SECTION 02230 SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain.
   2. Removing existing trees, shrubs, groundcovers, plants, and grass.
   3. Clearing and grubbing, including selective clearing in designated areas.
   4. Stripping and stockpiling topsoil.
   5. Removing above- and below-grade site improvements.
   6. Disconnecting, capping or sealing, abandoning site utilities in place, and removing site utilities.

1.2 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and 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 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots.

1.3 MATERIAL OWNERSHIP

A. Except for excess stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.
1.5 QUALITY ASSURANCE
   A. Stake limits of clearing, grubbing, and stripping, prior to commencing of work.

1.6 PROJECT CONDITIONS
   A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
      1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
      2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction. Detour routes shall be identified by adequate signs in accordance with the MUTCD.
   B. Protect areas outside limits of disturbance from encroachment by construction personnel or equipment, regardless of property Ownership. Access shall be by specific, written permission or easement only.
   C. Salvageable Improvements: Carefully remove items indicated to be salvaged and deliver to storage location defined on the plans or specified here in.
   D. Utility Locator Service: Properly notify utility locator service for area where Project is located before site clearing in accordance with local protocol.
   E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION
   A. Cut branches and roots, if required, with sharp pruning instruments; do not break or chop.
   B. Protect existing site improvements to remain from damage during construction.
      1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION
   A. Erect and maintain temporary fencing around tree drip line before starting site clearing. Remove fence when construction is complete.
      1. Do not store construction materials, debris, or excavated material within fenced area.
      2. Do not permit vehicles, equipment, or foot traffic within fenced area.
      3. Maintain fenced area free of weeds and trash.
   B. Do not machine excavate within tree drip line.
C. Where excavation for new construction is required within tree drip line, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

D. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with earth.

   1. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
   2. Coat cut faces of roots more than 1-1/2 inches (38 mm) in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
   3. Backfill with soil as soon as possible.
   4. Where trenching for utilities is required within drip line, tunnel under or around roots by hand digging. Do not cut main lateral roots or tap roots; cut only smaller roots that interfere with installation of new work. Cut roots with sharp pruning instruments; do not break or chop.

E. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the owner

3.3 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
   1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner’s Representative and owner not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner’s Representative written permission.

3.4 CLEARING AND GRUBBING

A. Completely remove obstructions, trees, shrubs, stumps, roots, grass, and other vegetation to permit installation of new construction.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Use only hand methods for grubbing within tree protection zone.
3. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations in accordance with Section “Earthwork,” unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Remove all roots/stumps before stripping topsoil.

B. Where trees are designated to remain, stop topsoil stripping and adequate distance from the trees to prevent damage to the main root system.

C. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including trash, debris, weeds, roots, and other waste materials.

D. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust. Haul all excess topsoil not required for reuse to the on campus 'Potato Field'. Neatly stockpile as directed by the Owner.

1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
2. Do not stockpile topsoil within tree protection zones.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.7 DISPOSAL

A. Burning of debris onsite is not permitted.

B. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION
SECTION 02333 TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the excavation of trenching, backfilling, compacting, excavation support and disposal, as shown on the Contract Drawings, and as herein specified.

B. The Engineer will determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor's expense.

1.2 QUALITY ASSURANCE

A. Reference Standards:

   1. The latest edition of the following standards, as referenced herein, shall be applicable.

      b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."
      d. National Electric Code(NEC)

B. The Contractor shall comply with the requirements for soil erosion and sedimentation control and other requirements of governmental authorities having jurisdiction, including the State.

C. Field Testing and Inspection Services: Owner shall retain the services of an independent soil testing laboratory to provide soil testing during construction.

1.3 SUBMITTALS

A. Samples:

   1. The Contractor shall furnish representative earth materials to the testing laboratory for analysis and report, as directed by the Engineer, or as outlined in the specifications.

B. Test Results:

   1. The testing laboratory shall submit written reports of all tests, investigations, findings and recommendations to the Contractor and the Engineer.
1.4 PROJECT REQUIREMENTS

A. Notify the Engineer of any unexpected subsurface condition.

B. Protect excavations by shoring, bracing, sheet piling, or by other methods, as required to ensure the stability of the excavation. Comply with OSHA requirements.

C. Underpin or otherwise support structures adjacent to the excavation which may be damaged by the excavation. This includes service lines.

D. Protection of Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations. Comply with OSHA requirements.

2. Coordinate interruption and/or termination of utilities with the utility companies and the Owner.

3. Provide a minimum of forty-eight (48) hours notice to the Owner and receive written notice to proceed before interrupting any utility.

E. Repair any damaged utilities as acceptable to the Owner, Engineer, and utility company at no additional cost to the Owner.

F. Contractor shall comply with maintenance and protection requirements as approved by the authority having jurisdiction.

G. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights, if required.

2. Operate warning lights as recommended by authorities having jurisdiction.

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

4. Perform excavation within drip-line of trees to remain by hand, and protect the root system from damage or dryout to the greatest extent possible. Maintain moist conditions for root system and cover exposed roots with burlap. Paint cut roots of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe Zone Bedding: Select mixture of graded crushed stone, free from organic, frozen or other deleterious materials, and meeting the following gradation requirements:
### B. Pipe Zone Backfill
Sound, durable sand, gravel, stone or blends of these materials, free from organic, frozen or other deleterious materials, and meeting the following gradation requirements:

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### C. Suitable Material
Sound, durable sand, gravel, stone or blends of these materials, free from organic, frozen or other deleterious materials, conforming to the requirements of CONNDOT Article M.02.06 Grading B (See Section 312000, 2.1 B “Selected Fill”).

Run-of-trench material, meeting the above criteria, shall be considered suitable material and shall be used for trench backfill only after tested in accordance with Section "Quality Requirements" and approved by the Engineer. The Contractor shall pay for all additional testing required to determine the conformance of run-of-trench material, if at any time during the Work this material appears to be in non-conformance in the opinion of the Engineer.

### PART 3 - EXECUTION

#### 3.1 PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

**A.** Owner shall employ and pay for a qualified independent soil testing laboratory to perform soil testing services for source qualifications.

**B. General:**

1. Sufficient size samples shall be obtained from the potential borrow source to allow completion of tests listed in paragraph B below. Samples may be obtained from test borings, test pits, or from borrow pit faces provided that surficial dry or wet soil is removed to expose undisturbed earth. Tests listed below shall be performed on each sample obtained. A minimum of three (3) representative samples from each potential borrow source shall be furnished to the testing laboratory for prequalification testing. Test data shall be provided to the Engineer a minimum of 2 weeks prior to construction for approval of borrow source. Three test reports completed within three months prior to construction may be submitted for commercial earth borrow sources or suppliers of stone products (crushed stone or graded stone products) in lieu of prequalification tests as approved by the Engineer.

**C. Material Tests:**
1. Particle Size Analysis:
   a. Method: ASTM D422
   b. Number of Tests: One (1) per sample; three (3) per potential source.
   c. Acceptance Criteria: Gradation within specified limits.

2. Maximum Density Determination:
   a. Method: ASTM D1557 - Modified Proctor
   b. Number of Tests: One (1) per sample; three (3) per potential source.

3. Re-establish gradation and maximum density of fill material if source is changed during construction.

3.2 PREPARATION

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

B. Maintain benchmarks and other elevation control points; re-establish if disturbed or destroyed, at no additional cost to the Owner.

C. Establish location and extent of existing utilities prior to commencement of excavation.

3.3 EXCAVATION

A. All excavation shall be made to such depth as required and of the width shown on the Contract Drawings to provide suitable room for building the structures and laying the pipe(s) they are to contain and for sheeting, shoring, pumping and draining as necessary, and for removing peat, silt, or any other materials which the Engineer may deem unsuitable. Hand trench excavation may be required to protect existing utilities and structures.

B. Trench excavation for pipes shall be made by open cut to accommodate the pipe or structure at the depths indicated on the Contract Drawings. Excavation shall be made to such a depth and to the width indicated on the Contract Drawings so as to allow a minimum of six (6) inches of pipe zone bedding to be placed beneath the bottom of all structures and barrels, bells or couplings of all pipes installed unless otherwise specified on the drawings.

C. The bottom of the trench shall be accurately graded to provide a uniform layer of bedding material, as required, for each section of pipe. Trim and shape trench bottoms and leave free of irregularities, lumps, and projections.

D. Stockpile excavated subsoil for reuse where directed or approved.

E. Over excavation/under cut: If, in the opinion of the Engineer, existing material below the trench grade is unsuitable for properly placing bedding material and laying pipe, the Contractor shall excavate and remove the unsuitable material and replace the same with an approved pipe zone bedding material properly compacted.

F. Stability of Excavation: Slope sides of excavations shall comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavation in safe condition until
3.4 DEWATERING

A. The Contractor shall remove all water from the excavation promptly and continuously throughout the progress of the work and shall keep the excavation dry at all times until the work is completed and excavation is backfilled or have sufficient weight to resist uplift pressures. Groundwater levels shall be depressed to a minimum of 2 feet below excavation subgrade. No pipe or structure is to be laid in water and water shall not be allowed to rise on or flow over any pipe or structure until such time as approved by the Engineer.

B. Provide a suitable point of discharge from dewatering operations shall be conveyed in a non erosive manner satisfactory to the Engineer.

C. Precautions shall be taken to protect uncompleted work from flooding during storms or from other causes. All pipe lines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced or otherwise protected.

3.5 BEDDING AND BACKFILLING

A. All pipe trenches backfill (pipe zone bedding, pipe zone backfill and trench backfill) shall be compacted by tamping or rolling to achieve a minimum dry density of 90 percent of the modified Proctor maximum dry density of the material used (ASTM D1557). Backfill in pipe trenches to be covered with pavement shall be compacted to a minimum of 95 percent of modified Proctor maximum dry density. Backfill materials shall be placed with water content within plus or minus 4 percent of optimum moisture content per the modified Proctor method (ASTM D1557). Any water used for compaction shall be provided by the Contractor at his own expense. The Contractor is responsible for the repair of any trench settlement at no expense to the owner.

B. Bedding and backfilling shall be accomplished in three stages unless otherwise specified on the Contract Drawings. The first stage shall involve placement of "pipe zone bedding" as a layer(s) of selected material required to support, or to stabilize unsound or unsatisfactory foundation conditions. The second stage shall involve placement of "pipe zone backfill" from the top of the bedding material up to one (1) foot above the pipe. The third stage involves the placement of "trench backfill" in the remainder of the trench up to the surface of the ground or the bottom of any special surface treatment subgrade elevation.

C. The bedding material shall be placed in the trench after the trench has been excavated a minimum of six (6) inches below the bell of the pipe to permit the placing of not less than six (6) inches of bedding material unless otherwise specified on the Contract Drawings. Where, in the opinion of the Engineer, more than six (6) inches of bedding material shall be required, the excavation shall be performed and bedding placed to the depth ordered by the Engineer.

D. Provide uniform bearing and support for each section of pipe at every point along the entire length, except where necessary to excavate for bell holes, pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make the joint connection properly.
E. The bedding material shall be placed to the full width of trench. The bedding material shall be placed in loose lifts not exceeding six (6) inches to the elevation shown on the Contract Drawings or directed by the Engineer. The bedding material shall be tamped and compacted to form a firm and even bearing surface.

F. Pipe zone backfill shall be placed to the elevation shown on the Contract Drawings in loose lifts not-to-exceed six (6) inches in thickness, before compaction. The backfill shall be placed on both sides of the pipe at the same time and to approximately the same elevation. Any pipe that is damaged or moved out of alignment, regardless of cause, shall be replaced or realigned at the Contractor's expense. Each layer shall be thoroughly compacted by hand-tamping or mechanical means being careful not to damage the pipe. When the pipe zone backfill reaches one (1) foot over the top of the pipe, the entire surface shall be compacted by mechanical means.

G. The remainder, if any, of the trench above the pipe zone backfill shall be backfilled with suitable material in loose lifts not exceeding six (6) inches in thickness before compaction. Each layer shall be thoroughly compacted by mechanical means.

3.6 BACKFILLING AROUND STRUCTURES

A. The Contractor shall not place backfill against any structure without obtaining the approval of the Engineer. No dumping shall be allowed where materials would flow against or around such structures. Backfill material shall be deposited in horizontal layers not exceeding 6 inches in loose thickness or as shown on the Contract Drawings and thoroughly compacted by hand or by mechanical means to the satisfaction of the Engineer.

3.7 SUSPENSION OF WORK

A. Whenever the work is suspended, excavations shall be protected and the roadways, if any, left unobstructed. Within or adjacent to private property, material shall be stored at such locations as will not unduly interfere with traffic of any nature and in no case shall materials be stored in locations which will cause damage to existing improvements.

3.8 DISPOSAL OF MATERIAL

A. Excess and unsuitable materials shall be disposed of by the Contractor on the site in an area approved by the Engineer or legally disposed of off-site at the Contractor's expense.

3.9 FIELD QUALITY CONTROL

A. Notify the Engineer at least three (3) working days in advance of all phases of filling and backfilling operations.

B. In-place density testing shall be performed to ascertain the compacted density of the fill and backfill materials in accordance with the following methods:

1. In-place relative density:
   a. Method: AASHTO T238, Nuclear Method

C. Perform initial density testing to verify that contractors proposed compaction effort will obtain the minimum required densities.
D. In-place density tests on trench backfills shall be provided for every 500 cubic yards of fill and in vertical lifts not exceeding 12", and at least once daily.

E. One particle size analysis (ASTM D422) and one modified Proctor compaction test (ASTM D1557) shall be competed for every 1,000 cubic yards of material placed.

F. The owner may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions, at the Contractor's expense.

G. Acceptance Criteria: The criteria for acceptability of in-place fill shall be in-situ dry density and moisture content. If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

END OF SECTION
SECTION 02621 POLYVINYL CHLORIDE PIPE

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the installation of polyvinyl chloride piping systems.

B. All piping, fittings, and appurtenances shall be new, clean and in accordance with material specifications. In no instance will second-hand or damaged materials be acceptable.

1.2 REFERENCES

A. American Water Works Association (AWWA).


C. National Sanitation Foundation (NSF).

1.3 QUALITY ASSURANCE

A. Product Markings: Plainly and permanently mark each pipe length with the following information:

   1. Nominal pipe size.
   2. Plastic pipe material designation.
   4. Pressure rating.
   5. ASTM designation.
   6. Manufacturers name or trademark and date of manufacture.
   7. Potable water pipe marking or seal, if applicable.

1.4 SUBMITTALS

A. Product Data:

   1. Submit manufacturer's catalog cuts, specifications and installation instructions.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage:

   1. Deliver and store pipe, fittings, specials, appurtenances and accessories and within the work limits as shown on the Drawings.

   2. Exercise special care during delivery and storage to avoid damage to the products.

   3. Store products in locations where unnecessary handling is avoided and where they will not interfere with the Owner's operations, construction operations or public travel.

B. Handling:
1. Handle pipe, fittings, specials appurtenances and accessories carefully with approved handling devices in strict conformance with the manufacturer's recommendations.

2. Do not drop or roll products off trucks, or otherwise drag, roll or skid products.

C. Products cracked, gouged, chipped, dented or otherwise damaged will not be approved and are to be removed and replaced at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe and Fittings:

1. Pressure Pipe for Water Distribution: 4 inch through 12 inch conforming to AWWA C900. DR Series made from Class 12454-A or Class 12454-B virgin compounds in accordance with ASTM D1784.

2. Pressure Rated Sewer Pipe: 4 inch through 15 inch conform to ASTM D-2241 made from Class 12454-B virgin compounds in accordance with ASTM D1784, SDR 26.

3. Gravity Sewer: 4 inch through 15 inches conforming to ASTM D-3034 Type PSM. SDR 35.


B. Joints:

1. Join pipe joints, including fittings, shall be joined with an integral bell and spigot type rubber gasketed joint.

2. Conform to ASTM F-477 for gaskets and mark to indicate nominal pipe size and proper insertion direction.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect all pipe and fittings prior to laying in the trench. Remove defective pipe and fittings from the site.

B. Do not backfill until inspection by the Engineer, unless otherwise approved by the Engineer.
3.2 INSTALLATION

A. Conform to Section "Trenching and Backfilling."

B. Conform to Section "Buried Pipe Installation."

3.3 TESTING

A. Conform to Section "Buried Pipe Installation."

END OF SECTION
SECTION 02740  PAVEMENT SUBBASE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes provisions for prepared subbase courses for under walks and pavements.

B. Proof rolling of subgrade for walks and pavements is included in this Section.

1.2 REFERENCES

A. "State of Connecticut Department of Transportation Standard Specifications."

B. “Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).”

C. “American Society for Testing and Materials (ASTM).”

1.3 SUBMITTALS

A. Source Quality Control Test Reports: Submit samples directly to owner for all required material tests.

1.4 QUALITY ASSURANCE

A. Field Testing and Inspection Service: Owner shall retain the services of an independent soil testing laboratory to provide soil testing during pavement subbase installation.

PART 2 - PRODUCTS

2.1 SOURCE QUALIFICATION TESTING

A. Owner shall employ and pay for a qualified independent soil testing laboratory to perform soil testing services for source qualification.

1. Obtain a 100-pound minimum representative sample from each potential aggregate source. Obtain samples for each different material gradation known to exist in the pit. Mix each sample thoroughly in accordance with AASHTO T87, and submit to the testing laboratory for reduction to specimen size. The laboratory shall perform the following tests in the order shown. Each material shall pass all tests in order to qualify.

   a. Particle Size Analysis:

      Method: ASTM D422
      Number of Tests: Two (2) per potential source.
      Acceptance Criteria: Gradation within specified limits.

   b. Plasticity Index Determination:

      Method: ASTM D424
Number of Tests: One (1) particle size analysis on material passing no 40 mesh.

Acceptance Criteria: Plasticity Index within specified limits.

c. Maximum Density Determination:

Method: ASTM D1557 Modified Proctor
Number of Tests: Two (2) per potential source.

d. Magnesium Sulfate Soundness Loss Test:

Method: AASHTO Method T 104.
Number of Tests: Two (2) per potential source.
Acceptance Criteria: Five cycle loss within specified limits.

Re-establish subbase material properties if source is changed during construction.

2.2 MATERIALS

A. Processed Aggregate Base: Materials shall consist of sound, durable stone, sand, gravel or blends of these materials, conforming to the requirements of CONNDOT Section M.05.01 as follows:

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1. Magnesium Sulfate soundness shall show a loss of not more than 15% at the end of five cycles, per AASHTO Method T104.

2. Plasticity Index shall conform to the requirements of CONNDOT M.02.06-2.

3. Not more than 30 percent, by weight, of the particles retained on a ½ inch sieve shall consist of flat or elongated particles. A flat or elongated particle is defined as one which has its greatest dimension more than 3 times its least dimension.

4. All material shall meet the specified gradation prior to placement. All processing shall be completed at the source.

PART 3 - EXECUTION

3.1 PREPARATION

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

B. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no additional cost to Owner.
C. Proof-roll existing subgrade to the satisfaction of the Engineer. Should the subbase course become unstable at any time prior to the placement of the overlying course(s), correct the unstable condition to the satisfaction of the Engineer. Replace unstable or weak subgrade materials with suitable material as provided in the Specifications.

3.2 INSTALLATION

A. Place subbase material in uniform horizontal layers, with a maximum compacted thickness of 8 inches.

B. Place subbase in a manner to avoid segregation. Uncontrolled spreading shall not be permitted.

3.3 COMPACTION

A. Where subbase courses must be moisture-conditioned before compaction, uniformly apply water to the surface. Prevent free water from appearing on the surface during or subsequent to compaction operations.

B. Compact all portions of each layer to a density not less than 95 percent of the maximum density.

C. Final tolerances for the top surface of the subbase course requires that the surface does not extend more than ¼ inch above nor more than ¼ inch below the specified grade at any location.

3.4 TRAFFIC ON SUBBASE

A. The movement of vehicular traffic over the final surface of the subbase may be permitted at locations designated by, and under such restrictions as ordered by the Engineer, provided such movements take place prior to the final finishing of this course to the specified tolerance. The movement of construction equipment on this course may be permitted, at locations designated by and under such restrictions as ordered by the Engineer at locations where permission is granted for such movement, the temporary surface of the course upon which the construction traffic is running, shall be placed and maintained for at least 2 inches above the final surface of this course. Just prior to paving, and after all construction traffic not required for the removal has ceased, remove the 2 inch protective layer, prepare the exposed surface of the course, and compact to the specified tolerance.

B. Should the subbase become mixed with the subgrade or any other material, through any cause whatsoever, remove such mixture and replace it with the specified subbase material.

3.5 FIELD QUALITY CONTROL

A. Notify the Engineer at least one (1) working day in advance of all phases of subbase installation.

B. Comply with the requirements of this Section for in-place relative density testing.

1. In-place relative density:

   Method: AASHTO T238, Nuclear Method
   Number of Tests: One (1) per specified interval.
   Acceptance Criteria: ± Two (2) percent of specified percent compactions.

2. Compaction tests shall be provided for every 1000 SY of subbase placement. A minimum of three for each lift is required.
3. The Engineer may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions.

4. Acceptance Criteria: The sole criterion for acceptability of in-place subbase shall be in situ dry density. Minimum dry density for all subbase shall be 95 percent of the maximum dry density. If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

END OF SECTION
SECTION 02741 ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY
A. This section includes provisions for hot-mixed asphalt concrete paving over prepared subbase.

1.2 REFERENCES
B. “Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO).”
C. “American Society For Testing and Materials (ASTM).”

1.3 SUBMITTALS
A. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.
B. Field Test Reports: Submit results of field testing directly to the owner.

1.4 SITE CONDITIONS
A. Weather Limitations: Apply tack coats when ambient temperature is above 50°F (10°C) and when temperature has not been below 35°F (1°C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
B. Construct hot-mixed asphalt concrete surface course when atmospheric temperature is above 40°F (4°C) and when base is dry. Base course may be placed when air temperature is above 30°F (minus 1°C) and rising.
C. Grade Control: Establish and maintain required lines and elevations.
D. In no instance shall the materials and thicknesses of pavement and subbase courses replaced be less than that removed, unless approved by the Engineer.

1.5 SEQUENCING AND SCHEDULING
A. Coordinate the placement of asphalt concrete pavement with the completion of underground work by other trades.

PART 2 - PRODUCTS

2.1 MATERIALS
A. General: Asphalt concrete and all related items shall meet the requirements of Form 816 M.04.01.
PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. General: Remove loose material from compacted subbase surface immediately before commencing paving operations.

B. Proof-roll prepared subbase surface with a ten-ton static, steel-wheel roller to check for unstable areas and areas requiring additional compaction, witnessed by the Engineer at least forty-eight (48) hours prior to scheduled paving operations.

C. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

D. Sawcut edges of existing pavement to achieve straight line transitions between old and new pavement. Make a second sawcut through the top course of existing pavement, 18 inches from the first cut to provide a staggered joint.

E. Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.03 to 0.07 gallons per square yard of surface.

F. Allow to dry until at proper condition to receive paving.

G. Exercise care in applying bituminous materials to avoid smearing of adjoining surfaces. Remove and clean damaged surfaces.

H. Do not commence pavement replacement operations until all buried work beneath pavement repair has been completed to the satisfaction of the Engineer.

I. Where trench dimensions preclude the use of proof rolling equipment, demonstrate the stability of the subgrade and subbase through other means, as acceptable to the Engineer.

3.2 PLACING AND COMPACTING MIX

A. General: Place and compact asphalt pavement courses in accordance with Form 816, unless otherwise specified.

B. Place inaccessible and small areas by hand, and compact with hot hand tampers or vibrating plate compactors.

C. Slope/Chamfer exposed edges of walks at 45° angle where walks do not abut curb.

D. Joints: Make joints between old and new pavements, or between successive days' work, to ensure...
continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

E. Place tack coat between successive courses if more than forty-eight (48) hours have elapsed after placing the preceding course. Apply tack coat at a rate of 0.03 to 0.07 gallons per square yard of surface.

F. Compaction: Compact asphalt pavement courses with a static steel wheel roller only, unless otherwise approved by the Engineer, based upon work conditions.

G. Remove and patch areas of any asphalt concrete course deemed unsatisfactory by the Engineer, at the Contractor’s expense. Remove hardened or set asphalt by saw cutting.

H. Adhere to Form 816 compaction requirements. This, however, shall not relieve the Contractor of his responsibility to provide a well densified pavement. It shall be the Contractor’s obligation to recognize difficulties in compacting the mix, and to make appropriate corrections.

I. Roll and compact the asphalt concrete course until the finished surface is free from depressions, waves or other defects that would prevent proper drainage. The finished surface shall be uniform in texture and appearance.

J. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

K. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.3 FIELD QUALITY CONTROL

A. General: Testing in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness will be done by Owner’s testing laboratory. Repair or remove and replace unacceptable paving as directed by Engineer.

B. Thickness: In-place compacted thickness tested in accordance with ASTM D 3549 will not be acceptable if exceeding following allowable variations:

1. Base Course: Plus or minus 1/2 inch.

2. Surface Course: Plus or minus 1/4 inch.

3. Cumulative Thickness Tolerances: Plus or minus 1/4 inch for nominal cumulative thicknesses less than or equal to 4 inches. Plus or minus 1/2 inch for nominal cumulative thicknesses greater than 4 inches.

C. Surface Smoothness: Test finished surface of each asphalt concrete course for smoothness, using 10-foot straightedge applied parallel with and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:

1. Base Course Surfaces: 1/4 inch.

2. Wearing Course Surface: 3/16 inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

D. Check surface areas at intervals as directed by Engineer.

E. Scuff Resistance: If, in the opinion of the Engineer, the pavement does not demonstrate reasonable resistance to deformation by punching loads and scuffing under horizontally applied shearing loads, after the pavement has cooled and hardened, the Engineer may require laboratory testing of cored pavement samples to determine the properties of the pavement; including aggregate gradation, asphalt content, air void ratio, density and any others deemed appropriate. If laboratory testing indicates that any parameters substantially deviate from the design mix tolerances specified, replace the affected areas of pavement at no additional cost, and reimburse the Owner for all costs incurred in procurement and testing of cores.

END OF SECTION
SECTION 02815 PRECAST CHANNEL DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. All materials, labor and equipment necessary to install a precast, interlocking polymer concrete trench drainage system as specified and as shown on the working drawings, shall be included.

B. System Description: Modular trench drain system precast from a corrosion resistant polymer including interlocking modular components for on-site installation.

1.2 QUALITY ASSURANCE

A. Warranty

1. Channel drain system is included under the Project Warranty.

1.3 SUBMITTALS

A. Contractor will submit shop drawings showing a plan of the total drainage system listing all parts being provided with exact center-line dimensions suitable for installation. Copies of the manufacturer’s recommended method of installation, assembly, and anchorage shall be submitted for review.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Physical and Mechanical Characteristics of Polymer Concrete Channel Units

1. Top unit width - Approximately 6.1 inches
2. Internal width - Approximately 4.0 inches
3. Unit depth - Approximately 9.8 inches
4. Compressive strength of specified polymer concrete - 14,000 psi min.
5. Flexural strength of specified polymer concrete - 4,000 psi min.
6. Water absorption rate - not to exceed 0.1%

B. Channel Profile shall include positive interlocking tongue and groove connections which can be sealed to provide water tight connections. Each precast polymer channel shall be an approximately 1 meter unit and be available in curved and straight sections.

C. Catch Basins shall be precast polymer concrete, 39.37” in length and include a plastic grating.

D. Channel Drainage System, Zurn, ACO or approved equal.

E. Grates:
1. Grates are to be ADA compliant, high density polyethylene. Color: Black.
2. Grate locking devices are to be galvanized steel.

PART 3 - EXECUTION

3.1 SITE PREPARATION

A. Excavate the area for channel placement wide enough to accommodate the channel size with a minimum of six inch concrete encasement. Channels require a minimum of six inches concrete support, and top of channel must be evenly aligned to the surface of the surrounding surface on both sides, as well as underneath the channel.

3.2 INSTALLATION

A. Install precast channel drain in accordance with the details on the plans and the manufacturers instructions.

B. Channel sections are installed from the outlet ends of the system, working from the catch basins. Insert channels from above to allow ends to interlock. Channel sections shall be placed on brick, rebar basket, channel chair, low slump concrete grout slurry, or suspended to obtain correct finished elevation. Cutting will be made, if required, by masonry or concrete saw. Cover top of channel with tape, plastic, or plywood strips to protect the channel surface from concrete during pouring.

C. Finishing and Cleanup

1. Following final set of concrete, remove protection covering top of channels.

2. Install drain system in strict accordance with manufacturer’s recommendations and shop drawings.

END OF SECTION