES

- A. Grout: Specified in Section 03 60 00.

### 2.6 BEDDING AND COVER MATERIALS

- A. Bedding: As shown.
- B. Backfill: As shown. No rocks over 6 inches in diameter, frozen earth or foreign matter.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify items provided by other sections of Work are properly sized and located.
- C. Verify built-in items are in proper location, and ready for roughing into Work.
- D. Verify correct size of manhole and structure excavation.

#### 3.2 PREPARATION

- A. Coordinate placement of inlet and outlet pipe(s) required by other sections.
- B. Do not install manholes and structures where site conditions induce loads exceeding structural capacity of manholes or structures.
- C. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify manholes and structures are internally clean and free from damage. Remove and replace damaged units.

#### 3.3 INSTALLATION - GENERAL

- A. Excavation and Backfill:
  - 1. Excavate for manholes and structures in location and to depth shown. Provide clearance around sidewalls of manhole or structure for construction operations and backfill.
  - 2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes or structures in dry trench.
  - 3. Where the possibility exists of a manhole becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation.
- B. Place manhole sections plumb and level, trim to correct elevations.
- C. Install manholes supported at proper grade and alignment on crushed stone bedding as shown on Drawings.
- D. Backfill excavations for manholes and structures in accordance with Section 31 23 23.
- E. Cut and fit for pipe.
- F. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.
- G. Paint exterior with one coat of bituminous at rate of 120 square feet per gallon for each coat.

H. Set cover frames and covers level without tipping, to correct elevations.

I. Mark interior with manhole name.

### 3.4 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

A. Lift precast manholes and structures at lifting points designated by manufacturer.

B. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and manhole remains clean.

C. Set precast manholes bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions as shown on Drawings.

D. Assemble multi-section manholes and structures by lowering each section into excavation. Install double butyl rubber joint sealant between precast sections in accordance with manufacturer's recommendations. Lower, set level, and firmly position base section before placing additional sections.

E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

F. Joint sealing materials may be installed on site or at manufacturer's plant.

G. Verify manholes and structures installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

I. Cut pipe to finish flush with interior of manhole or structure.

J. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.

### 3.5 SANITARY MANHOLE DROP CONNECTIONS

A. Construct drop connections into sanitary manholes in accordance with Drawings.

B. Form channel from pipe drop to sweep into main channel at maximum angle of 30 degrees.

### 3.6 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.

B. Test concrete manhole and structure sections in accordance with ASTM C497.

C. Vertical Adjustment .



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1. Where required, adjust top elevation of manholes to finished grades shown on Drawings.
2. Reset frames and covers, carefully removed, cleaned of mortar fragments, to required elevation in accordance with requirements specified for installation of castings.

END OF SECTION

SECTION 33 31 13

PUBLIC SANITARY UTILITY SEWERAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Sanitary sewer pipe and fittings.
  2. Underground pipe markers.
  3. Connection to existing manholes.
  4. Wye branches and tees.
  5. Sanitary Laterals.
  6. Bedding and backfill materials.

1.2 REFERENCES

- A. ASTM International:
1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  2. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
  3. ASTM D1785 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
  4. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
  5. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
  6. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
  7. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  8. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
  9. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  10. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  11. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
  12. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

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- B. Shop Drawings: Indicate layout of sewer system and appurtenances. Show size, materials, and components of system.
- C. Product Data: Submit catalog cuts and other pertinent data indicating proposed materials, accessories, details, and construction information.
- D. Submit reports indicating field tests made and results obtained.
- E. Manufacturer's Installation Instructions:
  - 1. Indicate special procedures required to install Products specified.
  - 2. Submit detailed description of procedures for connecting new sewer to existing sewer line.
- F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record location of pipe runs, connections, manholes, cleanouts, and invert elevations at cleanouts.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with PADOT's standards.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.

1.7 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.
- C. Include affected utility companies and appropriate local, County, State, Federal and other regulatory officials.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

- B. Block individual and stockpiled pipe lengths to prevent moving.

#### 1.9 FIELD MEASUREMENTS

- A. Verify field measurements and elevations are as indicated.

#### 1.10 COORDINATION

- A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate the Work with owner of existing sewer system.
- C. Notify affected utility companies minimum of 72 hours prior to construction.

### PART 2 PRODUCTS

#### 2.1 SANITARY SEWER PIPE AND FITTINGS

- A. Plastic Pipe: ASTM D3034, SDR 35, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter as shown, bell and spigot style rubber ring sealed gasket joint.
  - 1. Fittings: PVC.
  - 2. Joints: ASTM F477, elastomeric gaskets.
- B. Cast Iron Soil Pipe and Fittings:
  - 1. Cast iron fittings are required for the CIPP sections of the project. CIPP line through the cast iron fittings and restore the laterals.
  - 2. Hub and spigot fittings conforming to ASTM A 74.
  - 3. Gaskets shall conform to ASTM C 564. Push on type TY-SEAL or EZ-Tight gasket or equal.
  - 4. Cast iron soil pipe shall be Tyler Pipe, Tyler Texas, or equal.
  - 5. Must accept SDR-35 PVC pipe OD in 8 x 6 inch size.

#### 2.2 FLEXIBLE COUPLINGS

- A. All flexible transition couplings shall be Strong Backed RC series repair couplings, manufactured by Fernco, or equivalent meeting the following specifications:
  - 1. Clamp shall be 301 stainless steel.
  - 2. Screw shall be 305 stainless steel.
  - 3. Shear ring shall be 0.012 inch, 300 series stainless steel.
  - 4. Coupling shall be manufactured in accordance to ASTM C 1173.
  - 5. Gasket shall be manufactured to the following:
    - a. CSA B602
    - b. ASTM D 5926
    - c. ASTM C 1173
- B. Contractor shall provide shop drawings indicating existing pipe materials, and compatibility with proposed pipe materials, with regard to material and OD.

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- C. Flexible couplings shall only be installed at locations approved by the Engineer or depicted on the plans. Flexible couplings shall not be used to rectify inferior construction and installation efforts.
- D. Miscellaneous fittings are required for transitions from existing laterals on private property to the newly installed laterals. These fittings are incidental to construction.

2.3 MECHANICAL SEAL FOR MANHOLE PIPE ENTRANCES

- A. Furnish materials in accordance with PADOT's standards.
- B. Use "Link Seal" or other approved mechanical sealing device between the pipe and the newly cored manhole walls.

2.4 CONCRETE ENCASEMENT AND CRADLES

- A. Concrete: Sulfide resistant, conforming to 4,000 psi 28 day concrete, rough troweled finish.

2.5 UNDERGROUND PIPE MARKERS

- A. Furnish materials in accordance with PADOT's standards.
- B. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.
- C. Trace Wire: Magnetic detectable conductor, clear brightly colored plastic covering, imprinted with "Sewer Service" in large letters.
- D. Combination marking/locating tape and tracer tape is acceptable if approved by the Engineer.

2.6 BEDDING AND BACKFILL MATERIALS

- A. Bedding: As specified in Details and Drawings.
- B. Backfill: As specified in Details and Drawings. No rocks over 6 inches in diameter, frozen earth or foreign matter permitted in non-paved areas.

2.7 ACCESSORIES

- A. Grout: As specified.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify trench cut and excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

### 3.2 PREPARATION

- A. Correct over excavation with coarse aggregate or lean concrete.
- B. Remove large stones or other hard matter capable of damaging pipe or impeding consistent backfilling or compaction.
- C. Protect and support existing sewer lines, utilities and appurtenances.
- D. Maintain profiles of utilities. Coordinate with other utilities to eliminate interference. Notify Engineer where crossing conflicts occur.

### 3.3 BEDDING

- A. Excavate pipe trench.
- B. Excavate to lines and grades shown on Drawings or required to accommodate installation of pipe or encasement or to match existing conditions.
- C. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation.
- D. Provide sheeting and shoring as needed.
- E. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth; compact as indicated

### 3.4 INSTALLATION - CONNECTION TO EXISTING MANHOLE

- A. Core drill existing manhole to clean opening. Use of pneumatic hammers, chipping guns, sledge hammers, are not permitted.
- B. Core hole ID shall be as specified by seal manufacturer for a 8-inch nominal lateral.
- C. Install link seal, or equivalent, and seal with non-shrink concrete grout after the new pipe has been installed.
- D. Concrete encase new sewer pipe minimum of 24 inches or to nearest pipe joint, whichever is shortest. Use epoxy binder between new and existing concrete.
- E. Prevent construction debris from entering existing sewer line when making connection.

### 3.5 INSTALLATION - WYE BRANCHES AND TEES

- A. Install wye branches or pipe tees at locations indicated on Drawings concurrent with pipe laying operations.
- B. Maintain minimum 5 feet separation distance between wye connection and manhole if possible.

- C. Test cast iron to PVC or other material lateral connections above ground for blanket approval for the project. Connection shall hold a pressure head of 10 feet for 1 hour without leaking.

### 3.6 INSTALLATION – GRAVITY SANITARY SEWER MAIN AND LATERALS

- A. Sewer pipe specifications indicated above shall also apply to sewer laterals, except as noted below.
- B. Existing service connections shall be located and exposed by open cut methods before initiating sewer main CIPP operations. Any services remaining off-line for an extended period of time, or any connections as deemed necessary by the Owner to protect the customer, shall be bypass pumped until such time that the lateral can be reconnected or reinstated. If the Contractor neglects to reinstate or bypass pump the individual service lateral, the Contractor shall reimburse the individual property owner for lodging in a hotel until sewer service can be reinstated.
- C. Television inspect the location of sewer laterals. Field confirm through dye testing active laterals. Eliminate inactive laterals. Reinstate active laterals, or laterals to undeveloped parcels.
- D. Prior to CIPP installation, excavate and expose the service connection. Remove the existing service connection and section of the main, including any damaged sections. Field cut the new service connection with the cast iron wye fitting and connect to the existing sewer main with appropriately sized transition gaskets.
- E. Provide trench plugs at stream or storm water channel locations.
- F. Concrete encase the sewer main under stream or storm water channel locations.
- G. Construct laterals from cast iron wye branch to terminal point at right-of-way, property line, curb or as shown on the Drawings.
- H. Where depth of main pipeline warrants, or where existing conditions mandate, construct riser type laterals from wye branch.
- I. The Contractor shall match existing depth, alignment and slope as much as possible. If possible, maintain 4 feet minimum depth of cover over pipe in roadways and driveways. If the existing sewer lateral alignment and depth dictates, the depth of cover may be reduced to 2.5 feet in non-traffic areas upon the Engineer's approval.
- J. Maintain minimum 5 feet separation distance between laterals whenever possible.
- K. Provide sanitary sewer cleanouts for underground lateral connections. Utilize a double flo-tee with a SDR-35 PVC stack. Concrete encase the stack and cap the end with a threaded PVC cap with an inverted square nut. Place a cast iron cleanout cover indicating "sewer" above all cleanout caps.
- L. Install trench plugs on all laterals that pass under or near stormwater channels.
- M. Install pipe, fittings, and accessories in accordance with ASTM D2321. Seal joints watertight.

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- N. Lay pipe to slope gradients noted on drawings or to match existing conditions; with no variation from indicated slope. Begin at downstream end and progress upstream.
- O. Assemble and handle pipe in accordance with manufacturer's instructions except as modified on the Drawings or by Engineer.
- P. Keep pipe and fittings clean until work is completed and accepted by Engineer. Cap open ends during periods of work stoppage.
- Q. Cap lateral ends extended to undeveloped lots.
- R. Lay bell and spigot pipe with bells upstream.
- S. Connect pipe to existing sewer system or at existing manhole as appropriate.
- T. Install plastic ribbon tape continuous over top of pipe buried 6 inches below finish grade.
- U. Install trace wire continuous over top of pipe buried 6 inches below finish grade.
- V. Encase pipe as required by PADEP standards. The concrete encasement shall be extended a minimum horizontal distance of 10 feet to either side of the water pipe, if water pipe is below sanitary sewer pipe.
- W. When a sewer pipe that is within 50 feet horizontally from a domestic water well, it shall be encased in concrete.

3.7 BACKFILLING

- A. Backfill around sides and to top of pipe with cover fill in minimum lifts of 6 inches (unless indicated otherwise), tamp in place and compact to as indicated. Place and compact material immediately adjacent to pipes to avoid damage to pipe and prevent pipe misalignment.
- B. Backfill around sides and to top of pipe.
- C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.8 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Pressure Test: Test in accordance with Section 33 01 32.
- C. Infiltration Test: Test in accordance with Section 33 01 32.
- D. Request inspection prior to and immediately after placing bedding.
- E. Compaction Testing: In accordance with ASTM D698, ASTM D2922, and ASTM D3017.



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- F. When tests indicate Work does not meet specified requirements, remove work, replace and retest.
- G. Frequency of Compaction Tests: 1 test per lift per 500 feet (or fraction thereof) in open areas or 1 test per lift per 100 feet for paved/gravel areas.

3.9 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - 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

SECTION 33 41 13  
POLYPROPYLENE PIPE FOR STORM DRAIN/CULVERTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Furnishing and installing Polypropylene (PP) storm drainpipe, 18 inch, including:
  - a. Pipe fittings
  - b. Connecting drain lines to curb inlets
  - c. All joints
  - d. Connections to new or existing pipe or headwalls, manholes, etc., to the lines and grades shown on the Drawings.

1.2 REFERENCES

A. Reference Standards

1. Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification, unless a date is specifically cited.
2. ASTM International (ASTM):
  - a. D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewer and Other Gravity-Flow Applications.
  - b. D2412, Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
  - c. D3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
  - d. F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  - e. F2881, Standard Specification for 12 to 60 in. [300 to 1500 mm] Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications.
1. 3. AASHTO M330 Polypropylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. All submittals shall be approved by the Engineer or the City prior to delivery.

1.4 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS

A. Product Data

1. Manufacturer
2. Manufacturer Number (identifies factory, location, and date manufactured.)

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3. Nominal Diameter
4. Laying lengths

B. Certificates

- A. 1. Furnish an affidavit certifying that all Polypropylene Pipe meets the provisions of this Section and has been tested and meets the requirements of ASTM standards as listed herein.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers finished pipe shall be the product of 1 manufacturer for each size per project.
  - a. Pipe manufacturing operations shall be performed under the control of the manufacturer.
  - b. All pipe furnished shall be in conformance with this specification and ASTM F2881 and AASHTO M330 latest revision.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

1. Pipe shall be stored and handled in accordance with the manufacturer's guidelines.
2. Secure and maintain a location to store the material in accordance with Section 01 66 00.

PART 2 PRODUCTS

2.1 EQUIPMENT, PRODUCT TYPES AND MATERIALS

A. General

1. Provide Polypropylene (PP) pipe and fittings meeting the requirements in ASTM F2881 and AASHTO M330.
2. Provide PP pipe and fittings manufactured from polypropylene compounds comprised of the base unfilled copolymer polypropylene virgin resin and all additives, colorants, UV inhibitors and stabilizers. Conditioning, sampling, preparation and testing of molded specimens shall be in accordance with the requirements in Specification ASTM D4101.
3. The minimum wall thickness of the inner walls of PP pipe is specified in ASTM F2881, Section 6.2.1.
4. The pipe stiffness at 5 percent deflection, when determined in accordance with ASTM D2412, is specified in ASTM F2881, Table 2.

B. Performance / Design Criteria

1. Pipe

- a. Design in accordance with AASHTO LRFD Section 12
- b. Design minimum and maximum covers for pipe service loads that include:
  - 1) External groundwater and earth loads
  - 2) Traffic loads
  - 3) Practical considerations for handling, shipping and other construction operations

- c. Drainage design is to be conducted under the supervision of a Professional Engineer licensed in the State of Texas, who shall seal and sign the design.
  - d. Standard lay length of 20 feet and 13 feet except for special fittings or closure pieces necessary to comply with the Drawings.
  - e. Accommodate vertical alignment changes required because of existing utility or other conflicts by an appropriate change in pipe design depth.
  - f. Burial depth for corresponding diameter shall not exceed those specified by the manufacturer.
2. Dimensional Tolerances
- a. Pipe dimensions shall be in accordance with ASTM F2881, Table 2.
3. Gaskets
- a. Supply from approved gasket manufacturer in accordance with ASTM F477 and suitable for service intended.
4. Joints
- a. Provide watertight pipe joints meeting the requirements of ASTM D3212.
  - b. Integral Bell and Spigot.
    - 1) Ensure the bell overlaps a minimum of 2 corrugations of the spigot end when fully engaged.
    - 2) Provide the spigot end with an O-ring gasket that meets ASTM F477.
5. Pipe markings shall meet the minimum requirements of ASTM F2881. Minimum pipe markings shall be as follows:
- a. Manufacturer.
  - b. Manufacturer Number (identifies factory, location, date manufactured, shift and sequence).
  - c. Nominal diameter.
  - d. ASTM designation.
6. Connections
- 1. a. Use only manufactured fittings.

## 2.2 SOURCE QUALITY CONTROL

### A. Tests and Inspections

- 1. Test all Polypropylene storm drain pipe for elongation, brittleness, joint separation, quality and ring stiffness as specified in ASTM F2881 or AASHTO M330.
- 2. The quality of materials, the process of manufacture and the finished pipe may be subject to inspection and approval by the Engineer at the manufacturing plant.
- 3. In addition, the finished pipe may be subject to further random inspection by the Engineer at the project site before and during installation.

### B. Sizes

#### 1. Polypropylene Pipe

- a. Ensure variations for inside/outside diameter are in accordance with manufacturer's values for the respective manufacturing location and applicable ASTM Specifications.

### C. Marking

- 1. Furnish pipe clearly marked at maximum 12-foot intervals and clearly mark fittings and couplings as follows:

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- a. Manufacturer's name or trade mark
  - b. Nominal size
  - c. Specification designation (e.g., ASTM F2881 or AASHTO M330)
  - d. Plant designation code
  - e. Date of manufacture
- D. Pipe Rejection
1. Individual sections of pipe may be rejected if any of the Specification requirements are not met:
    - a. Any pipe or fittings with cracks, cuts, punctures, or other damage on the interior or exterior shall be rejected and replaced.
    - b. Any pipe or fittings with damaged ends, joints or gaskets, which would prevent proper sealing of the joints, shall be rejected and replaced.
  2. Mark rejected pipe with painted "REJECTED".
  3. Remove rejected pipe immediately from job site and replace with pipe meeting the requirements of this Specification
- A. Grout: As specified.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

1. Install all Polypropylene pipe systems in accordance with ASTM D2321.
  2. Establish and maintain lines and grades.
    - a. Unless otherwise shown on the Drawings or permitted in writing, do not use heavy earth-moving equipment over the structure until a minimum of 4 feet of permanent or temporary compacted fill is placed over the top of the structure.
    - b. Before adding each new layer of loose backfill material, until a minimum of 12 inches of cover is obtained, check the inside periphery of the structure for local or unequal deformation caused by improper construction methods.
      - 1) Evidence of such will be reason for corrective measures as directed.
  - c. Remove and replace pipe damaged by the Contractor at no expense to the City.
- B. Pipe Laying
1. Ensure that pipe and fittings are laid and jointed in firm trench bottom conditions.
  2. Start laying pipe on the bedding at the outlet or downstream end and proceed toward the inlet or upstream end, true to the established lines and grades.
  3. Provide appropriate facilities for hoisting and lowering the sections of pipe.
  4. Lift and lower sections of pipe into trench without damaging pipe or disturbing the prepared bedding or sides of trench.
  5. Carefully clean pipe ends before pipe is placed in trench.
  6. Protect pipe open end to prevent entrance of earth or bedding material as each length of pipe is laid.
  7. Fit, match and lay pipe to form a smooth, uniform conduit.
  8. Remove and re-lay, without extra compensation, pipe that is not in alignment or that shows excessive settlement after laying.

9. At the Engineer's discretion, all pipe exceeding 7.5 percent deflection will require replacement or re-compaction at the Contractor's expense when measured or inspected not less than 30 days following completion of installation.
  - a. Deflection is defined per ASTM D2321.

#### C. Pipe Joining

1. Install the joints so that the connection of the pipe sections forms a continuous line free from irregularities in the flow line.
2. Use joint lubricant provided by manufacturer on the bell and spigot end during joint assembly.
3. Surfaces to receive lubricants shall be clean and dry.
4. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced.
5. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.

#### D. Connections and Stub Ends

1. Make connections of pipe to existing systems or appurtenances as shown on the Drawings or as directed.
2. Mortar or concrete the bottom of the existing structures, if necessary, to eliminate any drainage pockets created by the new connection.
3. Where the pipe is connected into existing structures which are to remain in service, restore any damage to the existing structure resulting from making the connection to the satisfaction of the Engineer.
4. Seal stub ends, for connections to future work not shown on the Drawings, by installing watertight plugs into the free end of the pipe. Include the cost for the above in cost of the pipe.

#### E. Backfill

1. Crushed rock shall be used for bedding and embedment up to top of pipe.
2. Minimum cover requirements are measured from top of pipe to bottom of flexible pavement or top of rigid pavement for the following pipe diameters:
  - a. 12"-48" diameter pipe: 12" of cover.
  - b. 60" diameter pipe: 24" of cover.
  - c. Maximum cover requirements shall be in accordance with manufacturer's recommendations.

### 3.2 FIELD [OR] SITE QUALITY CONTROL

#### A. Field Tests and Inspections

1. Closed Circuit Television (CCTV) Inspection
  - a. Provide a CCTV inspection in accordance with Section 33 01 32.

END OF SECTION

SECTION 33 42 33  
STORM SEWER INLETS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Precast concrete storm sewer inlets with transition to cover frame, covers, anchorage, and accessories.
2. Bedding and cover materials.

1.2 REFERENCES

A. PennDOT Publication 72M, RC Standards:

1. RC-45 Inlet Tops, Grates and Frames.
2. RC-46 Inlet Boxes.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate structure locations, elevations, piping, sizes and elevations of penetrations.

C. Product Data: Submit manhole covers, component construction, features, configuration, and dimensions.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with PADOT's standards.

B. Verify manhole depths prior to ordering materials.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.

B. Manufacturer shall be PADOT approved.

C. Installer: Company specializing in performing work of this section with minimum 5 years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

- B. Comply with precast concrete manufacturer's instructions and ASTM C913 for unloading, storing and moving precast inlets.
- C. Store precast concrete inlets to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.
- D. 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.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements.
- B. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.

## PART 2 PRODUCTS

### 2.1 INLETS

- A. Furnish materials in accordance with PADOT's bulletin approvals and standards.
- B. Inlet Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923.
- C. Sleeves for pipe openings shall be factory cast and shall be resilient gasket-type.
- D. Joints for Precast Inlets: In accordance with ASTM C913; maximum leakage of 0.025 gallons per hour per foot of joint at 3 feet of head.
- E. All inlet sections shall be coated with a bitumastic waterproofing compound or other approved coating.

### 2.2 FRAMES AND COVERS

- A. Furnish materials in accordance with PADOT's standards.
- B. Product Description: ASTM A48/A48M, Class 30B Cast iron construction.
  - 1. Lid: Machined flat bearing surface, removable boltable lid, live load rating of H-20 highway loads; sealing gasket; cover molded with two-inch raised letters identifying "Sanitary Sewer".
  - 2. Nominal Lid Size: 30 inch clear manway opening.

### 2.3 COMPONENTS

- A. Manhole and Structure Steps: Formed polypropylene rungs; 3/4 inch diameter. Formed integral with manhole sections.



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- B. Anchor bolts shall be  $\frac{3}{4}$ -inch diameter by 6-inches long stainless steel to ASTM A123.
- C. Four bolt slots or inserts shall be cast into the manhole top, positioned at 90 degree intervals.
- D. Two (2) rings (one half inch diameter each) of butyl rubber sealing compound shall be set between the bottom of the frame and the top of the concrete section or grade ring.
- E. Two (2) rings (one half inch diameter each) of butyl rubber sealant shall be set between each concrete manhole section.
- F. Coat the exterior with standard black bitumastic.

2.4 CONFIGURATION

- A. As per PennDOT RC 45 and RC-46.
- B. Pipe Entry: Furnish openings as indicated on Drawings.
- C. Structure Joint Gaskets: ASTM C361; rubber.

2.5 ACCESSORIES

- A. Grout: Specified in Section 03 60 00.

2.6 BEDDING AND COVER MATERIALS

- A. Bedding: As shown.
- B. Backfill: As shown. No rocks over 6 inches in diameter, frozen earth or foreign matter.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify items provided by other sections of Work are properly sized and located.
- C. Verify built-in items are in proper location, and ready for roughing into Work.
- D. Verify correct size of manhole and structure excavation.

3.2 PREPARATION

- A. Coordinate placement of inlet and outlet pipe(s) required by other sections.
- B. Do not install inlets where site conditions induce loads exceeding structural capacity of structure.

- C. Inspect precast concrete inlets immediately prior to placement in excavation to inlets are internally clean and free from damage. Remove and replace damaged units.

### 3.3 INSTALLATION - GENERAL

#### A. Excavation and Backfill:

1. Excavate for inlets in location and to depth shown. Provide clearance around sidewalls of manhole or structure for construction operations and backfill.
2. When groundwater is encountered, prevent accumulation of water in excavations. Place inlets in dry trench.
3. Where the possibility exists of an inlet becoming buoyant in flooded excavation, anchor inlet to avoid flotation.

B. Place inlet sections plumb and level, trim to correct elevations.

C. Install inlet supported at proper grade and alignment on crushed stone bedding as shown on Drawings.

D. Backfill excavations for inlets in accordance with Section 31 23 23.

E. Cut and fit for pipe..

F. Paint exterior with one coat of bituminous at rate of 120 square feet per gallon for each coat.

### 3.4 PRECAST CONCRETE MANHOLE AND STRUCTURE INSTALLATION

A. Lift precast inlets at lifting points designated by manufacturer.

B. When lowering inlets into excavations and joining pipe to units, take precautions to ensure interior of pipeline and manhole remains clean.

C. Set precast inlets bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions as shown on Drawings.

D. Assemble multi-section inlets by lowering each section into excavation. Install double butyl rubber joint sealant between precast sections in accordance with manufacturer's recommendations. Lower, set level, and firmly position base section before placing additional sections.

E. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.

F. Joint sealing materials may be installed on site or at manufacturer's plant.

G. Verify inlets installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.

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- I. Cut pipe to finish flush with interior of manhole or structure.
- J. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel as indicated on Drawings.

3.5 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements and 01 70 00 - Execution and Closeout Requirements:  
Field inspecting, testing, adjusting, and balancing.
- B. Vertical Adjustment .
  - 1. Where required, adjust top elevation of inlets to finished grades shown on Drawings.
  - 2. Reset frames and covers, carefully removed, cleaned of mortar fragments, to required elevation in accordance with requirements specified for installation of castings.

END OF SECTION

SECTION 33 42 34  
REMOVE /FILL EXISTING STORM MANHOLE

PART 1 GENERAL

1.1 SUMMARY

- A. This section is the removal of the existing manhole cover, and cone unit, sealing all openings in manhole and filling said manhole with stone up to the limits of the roadway subbase as indicated on the plan.
- B. Cut out a 5'x5' section of roadway and patch roadway utilizing the requirements indicated on the temporary pavement restoration detail indicated on the plan.

SECTION 40 00 01

CONSTRUCTION ALLOWANCE-FLOWABLE FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Furnishing, transporting, and placing of flowable fill backfill for miscellaneous drainage, sump, springs, wells, and sink holes, as are encountered in the field and as directed by owner or Engineer.

1.2 REFERENCES

- A. PennDOT Publication 408 Section 220 (Flowable Backfill)
- B. PennDOT Publication 408 Section 220 .1 (a) (Type B)

1.3 MATERIAL

- A. PennDOT Publication 408 Section 220.2

1.4 CONSTRUCTION

- A. PennDOT Publication 408 Section 220.3

1.5 DOCUMENTATION

- A. Where the flowable fill was placed and for what reason
- B. The type of materials used in fill
- C. Computations and payment

1.6 MEASUREMENT AND PAYMENT

- A. Excavation is incidental to this item: Where drainage, sump, springs, wells, and sink holes, are encountered at places not shown on the plans, providing of flowable fill backfill will be at CY bid price for the quantity measured in the field and as directed by owner or Engineer.

1.7 ITEMS

- A. ITEM 13 – Construction Allowance – Flowable Fill

END OF SECTION

SECTION 40 00 02

CONSTRUCTION ALLOWANCE-STONE BACKFILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Furnishing and placing of stone backfill for miscellaneous drainage, sump, springs, wells, and sink holes, as are encountered in the field and as directed by owner or Engineer.

1.2 REFERENCES

A. PennDOT Publication 408:

1. Section 212 (Geotextiles)
2. Section 613 (Stone backfill for Miscellaneous Drainage)
3. Section 703 (Aggregates)

B. PennDOT Publication 213 (Traffic Control), if required.

1.3 MATERIAL & EQUIPMENT

- A. The coarse aggregate used in this work is type C or better (such as No. 1 and No. 57 aggregate); steel slag is not to be used. The contractor, if allowed, can use acceptable clean, sound, hard, and durable slabs of local stone no larger than 150 mm (6 inches) in any dimension. If local stone is used, the contractor must place a 150 mm (6 inches) layer of No. 57 stone on top. All material used must be from the suppliers listed on the contractor's approved material source of supply.
- B. The coarse aggregate must meet the requirements of Publication 408, Section 703. Geotextile, meeting the requirements of Publication 408, Section 212 is used to enclose the coarse aggregate.
- C. The contractor needs equipment capable of placing coarse aggregate, such as an excavator, gradall, backhoe or front-end loader. The equipment is acceptable if it can properly place the aggregate in the drainage structure.
- D. The inspector needs a tape measure or engineering rule to measure trench excavation.

1.4 DOCUMENTATION

- A. Where the stone backfill was placed and for what reason
- B. The type of coarse aggregate used
- C. If the contractor used Class 1 geotextile

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D. If the use of local stone was permitted, it met the requirements of Publication 408, Section 613 and the No. 57 stone was placed on top in a 6-inch layer

E. Computation and payment

1.5 MEASUREMENT AND PAYMENT

A. Excavation and geotextiles are incidental to this item: Where drainage, sump, springs, wells, and sink holes, are encountered at places not shown on the plans, providing of stone backfill will be at CY bid price for the quantity measured in the field and as directed by owner or Engineer.

1.6 ITEMS

A. ITEM 14 – Construction Allowance– Stone Backfill

END OF SECTION