

## SECTION 02080 - PIPED UTILITIES - BASIC MATERIALS AND METHODS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Piping joining materials.
  - 2. Transition fittings.
  - 3. Piped utility demolition.

## 1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.
- B. HDPE: High Density Polyethylene

## 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

## PART 2 - PRODUCTS

## 2.1 PIPING MATERIALS

- A. Rain conductors shall match the diameter of the existing pipe and be PVC Schedule 40 pipe with fittings.
- B. All other piped utilities shall match the existing piping material.

## 2.2 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
- B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Solvent Cements for Joining Plastic Piping:
  - 1. PVC Piping: ASTM D2564. Include primer according to ASTM F656.

## 2.3 TRANSITION FITTINGS

- A. Transition Fittings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Plastic-to-Metal Transition Fittings:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Spears Manufacturing Co.
  - 2. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

## C. Flexible Transition Shielded Couplings for Underground Non-pressure Drainage Piping:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cascade Waterworks Mfg. Co.
  - b. Fernco, Inc. – Strong Back RC Series.
  - c. Mission Rubber Company.
  - d. Plastic Oddities.
  - e. Approved Equal.
2. Description: Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear rings, ends of the same size as piping to be joined, and corrosion-resistant metal tension band and tightening mechanism on each end.

## PART 3 - EXECUTION

## 3.1 PIPED UTILITY DEMOLITION

- A. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
  1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
  3. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
- B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.2 PIPING INSTALLATION

- A. Install piping according to the following requirements and Division 2 Sections specifying piping systems.
- B. Plans indicate general location and arrangement of piping systems. Adjust as required.
- C. Install piping at indicated slopes.
- D. Install piping free of sags and bends.
- E. Install fittings for changes in direction and branch connections.
- F. Select system components with pressure rating equal to or greater than system operating pressure.

### 3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 2 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. PVC Non-pressure Piping: Join according to ASTM D2855.
- E. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D3212.
- F. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D2657.
  - 1. Plain-End PE Pipe and Fittings: Use butt fusion.
  - 2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- G. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

END OF SECTION 02080

## SECTION 02300 - EARTHWORK

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Preparing sub-grades for slabs on grade, walks, pavements, lawns and grasses and landscaping.
- B. Related Sections include the following:
  - 1. Division 2 Section "Trench Excavation and Backfill for Sewers and Utilities" for trench excavation and backfilling of sewer and utility trenches.

## 1.3 DEFINITIONS

- A. Backfill: Soil Material or aggregate material used to fill a trench excavation.
  - 1. Initial backfill (Pipe Zone): Aggregate material placed under, beside, and over pipes in a trench to depths indicated on the Standard Details and per pipe manufacturer's recommendations.
- B. Base Course: Course placed between the subgrade course and sidewalks, concrete pavement and hot mix asphalt paving.
- C. Borrow: Satisfactory soil material, free of organic or other deleterious material imported from off the project site for use as fill or backfill.
- D. Drainage Course: Course of washed granular material meeting PennDOT 2A or AASHTO #57 limestone requirements supporting the slab on grade that also minimizes upward capillary flow of pore water.

- E. Bulk Excavation (if applicable): Completion of all excavation (“cuts”) and structural fills to the lines and grades as shown on the Drawings.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by the Owner. Authorized additional excavation and replacement material will be paid for according to Contract provisions.
  2. Satisfactory Material: Soil whose composition is satisfactory for use in embankment construction. In general, any mineral (inorganic) soil, blasted or broken rock, and similar materials of natural or man-made origin including mixtures thereof.
  3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by the Owner. Unauthorized excavation, as well as remedial work directed by the Owner, shall be at the Contractor’s sole expense.
  4. Unsatisfactory Material: Any soil containing vegetation or organic matter, such as muck, peat, organic silt, topsoil or sod, which is not satisfactory for use in embankment construction or for support of permanent structures. Certain manmade deposits such as land-fill material may also be determined to be unsatisfactory material.
- F. Trench Excavation: Removal and replacement of material in order to install new piping and structures. For purposes of this Specification, all trench excavation shall be defined as “unclassified”. See additional paragraphs in this Section for further definition.
- G. Fill: Soil materials used to raise existing grades.
- H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below base, drainage fill, or topsoil materials.
- I. Topsoil: Natural or cultivated surface-soil layer containing not less than two (2%) percent nor more than ten (10%) percent of organic matter, as specified in AASHTO designation T194. The material contains sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than two (2) inches in diameter. Topsoil shall be free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- J. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- K. Final backfill: Aggregate material or fill placed over initial backfill to fill a trench to grades indicated on drawings.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
1. Each type of geotextile.

## 1.5 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities unless permitted in writing by the Facility Owner and the Owner and then only after arranging to provide temporary utility services according to requirements indicated.
1. Notify Facility Owner and the Owner not less than two (2) days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without the Facility Owner's written permission.
  3. Obtain PA One Call Number prior to beginning work.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed unless indicated otherwise. Coordinate with Facility Owners to shut off services if lines are active.

## PART 2 - PRODUCTS

## 2.1 SOIL MATERIALS

- A. General: Provide borrow materials when sufficient satisfactory soil materials are not available from bulk excavations.
- B. Base or Subbase Material: AASHTO No. 57 limestone or PennDOT 2A limestone as required.
- C. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least ninety (90%) percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- D. Drainage Course: AASHTO No. 57 limestone.
- E. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- F. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- G. Sand: ASTM C 33, fine aggregate, natural, or manufactured sand.
- H. Satisfactory Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, GC, SW, SP, SM, SC, ML and CL or a combination of these groups; free of rock or gravel larger than three (3) inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- I. Unsatisfactory Soils: ASTM D 2487 Soil Classification Groups OL, CL, MH, OH and PT expansive or carbonaceous shales and soils that cannot maintain an optimum moisture content of three (3) percent at the time of compaction.

## 2.2 GEOTEXTILES

1. Subsurface Drainage Geotextile: Shall comply with the requirements of a Class 1 geotextile in Section 735 in the current edition of PennDOT Publication 408.
2. Separation Geotextile: Shall comply with the requirements of a Class 4 Type A geotextile in Section 735 in the current edition of PennDOT Publication 408.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by bulk earthwork operations.
- B. Preparation of subgrade for bulk earthwork and trenching operations shall include removal of trees, vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface.

### 3.2 DEWATERING

- A. Prevent surface water and ground water from entering bulk excavations and trench excavations. Do not allow water to pond and collect on prepared subgrades. Do not allow water to flood project site and/or surrounding properties.
- B. Protect subgrades and trenches from softening, undermining, washout, and damage by rain or water accumulation.
- C. Provide and maintain all temporary drainage and dewatering systems, such as pumps, sumps and discharge lines as required during bulk excavation and trench excavation at no additional cost to the Owner.
- D. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations and trenches. Do not use excavated trenches as temporary drainage ditches.
- E. During grading operations, pits, cuts, excavation areas and/or embankments and subgrades shall be shaped, sloped and maintained to facilitate drainage of surface water. Existing drainage routes shall not be choked or obstructed until new ones are established. Temporary culverts, pumps or other equipment shall be used to facilitate drainage of fills during construction.
- F. Care shall be exercised during excavations to avoid discharge of surface flows across watershed lines.



## 3.3 BULK EXCAVATION REQUIREMENTS (IF APPLICABLE)

- A. The Contractor shall be responsible for bulk excavation (if applicable) of all material encountered regardless of type. All bulk excavation shall be considered as unclassified. The Contractor shall be responsible for any and all required excavation, including trench excavation, through any and all types of encountered material including soil, rock, and pavement materials (whether evident on the surface or not).
- B. The Contractor shall excavate all materials as required to the dimensions and grades indicated on the Drawings.
- C. The Contractor shall complete excavation and fill embankment procedures to the subgrade surface elevations which conform to the finished grades.
- D. The Contractor shall be responsible at all times for carrying out all excavation operations in a safe and prudent manner so that all persons and property will be protected from hazard.
- E. The Contractor shall prepare and submit a construction schedule for bulk excavation and trenching operations prior to beginning work.
- F. The Contractor shall be responsible for the offsite disposal of all surplus excavated or trenched material. Prior to commencement of work, the Contractor shall advise the Owner of the quantity of surplus material, if any, he estimates will be disposed of off-site. The Contractor shall provide the Owner with a copy of the approved grading permit and Erosion and Sedimentation Control Plan for the off-site spoil site.
- G. In the event the Contractor disposes of too much excavated material, he shall replace the material as necessary and required at his sole cost and expense. Material to be replaced shall meet the requirements for satisfactory material as specified herein and shall be subject to the approval of the Owner.
- H. The existing surface, subsurface and base may consist of any or all of the following materials: asphalt, plain concrete, brick pavers, cobblestone pavers, reinforced concrete, coarse aggregate, cinders, sand, slag, unclassified fill previously placed, rock and in-situ natural soils. Removal of the existing surface, subsurface and base shall include the removal of any materials encompassing manholes, utility boxes, utility lines, and trench lines.
- I. All excavations and trenching shall be considered as unclassified. No additional compensation, other than time, will be considered for excavation through any encountered subsurface materials.

- J. The Contractor shall provide all necessary measures to control dust through the use of water, calcium chloride, or other material approved by the Owner, at such locations and during such periods as directed or as be required by the Owner.
1. Calcium Chloride shall be spread in pellet or flake form by approved devices so that uniform distribution is attained over the entire area being treated.
  2. Watering equipment shall consist of pipelines, tanks, tank trucks or other approved devices capable of applying a uniform spread of water over the surface. A suitable device for regulating the flow and positive shut-off of the water shall be provided for positive control by the operator.
  3. The Owner will advise the Contractor of any unsatisfactory procedures used for dust control. If the unsatisfactory procedures are not corrected promptly, the Owner may suspend the performance of any or all construction until the condition has been corrected.
  4. Payment for dust control shall be incidental.

### 3.4 EXCAVATION FOR CONCRETE WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades to a tolerance of one-half ( $\frac{1}{2}$ ) of an inch.

### 3.5 DISPOSAL OF MATERIAL OUTSIDE OF THE WORK SITE

- A. The Contractor shall dispose all waste and excess materials off-site and shall be responsible for all costs incurred therefore.
- B. The Contractor must first obtain a written permit from the off-site property owner on whose property the disposal is to be made. He shall file with the Owner said permit or a certified copy thereof, together with a written release from the property owner, absolving the Owner from any and all responsibility in connection with the disposal of material on said off-site property.
- C. During the disposal of waste and excess materials the Contractor shall comply with all Federal, State and Local governmental rules, regulations, laws and ordinances concerning such disposal of waste and excess materials.

### 3.6 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavations under pavement, sidewalks, landscaping areas, utilities, sewer lines and other construction areas with satisfactory soil to subgrade in accordance with the soil fill requirements at no additional cost to the Owner.

### 3.7 BACKFILL

- A. Place and mechanically compact backfill in excavations and trenches promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage.
  - 2. Removal of concrete form work.
  - 3. Removal of trash and debris.
  - 4. Removal of temporary shoring and bracing.
  - 5. Installation of permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of water, mud, frost, snow, or ice.
- C. Place on-site satisfactory soil final trench backfill material in maximum twelve (12")-inch loose lifts mechanically compacted to ninety five (95%)-percent modified Proctor density per ASTM D1557.

### 3.8 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
  - 3. Slope grades to direct water away from buildings and to prevent ponding.

### 3.9 GEOTEXTILE INSTALLATION

- A. The Contractor shall be required to install Class 4 Type A geotextile fabric on the subgrade prior to installing the stone subbase.
  - 1. The Contractor shall install the Class 4 Type A geotextile fabric in accordance with the requirements set forth in Section 212 in the most current edition of the PennDOT Publication 408. The maximum overlap between rolls is twelve (12) inches with no additional compensation for the cost of the overlapping or pins required for installation.
  - 2. The geotextile shall be pinned to the sub-base using eight (8) penny aluminum nails spaced twelve (12) inches center to center.
  - 3. Trucks shall not be permitted to travel over the fabric when aggregate is being installed. The aggregate shall be placed on the fabric by dumping the trucks and then blading the aggregate onto the fabric with a front loader. The aggregate must be dropped onto the fabric and not shoved over it.
  - 4. Protect the geotextile fabric from traffic and other damage and install the subbase material on it the same day.

## 3.10 SUBBASE FOR CEMENT CONCRETE PAVEMENT AND WALKS

- A. Concrete Sidewalks and Driveways subbase shall be in accordance with applicable Specification Sections and Details.
- B. Shape subbase to required crown elevations and cross-slope grades.
- C. Place subbase six (6) inches or less to compacted thickness in a single layer.
- D. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than seventy percent (70%) density as per ASTM D4253 and D4254.

## 3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
  - 2. Stockpile topsoil for re-use in Owner-designated areas.

## 3.12 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by the Owner. Reshape and re-compact.
- C. Where settling occurs before project correction period elapses, remove finished surfacing, backfill with additional competent material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
  - 2. All corrective work shall be conducted at the Contractor's sole expense.

END OF SECTION 02300

## SECTION 02310 – TRENCH EXCAVATION AND BACKFILL FOR SEWERS AND UTILITIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes trench excavation and backfill for sewers and utility trenches, with the following components:
  - 1. Excavation Requirements
  - 2. PennDOT 2A Limestone
  - 3. AASHTO No. 57 Limestone
  - 4. Select On-site Final Backfill
- B. Related Sections include the following:
  - A. Division 1 Section “Earthwork” for additional requirements.
  - B. Division 2 Section “Hot Mix Asphalt Paving” for installation of bituminous asphalt pavement.

## 1.3 DEFINITIONS

- A. PennDOT: Pennsylvania Department of Transportation
- B. Backfill: Soil material or aggregate material used to fill an excavation.
  - 1. Aggregate Backfill: PennDOT 2A Limestone or AASHTO No. 57 Limestone
  - 2. Final Backfill: On-site material approved by the Owner
- C. Bedding Course: Six (6’)-inches of AASHTO No. 57 Limestone placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil, free of organic or other deleterious material imported from off-site for use as backfill.

- E. Trench Excavation: Removal of all material encountered above subgrade elevations and to lines and dimensions indicated regardless of type encountered.
  - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by the Owner. Authorized additional excavation and replacement material will be paid for according to applicable Contract provisions.
  - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by the Owner. Unauthorized excavation, as well as remedial work directed by the Owner to correct unauthorized excavation, shall be at the Contractor's sole cost and expense.
- F. Fill: Soil materials used to raise existing grades.
- G. Pipe Zone: The area from the pipe invert to one (1) foot above the crown of the pipe for the full width and length of the trench.
- H. Utilities: On-site underground pipes, conduits, ducts and cables within the project limits.

#### 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. PennDOT 2A Limestone
  - 2. AASHTO No. 57 Limestone

### PART 2 - PRODUCTS

#### 2.1 AGGREGATE MATERIALS

- A. PennDOT 2A Limestone and/or AASHTO #57 Limestone meeting specifications set for in Section 703 in the most current edition of PennDOT Publication 408 for PennDOT 2A and/or AASHTO No. 57 Limestone.
- B. Sand: ASTM C33, fine aggregate, natural, or manufactured sand.

## 2.2 SOIL MATERIALS

- A. Soil Material: Fine, clean earth soil material free from large stones, clods, topsoil, sod, frozen earth, wood or any other objectionable material as determined by the Owner.
- B. Unsuitable Soil Material at Bottom of Trench: Soil material at the bottom of the trench unable to support the pipe and backfill, as determined by the Owner.

## PART 3 - EXECUTION

### 3.1 GENERAL REQUIREMENTS

- A. Where the location and depth of existing utilities are of concern in maintaining grade, the Contractor may be directed to make exploratory excavations to verify that the design grades can be achieved or for making adjustments as approved by the Owner.
- B. The Contractor shall be responsible for the protection of all utilities in the trench zone. All damage to gas, water, telephone, power, cable or sewer lines shall be repaired immediately according to applicable Contract provisions and Facility Owner standards. In no event shall any utility service remain interrupted overnight.

### 3.2 TRENCH EXCAVATION

- A. The Contractor shall protect the installation of the pipe at all times during construction.
- B. Trench excavation shall conform to the line and grade of the sewer or utilities as shown on the Drawings and according to minimum manufacturer's recommended trench widths.
- C. All excavations shall be kept free from water, snow and ice during construction.
- D. Mats shall be placed for excavation equipment where damage could be caused to existing pavements.
- E. The minimum trench width shall be the outside diameter of the pipe plus twelve (12) inches on both sides of the pipe to ensure proper compaction of the bedding and backfill or as recommended by the pipe manufacturer. The maximum trench width shall conform to current ASTM and OSHA requirements predetermined by the depth of the excavation and pipe size or as required by site conditions. No additional compensation will be considered for required trench widths caused by existing site conditions or necessary to meet ASTM, OSHA or pipe manufacturer requirements.

- F. The bottom of the trenches shall be prepared to conform to the grade of the pipe and the bottom of the foundation of structures. Special precautions shall be exercised to insure that pipes, when installed, will not rest on rock, masonry or any other material that would present a non-uniform foundation. Where two or more pipes are to be laid in the same trench, the Contractor shall excavate the trench so that all pipes are laid in conformance with the specified pipe bedding, or better.
- G. Excavation below Required Grade: Excavation below the grade of pipes or subsurface structures shown on the drawings necessitated by changes in grades in accordance with the directions of the Owner will be paid for under "Additional Trench Excavation", as hereinafter defined. Excavation carried below the required level without authorization by the Owner shall be backfilled at the Contractor's expense with aggregate material as approved by the Owner. Compaction of such backfill material shall be as specified elsewhere herein.
- H. Excavation in Paved Areas: When excavations are to be made in paved surfaces, the paved surfaces shall be neatly cut one (1) foot beyond each side of the trench and ahead of the excavation by means of pneumatic tool, saw cutting or other approved tools to provide a clean, uniform edge, with minimum disturbance of remaining pavements. The pavements so removed shall not be used for trench backfill, but shall be disposed of off-site in an approved manner.
- I. Surplus Excavated Material: The Contractor shall remove all excess excavated material from the site or haul it to an on-site Owner-approved stockpile for removal before project completion.

### 3.3 MATERIAL EXCAVATION AND BACKFILL

- A. Authorized Changes and/or Alterations: The Owner may, as a result of unforeseen conditions arising during the progress of the work, order the grade or location of any pipe or other structure changed from that established on the Drawings.
- B. Credit to Owner: Should such changes or alterations result in a reduction in the quantity of earth excavation, a credit to the Owner for the reduction in the amount of earth trench excavation occasioned by such change shall be made.
- C. Payment for trench excavation, aggregate bedding/backfill and select on-site backfill shall be included in the pipe and manhole bid prices.



### 3.4 AGGREGATE PIPE BEDDING

- A. Aggregate Bedding: Bedding in the “pipe zone” shall consist of a minimum of six (6)-inches of approved AASHTO #57 limestone installed below the pipe for the entire trench width. In addition, a minimum of twelve (12’)-inches of approved AASHTO No. 57 limestone shall be installed above the crown of the pipe as well as aggregate placed in the trench alongside the pipe from the invert to the crown. The bedding shall be placed in six (6’)-inch loose lifts and compacted using mechanical compaction equipment to seventy (70%)-percent relative density per ASTM D 4253 and ASTM D 4254.

### 3.5 TRENCH BACKFILL FOR SEWERS AND SEWER STRUCTURES

- A. Under non-paved areas and outside eight (8)-feet of structures and/or curbs, the backfill shall be approved select on-site material placed to within four (4’)-inches from the final proposed elevation to allow for topsoil placement and compaction. Select on-site material shall be placed in eight (8’)-inch loose lifts mechanically compacted to ninety five (95%) modified Proctor density per ASTM D 1557.
- B. Under pavement and within eight (8)-feet of structures and/or curbs:
  - 1. Backfill shall be approved PennDOT 2A limestone placed in six (6’)-inch lifts to the subgrade elevation of the proposed impervious surface from twelve (12’)-inches above the crown of the pipe compacted using mechanical compaction equipment to seventy (70%)-percent relative density per ASTM D 4253 and ASTM D 4254.
- C. Backfilled areas which settle shall be repaired at the Contractor's sole expense.

### 3.6 UNSUITABLE MATERIALS

- A. If unsuitable material as determined by the Owner is found at the trench bottom, the Contractor shall be required to excavate below grade and backfill the trench with AASHTO No. 57 limestone meeting the specifications set forth in the most current edition of PennDOT Publication 408, Section 703.2(c), and Table C. Payment for excavation and placement of such material shall be by applicable contract provisions. No payment for unsuitable replacement will be allowed unless specifically directed by the Owner.

### 3.7 TRENCH BACKFILL FOR UTILITIES

- A. The Contractor shall backfill trenches for utilities in accordance with the requirements of the Facility Owner having jurisdiction for the utility being installed.

END OF SECTION 02310



## SECTION 02620 - SUBDRAINAGE

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes subdrainage systems for the following:
  - 1. Under slab areas.
  - 2. Curb drains.
  - 3. Landscaped areas.

## 1.3 DEFINITIONS

- A. PE: Polyethylene plastic.
- B. PVC: Polyvinyl chloride plastic.
- C. Sub-drainage: Drainage system that collects and removes subsurface or seepage water.

## 1.4 SUBMITTALS

- A. Product Data: For the following:
  - 1. Drainage conduits.
  - 2. Geotextile filter fabrics.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

## 2.2 SOIL MATERIALS

- A. Backfill, drainage course, impervious fill, and satisfactory soil materials are specified in Division 2 Section "Earthwork."

## 2.3 PERFORATED WALL PIPES AND FITTINGS

- A. Perforated PE Pipe and Fittings:
1. NPS 3 to 6: ASTM F405 and AASHTO M252, Type CP, snap and/or split couplers with Type A or Type B perforation pattern.
- B. Perforated PVC Sewer Pipe and Fittings:
1. NPS 3 to 6: ASTM D2729 solvent weld drain pipe belled end with standard perforation pattern.

## 2.4 GEOTEXTILE FILTER FABRICS

- A. Description: Use fabric consisting of long chain polymeric filaments or yarns such as polyethylene, polyamide, polyvinylidene-chloride, polypropylene, or polyester formed into a stable network so that the filaments or yarns retain their position to each other. Use Class 1 geotextile (either woven or non-woven) meeting all physical requirements shown on Table A, Section 735 of PennDOT Publication 408 (most recent revision).
1. Source of Supply: Use supplier listed on PennDOT Bulletin 15 (Qualified Products List for Construction).

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.
- B. If subdrainage is required for landscaping, locate and mark existing utilities, underground structures, and above ground obstructions before beginning installation. Protect all utilities and structures to avoid disruption and damage.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 2 Section "Earthwork."

## 3.3 PIPING APPLICATIONS

- A. Underslab Subdrainage Piping:

- 1. Perforated PE pipe and fittings, couplings, and coupled joints.

- B. Curb Drain

- 1. Curb drains shall be constructed using AASHTO #57 limestone aggregate to the detailed dimensions. Prior to placing the aggregate, the trench shall be thoroughly compacted and shaped to uniform grade for proper drainage. Four (4) inch, six (6) inch or eight (8) inch PE perforated drain tubing shall be placed where specified or detailed.
  - 2. Any and all other items of construction, including geotextile and tar paper, shall be placed according to the applicable Detail.

### 3.4 UNDERSLAB DRAINAGE INSTALLATION

- A. Excavate for underslab drainage system after subgrade material has been compacted but before drainage course has been placed. Include horizontal distance of at least six (6") inches between drainage pipe and trench walls. Grade bottom of trench excavations to required slope, and compact to firm, solid bed for drainage system.
- B. Lay flat-style geotextile filter fabric in trench and overlap trench sides.
- C. Place supporting layer of drainage course over compacted subgrade and geotextile filter fabric, to compacted depth of not less than four (4") inches
- D. Install horizontal drainage panels as follows:
  - 1. Coordinate placement with other drainage materials.
  - 2. Lay perforated drainage pipe at inside edge of footings.
  - 3. Place drainage panel meeting CSI Section 33 46 00 over drainage pipe with core side up. Peel back fabric and wrap fabric around pipe. Locate top of core at bottom elevation of floor slab.
  - 4. Butt additional panels against other installed panels. If panels have plastic flanges, overlap installed panel with flange.
  - 5. Install all panels according to manufacturer's recommendations.
  - 6. Use in conjunction with Owner-approved waterproofing system if required.

### 3.5 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
  - 1. Underslab Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of one (1%) percent.
  - 2. Lay perforated pipe with perforations down.
  - 3. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
  - 4. All drainage piping must outlet into an existing storm structure or connect to existing drainage piping.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
- C. Install PE and PVC piping according to ASTM D 2321 and manufacturer's published guidelines.

### 3.6 PIPE JOINT CONSTRUCTION

- A. Join perforated, PE pipe and fittings with couplings for soil-tight joints according to manufacturer's recommendations and all applicable AASHTO and ASTM standards.
- B. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and fit materials and dimensions of both pipes.

### 3.7 IDENTIFICATION

- A. Materials and their installation are specified in Division 2 Section "Earthwork." Arrange for installation of green warning tapes directly over piping.
  - 1. Install detectable warning tape over nonferrous piping and over edges of underground structures.

### 3.8 FIELD QUALITY CONTROL

- A. Testing: After installing drainage course to top of piping, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

### 3.9 CLEANING

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

END OF SECTION 02620





## SECTION 02741 – HOT MIX ASPHALT PAVING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Hot mix asphalt paving
  - 2. Cold milling of existing bituminous pavement
  - 3. Aggregate base
  - 4. Keyways

## 1.3 DEFINITIONS

- A. Hot Mix Bituminous Paving Terminology: Refer to ASTM D8 for definitions of terms.
- B. Hot Mix Asphalt Paving: Bituminous paving or material
- C. PennDOT: Pennsylvania Department of Transportation.
- D. City: City of Pittsburgh. The Contractor shall become familiar with and strictly follow the City of Pittsburgh, Department of Public Works, Right of Way Procedures Manual (January 2015 with updates if applicable) for all procedures and requirements for work within City rights of way at no additional cost to the Owner.

## 1.4 SUBMITTALS

## A. Job Mix Designs and Certifications:

1. PennDOT certification and job mix formulas from the supplier for the bituminous materials for the proposed Work seven (7) days prior to the pre-construction conference.
2. PennDOT Form TR 465 must be supplied for each day the bituminous material is delivered to the job.
3. PennDOT Form CS-4171 (Certificate of Compliance) and Form TR-448A (Job Mix Formula Report) being computer print outs for the weight of aggregate and asphalt cement content along with accumulated total tonnage listed and the temperature of the mix leaving the plant must be submitted daily.
4. Material Supplier's Bill of Lading indicating the temperature of the material is leaving the plant, the type of material, the net weight of material in the truck and a cumulative total tonnage of material being installed must be submitted on a daily basis.
5. Tack Coat: PennDOT certification and source of material must be submitted seven (7) days prior to the pre-construction meeting. Material Supplier's Bill of Lading must be submitted on a daily basis.

B. Qualification Data: PennDOT pre-qualification certifications from all Contractors and Suppliers meeting the appropriate classifications for the project and a minimum of three (3) references for previous projects completed or as listed on Pennsylvania State Contract 5610-36 for work with the City of Pittsburgh right of ways.

C. Material Test Reports: For each bituminous paving material by a company qualified and certified by PennDOT to complete the tests required by this specification.

D. Material Certificates: For each paving fabric, signed by manufacturers.

E. City Requirements: All bituminous (asphalt) for the City of Pittsburgh streets shall be in full accordance with the City of Pittsburgh, Department of Public Works, Right of Way Procedures Manual (January 2015 with updates if applicable).

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver geotextile materials to the project site in original packaging with the manufacturer's labels containing the brand name and type of material. Store geotextile materials and other paving fabrics in accordance with Section 735 in the most current edition of PennDOT Publication 408.

B. The temperature of the hot-mix asphalt paving mix being delivered shall not be more than fifteen (15) degrees below the minimum temperature shown on the material supplier's Bill of Lading and not above the maximum specified temperature.

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply bituminous materials, geotextiles or paving fabrics unless the following requirements are met:
1. The subbase or existing bituminous material is dry as determined by the Owner.
  2. The existing pavement has been cleaned in accordance with Section 401 of the most current edition of PennDOT Publication 408.
  3. Tack Coat: Minimum air and surface temperature of 40 degrees F and rising in accordance with Section 460 in the most current edition of PennDOT Publication 408.
  4. Bituminous Base Course: Minimum surface and air temperature of 35 degrees F and rising at time of placement in accordance with Section 305 in the most current edition of PennDOT Publication 408.
  5. Superpave Bituminous Binder and Wearing Surface: Minimum surface and air temperature of 40 degrees F and rising at time of placement in accordance with Section 409 in the most current edition of PennDOT Publication 408. Binder and wearing courses shall not be installed between October 31 and April 1 without written permission of the Owner.

## PART 2 - PRODUCTS

## 2.1 AGGREGATES

- A. Coarse Aggregate: Shall conform to the requirements in Sections 401 and 703 in the most current edition of PennDOT Publication 408.
- B. Fine Aggregate: Shall conform to the requirements in Sections 401 and 703 in the most current edition of PennDOT Publication 408.

## 2.2 ASPHALT PAVING MATERIALS

- A. Asphalt Cement: Shall conform to the requirements in Section 702 in the most current edition of PennDOT Publication 408 for AASHTO MP1, PG 64-22.
- B. Tack Coat: Shall conform to the requirements in Section 460 in the most current edition of PennDOT Publication 408 for emulsified asphalt, Class AE-T.
- C. Superpave Base, Binder and Wearing Surface: Superpave Asphalt Mixture Design, , PG 64-22, 0 to 0.3 million ESAL's, 9.5, 19 and 25 mm mix complying with the requirements in Section 409 in the most current edition of PennDOT Publication 408. The bituminous wearing surface shall incorporate coarse aggregate having a Skid Resistance Level (SRL) designation of "H" or better, supplied from sources approved for this classification as defined and listed in PennDOT Bulletin No. 14.
- D. Joint Sealant: Shall conform to the requirements for AET emulsified asphalt in Section 401 in the most current edition of PennDOT Publication 408.
- E. City Asphalt Paving Materials: Shall conform to City of Pittsburgh, Department of Public Works, Right of Way Procedures Manual (January 2015 with updates if applicable).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that subbase and existing bituminous paving is dry and in suitable condition to support paving and imposed loads.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

### 3.2 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot mix asphalt surface course to level sags and fill depressions in existing pavements.
- B. Crack and Joint Filling: Complete in accordance with the specifications of Section 469 of the most current editions of PennDOT Publication 408.

### 3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade and all existing bituminous material are ready to receive paving.
1. Clean existing pavement surface of loose and deleterious material immediately before installing any bituminous material or paving fabric. Cleaning shall be completed with a power broom or mechanical sweepers capable of collecting the material and disposing of it offsite. If, in the opinion of the Owner the cleaning is not adequate, the Contractor shall repeat the procedure until it is deemed satisfactory.
  2. All joints in existing concrete pavements and all larger cracks in bituminous pavement (1/2" wide or larger) shall be thoroughly cleaned to a depth of one (1) inch and filled with an approved sand and asphalt grout mix.
  3. The existing pavement surface shall be brought to a uniform grade and cross section as specified. The surface of the existing pavement shall be brought to the same transverse slope and longitudinal cross section as the finished pavement section using scratch coat of bituminous binder at a variable thickness.
- B. Tack Coat: Apply in accordance with the specifications in Section 460 of the most current edition of PennDOT Publication 408, not exceeding 0.02 gallon per square yard variation.
1. The tack coat shall be applied at the specified rate and uniform manner of 0.02 to 0.07 gallon per square yard at a surface temperature of 40 degrees and rising.
  2. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  3. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
  4. The tack coat shall be applied to all paving areas of the cartway, driveway edges, catch basins, inlets, manholes, curbs and utility boxes.
- C. After the subgrade and/or existing pavement surfaces have been prepared as specified herein, the Contractor shall check all frames, covers, grates, water valve boxes and all other miscellaneous castings that are located in the proposed pavement area to insure that all such items have been accurately positioned and set to the proper slope and elevation. All covers and grates are to be set flush with the required finished pavement surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of these appurtenances. All corrective work that may be necessary shall be performed at the Contractor's sole cost and expense.

- D. Where new pavements are to meet existing pavements (except as specified herein under Bituminous Concrete Overlays), the Contractor shall line cut the existing pavements with an approved pneumatic, saw cutting or mechanical cutting tool so that there will be a vertical butting surface between the old and new pavements. There shall be a one (1) foot offset in each pavement course to permit each successive course to overlap the lower existing course. Line cutting of existing pavements shall be along neat, straight and even lines, and shall be performed in such a manner so as not to damage the adjacent pavement to remain. The Owner shall approve the acceptability of the line cutting device and the method of operation prior to new asphalt placement.
- E. All vertical surfaces of curbs, structures, gutters, and existing pavement in contact with new bituminous mixtures shall be painted with a uniform coating of an approved bituminous emulsion or priming material. Extreme care shall be exercised in the application of this material to prevent splattering or staining of surfaces that are to remain exposed. Work that is stained as a result of the Contractor's operations shall be repaired and/or replaced at the Contractor's sole cost and expenses.
- F. For milling operations, the Contractor shall provide a milling machine designed and built for milling existing bituminous pavements with an automatic grade and slope control system. The Contractor shall mill to provide a finished surface free from gouges, grooves and ridges and that conforms to the surface tolerance requirements of Section 409.3(l) in the most current edition of PennDOT Publication 408. Immediately after milling, remove milled material. When indicated that milled material is to be retained by the Contractor, satisfactorily dispose of milled material at an approved off-site facility off the Owner's property immediately after milling. When indicated that milled material is to be retained by the Owner, deliver milled material to the designated stockpiling location immediately after milling. Carefully remove the existing bituminous material around utility facilities within work areas. Repair or replace utility facilities damaged by the milling operation to the satisfaction of the Facility Owner at no additional cost to the Owner. Control the rate of milling to avoid tearing of the mat. If directed, separate oversized and chunky milled material. Maintain the milled surface free of all loose materials and dust. Place the first overlaying bituminous course within five (5) calendar days from the start of milling operations. Failure to overlay a milled section of roadway within five (5) calendar days will result in a penalty of five hundred (\$ 500.00) dollars per calendar day until overlay operations begin. Work stoppages caused by the Owner, Facility Owners, and documented weather delays will not count towards the five (5) calendar days for calculating the penalty.
- G. The Contractor shall cut or mill keyway into the existing pavement to provide a tight, smooth joint. The keyway length shall be a minimum of fifteen (15) feet per inch of vertical change or as directed by the Owner.
- H. Milling operations conducted on City of Pittsburgh primary and secondary streets shall follow all utility paving specifications listed in the City of Pittsburgh, Department of Public Works, Right of Way Procedures Manual (January 2015 with updates if applicable) at no additional cost to the Owner.

### 3.4 HOT MIX ASPHALT PAVING EQUIPMENT

- A. Trucks: Trucks used to transport hot mix bituminous material to the project site shall conform to Section 401.0(c) in the most current edition of PennDOT Publication 408.

### 3.5 HOT MIX ASPHALT MATERIAL INSTALLATION

- A. Place the bituminous paving material in accordance to the Details and PennDOT Publication 408.
- B. Install the bituminous materials in accordance with the following:
  - 1. All hot mix asphalt materials shall be installed in accordance with the most current edition of PennDOT Publication 408.
  - 2. Do not place bituminous paving when the surface is wet or when its air or surface temperature is less than 40 degrees Fahrenheit.
  - 3. No hot mix asphalt material shall be installed if the temperature of the material is less than 275 degrees Fahrenheit or greater than 325 degrees Fahrenheit. All temperatures must be shown on the Bill of Lading. If these requirements are not met, the bituminous material shall be rejected and removed from the project site.
  - 4. All asphalt trucks are to remain covered and/or tarped until ready to dump into the paver. Any truck with an uncovered partial load waiting for unloading will not be permitted to dump into the paver.
  - 5. No traffic shall be permitted on newly compacted hot mix asphalt material until its temperature is lower then 140 degrees F.
  - 6. No kerosene is to be used on the paving equipment.
  - 7. The edge of the overlay shall be sealed with PG 64-22 twelve (12'')-inches wide with six (6'')-inches on the overlay and six (6'')-inches on the existing pavement.
  - 8. A twelve (12'')-inch pass of PG 64-22 shall be placed along concrete curbs and the gutter section of bituminous curbs. Sand gutter line when sealing past driveways and sidewalks and at all roadway joints in order to prevent tracking.
  - 9. All sealing must be completed within two (2) working days after completion of asphalt placement.

### 3.6 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with the same texture and smoothness as adjacent sections of the hot mix asphalt course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of six (6'')-inches.
  - 3. Offset transverse joints, in successive courses, a minimum twenty four (24'')-inches.
  - 4. Construct transverse and longitudinal joints per the most current edition of PennDOT Publication 408.

- B. Install Joint Sealant in accordance with the following:
1. All edges of the new pavement, including around inlet, manhole and utility box castings shall be sealed with PG 64-22.
  2. On pavements with bituminous wedge curbs, apply PG 64-22 twelve (12")-wide with four (4")-inches applied to the wedge curb.
  3. On pavements with concrete curbs, apply PG 64-22 twelve (12")-inches with two (2")-inches applied to the inside face of the curb.
  4. All joints at driveways and sidewalks shall be sanded to prevent tracking.
  5. All joints shall be sealed within two (2) working days of completion of asphalt placement.

### 3.7 COMPACTION

- A. Complete compaction as per the specifications in Section 401 in the most current edition of PennDOT Publication 408.
- B. Compact hot mix asphalt paving with hot, hand tampers or vibratory compactors in areas inaccessible to rollers.
- C. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot mix asphalt. Compact by rolling to the specified density and surface smoothness.
- D. Erect barricades to protect paving from traffic until the mixture has cooled enough not to become marked.

### 3.8 INSTALLATION TOLERANCES

- A. Thickness: In accordance with Section 401 in the most current edition of PennDOT Publication 408.
- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  1. Base and Binder Course: 1/4 inch
  2. Wearing Surface: 1/8 inch
- C. Crowned Surfaces: Test using appropriate methods and procedures acceptable to the Owner to insure the required crown cross section is obtained.



### 3.9 FIELD QUALITY CONTROL

- A. Hot Mix Asphalt Pavement: The testing agency shall conduct compaction and depth tests as follows:
1. The Contractor shall be required to provide tests for density for all layers of bituminous material by following the requirements set for in Section 409.9b HMA in the most current edition of PennDOT Publication 408 for nuclear gage testing. The test shall be performed by a licensed nuclear gage operator as witnessed by the Owner utilizing the following procedure set forth in Section 409 in the most current edition of PennDOT Publication 408. The Contractor shall complete the following with regards to density testing:
    - a. Use a nuclear gage meeting the requirements of PTM No 402.
    - b. Use a nuclear gage calibrated in accordance with AASHTO Test Method T-238-86. Submit certification of annual calibration of gages and documentation of licensed operators training to the Owner prior to the placement of any material.
    - c. Use the control strip technique specified in PTM No. 402, Section 7.2.3., to determine the optimum rolling pattern for each material course. Record all counts and plot the rolling pattern growth curve on form TR 4276-B.
    - d. The Contractor shall submit the testing results to the Owner on a daily basis.
  2. The Contractor will be paid for material placed based on the above required testing and in accordance with the most current edition of PennDOT Publication 408. The Owner retains the right to verify density testing in accordance with the above testing procedure in order to confirm the results.

### 3.10 TEST FOR SURFACE IRREGULARITIES

- A. Use a template cut to the required cross section of the finished base course. Equip the template with metal or other vertical extensions attached to each end, so the bottom of the template will be at the elevation of the top of the base course. Test the cross section for surface irregularities at intervals of not more than twenty (25) feet
- B. Use a ten (10) foot straight edge to test for longitudinal irregularities in the surface of the base course. Hold the straight edge parallel to the road centerline in contact with the surface. Move the straight edge from one side of the base course to the other. Advance along the base course in five (5) foot increments.
- C. Correct all surface irregularities exceeding one-half (1/2")-inch loosening the surface and removing or adding material as required. Compact the repaired area and surrounding surface by rolling.

## D. Tests for Materials

1. All materials used in permanent pavement construction shall be subject to all testing and certifications as required by the PennDOT procedures and regulations. All tests shall be performed by the Contractor, his suppliers or independent testing laboratories, at no cost additional cost to the Owner.
2. Aggregate - Supplier's certifications, plus one (1) grab sample per ten thousand (10,000) produced tons to be tested by an independent laboratory.
3. Hot Mix Asphalt Materials - Daily plant certification plus one (1) grab sample per day for each type of material placed for an extraction test by an independent testing laboratory.
4. The City reserves the right to test the paving material at the Asphalt Testing Laboratory located at 4501 Centre Avenue, Pittsburgh, PA.

END OF SECTION 02741

## SECTION 02743 – DRIVEWAY RESTORATION REQUIREMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Bituminous driveway restoration.
  - 2. Concrete driveway restoration.
  - 3. Stone or aggregate driveway restoration.
- B. Related Sections include the following:
  - 1. Division 2 Section “Earthwork” for aggregate subbase and base courses.
  - 2. Division 2 Section “Hot Mix Asphalt Paving” for bituminous asphalt pavement.
  - 3. Division 2 Section “Cement Concrete Pavement” for concrete pavement.

## 1.3 DEFINITIONS

- A. Hot Mix Bituminous Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. PennDOT.: Pennsylvania Department of Transportation

## PART 2 - PRODUCTS

## 2.1 BITUMINOUS DRIVEWAY RESTORATION

- A. All products shall conform with the materials listed in Section 02741 “Hot Mix Asphalt Paving” for the installation of bituminous materials

## 2.2 CONCRETE DRIVEWAY RESTORATION

- A. All products shall conform to the materials listed in Section 02751 “Cement Concrete Pavement” for the installation of concrete material.

### 2.3 STONE OR AGGREGATE DRIVEWAY RESTORATION

- A. All products shall conform to aggregate materials listed in Section 02741 “Hot Mix Asphalt Paving” for the installation of stone or aggregate material.

## PART 3 - EXECUTION

### 3.1 BITUMINOUS DRIVEWAY RESTORATION

- A. The Contractor shall prepare the edge of the existing driveway by saw cutting the pavement to achieve a straight edge, removing the asphalt material and subbase and hauling it to an approved offsite dump site.
- B. The Contractor shall remove adequate existing driveway material to allow for the installation of the following: three (3) inches compacted depth PennDOT 2A limestone base; four (4) inches compacted depth 19.0 mm Superpave binder and one and a half (1 1/2) inches compacted depth 9.5 mm Superpave wearing course (0 to < 0.3 ESAL’s, PG 64-22, SRL “H” or better). The Contractor shall be directed by the Owner as to the limits of driveway removal required in order to achieve an adequate grade for a smooth transition.
- C. The Contractor shall proof roll the subgrade material in accordance with Section 02741 “Hot Mix Asphalt Paving” prior to installing the aggregate base.
- D. The Contractor shall install three (3) inches compacted depth of PennDOT 2A limestone base in accordance with Section 02741 “Hot Mix Asphalt Paving”.
- E. The Contractor shall install four (4) inches compacted depth of 19.0 mm Superpave binder and one and a half (1 1/2) inches compacted depth of 9.5 mm Superpave Wearing Course in accordance with Section 02741 “Hot Mix Asphalt Paving”.
- F. The Contractor shall seal all new joints in the asphalt paving with PG 64-22 in accordance with Section 02741 “Hot Mix Asphalt Paving”.

### 3.2 CONCRETE DRIVEWAY RESTORATION

- A. The Contractor shall remove the damaged existing concrete slab to the next existing joint or as directed by the Owner. The Contractor shall haul the removed material to an approved off-site dump.
- B. The Contractor shall remove adequate existing driveway material to allow for the installation of four (4) inches compacted depth AASHTO #57 limestone base and six (6) inches of 4000 psi concrete. The Contractor will be directed by the Owner as to the limits of driveway removal required in order to achieve an adequate grade for a smooth transition.
- C. The Contractor shall protect adjacent slabs from damage during restoration. Any damage to adjacent slabs shall be repaired at the Contractor’s sole cost and expense.

- D. The Contractor shall proof roll the subgrade material in accordance with Section 02751 “Cement Concrete Pavement” prior to installing the aggregate base.
- E. The Contractor shall install four (4) inches compacted depth of AASHTO No. 57 limestone in accordance with Section 02751 “Cement Concrete Pavement”.
- F. The driveway shall be reinforced with welded wire fabric 6x6-W2.9xW2.9 (or most current designation) with a minimum cover of three (3) inches
- G. The Contractor shall install six (6) inches of 4000 psi air entrained ( 5% +/- 1%) concrete in accordance with Section 2751 “Cement Concrete Pavement”.
- H. Driveways shall be neatly saw-cut prior to beginning restoration work. Saw cutting shall be included in the price of the driveway restoration.
- I. Contraction joints shall be spaced at a maximum of five (5) foot intervals and formed with a device to have the completed joint at least ½” deep. Expansion joints shall be spaced no more than fifty (50) feet apart and formed with ¼” pre-molded filler to the full depth of the slab. The ¼” pre-molded filler shall also be placed adjacent to curbs, sidewalks, other driveways, manhole castings, buildings and pavements. If the driveway abuts a curb, the joints on the driveway shall match the joints on the curb.
- J. The surface of the slab shall be brought to a uniform plane surface by means of a wood screed riding on forms. The surface shall then be finished with a wood or magnesium float and finished to match the existing concrete. The tool marks for joints and edges shall match the marks in the existing driveway. Neither dry cement nor water shall be added to the surface during the finishing process.
- K. On any tooled joints or edges of concrete do not use the jointing or edging tool until the surface water has evaporated from the concrete. Bull float and broom the surface, finish the joint and edges and use the broom to remove the tool marks on the surface.
- L. After placement, the concrete shall be cured per Section 02751 “Cement Concrete Pavement”.
- M. Sealing of Joints
  - 1. All expansion joints and joints against structures shall be joints, both expansion shall be sealed.
  - 2. The sealant shall be “Sikaflex-1A Polyurethane, Elastomeric Sealant/Adhesive” (or Owner approved equal). Sealant color shall be selected from the range of available colors by the Owner prior to application.
  - 3. All joints must be sound, clean, dry and free from oil and grease. Curing compound residues and any foreign material must be thoroughly removed. A roughened surface will also enhance the bond. Install bond breaker tape or back rod to prevent bond at the base of the joint.

4. Apply Sikaflex-1A at a temperature between forty (40) degrees Fahrenheit and one hundred (100) degrees Fahrenheit with a gun using the twenty (20) ounce “uni-pac” sausage.
- N. Replace rain conductors in kind if found under a driveway. Place a piece of No. 9 gauge wire mesh reinforcing one (1) foot over the pipe for reinforcement. In addition, a construction joint shall be placed over the rain conductor location. No additional compensation will be considered for the removal and/or replacement of roof or driveway drains under the driveway.
- O. Restore and/or raise to grade all gas valves, water valves, sewer vents, or other utility valve boxes encountered during driveway restoration. No additional compensation will be considered for work associated with this requirement.
- P. Insulated protection of the concrete shall be required dependent on weather conditions at the time of pouring and during the curing period. A polyethylene plastic sheeting shall be considered as the adequate minimum protection required for concrete during adverse weather conditions. The Owner reserves the right to require additional protective measures such as blanketing. No additional compensation will be considered in the event protective measures above the minimum are required by the Owner.

### 3.3 STONE OR AGGREGATE DRIVEWAY RESTORATION

- A. The Contractor shall install a minimum of six (6) inches of in kind stone or aggregate material. The gradation, color and texture of the replacement material shall match the existing material as closely as practical.
- B. The Contractor will be directed by the Owner as to the limits of driveway removal required in order to achieve an adequate grade for a smooth transition.

END OF SECTION 02743

## SECTION 02764 - PAVEMENT JOINT SEALANTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Expansion and contraction joints within cement concrete pavement.
  - 2. Joints between cement concrete and asphalt pavement.
- B. Related Sections include the following:
  - 1. Division 2 Section "Hot Mix Asphalt Paving" for constructing joints between concrete and asphalt pavement.
  - 2. Division 2 Section "Cement Concrete Pavement" for constructing joints in concrete pavement.

## 1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
  - 1. For primers and substrate preparation needed for adhesion.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for sealants.

## 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multi-component materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

## 1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 degrees F.
  - 2. When joint substrates are wet or covered with frost.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles. Products not listed, but considered as "or equal" by the Contractor, may be submitted for review and approval by the Owner.

### 2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.



### 2.3 COLD-APPLIED JOINT SEALANTS

- A. Grade NS Silicone Sealant for Concrete: Moisture-cured, one-component polyurethane-based, non-sag elastomeric sealant meeting Federal Specification TT-S-0023C, Type II, Class A; ASTM C-920, Type 6, Grade NS, Class 35 and certified to the NSF/ANSI Standard 61 for potable water.
- B. Color: White, colonial white, aluminum gray, limestone, black, dark bronze, capitol tan, stone and medium bronze. Owner to select color prior to application.

### 2.4 HOT-APPLIED JOINT SEALANTS

- A. Sealant for Concrete and Asphalt: Performance graded asphalt cement binder meeting AASHTO M320.

### 2.5 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- D. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

### 2.6 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

## 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of backer materials.
  - 2. Do not stretch, twist, puncture, or tear backer materials.
  - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses provided for each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- E. Tooling of Non-sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealants from surfaces adjacent to joint.
  - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

### 3.4 CLEANING

- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

### 3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 02764