

**DIVISION 31: EARTHWORK****31 0500 COMMON WORK RESULTS FOR EARTHWORK**

31 0501 COMMON EARTHWORK REQUIREMENTS

**31 1000 SITE CLEARING**

31 1100 CLEARING AND GRUBBING

31 1123 AGGREGATE BASE

31 1413 TOPSOIL STRIPPING AND STOCKPILING

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**SECTION 31 0501****COMMON EARTHWORK REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited to:
  - 1. General procedures and requirements for earthwork.
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
  - 2. Pre-Installation conferences held jointly with Section 31 0501 as described in Administrative Requirements on Part 1 of this specification section:
  - 3. Section 32 9001: 'Common Planting Requirements':
    - a. Pre-installation conference held jointly with other landscape related sections.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Aggregate Base: Layer of granular material immediately below concrete and asphalt paving or miscellaneous site concrete (sidewalks, curbs, etc) and below interior concrete slabs on grade.
  - 2. Base: See aggregate base.
  - 3. Building Grading: sloping of grounds immediately adjacent to building. Proper grading causes water to flow away from a structure. Grading can be accomplished either with machinery or by hand.
  - 4. Compacted Fill: Placement of soils on building site placed and compacted per Contract Documents. Used to replace soils removed during excavation or to fill in low spot on building site.
  - 5. Excavation: Removal of soil from project site or cavity formed by cutting, digging or scooping on project site.
  - 6. Fine Grading (FG): Preparation of subgrade preceding placement of surfacing materials (aggregate base, asphalt or concrete paving, and topsoil) for contour of building site required. Fine Grading is conducted to ensure that earth forms and surfaces have been properly shaped and subgrade has been brought to correct elevations. It is performed after rough grading and placement of compacted fill but before placement of aggregate base or topsoil.
  - 7. Finish Grading: Completed surface elevation of landscaping areas for seeding, sodding, and planting on building site.
  - 8. Natural Grade: Undisturbed natural surface of ground.
  - 9. Rough Grading (RG): Grading, leveling, moving, removal and placement of existing or imported soil to its generally required location and elevation. Cut and fill is part of rough grading.
  - 10. Subgrade (definition varies depending upon stage of construction and context of work being performed):
    - a. Prepared natural soils on which fill, aggregate base, or topsoil is placed.
    - or
    - b. Prepared soils immediately beneath paving or topsoil.
  - 11. Topsoil Placement and Grading: Topsoil placement and finish grading work required to prepare site for installation of landscaping.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in MANDATORY pre-installation conference for common earthwork sections:
    - a. Schedule conference after completion of site clearing but before beginning grading work.
    - b. Participate in pre-installation conference held jointly with following sections:

- 1) Section 03 3111: 'Cast-In-Place Structural Concrete'.
  - 2) Section 31 1100: 'Clearing and Grubbing'.
  - 3) Section 31 1123: 'Aggregate Base'.
  - 4) Section 31 1413: 'Topsoil Stripping and Stockpiling'.
  - 5) Section 31 2213: 'Rough Grading'.
  - 6) Section 31 2216: 'Fine Grading'.
  - 7) Section 31 2316: 'Excavation'.
  - 8) Section 31 2323: 'Fill'.
  - 9) Section 32 1216: 'Asphalt Paving'.
  - c. In addition to agenda items specified in Section 01 3100, review following:
    - 1) Review Geotechnical Evaluation Report.
    - 2) Review common earthwork schedule.
    - 3) Review protection requirements.
    - 4) Review cleaning requirements.
    - 5) Review safety issues.
    - 6) Review field tests and inspections requirements.
  - d. In addition to agenda items specified above, review following. These are items that will occur before pre-installation conference for landscape sections:
    - 1) Review clearing and grubbing requirements.
    - 2) Review topsoil stripping and stockpiling requirements.
    - 3) Review landscape grading requirements.
    - 4) Review landscape finish grade tolerance requirements.
    - 5) Review landscape and plant tolerances.
    - 6) Review surface preparation of landscape and planting areas.
    - 7) Review additional agenda items as specified in related sections listed above.
  2. Participate in pre-installation conference for landscape sections as specified in Section 32 9001:
    - a. Schedule pre-installation conference after completion of Fine Grading specified in Section 31 2216, but one (1) week minimum before beginning landscape work and held jointly with following sections:
      - 1) Section 32 8423: 'Underground Sprinklers'.
      - 2) Section 32 9120: 'Topsoil And Placement'.
      - 3) Section 32 9121: 'Topsoil Physical Preparation' (section included based on Topsoil Testing Report).
      - 4) Section 32 9122: 'Topsoil Grading'.
      - 5) Section 32 9223: 'Sodding'.
      - 6) Section 32 9300: 'Plants'.
    - b. In addition to agenda items specified in Section 01 3100 and Section 32 9001, review following that these items have been installed correctly:
      - 1) Review topsoil placement requirements.
      - 2) Review topsoil surface preparation requirements.
      - 3) Review topsoil depth requirements.
      - 4) Review landscape finish grade tolerance requirements.
      - 5) Review surface preparation of landscape and planting areas.
- B. Sequencing:
1. General Earthwork:
    - a. Excavation.
    - b. Rough Grading.
    - c. Fill.
    - d. Fine Grading.
    - e. Aggregate Base or Topsoil Grading.

## 1.4 QUALITY ASSURANCE

- A. Testing And Inspection:
1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
    - a. Owner will employ testing agencies to perform testing and inspection as specified in Field Quality Control in Part 3 of this specification:

- 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
- 2) See Section 01 1200: 'Multiple Contract Summary'.

## **PART 2 - PRODUCTS: Not Used**

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification Of Conditions:
1. Forty-eight (48) hours minimum before performing any work on site, contact Blue Stakes to arrange for utility location services.
  2. Perform minor, investigative excavations to verify location of various existing underground facilities at sufficient locations to assure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.
  3. Perform investigative excavating ten (10) days minimum in advance of performing any excavation or underground work.
  4. Upon discovery of conflicts or problems with existing facilities, notify Architect by phone or fax within twenty-four (24) hours. Follow telephone or fax notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate problem.

### **3.2 PREPARATION**

- A. Protection:
1. Spillage:
    - a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
    - b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
  2. Dust Control:
    - a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
    - b. Correct or repair damage caused by dust.
  3. Existing Plants And Features:
    - a. Do not damage tops, trunks, and roots of existing trees and shrubs on site that are intended to remain.
    - b. Do not use heavy equipment within branch spread.
    - c. Interfering branches may be removed only with permission of Architect.
    - d. Do not damage other plants and features that are to remain.

### **3.3 REPAIR / RESTORATION**

- A. Adjust existing covers, boxes, and vaults to grade.
- B. Replace broken or damaged covers, boxes, and vaults.
- C. Independently confirm size, location, and number of covers, boxes, and vaults that require adjustment.

### **3.4 FIELD QUALITY CONTROL**

- A. Field Tests And Inspections:

1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
    - a. Quality Control is sole responsibility of Contractor. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform The Work or Contractor's own Testing and Inspection services.
  2. Testing and inspection of earthwork operations is required.
  3. Field Tests and Laboratory Tests:
    - a. Owner reserves right to require additional testing to re-affirm suitability of completed work including compacted soils that have been exposed to adverse weather conditions.
  4. Field Inspections:
    - a. Notify Architect forty-eight (48) hours before performing excavation or fill work.
    - b. If weather, scheduling, or any other circumstance has interrupted work, notify Architect twenty-four (24) hours minimum before intended resumption of grading or compacting.
- B. Non-Conforming Work:
1. If specified protection precautions are not taken or corrections and repairs not made promptly, Owner may take such steps as may be deemed necessary and deduct costs of such from monies due to Contractor. Such action or lack of action on Owner's part does not relieve Contractor from responsibility for proper protection of The Work.

**END OF SECTION**

**SECTION 31 1100****CLEARING AND GRUBBING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform clearing and grubbing as necessary to prepare site for rough grading and structure excavation as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 31 0501: Common Earthwork Requirements:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
    - c. Pre-installation conference held jointly with other landscape related sections.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conferences as specified in Section 31 0501.

**PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 PERFORMANCE**

- A. Tree And Brush Removal:
  - 1. Cut off trees, shrubs, brush, and vegetative growth 12 inches (300 mm) maximum above ground.
  - 2. Do not pull up or rip out roots of trees and shrubs that are to remain. If excavation through roots is required, excavate by hand and cut roots with sharp axe. Make clean, smooth, sloping cuts.
  - 3. Cut roots 6 inches (150 mm) or larger in diameter only with Architect's written permission.
- B. Grubbing:
  - 1. Grub out stumps and roots 12 inches (300 mm) minimum below original ground surface, except as follows:
    - a. Entirely remove roots of plants that normally sprout from roots, as identified by Architect.

**3.2 CLEANING**

- A. Remove from site trees, shrubs, uprooted stumps, vegetative layer, and surface debris and dispose of legally.
- B. Do not bury cuttings, stumps, roots, and other vegetative matter or burnt waste material on site.

**END OF SECTION**

**SECTION 31 1123****AGGREGATE BASE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install the following as described in Contract Documents:
    - a. Aggregate Base:
      - 1) Miscellaneous exterior concrete (sidewalks, curb, gutter and exterior slabs).
      - 2) Asphalt paving.
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
  - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 3. Section 03 3111: 'Cast-In-Place Structural Concrete'.
  - 4. Section 31 0501: 'Common Earthwork Requirements':
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 5. Section 31 2213: 'Rough Grading'.
  - 6. Section 31 2216: 'Fine Grading' for subgrade procedures.
  - 7. Section 31 2323: 'Fill' for compaction procedures and tolerances.
  - 8. Section 32 1216: 'Asphalt Paving'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Aggregate (Asphalt Paving):
    - a. Aggregate: A hard inert mineral material, such as gravel, crushed rock, slag, or sand.
    - b. Coarse Aggregate: Aggregate retained on No. 8 (2.36 mm) sieve.
    - c. Dense-Graded Aggregate: Aggregate that is graded from maximum size down through filler with object of obtaining an asphalt mix with controlled void content and high stability.
    - d. Fine Aggregate: Aggregate passing No. 8 (2.36 mm) sieve.
    - e. Reclaimed Asphalt Pavement (RAP): Existing asphalt mixture that has been pulverized, usually by milling, and is used like an aggregate in recycling of asphalt pavements.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM C131/C131M-14, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine'.
    - b. ASTM D1556/D1556M-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method'.
    - c. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))'.
    - d. ASTM D1883-16, 'Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils'.
    - e. ASTM D2167-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method'.
    - f. ASTM D2419-14, 'Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate'.
    - g. ASTM D4318-17, 'Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils'.

- h. ASTM D6938-17, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
  - 1. Participate in MANADORY pre-installation conference as specified in Section 31 0501.
  - 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
    - a. Review requirements and frequency of testing and inspections.
    - b. Review aggregate base installation requirements.
    - c. Review proposed miscellaneous exterior concrete schedule.
    - d. Review proposed asphalt paving schedule.
    - e. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
      - 1) Review frequency of testing and inspections.
- B. Scheduling:
  - 1. Miscellaneous exterior concrete:
    - a. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing concrete for exterior site work concrete (sidewalks, curbs, gutters, etc.), footings, foundation walls, and building slabs to allow inspection of aggregate base.
  - 2. Asphalt Paving:
    - a. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing aggregate base to allow inspection of aggregate base.

### 1.4 SUBMITTALS

- A. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Testing and Inspecting Reports of aggregate base.

### 1.5 QUALITY ASSURANCE

- A. Testing And Inspection:
  - 1. Owner will provide Testing and Inspection for aggregate base:
    - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
    - b. Owner will employ testing agencies to perform testing and inspection for aggregate base as specified in Field Quality Control in Part 3 of this specification.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
      - 2) See Section 01 1200: 'Multiple Contract Summary'.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.

### 1.7 FIELD CONDITIONS

- A. Ambient Conditions:



1. Do not perform work during unfavorable conditions as specified below:
  - a. Aggregate Base:
    - 1) Presence of free surface water.
    - 2) Over-saturated sub base materials.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Aggregate Base:
  1. Under Exterior Concrete (Section 03 3111 'Cast-In-Place Structural Concrete') excluding Concrete Paving):
    - a. New Aggregate Base:
      - 1) Road Base to conform to State DOT Specifications.
  2. Under Asphalt Paving (Section 32 1216 'Asphalt Paving'):
    - a. New Aggregate Base:
      - 1) Road Base to conform to 1-1/2 inches (38 mm) minus State DOT Specifications and Gradations.
      - 2) Aggregate base shall be non-plastic.
- B. Recycled Concrete or Slag is not permitted as aggregate base of any kind.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Stockpiles:
  1. Provide area for each stockpile of adequate size, reasonably uniform in cross-section, well drained, and cleared of foreign materials.
  2. Locate piles so that there is no contamination by foreign material and no intermingling of aggregates from adjacent piles. Do not use steel-tracked equipment on stockpiles.
  3. Do not store aggregates from different sources, geological classifications, or of different gradings in stockpiles near each other unless bulkhead is placed between different materials.
  4. Do not use washed aggregates sooner than twenty-four (24) hours after washing or until surplus water has drained out and material has uniform moisture content.
  5. Do not stockpile higher than 15 feet (4.57 m). Cover or otherwise protect stockpiles for use in HMA to prevent buildup of moisture.
- B. Surface Preparation (Miscellaneous Exterior Concrete):
  1. Subgrade:
    - a. Finish grade to grades required by Contract Documents.
    - b. Compact subgrade as specified in Section 31 2323.
- C. Surface Preparation (Asphalt Paving):
  1. Subgrade:
    - a. Finish grade parking surface area to grades required by Contract Documents.
    - b. Aggregate base and paving must be placed before any moisture or seasonal changes occur to subgrade that would cause compaction tests previously performed to be erroneous. Recompact and retest subgrade soils that have been left exposed to weather.

### **3.2 INSTALLATION**

- A. Aggregate Base:

1. General:
    - a. Do not place aggregate base material when subgrade is frozen or unstable.
    - b. Spread aggregate base material with equipment except in limited or restricted areas where use of hand spreading is allowed.
    - c. Spread aggregate base material in manner that does not break down material and eliminates segregation, ruts, and ridges.
    - d. Correct damage to aggregate base caused by construction activities and maintain corrected aggregate base until subsequent course is placed.
    - e. Do not allow traffic on aggregate base.
    - f. Remove all standing storm water.
  2. Under miscellaneous exterior concrete aggregate base:
    - a. Except under mow strips, place 4 inches (100 mm) minimum of aggregate base, level, and compact as specified in Section 31 2323.
  3. Asphalt paving aggregate base:
    - a. 8 inches thick minimum after compaction in accordance with Contract Drawings.
    - b. If roller is smaller than 8 ton (7260 kg), lay aggregate base and compact in two courses.
    - c. Compact as specified in Section 31 2323.
    - d. Priming: Prime aggregate base with application of 0.2 to 0.5 gallons (2 to 5 liters) of asphalt cement primer per square yard (meter) if pavement will be laid more than three days after compaction of aggregate base, or if precipitation is anticipated between completion of compaction of aggregate base and laying of asphalt paving.
    - e. Recompact unprimed aggregate base if it receives precipitation before pavement is laid.
    - f. Remove or repair improperly prepared areas as directed by Architect.
- B. Tolerances:
1. Asphalt Paving Areas:
    - a. Aggregate base:
      - 1) 8.00 inches (0.00 mm) high.
      - 2) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
      - 3) Finished base course shall be true to line and grade within plus or minus 1/4 inch in 10 feet (6 mm in 3 meters).
      - 4) Maximum variation from required grades shall be 1/10 of one foot (28 mm).

### 3.3 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
    - a. Quality Control is sole responsibility of Contractor.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
        - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
  2. Aggregate Base:
    - a. Miscellaneous exterior concrete areas:
      - 1) Testing Agency shall provide testing and inspection for exterior aggregate base.
      - 2) Number of tests may vary at discretion of Architect.
      - 3) Testing Agency will test compaction of base in place according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
        - a) Sitework Areas: One test for every 10,000 sq. ft. (930 sq. m) or less of exterior pads area but no fewer than three tests.
    - b. Asphalt paving area:
      - 1) Testing Agency shall provide testing and inspection for exterior aggregate base.
      - 2) Number of tests may vary at discretion of Architect.
      - 3) Testing Agency will test compaction of base in place according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
        - a) Sitework Areas: One test for every 10,000 sq. ft. (930 sq. m) or less of exterior pads area but no fewer than three tests.
      - 4) Sitework Areas: One test for every 10,000 sq. ft. (930 sq. m) or less of exterior pads area but no fewer than three tests.

**END OF SECTION**

**SECTION 31 1413****TOPSOIL STRIPPING AND STOCKPILING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Strip and stockpile acceptable topsoil as described in Contract Documents for re-use as fill in landscape areas. Topsoil for this project to be 100% imported.
- B. Related Requirements:
  - 1. Section 31 0501: 'Common Earthwork Requirements':
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
    - c. Pre-installation conference held jointly with other landscape related sections.
  - 2. Section 31 1100: 'Clearing and Grubbing'.
  - 3. Section 31 2213: 'Rough Grading'.
  - 4. Section 31 2316: 'Excavation'.
  - 5. Section 32 9001: 'Common Planting Requirements'.
  - 6. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
  - 7. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
  - 8. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Existing topsoil: Defined as total amount of soil stripped and stored for reuse, less vegetation layer stripped and disposed of as specified in Paragraphs below.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conferences as specified in Section 31 0501.

**PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 PERFORMANCE**

- A. Strip existing vegetation layer **2** inches (mm) deep minimum from areas of site to receive landscaping, and paving and remove from site before stripping topsoil for storage and reuse.
- B. After stripping vegetation layer, strip existing topsoil additional 5 inches deep minimum from existing lawn areas of site to receive re-grading and store on site for later use.
  - 1. Existing topsoil is property of Contractor with restriction that topsoil is to be used for for non-structural fill and backfill.
  - 2. After Project fill and backfill requirements are satisfied, remove excess existing topsoil from site. Do not remove existing topsoil from site without Architect's written approval.

**END OF SECTION**

**SECTION 31 2213****ROUGH GRADING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform rough grading work required to prepare site for construction as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 2. Section 03 3053: Miscellaneous Exterior Cast-In-Place Concrete.
  - 3. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 4. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
  - 5. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
  - 6. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
  - 7. Section 31 2316: 'Excavation'.
  - 8. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
  - 9. Section 32 1216: 'Asphalt Paving'.
  - 10. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501:
  - 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
    - a. Identify benchmark to be used in establishing grades and review Contract Document requirements for grades, fill materials, and topsoil.
    - b. Examine site to pre-plan procedures for making cuts, placing fills, and other necessary work.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Materials used for fill shall be as specified for backfill in Section 31 2323 'Fill'.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Verify elevations of rough grading are correct before compacted fill, fine grading, aggregate base or landscape grading are placed.

### **3.2 PREPARATION**

- A. Protection Of In-Place Conditions:
  - 1. When existing grade around existing plants to remain is higher than new finish grade, perform regrading by hand.
  - 2. Do not expose or damage shrub or tree roots.
- B. Surface Preparation:
  - 1. Before making cuts, remove topsoil over areas to be cut and filled that were not previously removed by stripping specified in Section 31 1413 'Topsoil Stripping And Stockpiling'. Stockpile this additional topsoil with previously stripped topsoil.

### **3.3 PERFORMANCE**

- A. Subgrade (Natural Soils):
  - 1. Subgrade beneath compacted fill or aggregate base under asphalt or concrete paving shall be constructed smooth and even.
- B. Special Techniques:
  - 1. Compact fills as specified in Section 31 2323 'Fill'.
  - 2. If soft spots, water, or other unusual and unforeseen conditions affecting grading requirements are encountered, stop work and notify Architect.
- C. Tolerances:
  - 1. Maximum variation from required grades shall be 1/10 of one foot (28 mm).

**END OF SECTION**

**SECTION 31 2216****FINE GRADING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform fine grading of subgrade work required to prepare site for paving finish grading and for placement of topsoil as described in Contract Documents.
  - 2. Asphalt Paving:
    - a. Prepare natural soil subgrade as described in Section 31 2213 'Rough Grading' or prepare fill subgrade as described in this specification section for asphalt paving.
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
  - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 3. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 4. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
  - 5. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
  - 6. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
  - 7. Section 31 2316: 'Excavation'.
  - 8. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
  - 9. Section 32 1216: 'Asphalt Paving' for finish grading for asphalt paving.
  - 10. Section 32 9001: 'Common Planting Requirements'.
    - a. Pre-installation conference held jointly with other common planting related sections.
  - 11. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
  - 12. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
  - 13. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501 and Section 32 9001.
  - 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
    - a. Review backfill requirements.
    - b. Review geotechnical report.
    - c. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
      - 1) Review requirements and frequency of testing and inspections.
- B. Scheduling:
  - 1. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of fill / engineered fill to allow inspection.
  - 2. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical report prior to placing any fill, aggregate base or concrete.

3. Allow inspection and testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after inspections and test results for previously compacted work comply with requirements.

### 1.3 SUBMITTALS

- A. Closeout Submittals:
  1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Testing and Inspecting Reports of fill / engineered fill.

### 1.4 QUALITY ASSURANCE

- A. Testing And Inspection:
  1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
  2. Owner will provide Testing and Inspection for fill / engineering fill:
    - a. Owner will employ testing agencies to perform testing and inspection for fill / engineering fill as specified in Field Quality Control in Part 3 of this specification.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
      - 2) See Section 01 1200: 'Multiple Contract Summary'.

## PART 2 - PRODUCTS: Not Used

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection Of In-Place Conditions: Protect utilities and site elements from damage.
- B. General:
  1. Limit use of heavy equipment to areas no closer than 6 feet (1.80 meter) from building or other permanent structures.
- C. Surface Preparation:
  1. Landscaping and Planting Areas:
    - a. Before grading, dig out weeds from planting areas by their roots and remove from site. Remove rocks larger than 1-1/2 inches (38 mm) in size and foreign matter such as building rubble, wire, cans, sticks, concrete, etc.
    - b. Remove imported paving base material present in planting areas down to natural subgrade or other material acceptable to Architect.
  2. Asphalt Paving:
    - a. Survey and stake parking surfaces to show grading required by Contract Documents.
    - b. Subgrade (material immediately below aggregate base):
      - 1) Compact subgrade as specified in Section 31 2213 (natural soils) and Section 31 2323 (fill).
      - 2) Fine grade parking surface area to grades required by Contract Documents.
      - 3) Subgrade to be constructed smooth and even.



### 3.2 PERFORMANCE

- A. Interface With Other Work: Do not commence work of this Section until grading tolerances specified in Section 31 2213 are met.
- B. General:
  - 1. Do not expose or damage existing shrub or tree roots.
- C. Tolerances:
  - 1. Site Tolerances:
    - a. Subgrade (material immediately below aggregate base):
      - 1) 18.00 inches (0.00 mm) high.
      - 2) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
    - b. Maximum variation from required grades shall be 1/10 of one foot (28 mm).
  - 2. Aggregate Base (Asphalt Paving) Tolerances:
    - a. Aggregate base shall be 8 inches thick minimum after compaction, except where shown thicker on Drawings.
    - b. Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.

### 3.3 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
  - 1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
    - a. Quality Control is sole responsibility of Contractor:
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
        - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
  - 2. Site Preparation:
    - a. Prior to placement of fill / engineered fill, inspector shall determine that site has been prepared in accordance with geotechnical report.
    - b. Footing subgrade: At footing subgrades, Certified Inspector is to verify that soils conform to geotechnical report.
  - 3. Fill / Engineered Fill:
    - a. Testing Agency shall provide testing and inspection for fine grading.
    - b. Number of tests may vary at discretion of Architect.
    - c. Testing Agency is to provide one (1) moisture-maximum density relationship test for each type of fill material.

**END OF SECTION**

**SECTION 31 2316****EXCAVATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform Project excavating and trenching as described in Contract Documents, except as specified below.
  - 2. Procedure and quality for excavating and trenching performed on Project under other Sections unless specifically specified otherwise.
- B. Related Requirements:
  - 1. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 2. Section 31 1100: 'Clearing and Grubbing'.
  - 3. Section 31 1123: 'Aggregate Base'.
  - 4. Section 31 1413: 'Topsoil Stripping and Stockpiling'.
  - 5. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
  - 6. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
  - 7. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
  - 8. Performance of excavating inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501:
  - 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
    - a. Review protection of existing utilities requirements.

**PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Carefully examine site and available information to determine type soil to be encountered.
  - 2. Discuss problems with Architect before proceeding with work.

**3.2 PREPARATION**

- A. Protection of Existing Utilities:
  - 1. Protect existing utilities identified in Contract Documents during excavation.
  - 2. If existing utility lines not identified in Contract Documents are encountered, contact Architect before proceeding.

### 3.3 PERFORMANCE

- A. Interface With Other Work:
  - 1. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
  - 2. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
- B. Excavation:
  - 1. Pavement And Miscellaneous Cast-In-Place Concrete:
    - a. Under Paving:
      - 1) Excavate a minimum of ( 1 foot ) and up to ( 5 feet ) below existing grade so final grade allows for ( 2 feet 5 inches ) of compacted fill below paving, (8 inch aggregate base and 1 foot 6 inches minimum of engineered fill).
    - b. Excavate as necessary for proper placement and forming of concrete site elements and pavement structure on engineered fill. Remove vegetation and deleterious material and remove from site.
    - c. Backfill over-excavated areas with compacted base material specified in Section 31 1123.
    - d. Remove and replace exposed material that becomes soft or unstable.
  - 2. Utility Trenches:
    - a. Unless otherwise indicated, excavation shall be open cut. Short sections of trench may be tunneled if pipe or duct can be safely and properly installed and backfill can be properly tamped in tunnel sections and if approved by Architect.
    - b. Excavate to proper alignment, depth, and grade. Excavate to sufficient width to allow adequate space for proper installation and inspection of utility piping.
    - c. If trenches are excavated deeper than required, backfill until trench bottom is proper depth with properly compacted native material.
    - d. Pipe 4 Inches (100 mm) In Diameter Or Larger:
      - 1) Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its length.
      - 2) Except where rock is encountered, take care not to excavate below depths indicated.
        - a) Where rock excavations are required, excavate rock with minimum over-depth of 4 inches (100 mm) below required trench depths.
        - b) Backfill over-depths in rock excavation and unauthorized over-depths with loose, granular, moist earth, thoroughly compacted.
      - 3) Whenever wet or unstable soil incapable of properly supporting pipe, as determined by Architect, occurs in bottom of trench, remove soil to depth required and backfill trench to proper grade with coarse sand, fine gravel, or other suitable material acceptable to Architect.
  - 3. If unusual excavating conditions are encountered, stop work and notify Architect.

### 3.4 REPAIR / RESTORATION

- A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

### 3.5 CLEANING

- A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

**END OF SECTION**

**SECTION 31 2323****FILL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform Project backfilling and compacting as described in Contract Documents, except as specified below.
  - 2. Procedure and quality for backfilling and compacting performed on Project under other Sections unless specifically specified otherwise.
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
  - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 3. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 4. Section 31 1100: 'Clearing and Grubbing'.
  - 5. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
  - 6. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
  - 7. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
  - 8. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
  - 9. Section 31 2316: 'Excavation'.
  - 10. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
  - 11. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
  - 12. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.
  - 13. Division 32: Compaction of subgrade under walks and paving.
  - 14. Performance of backfilling and compacting inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International (Following are specifically referenced for fill and aggregate base testing):
    - a. ASTM D698-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))'.
    - b. ASTM D1556/D1556M-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method'.
    - c. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))'.
    - d. ASTM D2167-15, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method'.
    - e. ASTM D2487-17, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)'.
    - f. ASTM D6938-17a, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
  - 1. Participate in MANDATORY pre-installation conference as specified in Section 31 0501.
  - 2. In addition to agenda items specified in Section 01 3100, Section 31 0501, and Section 31 2324 if Flowable Fill is included, review following:
    - a. Review backfill requirements.
    - b. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
      - 1) Review requirements and frequency of testing and inspections.
- B. Scheduling:
  - 1. Notify Testing Agency and Architect seventy-two (72) hours minimum before installation of fill / engineered fill to perform proctor and plasticity index tests on proposed fill or subgrade.
  - 2. Notify Testing Agency and Architect twenty-four (24) hours minimum before installation of fill / engineered fill to allow inspection.
  - 3. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical report prior to placing any fill (or concrete).
  - 4. Allow inspection and testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after inspections and test results for previously compacted work comply with requirements.

### 1.4 SUBMITTALS

- A. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Testing and Inspecting Reports of fill / engineered fill.

### 1.5 QUALITY ASSURANCE

- A. Testing and Inspection:
  - 1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
  - 2. Owner will provide Testing and Inspection for fill / engineering fill:
    - a. Owner will employ testing agencies to perform testing and inspection for fill / engineering fill as specified in Field Quality Control in Part 3 of this specification.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
      - 2) See Section 01 1200: 'Multiple Contract Summary'.

### 1.6 FIELD CONDITIONS

- A. Ambient Conditions:
  - 1. Do not perform work during unfavorable conditions as specified below:
    - a. Aggregate Base:
      - 1) Presence of free surface water.
      - 2) Over-saturated sub base materials.

## 1.7 MATERIALS

- A. Site Material:
  - 1. Existing non-engineered fills, as well as excavated natural soils, can be re-used as fills in the landscape areas below new topsoil. They cannot be used as engineered fill under the parking lot areas and site concrete areas.
- B. Imported Fill / Backfill:
  - 1. Well graded material conforming to ASTM D2487 free from debris, organic material, frozen materials, brick, lime, concrete, and other material which would prevent adequate performance of backfill.
    - a. Under Site Concrete And Paved Areas: Use engineered fill as required by Contract Documents.
    - b. Under Landscaped Areas:
      - 1) Fill more than 36 inches (900 mm) below finish grade shall comply with soil classification groups GW, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches (150 mm) diameter and 90 percent minimum of fill shall be smaller than 1-1/2 inch (38 mm) in any direction.
      - 2) Fill less than 36 inches (900 mm) below finish grade shall comply with soil classification groups SW, SP, SM, or SC. Fill may not contain stones larger than 1-1/2 inches (38 mm) in any direction and 90 percent minimum of fill shall be smaller than 3/8 inch (4.7 mm) in any direction.
- C. Engineered Fill:
  - 1. Engineered fill must be free of sod, rubbish, topsoil, frozen soil, and other deleterious materials. The maximum particle size shall not exceed 4 inches; although, occasional larger particles, not exceeding 8 inches in diameter, may be incorporated if placed randomly in a manner such that "honeycombing" does not occur and the desired degree of compaction can be achieved. The maximum particle size within engineered fill placed within confined areas shall be restricted to 2 inches with no more than 30 percent material retained on the 3/4-inch sieve in order to facilitate Proctor tests, as well as testing with a nuclear densometer. Imported engineered fill shall consist of fairly well-graded sand and gravel with less than 20 percent fines, clays and silts, (percent by weight of material passing the U.S. No. 200 sieve).
- D. Recycled Concrete or Slag is not permitted as fill of any kind.

## PART 2 - EXECUTION

### 2.1 PREPARATION

- A. Before placing fill, aggregate base, or finish work, prepare existing subgrade as follows:
  - 1. Do not place fill or aggregate base over frozen subgrade.
  - 2. Under Driveways And Parking Areas:
    - a. Scarify subgrade 8 inches deep, moisture condition to uniform moisture content between optimum and four (4) percent over optimum, and mechanically tamp to ninety-five (95) percent minimum of relative compaction.
  - 3. Under Miscellaneous Concrete Site Elements And Outside Face of Foundation Walls
    - a. Scarify subgrade 8 inches deep, moisture condition to uniform moisture content between optimum and four (4) percent over optimum, and mechanically tamp to ninety-five (95) percent minimum of relative compaction.
  - 4. Landscape Areas:
    - a. Compact subgrade to eighty-five (85) percent relative compaction.

## 2.2 PERFORMANCE

- A. Interface With Other Work:
  - 1. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
  - 2. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
  - 3. Section 31 2324: 'Flowable Fill' for backfilling of piping systems and other utilities under paving'.
- B. Fill / Backfill:
  - 1. General:
    - a. Around Buildings And Structures: Slope grade away from building as specified in Section 31 2216. Hand backfill when close to building or where damage to building might result.
    - b. Site Utilities:
      - 1) In Landscape Areas: Use backfill consisting of engineered fill. Use imported gravel in trenches 5 feet below existing grade and deeper where water is present. Use filter fabric around gravel.
      - 2) Under Pavement And Concrete Site Elements: At Contractor's Option (Except where required by Spanish Fork City) Extend flowable fill / backfill to elevation of subgrade. Do not place base materials until flowable fill / backfill has cured 72 hours. If flowable fill is not used then use engineered fill. Use imported gravel in trenches 5 feet below existing grade and deeper where water is present. Use filter fabric around gravel.
    - c. Do not use puddling or jetting to consolidate fill areas.
  - 2. Compacting:
    - a. Fill / Backfill And Aggregate Base:
      - 1) Under Concrete Site Elements, Driveways, And Parking Areas: See Engineered Fill requirements below. Under Parking Areas, final 8 inches of fill shall be aggregate base as specified in Section 31 1123 and be compacted to 96% of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) compaction criteria.
      - 2) Under Concrete Site Elements: See Engineered fill requirements below.
      - 3) Utility Trenches: See Engineered Fill requirements below. Except compact utility trenches to 96% compaction of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) compaction criteria.
      - 4) Fill Slopes: Compact by rolling or using sheepsfoot roller.
      - 5) Backfill Under Footings: Not allowed.
      - 6) Landscape Areas:
        - a) Compact fill to eighty five (85) percent minimum relative compaction.
      - 7) Other Backfills: Place other fills in 12 inch (300 mm) layers and compact to 90 percent relative compaction.
      - 8) Loose material from compacted subgrade surface shall be immediately removed before placing compacted fill or aggregate base course.
    - b. Engineered Fill:
      - 1) Place in lifts not exceeding 8 inches in loose thickness. Engineered Fill shall be compacted to at least 95 percent in parking lot, and 96% at utility trenches of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) compaction criteria.

## 2.3 REPAIR / RESTORATION

- A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

## 2.4 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
  - 1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
    - a. Quality Control is sole responsibility of Contractor:

- 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control:
  - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
2. Fill / Engineered Fill:
  - a. Testing Agency shall provide testing and inspection for fill.
  - b. Number of tests may vary at discretion of Architect.
  - c. Testing Agency is to provide one (1) moisture-maximum density relationship test for each type of fill material.
  - d. Prior to placement of engineered fill, inspector shall determine that site has been prepared in accordance with geotechnical report.
  - e. Footing subgrade: At footing subgrades Certified Inspector is to verify that soils conform to geotechnical report.
  - f. Testing Agency will test compaction of soils according to ASTM D1556/D1556M, ASTM D2167, and ASTM D6938, as applicable. Lift thicknesses shall comply with geotechnical report. Inspector shall determine that in-place dry density of engineered fill material complies with geotechnical report. Tests will be performed at following locations and frequencies:
    - 1) Paved Areas: At each compacted fill and backfill layer, at least one (1) test for every 10,000 sq. ft. (930 sq. m) or less of paved area but in no case less than three (3) tests.
    - 2) Retaining Wall/Continuous Footing Backfill: At each compacted backfill layer, at least one (1) test for each 40 linear feet (12 linear m) or less of wall length, but no fewer than two (2) tests.
    - 3) Trench Backfill: At each 12 inch (305 mm) compacted lift for each 100 linear feet (30.5 linear m) or less of trench length but no fewer than two (2) tests.
    - 4) Sidewalks, Curbs, Gutters, Exterior Pads: Minimum of one (1) test for each lift for each 40 lineal feet (12 linear m) or one (1) test for every 5,000 sq. ft. (465 sq. m) or less of pad area but no fewer than three (3) tests.
  - g. Required verification and inspection of soils as referenced in 2015 IBC (or latest approved edition) Table 1704.7 'Required Verification And Inspection Of Soils'. Periodic and continuous inspections include:
    - 1) Verify materials below shallow foundations are adequate to achieve design bearing capacity (periodic).
    - 2) Verify excavations are extended to proper depth and have reached proper material (periodic).
    - 3) Perform classification and testing of compacted fill materials (periodic).
    - 4) Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill (continuous).
    - 5) Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly (periodic).

## 2.5 CLEANING

- A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

**END OF SECTION**