SECTION 02300 - EARTHWORK

All work, materials and testing shall conform to the Drawings and the provisions of MDOT SECTION 106 – QUALITY, SECTION 203 – EXCAVATION AND EMBANKMENT, SECTION 206 – STRUCTURAL EXCAVATION, SECTION 304 – AGGREGATE BASE AND SUBBASE COURSE, SECTION 637 – DUST CONTROL, SECTION 656 – TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL, and SECTION 703 – AGGREGATES with the following modifications and additions:

MODIFICATIONS:

Section 106 Quality – Add the following:

Field density tests shall be performed as outlined in Section 106 in accordance with ASTM D1557

1. Footing Subgrade: For each subgrade, one test shall be conducted to verify required design bearing capacities.
2. Building Slab Subgrade:
   a. One field density test of subgrade for each 2000 sq. ft., minimum 3 tests.
   b. One field density test for each layer compacted fill, for each 2000 sq. ft., minimum 3 tests each layer.

Section 203.04 General – Add the following: All unsuitable or surplus material excavated shall become the property of the CONTRACTOR and shall be removed from the site and managed in accordance with local, state, and federal regulations.

Section 203.04 General – Delete the fourth paragraph ("Suitable material…) from this section in its entirety.

Section 203.041 Salvage of Existing Bituminous Pavement – Method of Utilization (1) shall be revised to allow for the use of this material onsite in gravel parking areas. Salvaged bituminous pavement shall not be used in travelways or driveways, except where below aggregate subbase.

Section 206.01 Description – Add the following: The specification for all earthwork associated with subsurface utilities is included in this section. Payment for all utility trenching shall be handled on a utility by utility basis and shall be paid as identified in Section 01025 Measurement and Payment.

Section 703.06 Aggregate for Base and Subbase – The term "GRAVEL" shall refer to hard durable material meeting MDOT "Standard Specification" Section 703.06 Type C aggregate, with the following exception: The measurement of materials passing the 1/4" sieve shall be based on 100% of the material passing the 3" sieve.

ADDITIONS:

SUBMITTALS: The CONTRACTOR shall comply with the following provisions:

A. Submit schedule indicating proposed sequence of construction to DEPARTMENT and RESIDENT for review prior to start of work. Include coordination for shutoff, capping and continuation of utility services as required, together with details for dust and noise control protection, and Erosion Control Measures.

B. Submit results of all aggregate gradation, moisture density, and field compaction testing for all materials to RESIDENT.

GENERAL:

A. Paved Surfaces: Do not operate equipment that will cause damage to paved surfaces on paved surfaces. Any damage to existing roads or other paved surfaces caused by construction equipment shall be repaired at no additional cost to DEPARTMENT.

B. Maintain Excavations with approved barricades, lights, and signs to protect life and property until excavation is filled and graded to a condition acceptable to the RESIDENT.

C. Protect structures, utilities, monitoring wells, property monuments, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. The CONTRACTOR shall be responsible for actual cost of repair or replacement of any items damaged as a result of construction activities, including any professional services required for inspection of repairs and replacement.

D. Subsurface Obstructions: Buried and abandoned foundation structures and other obstructions are believed to be present on the work site. The number, locations, depths and construction of these structures are unknown. Locating and handling these obstructions during construction is the CONTRACTOR'S responsibility.

JOB CONDITIONS:

A. Site Information: The CONTRACTOR may make his own borings, hand probes, explorations, and observations to determine soil, water levels, and other subsurface conditions at no additional cost to DEPARTMENT. Coordinate with RESIDENT prior to start of additional investigative work.

B. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations. Coordinate with utility companies for actual locations and shut-off services. If utilities are encountered that are not shown or that are shown incorrectly on the Drawings, notify RESIDENT immediately. Repair damaged utilities to satisfaction of RESIDENT and utility.

C. Site Safety: All site activities should be carried out in compliance with local, state and federal construction safety regulations.

REFERENCES:

A. Manual of Accident Prevention in Construction - Associated General Contractors of America, Inc.

B. 29 CFR 1926/1910 - OSHA Safety and Health Standards for Construction Industry

EXCAVATION:

A. General: Remove all materials encountered to the limits shown on the Drawings, or designated in the Specifications. All wasted materials shall be the property of the Contractor unless otherwise noted on the Drawings.

B. Classifications: The following classifications of excavation will be made as needed and will be handled as a Contract Modification: Rock Excavation; and Excavation Below Normal Grade

C. Rock Excavation is defined in Section 203.01 as any hard rock or masonry or greater than 2 cubic yards in volume and cannot be removed without drilling, blasting or splitting. Do not perform rock excavation or excavation of unsuitable materials until material to be excavated has been cross-sectioned and classified by RESIDENT. Pre-drilling and blasting of bedrock through overburden may be allowed. However, if this method is used, the rock excavation quantities will be adjusted downward in proportion to the ground swell from this blasting method. Rock excavation shall be conducted in accordance with City of Portland Guidelines and Ordinances and all other local, state and federal regulations.

D. Earth Excavation: Remove and dispose of obstructions visible on ground surface, underground structures, utilities, and items indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

E. Excavation in Paved Areas: Cut pavement prior to excavation to provide a clean, uniform edge. Minimize disturbance of remaining pavement. Cut and remove the minimum amount of pavement required to do the Work. Use shoring and bracing where sides of excavation will not stand without undermining pavement.

F. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete formwork and reinforcement is installed. Trim bottoms to required lines and grades to leave solid base to receive other Work. When excavating in clay material, use a smooth-edged bucket to avoid disturbance of the bottom of the excavation. Use shoring and bracing where sides of excavation will not support itself.

G. Excavation for Trenches: Excavate to widths shown on the Drawings and depths indicated or required to establish indicated slope and invert elevations. Produce an evenly graded, flat trench bottom at the subgrade elevation required for installation of pipe and bedding material. Place backfill material directly into trench or excavation.

H. Unauthorized Excavation: Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of RESIDENT. Unauthorized excavation, as well as remedial work directed by RESIDENT, including refilling, shall be at CONTRACTOR's expense.

I. Refilling Unauthorized Excavation: For trenches, use 3/4-inch crushed stone. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by RESIDENT.

J. Excavation of Unsuitable Materials: When excavation has reached required subgrade elevations, notify RESIDENT who will make an inspection of conditions. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper as directed by RESIDENT and replace excavated material as specified. Removal of unsuitable material and its replacement as directed by RESIDENT will be paid for as Excavation Below Normal Grade unless material has been made unsuitable by CONTRACTOR’s operations. In this instance, removal and replacement will be performed at CONTRACTOR’s expense.

K. Material Storage: Stockpile and maintain suitable surplus excavated materials for re-use as backfill within the Project limits, as directed by RESIDENT. Place, grade and shape stockpiles to allow for proper drainage. Locate and retain soil materials away from edge of excavations.

L. Blasting: Blasting shall be performed in accordance with City of Portland Guidelines and Ordinances and all other applicable local, state and federal regulations.

STABILITY OF EXCAVATIONS:

A. General: Slope sides of excavations to comply with OSHA Regulations and Local Codes. Shore and brace per Section 02260 where sloping is not possible due to space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

BACKFILL AND FILL:

A. General: Place suitable soil material in layers to required elevations as shown on the Drawings. Fill, backfill, and compact to produce minimum subsequent settlement of the material and provide adequate support for the surface treatment or structure to be placed on the material. Place material in approximately horizontal layers of beginning at lowest area to be filled. Do not impair drainage.

B. Ground Surface Preparation: Remove vegetation, debris, unsuitable soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Remove material to the full extent of root penetration. Scarify surfaces so that fill material will bond with existing surface. When existing ground surface has a density less than that specified below, under "Compaction," for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum dry density.

C. Placement: Place backfill and fill materials in layers not more than 8-inches in loose depth for material compacted by heavy compaction equipment, and not more than 6-inches in loose depth for material compacted by hand-operated tampers. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

Place backfill and fill materials evenly adjacent to structures to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping, or conduit to approximately same elevation in each lift. Do not allow heavy machinery within 5 feet of structure during backfilling and compacting.

D. Backfill excavations as promptly as work permits, but not until completion of the following:

Acceptance of construction below finish grade including dampproofing, and/or waterproofing.
Inspection, approval and recording locations of underground utilities.
Removal of concrete formwork.
Removal of shoring and bracing, and backfilling of voids with suitable materials.
Removal of trash and debris from excavation.
Permanent or temporary horizontal bracing is in place on horizontally supported walls.

Backfill cast-in-place concrete structures when the concrete has developed adequate strength. Use care in backfilling to avoid damage or displacement of underground structures and pipe.

E. Backfilling Trenches: See Trench Details on the Drawings.

F. Backfilling Structures:

1. Place fill and backfill in layers that will uniformly compact to the required densities, but in loose layers not more than 8 inches thick.
2. Place backfill only after walls have been supported by completion of interior floor systems or have been sufficiently braced to resist the imposing loading.
3. Place backfill against walls below grade after waterproofing systems have been completed and approved.
4. Protect waterproofing systems during backfill operations.
5. If waterproofing is damaged, do not continue backfilling until membrane damage is repaired as approved by RESIDENT
6. Restore grades to indicated elevations.
7. The finished subgrade shall be brought to elevations indicated and sloped to drain water away from the building walls. Fill to required elevations any areas where settlement occurs.

G. Fill Under Slabs on Grade: Fill under slabs on grade shall be suitable backfill with gravel no larger than 2 inches in any dimension, backfilled in layers to required subgrade elevation. Place fill material as required to achieve the grades indicated on the drawings. Deposit fill material under floor slabs in horizontal layers not exceeding 12" in depth before compacting. Spread fill evenly and compact each layer by uniformly rolling, pneumatic tamping, or use of other approved equipment. If necessary, soil shall be moistened, or allowed to dry to the correct moisture content before compaction.

MATERIALS ADDITIONAL TO SECTION 703:

A. 3/4" Crushed Stone: Durable, clean angular rock fragments obtained by breaking and crushing rock material. Sieve analysis by weight:

Sieve Size	Max % Passing by Weight
1"	100
3/4"	95-100
1/2"	35-70
3/8"	0-25
No. 200	0-2

B. Suitable Backfill: Suitable soil materials are defined as those complying with ASTM D2487 soil classification groups GW, SM, SW, and SP. Materials containing excessive amounts of water, blue clay, vegetation, organic matter, debris, pavement, stones or boulders, or frozen material are not suitable. Unsuitable materials include ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH and PT.

C. Soil Filter Bed: Soil filter shall consist of loamy coarse sand, with high level of organic matter. Sieve analysis by weight:

Sieve Size	Max % Passing by Weight
No. 10	85-100
No. 20	70-100
No. 60	15-40
No. 200	10-15

D. Gravel: Refer to *MODIFICATIONS*

COMPACTION:

A. Methods: Use methods which produce the required degree of compaction throughout the entire depth of material placed without damage to new or existing facilities and which are approved by the RESIDENT. Adjust moisture content of soil as required. Remove and replace material that is too wet to compact to required density. Compact each horizontal layer of fill and slope as Work progresses.

B. Degree of Compaction: Compact to the following minimum densities:

FILL AND BACKFILL LOCATION	DENSITY (% of max)
Under structure foundations and slab on grade	95%
Top 2 feet under pavement and walkways	95%
Below top 2 feet under pavement	92%
Structural fills	95%
Pipe Bedding	95%
Adjacent to structure foundation walls, retaining walls, and tank walls	95%
Trenches through Gravel areas	95%
Trenches through other non-paved areas	90%
Embankments	90%
Lawn or Unpaved Areas	85% (cohesive soils)
Lawn or Unpaved Areas	90% (cohesionless material)

Maximum density: ASTM D1557. Field density tests: ASTM D2922 (nuclear methods).

C. Testing: Determine actual in-place densities using field tests as directed by the RESIDENT. Testing requirements shall comply with MDOT Section 106.4.3.

GRADING:

A. Grading: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finish surface within specified tolerances and compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Grading Outside Structure Lines: Grade areas adjacent to structure to drain away from structures and to prevent ponding.

C. Finish surfaces free from irregular surface changes and as follows:
   1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.
   2. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2 inch above or below required subgrade elevation.
   3. Fill Under Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2-inch when tested with a 10-foot straightedge.

MAINTENANCE AND PROTECTION:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during warranty period; remove surface, add backfill material, compact, and replace surface. Restore appearance, quality, and condition of surface to match adjacent work, and eliminate evidence of restoration work to greatest extent possible.

D. Dust Control: Dust control techniques shall comply with MDOT Section 637. Throughout entire duration of project, CONTRACTOR shall practice dust control techniques that effectively limit the amount of dust generated by work. Dust control techniques shall be compliant with all local, state and federal guidelines.

E. Water Control: Do not allow rain, surface or subsurface water, or other fluid to accumulate in excavation, nor under or above the structures. Should such conditions develop or be encountered, constantly control and legally dispose of the water in accordance with 02240 Dewatering.

DISPOSAL OF EXCESS MATERIALS: Remove excess excavated material and dispose of it off-site in a lawful manner, unless otherwise directed by RESIDENT.

EXCAVATION/TRENCHING FOR GAS UTILITY MAIN

A. CONTRACTOR to coordinate construction activity/schedule with Northern Utilities Resource Coordinator, Samuel J. Murray and construction activities supervisor, Brad Buzzell. Mr. Murray can be reached at 800-524-4486, extension 5340. Mr. Buzzell can be reached at 800-524-4486, extension 6230. CONTRACTOR shall initiate contact at least four weeks prior to desired trench opening date to arrange pre-construction inspection and meeting.

B. Trenching and backfill of gas trench for gas mains and services shall be conducted in accordance with the Gas Main Trench detail and the following provisions:

1 Gas main / service trench shall be deep enough to provide a minimum of 36” of cover over installed gas main.
2. Trench shall have 4” sand layer at bottom for gas main base
3. A minimum of 6” sand shall be placed over installed pipe prior to use of excavated materials to backfill the trench.
4. Furnish and install a number 12 AWG solid copper tracer wire with yellow insulating jacket along the length of the main / service. Tracer wire should be at least 4” away from gas pipe.
5. Furnish and install yellow, non-detectable, 6” wide warning tape along length of gas main / service. Warning tape should be one foot or less under finish surface grade over pipe.

EXCAVATION/TRENCHING FOR CENTRAL MAINE POWER

A. CONTRACTOR to coordinate construction activity/schedule/locations with Central Maine Power.

*** END OF SECTION ***