

SECTION 02200

STRUCTURE EXCAVATION AND EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pavement Removal
- B. Preparation
- C. Stripping Topsoil
- C. Rock Excavation
- D. Excavation
- E. Subgrade Preparation
- F. Filling, Backfilling and Rough Grading
- G. Backfill Schedule

1.2 REFERENCES

- A. ASTM C136 Sieve Analysis of Fine and Coarse Aggregates
- B. ASTM D1556 Density of Soil in Place by the Sand Cone Method
- C. ASTM D1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 Pound Rammer and 18-inch Drop
- D. ASTM D2167 Density of Soil in Place by the Rubber Balloon Method
- E. ASTM D2922 Density of Soil and Soil Aggregate in place by Nuclear Methods
- F. NFPA 495 Explosive Materials Code

1.3 QUALITY ASSURANCE

- A. Blasting of subsurface rock must be performed under the supervision of a licensed blaster with a minimum of five years of documented experience.
- B. Filling and backfilling and subgrade preparation will be laboratory and field tested to verify compaction requirements.

1.4 REGULATORY REQUIREMENTS

- A. Conform to local code requirements for disposal and/or burning of debris.
- B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.
- C. Comply with all state, county and local regulations governing use of explosives for removal of subsurface rock.

- D. Comply with NFPA 495, Explosive Materials Code.
- E. Rules and regulations of the various utility companies and other authorities having jurisdiction over such Work shall be observed in the performance of all earthwork operations.

1.5 PROTECTION

- A. Protect existing monuments, bench marks, structures, fences, sidewalks, paving and curbs and other markers before starting Work. Restore any damaged items to original condition or repair as directed.
- B. Protect any trees or shrubs shown or designated to be saved by boxing or wire fencing staked securely in place or other approved means, maintained until completion of work.
- C. Protect and maintain above and below grade utilities that are to remain.
- D. Protect excavations and adjacent property and structures by shoring, bracing, sheet piling, underpinning or other methods as required to prevent cave-in, damage, and/or loose soil from falling into the excavation.
- E. Underpin adjacent structures and utilities which may be damaged by excavation work.
- F. The OWNER and ENGINEER shall be notified immediately if any unexpected subsurface condition, such as buried structures or utility lines is encountered, and discontinue work in that area until notified to proceed. The ENGINEER will determine the disposition of the obstruction. The CONTRACTOR shall adequately protect and support the obstruction until a determination is made and relocate, realign or dispose of the obstruction as authorized by the ENGINEER.
- G. Protect the bottom of excavations and soil adjacent to and beneath foundations from frost.
- H. The top of the excavation shall be mounded or graded to prevent surface water runoff from entering the excavation.
- I. Erect and maintain guide rails, fences, warning lights or other protection as required for the safety of all persons at the excavations.

1.6 SUBMITTALS

- A. As-built record drawings shall be submitted. Locate both new and existing utilities horizontally from some permanent structure and vertically by elevation.

PART 2 PRODUCTS

- 2.1 Topsoil: excavated material, graded free of roots, rocks larger than 1 inch, subsoil, debris and weeds.
- 2.2 Subsoil: excavated material, graded free of lumps larger than 6 inches, rocks larger than 3 inches and debris.
- 2.3 Buried Structures: concrete and masonry structures not shown on the drawings and encountered during the excavation and requiring removal shall be classified as rock.

2.4 Select Fill Materials:

- A. Type A - Crushed Stone: natural stone free of shale, clay, friable materials, debris and organic materials size and grading to comply with AASHTO No. 57.
- B. Type B - Crushed Stone: natural stone free of clay, shale, friable material, debris and organic materials and graded in accordance AASHTO No. 3.
- C. Type C - Crushed Stone or Gravel: free of shale, clay, friable materials, debris and organic materials graded in accordance with PennDOT Number 2A.
- D. Type D - Sand: natural river or bank sand, washed, free of silt, clay, loam, friable or soluble materials and organic matter graded in accordance with ANSI/ASTM C136 within the following limits:

<u>Sieve Size</u>	<u>Total Percent Passing</u>
#4	100
14	60-100
50	20-80
100	10-30
200	0

2.5 Common Fill Materials - subsoil; either reused or imported free of lumps larger than 6 inches, rocks larger than 3 inches, roots, organic material and debris.

2.6 Accessories:

- A. Silt Barrier Fence - PennDOT Class 3, Type B.
- B. Separation Fabric - PennDOT Class 4.

PART 3 EXECUTION

3.1 PAVEMENT REMOVAL

- A. Remove all pavement, road surfaces, curbing, driveways and sidewalks within the lines of excavation.
- B. Cement concrete pavements shall be opened by sawing. Bituminous concrete pavements shall be cut to neat straight lines with channeling machines or other methods to provide a clean cut in the pavement and base without undue shattering.
- C. All debris and material resulting from the removal shall be removed from the site and disposed of in an approved manner by the CONTRACTOR.

3.2 PREPARATION

- A. Identify required lines, levels, contours and datum.
- B. Identify all utilities and mark locations.

- C. Maintain and protect existing utilities that pass through the work area and are to remain in service.
- D. Notify utility companies to remove and/or relocate utilities as required.
- E. Upon discovery of unknown utility or concealed conditions, discontinue Work in the affected area and notify the ENGINEER.
- F. Implement all procedures as required by the sediment and erosion control plan. Temporary seeding shall be employed on all areas that are disturbed and remain exposed for more than twenty days.

3.3 STRIPPING TOPSOIL

- A. Before starting excavation, remove topsoil to its full depth, from all areas that are to be further excavated, relandscaped or regraded. Do not excavate saturated topsoil.
- B. Topsoil shall be stockpiled at the site as directed for use in further finish grading. All stockpiles shall receive temporary seeding.

3.4 ROCK EXCAVATION

- A. The CONTRACTOR shall excavate and remove rock by mechanical methods to the dimensions and elevations as required for the proposed construction.
- B. Blasting will not be permitted.
- C. Cut away rock at excavation bottom to form a sound level bearing surface. Shattered, fractured, or otherwise unsound shale layers shall be removed.
- D. All excavated material shall be removed from the site and disposed of in a proper manner by the CONTRACTOR.

3.5 EXCAVATION

- A. The CONTRACTOR shall perform all excavation required to construct all structures, skate park technical features, paved areas, and Work incidental thereto. Excavation shall extend a sufficient distance to allow working space and inspection, except where concrete is to be deposited directly against excavated surfaces. All loose material shall be removed from excavations, and bottoms shall be carefully leveled to grade.
- B. None of the above provisions shall be construed to relieve the bidder of his responsibility to make a careful personal examination of the site in order to satisfy himself as to the nature and location of the Work required, the conformation of the ground, the soil and rock conditions and the character, quality, and quantity of the materials.
- C. Excavated materials to be used for backfill or other purposes shall be piled away from the edge of the excavated area a sufficient distance to prevent overloading the bank, and graded to prevent surface water from entering the excavated area. Excess material from excavation not suitable nor required for backfill or other purposes shall be hauled from the site.
- D. Do not excavate to full depth when rain or freezing conditions are imminent. Completed foundation soil surface shall be protected from frost. Where foundation soil surfaces are

damaged by water, mud, or otherwise disturbed, all loose mud or other materials shall be removed and the surface regraded and restored to plan grade with the same strength concrete as that specified for the footing above or compacted select backfill as directed by the ENGINEER.

- E. The CONTRACTOR shall pump or otherwise remove any water which may be found in the excavation, and he shall provide drainage ditches, underdrains, flumes, well points, pumping equipment or other materials as necessary to keep the excavation free of water so that all required Work can be done in the dry.

3.6 SUBGRADE PREPARATION

- A. After excavating and/or stripping topsoil in the areas of roads and other structures, the existing subgrade for paving shall be proofrolled with at least ten complete coverages of a 10-ton static capacity roller, to obtain a firm unyielding subgrade. The CONTRACTOR shall notify the ENGINEER at least twenty-four hours in advance of the proofrolling operation, so that his representative can observe the process.
- B. If during the proofrolling operations any soft, unstable or yielding areas are found, they shall be overexcavated to a depth and width as authorized by the ENGINEER and back-filled with select fill compacted to an in-place density of ninety-eight percent of the maximum dry density or otherwise stabilized or modified as authorized by the ENGINEER. Work performed to correct these irregularities shall be paid as an extra to the CONTRACT price based on established unit prices.

3.7 FILLING, BACKFILLING AND ROUGH GRADING

- A. Filling and backfilling shall be performed to the rough grades and compaction percentages as indicated in the schedule below by placing and compacting select fill or approved common fill in continuous layers not exceeding eight inches (8") loose depth.
- B. The fill or backfill material shall be maintained at $\pm 3\%$ of the optimum moisture content, as determined by laboratory testing, to ensure proper compaction.
- C. No backfill shall be placed on frozen, wet, spongy or unstable subgrade surface. No frozen material shall be used for fill.
- D. The CONTRACTOR shall employ a placement method to avoid damage to buried piping and accessories.

3.8 BACKFILL SCHEDULE

- A. The paragraphs below identify location, fill material to be used in layers from the prepared existing subgrade up to the proposed rough grade or base elevation and compaction as a percentage of the maximum density as determined by laboratory testing.
- B. Compaction testing will be performed at the discretion of the OWNER. If tests indicate Work does not meet the specified requirements, it shall be removed, replaced and retested until compliance is achieved.
- C. Schedule
 - 1. Grassed Areas - subsoil to six inches below finished grade compacted to 85%.

2. Landscaped Areas - subsoil to six inches below finished grade compacted to 80%.
 3. Bituminous or concrete walkways - approved common fill compacted to 90% with a four inch thick cover of Type C select fill compacted to 95%.
 4. Bituminous or concrete roadways, driveways and parking areas - approved common fill compacted to 97% up to 3 feet from the subgrade elevation, and to 100% within 3 feet of the subgrade elevation. Subbase as indicated.
- D. Clean stockpile areas of excess fill material and remove surplus from the site. Any paved area (new or existing) over which hauling operations or other equipment moving are conducted shall be kept clean and any soil or other material left on paved surfaces shall be promptly removed by the CONTRACTOR.

Any areas damaged or disturbed during the course of the Work shall be restored to their original condition as authorized by the ENGINEER.

END OF SECTION

SECTION 02225

TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cutting paved surfaces
- B. Blasting
- C. Trench excavation
- D. Control of excavated material
- E. Backfilling trenches
- F. Disposal of excavated material
- G. Restoration of surfaces

1.2 REFERENCE STANDARDS

- A. Pennsylvania Department of Transportation:
 - 1. PennDOT Publication 408 Specifications
 - 2. Pennsylvania Test Method, PTM 106 (Soil Moisture-Density)
 - 3. Pennsylvania Test Method, PTM 112 (Soil-Cement Moisture-Density)
 - 4. Pennsylvania Test Method, PTM 402 (Nuclear Density)
 - 5. PennDOT Publication 72, Standards for Roadway Construction
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C33: Specifications for Concrete Aggregates
 - 2. ASTM D698: Tests for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, using 5.5 lb (2.49 kg). Rammer and 12-inch (304.8 mm) drop
 - 3. ASTM D2922: Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods

1.3 SUBMITTALS

- A. Submit certification attesting that the composition analysis of pipe bedding and select material stone backfill materials meets specification requirements.
- B. Submit a list of all equipment to be used for compacting, including manufacturer's lift thickness limitations.

1.4 JOB CONDITIONS

- A. Classification of Excavation:

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

- B. Protection of Existing Utilities and Structures:

- 1. Take all precautions and use all facilities required to protect existing utilities and

structures. In compliance with Act 287 of the General Assembly of Pennsylvania, as most recently amended, advise each Utility at least three (3) working days in advance of intent to excavate, do demolition work or use explosives and give the location of the job site. Request cooperative steps of the utility and suggestions for procedures to avoid damage to its lines.

2. Advise each person in physical control of powered equipment or explosives used in excavation or demolition work of the type and location of utility lines at the job site, the utility assistance to expect, and procedures to follow to prevent damage.
3. Immediately report to the utility and the ENGINEER any break, leak or other damage to the lines or protective coatings made or discovered during the Work and immediately alert the occupants of premises of any emergency created or discovered.
4. Allow free access to utility personnel at all times for purposes of maintenance, repair and inspection.

1.5 QUALITY ASSURANCE

- A. Conduct testing of backfill at locations as authorized by ENGINEER.
- B. Testing, if required, will be performed by an independent Testing Laboratory.

PART 2 PRODUCTS

2.1 PIPE BEDDING MATERIAL

- A. Refer to the Drawings for bedding requirements for thermoplastic pipe.

2.2 BACKFILL MATERIAL

- A. Refer to the Drawings for backfill requirements for thermoplastic pipe.

PART 3 EXECUTION

3.1 CUTTING PAVED SURFACES

- A. Where installation of pipelines, miscellaneous structures, and appurtenances necessitate breaking a paved surface, make cuts in a neat uniform fashion forming straight lines parallel with the centerline of the trench. Cut offsets at right angles to the centerline of the trench. Cuts may be made with a saw or by bituminous pavement milling.
- B. Protect edges of cut pavement during excavation to prevent raveling or breaking; square edges prior to pavement replacement.

3.2 BLASTING

- A. Blasting will not be permitted.

3.3 TRENCH EXCAVATION

A. Depth of Excavation:

1. Excavate trenches to the depth indicated plus that excavation necessary for placement of pipe bedding material.
2. Where rock is encountered in the trench bottom, remove the rock to the depths as shown on PennDOT RC-30M.

B. Width of Excavation:

1. Excavate trenches to the indicated width.
2. Shape trench walls completely vertical.

3.4 CONTROL OF EXCAVATED MATERIAL

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

3.5 BACKFILLING TRENCHES

- A. Backfill trenches as indicated.

3.6 DISPOSAL OF EXCAVATED MATERIAL

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

3.7 RESTORATION OF SURFACES

- A. Restore unpaved surfaces disturbed by construction to equal the surface condition prior to construction.
- B. Restore grassed areas in accordance with Section 02936.
- C. Restore paved surfaces as indicated.

END OF SECTION

SECTION 02510
BITUMINOUS PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Bituminous paving.

1.3 REFERENCES

- A. Pennsylvania Department of Transportation Publication 408 Specifications, latest edition.

All sections apply. Notable Sections:

1. Section 210 – Subgrade
2. Section 313 – Superpave Asphalt Mixture Design, Standard Construction, base Course
3. Section 316 – Flexible Base Replacement
4. Section 323 – Roller Compacted Concrete Base Course
5. Section 350 – Subbase
6. Section 410 – Superpave Mixture Design
7. Section 460 – Tack Coat
8. Section 469 – Asphalt Joint and Crack Sealing
9. Section 490 – Removal of Existing Surface Course
10. Section 491 – Milling of Bituminous Pavement Surface
11. Section 702 – Asphalt Material
12. Section 703 – Aggregate

1.4 SUBMITTALS

- A. Product Data: Submit product information and mix design.
- B. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Perform work in accordance with the Pennsylvania Department of Transportation Specifications - Publication 408, as applicable.
- B. Mixing Plant: Conform to Pennsylvania Department of Transportation Specifications - Publication 408, as applicable.
- C. Obtain materials from same source throughout.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable local standards for paving work on public property.

1.7 CERTIFICATION

- A. The suppliers' invoices shall contain a statement of certification that the materials furnished meet PennDOT requirements.
- B. Bituminous material certifications shall be on the PennDOT "Certificate of Compliance for Daily Bituminous Mixtures" (Form CS-4171B); other materials may be on the "Certificate of Compliance" (Form CS-4171).

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not place bituminous wearing course when surfaces are wet or when the temperature of either the air or surface is 35 degrees F. or lower.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials to be used shall meet the requirements of Publication 408, as applicable.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that the subgrade meets the requirements of Pennsylvania Department of Transportation Publication 408, Section 210, before beginning work.
- B. Verify that the compacted subbase meets the requirements of Pennsylvania Department of Transportation Publication 408, Section 350, before beginning work.
- C. Verify gradients and elevations of base are correct.
- D. Beginning of installation means acceptance of substrate.

3.2 PREPARATION

- A. Prepare existing surfaces for the laying of pavement as required in the Pennsylvania Department of Transportation Specifications - Publication 408, Section 210.
- B. Apply a bituminous tack coat to any existing surface that is scheduled to receive additional bituminous paving material (overlay) in accordance with Pennsylvania Department of Transportation Specifications - Publication 408, Section 460. Includes milled surfaces.
- C. Where existing paved surfaces that are scheduled to receive additional bituminous paving material (overlay) must match existing fixed elevations, i.e., entrance to an existing structure, adjust the finished elevation of the paved surface by one of the following methods:
 - 1. Mill the surface of the existing bituminous pavement in accordance with Pennsylvania Department of Transportation Specifications - Publication 408, Section 491. Length of horizontal transition section shall be at least four feet for each one inch of vertical adjustment.

2. Remove the pavement down to the depth, as specified, and replace the section as specified per Pennsylvania Department of Transportation Specifications - Publication 408. Length of horizontal transition section shall be at least four feet for each one inch of vertical adjustment.
- D. Where existing paved surfaces have been damaged during the course of construction, remove the pavement down to the level of the subgrade and replace the damaged section as required in the Pennsylvania Department of Transportation Specifications - Publication 408.

3.3 PLACING BITUMINOUS PAVEMENT

- A. Place No. 2A subbase course in accordance with Pennsylvania Department of Transportation Specifications - Publication 408, Section 350.
- B. Place bituminous paving courses in accordance with Pennsylvania Department of Transportation Specifications - Publication 408, Sections 313.
- C. Place each course to compacted thickness indicated.

3.4 TOLERANCES

- A. The completed paving must meet the tolerances stated in Pennsylvania Department of Transportation Specifications - Publication 408, Section 313.

3.5 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed directed by the OWNER.

3.6 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury under provisions of Section 01500 and of the Pennsylvania Department of Transportation Specifications - Publication 408, Sections 413.
- B. Do not allow vehicular traffic or loads on newly compacted courses for 24 hours or until the course uniformly cools to a temperature of 140F or less. Provide alternate routes as indicated or as directed. If both lanes that form a longitudinal joint are placed on the same day and public safety is not restricted, do not allow vehicular traffic or loads on the lanes until adequate stability and adhesion is obtained and the material has uniformly cooled to 140F or less.

END OF SECTION

SECTION 02580

PAVEMENT MARKINGS (PENNSYLVANIA)

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Application of traffic lines and pavement markings
- B. Application of parking lot lines and markings

1.2 REFERENCES

- A. Pennsylvania Department of Transportation Publication 408, Specifications
 - 1. Section 960 - Hot Thermoplastic Pavement Markings
 - 2. Section 961 - Cold Plastic Pavement Markings or Legends
 - 3. Section 962 - Waterborne Pavement Markings
 - 4. Section 963 - Pavement Marking Removal
 - 5. Section 964 - Epoxy Pavement Markings
 - 6. Section 1103 - Traffic Signing and Marking
- B. Pennsylvania Department of Transportation Publication 68: Regulations - Traffic Signs, Signals and Markings

1.3 SUBMITTALS

- A. Submit catalog cuts, listing PennDOT approval numbers, for all materials, as applicable, under provisions of Section 01300.

1.4 QUALITY CONTROL

- A. Field observation will be performed under provisions of Section 01400.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Pavement marking materials shall be as approved by PennDOT in accordance with Publication 408, Sections 960, 961, 962, 964 and 1103.
- B. All materials shall be manufactured and/or supplied by an entity listed in the current version of PennDOT Bulletin 15, for the type of material proposed.
- C. All materials shall be supplied by the CONTRACTOR.

PART 3 EXECUTION

3.1 INSPECTION

- A. Verify that paved surface is ready to receive the work of this Section.

3.2 SURFACE PREPARATION

- A. Satisfactorily clean and dry paved surface. Blow or sweep free of loose dirt and other debris.
- B. Properly locate and place lines and markings.

3.3 APPLICATION

- A. Pavement markings existing in good condition as determined by the ENGINEER and in accordance with the Drawings are not required to be replaced.
- B. Remove any existing markings in conflict with the proposed markings.
- C. Furnish and apply pavement markings for traffic lines and markings as indicated.
- D. Satisfactorily remove any line or legend improperly located, then replace it in the proper location.

END OF SECTION

SECTION 02590

TRAFFIC SIGNS (PENNSYLVANIA)

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Installation of traffic signs

1.2 REFERENCES

- A. Pennsylvania Department of Transportation Publication 408, Specifications
 - 1. Section 930 - Post Mounted Signs, TypeA
 - 2. Section 931 - Post Mounted Signs, TypeB
 - 3. Section 932 - Post Mounted Signs, TypeC
 - 4. Section 933 - Post Mounted Signs, TypeD
 - 5. Section 934 - Post Mounted Signs, TypeE
 - 6. Section 935 - Post Mounted Signs, TypeF
 - 7. Section 936 - Structure Mounted Signs
 - 8. Section 1103 - Traffic Signing and Marking
- B. Pennsylvania Department of Transportation Publication 68: Regulations - Traffic Signs, Signals and Markings
- C. Pennsylvania Department of Transportation Publication 111: TC-7700 Traffic Signing Standards

1.3 SUBMITTALS

- A. Submit catalog cuts, listing PennDOT approval numbers, for all materials, as applicable, under provisions of Section 01300.

1.4 QUALITY CONTROL

- A. Field observation will be performed under provisions of Section 01400.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Signs and appurtenant materials and fabrication shall be as approved by PennDOT in accordance with Publication 408, Sections 930 through 936 and 1103, and Publication 111.

PART 3 EXECUTION

3.1 SIGN INSTALLATION

- A. Signs shall be constructed and installed as indicated, and in accordance with PennDOT Publication 408, Sections 930 through 936, and PennDOT Publication 111.

END OF SECTION

SECTION 02602

STORM INLETS AND ENDWALLS

PART 1 GENERAL

1.1 DESCRIPTION

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

1. Storm drainage inlets

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. Pennsylvania Department of Transportation:

Publication 408 Specifications
Publication 72 Standards for Roadway Construction

1.3 SUBMITTALS

A. Shop Drawings: Submit detailed shop drawings of inlet and basin units and end walls, including reinforcing steel details.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Precast Concrete Units:

1. After fabrication and curing, transport the units to the job site. Protect until required for installation.
2. Handle to avoid damage to surfaces, edges and corners and to avoid creation of stresses within the units.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Reinforcement bars: Publication 408, Section 709
- B. Brick: AASHTO-M91, Grade SS
- C. Masonry Mortar: ASTM C270, Type N
- D. Malleable Iron Castings: AASHTO, Division II, Section 11.3.6.1(3)
- E. Ductile Iron Castings: AASHTO, Division II, Section 11.3.6.1(2)
- F. Structural Grade Carbon Steel: ASTM A709, Grade 36
- G. Concrete: PennDOT Class A or better for cast-in-place items. PennDOT Class AA for

precast items

- H. No. 2A Subbase Material: Publication 408, Section 350.2

2.2 FABRICATION

- A. Precast Cement Concrete Units:

- 1. Comply with the requirements of Publication 408, Section 714, and Publication 72.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Perform excavation in accordance with PennDOT Publication 408.
- B. Locate inlets as indicated on the Drawings.

3.2 CONSTRUCTION

- A. Construct inlets of precast sections of the type indicated on the Drawings.
 - 1. Place precast units on a 12" depth of No. 2A subbase placed in 4" layers compacted to the ENGINEER'S satisfaction.
 - 2. Shape bottom of inlet boxes with concrete to channel flow of water to the outlet pipe and to prevent water from standing in box.
 - 3. Use precast concrete rings or brick to adjust to grade. Mortar in place.
- B. Do not permit pipes to project more than 2" into inlets.

3.3 BACKFILLING

- A. Backfill structures only after examination by the ENGINEER.
- B. Perform backfilling and compaction in accordance with PennDOT Publication 408.

END OF SECTION

SECTION 02720
STORM DRAIN PIPE

PART 1 GENERAL

1.1 DESCRIPTION

- A. The Work of this Section includes, but is not limited to:
 - 1. Storm sewer pipelines

1.2 QUALITY ASSURANCE

- A. Reference Standards:
 - 1. Pennsylvania Department of Transportation: Publication 408, Specifications

1.3 SUBMITTALS

- A. Provide manufacturer's installation instructions for any special procedures.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. During loading, transporting and unloading, exercise care to prevent damage to materials.
- B. Do not drop pipe or fittings.

PART 2 PRODUCTS

2.1 HIGH DENSITY POLYETHYLENE PIPE

- A. PennDOT Publication 408, Section 601.2(a)6.a.1.

PART 3 EXECUTION

3.1 PREPARATION

- A. Perform trench excavation to the line and grade indicated and as specified in Section 02225.
- B. Provide pipe bedding as specified in Section 02225 for each type of pipe used. Place aggregate in a manner to avoid segregation, and compact to the maximum practical density so that the pipe can be laid to the required tolerances.

3.2 LAYING PIPE IN TRENCHES

- A. Give ample notice to the ENGINEER in advance of pipe laying operations.

- B. Lay pipe to a true uniform line with the barrel of the pipe resting solidly in bedding material throughout its length. Excavate recesses in bedding material to accommodate joints, fittings, and appurtenances.
- C. Lay each section of pipe to form a close concentric joint with the adjoining section and to avoid offsets in the flow line.
- D. Clean and inspect each pipe and fitting before joining. Align pipe with previously laid sections. Assemble to provide tight, flexible joints that permit movement caused by expansion, contraction, and ground movement. Assemble joints in accordance with the pipe manufacturer's instructions.
- E. Check each pipe installed as to line and grade in place. Correct deviation from line and grade immediately. Deviation from the designed grade or deflection of pipe joints, will be causes for rejection.
- F. Place and compact sufficient backfill to hold each section of pipe firmly in place as the pipe is laid.

3.3 BACKFILLING TRENCHES

- A. Backfill pipeline trenches only after examination of pipe laying by theENGINEER.
- B. Backfill and compact trenches as specified in Section 02225.

END OF SECTION

SECTION 02936

SEEDING, MULCHING,
FABRIC AND ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Seeding, hydroseeding, mulching and fertilizing
- B. Erosion Control Blankets, Matting and Channel Liners
- C. Maintenance

1.2 REFERENCES

- A. FS O-F-241 - Fertilizers, Mixed, Commercial
- B. PennDOT Publication 408, Specifications

1.3 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

1.5 REGULATORY REQUIREMENTS

- A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.7 SUBMITTALS

- A. For hydroseeding, submit mix formulation.
- B. Provide catalog cuts and manufacturer's instructions for erosion control matting.

1.8 MAINTENANCE SERVICE

- A. The CONTRACTOR shall maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.

- B. The CONTRACTOR shall replace topsoil at all eroded areas and/or washouts and shall reseed with the same seed mix, or shall place sod of the same seed mix.
- C. The CONTRACTOR shall replace any blanket or liner which failed and reseed as required.
- D. The CONTRACTOR shall be responsible for replacing all failures which occur within one year of final completion.

PART 2 PRODUCTS

2.1 SEED

- A. All seed used shall be labeled in accordance with the U.S. Department of Agricultural Rules and Regulations under the Federal Seed Act in effect at the time of purchase, which shall be later than the date of this Contract. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. Seed shall not be more than two (2) years old and shall be retested for germination rate no more than ninety (90) days prior to use.
- B. Inert matter shall not exceed 15%. Blue Tag Certified Seed shall be supplied wherever possible.

2.2 SEED MIXTURE

	<u>% by Weight</u>	<u>Purity</u>	<u>Min. % Germination</u>	<u>Max. % Weed Seed</u>
A. Lawn Seed (PennDOT Formula B)				
Kentucky Bluegrass (4 or more varieties - none greater than 25% of total Bluegrass component)	50	98	80	0.20
Pennfine Perennial Ryegrass	20	98	90	0.15
Creeping Red Fescue	30	98	85	0.15

	<u>% by Weight</u>	<u>Min. % Purity</u>	<u>% Germination</u>	<u>Max. % Weed Seed</u>
B. Slope areas steeper than 3 horizontal to 1 vertical which will not be mowed (PennDOT Formula C)				
Crown Vetch	45	99	70	0.10
Annual Ryegrass	55	98	90	0.15
C. Special Areas - swales, pond embankments, levees, diversion channels, and occasional water flow areas (PennDOT Formula D).				
Kentucky 31 Tall Fescue	70	98	85	0.25
Creeping Red Fescue	30	98	85	0.15
D. Temporary Seeding (PennDOT Formula E)				
Annual Ryegrass	100	98	90	0.15
E. Temporary Seeding				
Winter Rye	100	95	80	0.15

2.3 ACCESSORIES

- A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- B. Pulverized agricultural limestone.
- C. Fertilizer: FS O-F-241, Type I, Grade A; recommended for grass, with fifty percent (50%) of the elements derived from organic sources, to the following proportions: Nitrogen ten percent (10%), phosphoric acid ten percent (10%), soluble potash ten percent (10%).
- D. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.
- E. Herbicide: In accordance with Publication 408, Section 804.2(d).
- F. Erosion Control Matting: Install in accordance with the manufacturer's specifications, and in all locations with the following conditions:
 - Matting: North American Green or approved equal S150 for slopes 3:1 up to 2:1 and SC 150 for slopes 2:1 and steeper.
- G. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; minimum pH value of 6.5 and maximum pH value of 7.0.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this Section. The topsoil shall be a minimum of 6" depth and shall be free of rocks and other matter.

3.2 FERTILIZING

- A. Apply pulverized agricultural limestone at a rate of 6 tons per acre.
- B. Apply fertilizer in accordance with manufacturer's instructions.
- C. Apply after smooth raking of topsoil and prior to roller compaction.
- D. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- E. Mix fertilizer and limestone thoroughly into upper four inches of topsoil.
- F. Lightly water to aid the dissipation of fertilizer.

3.3 SEEDING

- A. Do not seed areas in excess of that which can be mulched on same day.
- B. Planting Season:

Formula B	March 1 to June 1 and August 1 to October 15
Formula C	Ryegrass portion March 1 to October 15; Crown Vetch portion November 1 to August 31
Formula D	March 1 to June 1 and August 1 to October 15
Formula E	March 1 to August 15
Winter Rye	August 16 to October 15
- C. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- D. Immediately following seeding and compacting, apply mulch at a rate of 3 tons per acre. Maintain clear of shrubs and trees.
- E. Apply water with a fine spray immediately after each area has been mulched. Saturate to four inches of soil.

3.4 HYDROSEEDING

- A. Apply seeded slurry with a hydraulic seeder to match seed rates specified below, evenly in two intersecting directions.

Formula B	2.5 lbs per 1,000 sq. ft.
Formula C	1.0 lbs per 1,000 sq. ft.
Formula D	2.5 lbs per 1,000 sq. ft.
Formula E	1.2 lbs per 1,000 sq. ft.
Winter Rye	4 lbs per 1,000 sq. ft.
- B. Inoculate Crown Vetch at 5 times the manufacturer's rate.
- C. If fertilizer is applied with inoculant, the mixture shall not remain in a slurry for more than one

hour.

- D. Mulch as specified in Section 3.3D., or apply wood cellulose fiber, at a rate of 900 lbs. per acre, as part of the slurry.

3.5 PLACING TOPSOIL

- A. Spread topsoil to a minimum depth of 6 inches over area to be planted. Rakesmooth.
- B. Place topsoil during dry weather and on dry unfrozen subgrade.
- C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.
- D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.
- E. Install topsoil into pits and beds intended for plant root balls, to a minimum thickness of six inches (6").

3.6 SEED PROTECTION AND EROSION PROTECTION

- A. Mulch shall be kept moist and anchored either mechanically, or with cutback asphalt or polymer tackifier, as required to prevent it from blowing away.
- B. Cover seeded areas with erosion control matting or channel liner as indicated. Install in accordance with manufacturer's specifications and instructions.
- C. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- D. Apply herbicides in accordance with Publication 408, Section 804.3(h).
- E. The seed mixtures should be PennDOT Formula B and PennDOT Formula C for this project for the locations adjacent to the sidewalk and fencing.

3.7 MAINTENANCE

- A. Roll and/or rake surface to remove minor depressions or irregularities.
- B. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- C. Immediately reseed and mulch areas which show bare spots. If areas continue to be bare, then sod will be required.
- D. Immediately replace matting or liner which failed, and reseed disturbed areas. If problems continue, sod may be required.
- E. Immediately replace topsoil at all eroded areas and/or washouts and reseed with the same mix, or place sod of the same seed mix, if the erosion continues.

END OF SECTION

SECTION 03603

NON-SHRINK GROUT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Non-shrink cementitious grout.
 - 2. Grouting of dowels, base plates, equipment, machinery, and elsewhere as noted on the drawings.

1.2 REFERENCES

- A. American Society of Testing and Materials:
 - 1. ASTM C191 - Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
 - 2. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
 - 3. ASTM C531 - Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 4. ASTM C579 - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, monolithic Surfacing and Polymer Concretes.
 - 5. ASTM C827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
- B. U. S. Army Corps of Engineers Concrete Research Division (CRD):
 - 1. CRD C621 - Non-Shrink Grout.

1.3 SUBMITTALS

- A. Product Data: Submit product data on grout.
- B. Manufacturer's Installation Instructions: Submit manufacturer's instructions for mixing, handling, surface preparation and placing non-shrink type grouts.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grout in manufacturer's unopened containers with proper labels intact.
- B. Store grout in a dry shelter, protect from moisture.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Observe manufacturer's requirements for minimum and maximum air temperatures.

PART 2 PRODUCTS

2.1 NON-SHRINK CEMENTITIOUS GROUT

- A. Manufacturers:

1. Sika Corporation.
 2. L & M Construction Chemicals, Inc.
 3. Substitutions: Section 01600 - Product Requirements.
- B. Non-shrink Cementitious Grout: Pre-mixed ready for use formulation requiring only addition of water; non-shrink, non-corrosive, non-metallic, non-gas forming, no chlorides.
- C. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621, 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. 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. Construct leakproof forms anchored and shored to withstand grout pressures.
- B. Install formwork with clearances to permit proper placement of grout.

3.4 MIXING

- A. 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 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.

END OF SECTION