

SECTION 02220

EXCAVATION AND BACKFILLING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: Excavation, backfilling, filling, grading and related work as required by the Drawings and as specified herein.

B. Related Work Described Elsewhere:

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| 1. Subsurface conditions. | Section 01030 |
| 2. Testing laboratory services. | Section 01400 |
| 3. Temporary facilities and controls. | Section 01500 |
| 4. Traffic control. | Section 01570 |
| 5. Sheet piling, bracing and underpinning. | Section 02150 |

1.02 DEFINITIONS

A. Earth Excavation: The removal of all surface and subsurface materials of whatever nature encountered and not classified as rock as defined below.

B. Rock:

1. Hard ledge rock in solid beds or masses in its natural bed, which in the opinion of the Engineer, can be removed only by blasting, drilling, wedging or use of pneumatic tools, or by other methods ordinarily used to remove hard ledge rock.

2. Boulders over one cubic yard in volume.

C. Removal of materials which can be loosened with a pick or backhoe, frozen materials, soft laminated shale or hardpan, pavements, curbs, and similar materials shall be classified as earth excavation.

D. "Maximum Density": The maximum dry weight in pounds per cubic foot obtained in a soil when tested in accordance with ASTM D1557, Method C.

E. "Optimum Moisture Content": The percentage of water required to achieve the maximum density of the soil when tested in accordance with ASTM D 1557 Method C.

F. "Percent Density": The density of compacted layer expressed as a percentage of the maximum density of the material.

1.03 SUBMITTALS

A. General: Comply with provisions of Section 01300.

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- B. Excavation Procedure: Submit a detailed outline of intended excavation procedure for the Engineer's information. This submittal will not relieve the Contractor of complete responsibility for the successful performance of intended excavation methods.
- C. Sheet piling, Shoring, and Bracing: Submit for the Engineer's information a detailed plan of intended sheet piling, shoring and bracing, decking, underpinning, and other temporary not otherwise provided for in Sections 01519 or 02150, and signed by a licensed Professional Engineer. This submittal will not relieve the Contractor of complete responsibility for the successful performance of the intended methods.
- D. Procedures at Restricted Area: Submit proposed procedures at restricted area over Amtrak tunnels as specified in this Section.
- E. Product Data: Submit manufacturer's specifications, performance characteristics and operating instructions for compaction equipment.
- F. Backfill Material: For each backfill material used, submit laboratory test results for moisture - density relationships, per ASTM D 1557 Method C.

1.04 JOB CONDITIONS

- A. Barricade open excavations and post with warning lights those excavations occurring on property adjacent to or with public access. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
- B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation and backfill operations. Coordinate as required with work specified in Sections 01519 and 02150.
- C. Comply with provisions of Section 01500 for temporary controls.
- D. Comply with all other restrictions specified in this Section.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Common Backfill Material: Acceptable material as approved by the Engineer free from organic matter products of demolition, and other deleterious substances, and containing no rocks or lumps over 6 inches in greatest dimension except where otherwise approved by the Engineer. To the extent that it is available obtain common backfill material from excavation operations. If sufficient suitable materials are not available to meet backfilling requirements, obtain the required material from outside sources at no additional cost to the Authority.
 - 1. Earth excavation may contain excess moisture in its natural state or may take on excess moisture during handling and stockpiling. Manipulation

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to dry the material proper moisture content prior to compaction may be necessary. Earth excavation will not be considered as unacceptable backfill material by virtue of its moisture content only.

- B. **Select Backfill Material:** Imported material shall be provided for backfill where specified. The material shall consist of sound, durable particles of a maximum 3" size. No more than 70% by weight shall pass a No. 40 sieve and no more than 10% by weight shall pass a No. 200 sieve. The material shall be granular and free of organic or other deleterious material. Select backfill material will be subject to testing by the Engineer.

PART 3 - EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITY

- A. Conform to applicable laws, codes, ordinances and regulations of City and municipal authorities, including the furnishing of any required excavation drawings and the obtaining of permits.
- B. Prior to commencing work, examine the Drawings and Specifications, inspect the site, consult all available record drawings of existing work and utilities, and note all conditions and limitations which may influence work required by this Section.

3.02 FINISH ELEVATIONS AND LINES

- A. The Contractor shall be responsible for setting and establishing finish elevations and lines.
- B. Use existing established reference points designated by the Engineer to establish the new elevations and lines. Carefully preserve all established reference points, and if displaced, damaged or lost, replace them immediately at no additional cost to the Authority.

3.03 SHEETING, SHORING & BRACING

- A. Provide sheeting, shoring, bracing and other temporary protective work as may be necessary. Comply with provisions of Section 02150.
- B. Where required for safety or by governing laws, and when so ordered in writing by the Engineer, leave sheeting in place. In such instances remove original braces and rebrace sheeting against the structure in a manner approved by the Engineer. Cut off sheeting at elevations directed by the Engineer.

3.04 EXISTING UNDERGROUND UTILITIES

- A. **Known Utilities:**
 - 1. Locate underground utilities and service connections prior to commencing excavation work. Determine exact utility locations by hand-excavated test pits dug at locations approved by the Engineer.

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2. Support utilities to remain in place.
3. For utilities to be relocated, arrange for such relocation with appropriate utility companies.
4. Remove all inactive, abandoned utilities within the limits of the area to be excavated, whether or not such utilities are indicated for removal on the Drawings.
 1. Permanently close open ends of abandoned underground utilities which are indicated to remain, with sufficiently strong closures to withstand pressures which may result after closing.
 2. Use suitable methods and materials to effect such closures, as required and as approved by the Engineer.

B. Unknown Utilities:

1. When utility lines, that are not made known or indicated, are encountered within the area of operations, notify the Engineer in ample time for the necessary measures to be taken.
2. Do not disrupt any service until required action on such lines has been determined by the Engineer.

3.05 PUMPING AND DRAINAGE

- A. At all times during construction of the work and at its completion for final inspection, by the Engineer, provide and maintain ample means and suitable equipment, consistent with conditions encountered, to promptly remove and properly dispose of all water entering excavations or other parts of the work.
- B. Control surface and subsurface water in excavations at all times until the structures to be built therein are completed and backfilled to approximately final grades.
- C. Dispose of water in a suitable manner and as shown on the Drawings so as to avoid damage to adjacent property, existing structures and all work under construction. Do not pump drainage water on to the streets without the written permission in advance from the Engineer.
- D. Provide and maintain settling basins and sumps for catching and holding settleable matter. These shall be frequently cleaned and maintained. Wherever water containing mud, clay, sand or other material in suspension, is pumped from excavations, make suitable provisions to insure that the flow will be unobstructed. Take precautions to avoid pumping water through freshly placed concrete.
- E. At no time shall the uplift pressure on any structure exceed 80 percent of the downward pressure produced by the weight of the structure and any backfill in place. The Contractor shall submit his proposed methods of controlling uplift pressure to the Engineer for approval prior to the start of excavation.

- F. No water may be diverted from the construction site into the existing tunnel at 32nd Street or into the existing yard east of the 10th Avenue Bridge. The Contractor shall submit his proposed methods of controlling and disposing of water to the Engineer for approval prior to the start of excavation.

3.06 EXCAVATION

A. General

1. Perform all excavations of every description of all materials that are not provided for under other sections of these Specifications. Excavations shall be made to the lines, grades, thicknesses, and typical sections specified herein or shown on the Drawings.
2. Excavated material, not required for use as backfill, shall become the property of the Contractor and shall be disposed of off the jobsite.
3. Provide sufficient clearance for proper execution of concrete work. Make allowance for sheet piling and formwork where required, and for inspection of the work.
4. During excavation, store the material suitable for backfilling as shown on the Drawings or as approved by the Engineer. Dispose of unsatisfactory and excess material away from the site at the expense and responsibility of the Contractor.

B. Unauthorized Excavation:

1. Unauthorized excavation consists of removal of materials beyond the limits specified herein or shown on the Drawings.
2. Under structural footings and foundation bases, fill unauthorized excavation by extending the indicated bottom elevation of the footing or base to the excavation bottom, without altering required top elevation. Concrete fill of the same type specified for the footing or structural base shall be used to bring bottom elevations to level and proper position.
3. Elsewhere, backfill and compact unauthorized excavations as specified for adjacent authorized excavations, unless otherwise directed by the Engineer.
4. All additional concrete fill or earth backfill required as a result of unauthorized excavations shall be provided by the Contractor at no additional cost to the Authority.

C. Stability of Excavations:

1. Where the sides of excavations are sloped, angle of slopes shall be as approved by the Engineer and shall not be steeper than allowed by the Title 29 Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction (OSHA).

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2. Provide sheeting and bracing at excavations where required by the Drawings, or where sloping is not possible due to space restrictions or the nature of the material excavated.
3. Maintain sides and slopes of excavations in safe condition until backfilling is completed.
4. Where the Contractor elects to slope the sides of excavations, backfill of the over-excavated areas shall be made in the same manner specified for the adjacent excavated area. All additional backfill required shall be at no additional cost to the Authority.
5. Where indicated on the Drawings, excavations in rock shall be made by vertical line drilling in a manner that will provide a safe, secure vertical cut as approved by the Engineer.
6. Where vertically line-drilled rock is to be used as a back form for the walls of the concrete structures, provide for a continuous approved type separating form liner between the concrete and rock where required by the Drawings. In such instances, the line of the rock cut shall provide for the placing of the liner and the full dimension of the concrete shown on the Drawings.

D. Filling of Voids:

1. Where vertical structural components are to be placed against an excavated face, or against a bond breaking form liner placed on the excavated face, no voids shall be left between the back of the vertical structural element and the excavated face or the liner. In each instance, the structural concrete of the vertical element shall be extended to the actual excavated face or to the bond breaking liner placed against the excavated face.
2. Voids that occur between the form liner and the excavated face shall be filled with 3000 psi concrete where the voids are 3 inches or greater, and with Portland cement grout where the voids are less than 3 inches. The Contractor shall obtain the written approval of the Engineer for the methods of placing such concrete or grout.
3. Any additional concrete provided for the elimination of voids behind vertical structural elements, and any concrete or grout used to fill voids behind form liner, shall be provided at no additional cost to the Authority.

E. Excavation for Structures:

1. Excavate to required lines and grades.
2. In rock areas excavate so that concrete for foundations or mud slabs bears on solid, firm bedrock. Remove all loose material, clean out fissures. Where required, pressure grout cavities and fractures as approved.

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3. In earth areas, excavate so that foundations and base slabs bear on undisturbed subgrade.

F. Unsuitable Subgrades:

1. If unsuitable materials are encountered at the design subgrades, the Engineer may authorize the removal of such unsuitable materials and replacement with suitable compacted fill or with concrete.

3.07 ROCK EXCAVATION

- A. Where rock is encountered, expose the rock surface and notify the Engineer so that rock surfaces may be surveyed and cross-sectioned if required by the Engineer.
- B. Excavate in rock strata to lines and grades shown on Drawings. Use line drilling at locations indicated on Drawings. Line drilling shall consist of 2 inch diameter holes at 6 inches on center drilled to required subgrade level. No explosives shall be placed in line - drilled holes.
- C. Remove rock in a manner that will avoid shattering of rock formations outside the limits of line-drilled excavation. Remove loose or fractured rock in the vertical face of rock excavation along the perimeter of the structure, and fill the spaces with 3000 psi concrete.
- D. Work rock excavation down to a satisfactory bottom. Only drilling, picking, barring, wedging, chipping or similar methods, that will leave the rock adjacent to foundations in an entirely solid and unshattered condition shall be used on rock surfaces which are to receive or be in contact with concrete.
- E. Inspection of exposed rock surfaces will be conducted by the Engineer during all phases of rock excavation. Loose or fractured rock on faces of excavations shall be removed or adequately anchored to prevent collapse. Where necessary, the Contractor shall install posting, bracing, rock anchors or use other measures to prevent collapse of the rock faces. The methods used by the Contractor shall be subject to approval by the Engineer.
- F. The surface of rock at subgrade shall be cleared and leveled.
- G. Exercise care so that excavations are not carried below required elevations shown on the Drawings. If excavations are carried too low, backfill to the design elevations indicated with 3000 psi concrete, as approved by the Engineer, at no additional cost to the Authority.
- H. Footings shall bear on undisturbed rock having the bearing capacities approved by the Engineer. Bottoms of footings shall be level or stepped where so indicated and excavated to elevations shown on the Drawings, or if authorized, to other elevations where proper bearing exists.
- I. Where broaching is shown on the Drawings, 2 inch diameter holes shall be drilled at 4 inches on center to subgrade level, the rock between the

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drilled holes shall be cut to achieve a complete separation of the rock formation along the broached line.

- J. In areas where footings and foundation walls are to be constructed, excavate to the grades indicated on the Drawings, and to rock which meets the New York City Building Code requirements for a bearing value of 40 tons per square foot. Rock underpinning for the existing West Yard building, under caissons for the 10th and 11th Avenue bridges, and under jacking apparatus for the north access tunnel, shall meet the New York City Building Code requirements for a bearing value of 60 tons per square foot.

- 1. Immediately after approval of the bearing capacity of the footing by the Engineer, all seams and fissures in the rock at bottoms of footings shall be grouted. Top of the sealed surface shall be at the design elevation of the bottom of the footing.

3.08 EXPLOSIVES AND BLASTING

- A. The Contractor shall make himself fully aware of the character, use, and occupancy of adjoining buildings prior to start of blasting operations and shall regulate his work accordingly.
- B. Where blasting is required, use only persons skilled and experienced in such work. Handle and store detonators and explosives, and conduct blasting operations in strict conformance with the regulations and ordinances of the authorities having jurisdiction, and as required to avoid damage to property and injury to persons. All blasting shall be done by a licensed blaster.
- C. Charges shall be of such power and so placed that the blasts will not make the excavations unduly large, will not shatter adjoining rock, and will not cause movement or damage to utilities, structures or other work in the vicinity. Properly cover each blast with steel mats. Blasting caps shall be of a type that will not be affected by the presence of live contact rail, signal and electrical equipment, radio transmissions or railroad operations in the existing railroad tunnel. Detonating devices shall conform to local codes and to Amtrak requirements. The Contractor shall submit his proposed procedures and materials for blasting to the Engineer for approval.
- D. Comply with applicable paragraphs of the "Manual of Accident Prevention in Construction of AGCA Inc.", which shall form a part of these Specifications. Comply with applicable requirements of OSHA.
- E. Conduct pre-blasting surveys and keep accurate logs of each detonation. Make logs available to the Engineer..
- F. Design the blasting procedure including delays so that vibrating velocities measured along the property line do not exceed 1.0 inch per second except along the east side of the Site (West Yard Building) where the vibration velocities are limited to 0.5 inch per second. In no case shall the peak particle velocity exceed 2.0 inches per second at the pipe or structure nearest to the blast site. The design of the blasting procedure shall be based upon trial detonations made in areas designated by the Engineer. The results of these detonations shall be monitored by a seismologist engaged by the Authority. Vibration velocities in the existing Amtrak North River Tunnels shall not exceed the ambient levels caused by the simultaneous passage of a train in each tunnel, and in no case shall peak particle velocity exceed 1 inch per second.

- G. The vibrations will be monitored by the Engineer or by a seismologist employed by the Authority. The Contractor shall comply with the instructions given to him by the Engineer in conducting blasting operations and making necessary adjustments in his blasting procedures. Where maximum peak particle velocities are specified herein, they shall be reduced by the Contractor where necessary to prevent damage to or movement of adjacent structures, or where directed by the Engineer.
- H. All handling, transporting, and use of explosives shall meet the requirements of the Fire Department of the City of New York.
- I. Provide such magazines and magazine houses for the storage of explosives in such manner as may be approved by the proper municipal and/or other authorities having jurisdiction. Only that quantity of explosives anticipated for immediate use shall be removed from the magazine. After loading of holes, any surplus of explosives shall be immediately returned to the magazine. The amount of explosives kept in any one place shall not exceed the limit permitted by any ordinance of the City or as may be determined by the Authority.
- J. Do not keep caps and exploders in the same place with dynamite and other explosives. During freezing weather, take special precautions as to the care and manipulation of dynamite.
- K. At certain locations as indicated on the drawings and where the use of even light charges of explosives for the removal of rock might undermine, shatter or otherwise endanger adjacent portions of an existing structure, remove the rock by means other than blasting, such as "Bristar" a non-explosive demolition agent.
- L. Before commencing blasting operations, give 72 hours advance notice to the Engineer and to all parties owning or operating structures and utilities that could be affected by the blasting operations.
- M. The Contractor shall be fully liable for all damage or nuisance caused by his blasting operations, and shall promptly repair all damage at his own expense and as approved by the Engineer.
- N. Where the use of explosives for rock removal might undermine, shatter or otherwise endanger adjacent portions of existing structures, utilities or other work, or where directed by the Engineer discontinue blasting and remove the rock by other means.

3.09 BLASTING RESTRICTIONS

- A. General: Where indicated on the Drawings and under certain conditions as specified herein, blasting will not be permitted, and required rock removal shall be accomplished by means of pneumatic or mechanical tools, by the use of Bristar non-explosive demolition agent, or by other methods approved by the Engineer.
- B. Existing Amtrak Railroad Tunnels:

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1. No blasting will be permitted closer than 50 feet from the existing operating railroad tunnels when there is a train or trains in the section of tunnel adjacent to the blast. The Contractor shall provide, maintain and operate a telephone or other electric communications system between the work site and the Railroad's operating tower so that blasting operations can be safely coordinated with the Railroad's train operations in the tunnels. The communications system shall be of a type that will not affect the detonating devices used for blasting.
2. No blasting will be permitted above the existing Amtrak tunnels within the restricted area defined in paragraph 3.11 of this Section.
3. Comply with provisions of paragraph 3.11 of this Section.

C. Tenth Avenue Bridge Area:

1. No blasting will be permitted for rock excavation east of the broach line lying on the easterly property line of the 10th Avenue Bridge.
2. Blasting east of the centerline of 10th Avenue shall proceed only after underpinning of the West Yard Building has been completed, and prior to excavation of rock east of the broach line lying on the easterly property line of the 10th Avenue Bridge. Explosive charges for this excavation shall be designed so that peak particle velocities measured at underpinning columns do not exceed 0.5 inch per second. Coordinate the work with underpinning work specified in Section 02150. No blasting will be permitted within 400 feet of the underpinning work during the actual load transfer operation.

- D. Existing Evacuation Shaft of Amtrak North River Tunnels: No blasting will be permitted in the vicinity of the existing Evacuation Shaft as shown on Drawing No. S-E2.
- E. Eleventh Avenue Viaduct: No blasting will be permitted in the area indicated on the Drawings adjacent to the existing Eleventh Avenue viaduct column.
- F. North Access Tunnel: No blasting will be permitted in the area of the jacked section of the North Access Tunnel as shown on Drawing No. ST-N1a.
- G. Existing 32nd Street Demolition: Blasting may be utilized in the demolition of the existing 32nd Street structures provided that the requirements of paragraph 3.08 F of this section are complied with.
- H. Line Drilling: Line drilling shall be completed before blasting operations are conducted closer than 50 feet from these lines, except in the area of the Tenth Avenue Bridge where line drilling and broaching shall be performed as specified in Section 01030.

3.10 SEISMOLOGIC MONITORING

- A. During all blasting operations, the work will be subject to seismologic monitoring by a seismologist engaged by the Authority at the expense of the Authority. Coordinate blasting operations and schedules with the Engineer give advance of each blast as required and as directed.

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- B. The Contractor shall provide all required cooperation and assistance to the Authority's seismologist in setting up instruments, taking of readings, measuring of distances and other related operations.

3.11 RESTRICTED AREA AT EXISTING AMTRAK NORTH RIVER TUNNELS

- A. A 50 foot width centered on the existing Amtrak North River Tunnels and extending from the westerly right-of-way of Tenth Avenue to west of the westerly right-of-way of Eleventh Avenue shall be considered a restricted area.
- B. The Contractor shall not store equipment or materials in the restricted area unless approved by the Engineer.
- C. Equipment may cross the restricted area only where excavation has not taken place or where backfill in the restricted area has been completed to the indicated finish grade, subject to limitation specified elsewhere in this Section, on the Drawings, or as ordered by the Engineer.
- D. Submit a detailed plan for all work that will be performed in the restricted area. This plan must be approved by the Engineer prior to the start of any work in the restricted area. The plan shall include the type of equipment, with weights and load distribution, proposed for use in the work. Also included in the plan shall be the Contractor's proposed methods of protecting the existing tunnels and the proposed methods of monitoring vibrations transmitted to the tunnels.
- E. Wagon drills up to 14,000 pounds gross weight will be permitted to work in the restricted area when a minimum four feet of cover exists above the section line of the tunnels. The section line is shown on the "as constructed" Drawings of the existing Amtrak tunnel prepared by the Pennsylvania Railroad.
- F. Excavation and other equipment will not be permitted in the restricted area. Excavation equipment shall be positioned outside the restricted area and material shall be removed by backhoe, bucket or clamshell. Other means of excavation must be approved by the Engineer. Excavation within the restricted area shall proceed in maximum four foot lifts across the entire width of the excavation.
- G. Caisson drilling equipment shall not be operated in the restricted area or in any position that the Engineer determines may cause damage to the existing tunnels.
- H. Drill holes in rock shall be terminated no deeper than 2 inches below the subgrade as shown on the Drawings.
- I. The use of mechanical rock breakers will not be permitted in the restricted area of the Amtrak tunnel. The rock shall be excavated by means of drilling and the use of non-explosive demolition agents such as Bristar as approved by the Engineer, or by the use of approved rock splitters. Excavation within the restricted area shall proceed in maximum four foot lifts across the entire width of the excavation.

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- J. The existing Amtrak tunnels shall be continuously inspected by the Contractor from the inside. Any damage such as cracks, falling bricks or loosening of bricks or mortar shall be immediately reported to the Engineer. The Contractor shall modify his excavation procedure to prevent further damage. All damage to the tunnels caused by the Contractor's operations shall be repaired to the satisfaction of Amtrak and the Engineer at no cost to the Authority.
- K. Where there is less than four feet of cover above the section line of the Amtrak tunnels, construction equipment weighing more than 1,000 lbs. gross weight shall not be used in the backfilling and compaction work. Where more than four feet of cover exists over the section line, equipment having a gross weight of up to 10 tons may be utilized.

3.12 EXCAVATION PROCEDURES - TENTH AVENUE BRIDGE AREA

- A. Excavation of rock within 50 feet of the Tenth Avenue Bridge may not begin until broaching in the area of the bridge has been completed to subgrade elevation. Line drilling in the area may be done in two equal vertical lifts provided line drilling for each lift is done prior to the start of production blasting for that lift.
- B. The excavation shall proceed in a west to east direction. Blasting and excavation of rock east of the centerline of Tenth Avenue may not proceed until the underpinning of the West Yard Building has been completed.
- C. Rock east of the broach line, lying on the easterly property line of Tenth Avenue, may not be removed prior to excavation of all rock to the west of this line. Blasting in this area will not be permitted.
- D. Removal of rock for a 15 foot width, as measured at right angles to the broach line at the south abutment, shall be made in sections coinciding with each section of the abutment stem. A section is defined as that portion between construction joints. Removal of rock may be made on alternate sections simultaneously. Sections of rock remaining may not be removed until adjacent abutment sections have been placed and concrete has achieved 28 day strength. The length of sections as defined above will be increased, as approved by the Engineer, to allow room for reinforcing bar splices.

3.13 BACKFILLING

- A. General: Backfill with approved backfill material. Place backfill as promptly as work permits but not until completion of the following:
 - 1. Acceptance by the Engineer of the construction below finish grade including waterproofing where applicable.
 - 2. Recording of final location and limits of the structure, and of any utilities or other underground features that will be covered by backfill.
 - 3. Removal of concrete formwork, trash and debris.

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4. Removal of shoring and bracing where applicable, and as directed,
 - B. Backfill Material: Except where concrete is specified for backfill at structures, use select backfill material for backfill up to the elevation below future yard level as indicated on the Drawings. Use common backfill material for all other backfill.
 - C. Placement and Compaction:
 1. Place backfill materials in layers 8" in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum density as specified. Do not place backfill material on surfaces that are muddy, or contain frost.
 2. Backfill materials shall be installed evenly on opposing sides of structures to prevent wedging action from occurring.
 3. Over tunnel roof slabs, place backfill in uniform lifts over the full area or as approved. Exercise care to ensure maintenance of the integrity of the waterproofing. Backfilling shall not be started over roof slabs until concrete has achieved design strength unless otherwise permitted by the Engineer.
 - D. Grading: Carry backfill up to approximate existing grade elevations. Rough grade the area to drain away from the structure and to prevent ponding.
 - E. Concrete Backfill: Place and vibrate in accordance with applicable requirements of paragraph 3.06 of Section 03310.
- 3.14 COMPACTION
- A. General: The Contractor shall control compaction during construction to provide minimum percentage of density specified, as determined per ASTM D 1557, Method C. Field testing will be conducted by the Engineer in accordance with ASTM D 1556 or D 2922. The Contractor shall conduct such field tests for his own purposes as may be required to ensure the prosecution of the work in accordance with these Specifications.
 - B. Density: Compact each layer of select backfill material to not less than 95 percent of maximum density. Compact each layer of common backfill material to 90 percent of maximum density.
 - C. Moisture Control:
 1. Where layer of material must be moisture conditioned before compaction, uniformly apply water to surface of layer of placed material, in such manner as to prevent free water appearing on surface during or subsequent to compaction operations.
 2. Remove and replace, or scarify and air dry soil material that is too wet to permit compaction to specified density.

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3. Material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing, until moisture content is reduced to a satisfactory value, as determined by moisture-density relation test.

3.15 FIELD QUALITY CONTROL

- A. Contractor's testing laboratory shall perform laboratory maximum density tests for each material proposed for use in backfilling. Results of these tests shall be submitted to the Engineer and may be used by the Engineer to determine acceptability of materials and methods of compacting. Perform sampling and testing, and submit test results in a timely manner to avoid unnecessary delays in the work.
- B. Field density tests will be performed by the Engineer. The Contractor shall provide necessary cooperation and shall schedule his operations as required to permit sampling and testing.

3.16 MAINTENANCE

- A. Protect newly graded areas from unnecessary traffic and from erosion, and keep free of trash and debris.
- B. Repair and reestablish grades in settled, eroded, and rutted areas to specified tolerances.

END OF SECTION

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