

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include, but are not limited to:
 - 1. 31 23 00 - Excavation and Fill
 - 2. 31 23 16 - Excavation and Backfill for Utilities
 - 3. 31 25 00 - Erosion and Sedimentation Controls
 - 4. 32 91 00 - Planting Soil Preparation
 - 5. 31 05 19 - Geotechnical Exploration Reports
 - 6. 01 33 00 - Submittal Procedures
 - 7. 01 35 43 - Environmental Compliance
 - 8. 01 74 19 - Construction Waste Management and Disposal

1.2 SUMMARY

- A. This Section includes site grading including cutting, filling, leveling, and contouring for building pads, utilities, roadways, sidewalks, and landscaped areas.
- B. Related work specified elsewhere includes:
 - 1. Excavation and fill for utilities in Section 31 23 16.
 - 2. Erosion and sediment control in Section 31 25 00.
 - 3. Soil preparation and amendments in Section 32 91 00.

1.3 DEFINITIONS

- A. Grading: The process of reshaping the ground surface by cutting, filling, or leveling to the required lines, elevations, and slopes.
- B. Finish Grade: The final elevation and slope of the ground surface after grading is complete.
- C. Rough Grade: The initial shaping of the site prior to finish grading.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- A. Action Submittals:
 - 1. Grading Plan: Detailed plan indicating existing and proposed grades, contours, drainage patterns, and locations of cuts and fills.
 - 2. Soil Reports: Geotechnical reports including recommendations for grading, compaction, and fill materials.
 - 3. Equipment List: List of equipment proposed for grading operations.
 - 4. Mix Designs: For any engineered fill or soil stabilization materials.

5. Erosion and Sediment Control Plan demonstrating compliance with applicable environmental regulations.
- B. Informational Submittals:
1. Field Quality Control Reports including compaction test results.
 2. Material Certificates for fill materials.
 3. Manufacturer's product data for any soil stabilization or erosion control products used.

1.5 QUALITY ASSURANCE

- A. Perform grading in accordance with accepted industry standards including ASTM and local building codes.
- B. Compaction Testing:
1. Engage an independent testing agency to perform field density tests at frequencies required by the geotechnical engineer and local authorities.
 2. Tests shall comply with ASTM D1556, ASTM D698, ASTM D2922, or ASTM D6938 as applicable.
- C. Personnel Qualifications:
1. Contractor shall employ personnel with minimum 5 years' experience in site grading and earthwork operations.
 2. Operator certification for heavy equipment shall be current and verifiable.
- D. Compliance with Codes and Standards:
1. Comply with applicable federal, state, and local regulations including OSHA safety standards related to earthwork operations.
 2. Comply with stormwater management and erosion control requirements as per EPA and local jurisdictional authorities.
- E. Mock-Up:
1. When requested by the Architect/Engineer, provide a mock-up area to demonstrate grading techniques and finish quality.

1.6 STORAGE AND HANDLING

- A. Store fill materials in designated areas protected from contamination, erosion, and loss by wind or water.
- B. Protect excavated materials from moisture changes and contamination.
- C. Handle all materials to prevent segregation, contamination, or damage.
- D. Equipment used for grading shall be maintained in good working condition to prevent leaks or spills of fuel, oil, or hydraulic fluids.
- E. Store erosion control materials and equipment on-site in dry, accessible locations.

1.7 WARRANTY

- A. Provide a warranty for grading work that guarantees the work will remain stable and free from erosion, settling, or other defects for a minimum period of one year from date of final acceptance.
- B. Warranty shall include repair or replacement of any areas showing failure or nonconformance to specified grades.
- C. Provide manufacturer warranties for soil stabilization or erosion control products as applicable.

1.8 APPLICABLE CODES, STANDARDS, AND REFERENCES

- A. Codes:
 - 1. International Building Code (IBC), latest edition.
 - 2. Occupational Safety and Health Administration (OSHA) Standards, 29 CFR Part 1926 – Construction.
 - 3. Local Building and Zoning Codes.
 - 4. Clean Water Act, Section 402 NPDES Stormwater Program.
- B. Standards:
 - 1. ASTM International:
 - a) ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - b) ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - c) ASTM D2922 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - d) ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Depth Moisture Gauge).
 - e) ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - f) ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 - 2. USDA Natural Resources Conservation Service (NRCS) Soil Survey and Classification Guidelines.
- C. References:
 - 1. “Earthwork and Grading Handbook,” Nick Capachi, McGraw Hill, latest edition.
 - 2. “Site Engineering for Landscape Architects,” Steven Strom, Kurt Nathan, Jake Woland.
 - 3. Local Geotechnical Engineering Reports.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Fill Material:
 - 1. Shall be free of organic matter, debris, frozen material, trash, and other deleterious substances.
 - 2. Shall meet gradation and compaction requirements as specified in the geotechnical report or as approved by the Engineer.
 - 3. Shall have plasticity index and liquid limit within acceptable ranges to ensure stability and compaction.
- B. Topsoil:
 - 1. Shall be fertile, friable natural loam free of subsoil, clay lumps, stones over 1 inch, roots, sticks, and other foreign matter.
 - 2. Shall meet requirements specified in Section 32 91 00.
- C. Soil Stabilization Products (if applicable):
 - 1. Chemical stabilizers, geotextiles, or other additives shall be compatible with site conditions and meet manufacturer's recommendations.
 - 2. Shall comply with environmental regulations.
- D. Erosion Control Materials:
 - 1. Mulches, mats, blankets, and other devices shall conform to Section 31 25 00.
- E. Water:
 - 1. Potable water free of impurities harmful to soil stabilization or vegetation.

2.2 EQUIPMENT

- A. Use heavy equipment suitable for grading operations including but not limited to bulldozers, graders, scrapers, compactors, and water trucks.
- B. Equipment shall be maintained in good working order and free of leaks.

2.3 MANUFACTURERS

- A. 2.3.1 Soil Stabilizers and Additives:
 - 1. TerraSystems, Inc.
 - 2. Soilworks, LLC
 - 3. BASF Corporation
 - 4. Sika Corporation
- B. 2.3.2 Erosion Control Products:
 - 1. North American Green
 - 2. Profile Products LLC
 - 3. Western Excelsior
- C. 2.3.3 Testing and Compaction Equipment:
 - 1. Troxler Electronic Laboratories
 - 2. Humboldt Mfg. Co.
- D. 2.3.4 Heavy Equipment:
 - 1. Caterpillar Inc.
 - 2. John Deere

3. Komatsu America Corp.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that existing site conditions, including grades, drainage patterns, and utilities, conform to requirements.
- B. Review geotechnical reports and recommendations.
- C. Notify Architect/Engineer of any discrepancies or conditions detrimental to proper execution of grading.
- D. Do not proceed with grading until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect existing structures, utilities, vegetation, and improvements designated to remain.
- B. Remove debris, vegetation, and unsuitable materials from areas to be graded.
- C. Establish erosion and sediment control measures prior to grading operations.
- D. Identify and mark limits of grading and stockpile locations.

3.3 GRADING

- A. General Requirements:
 1. Perform grading to lines, elevations, and slopes indicated on the Drawings.
 2. Maintain grades to ensure positive drainage away from structures and utilities.
 3. Avoid over-excavation; fill and compact as required to achieve design elevations.
 4. Do not place fill or compact when moisture content is unsuitable.
- B. Rough Grading:
 1. Cut and fill to approximate grades to facilitate drainage and installation of utilities.
 2. Scarify subgrade where required to enhance bonding of fill material.
- C. 3.3.3 Fill Placement and Compaction:
 1. Place fill in layers not exceeding 8 inches loose thickness.
 2. Compact each layer to minimum 95% of maximum dry density as determined by ASTM D698 or as specified by the geotechnical engineer.
 3. Moisture content of fill material shall be maintained within +/- 2% of optimum moisture content.
- D. 3.3.4 Finish Grading:
 1. Fine grade areas to final elevations and slopes, providing smooth and even surfaces.
 2. Remove irregularities, depressions, or humps.
- E. 3.3.5 Tolerances:
 1. Finish grade elevations shall be within +/- 0.05 feet of indicated elevations.

2. Slopes shall be within 2 percent of specified gradients.

3.4 FIELD QUALITY CONTROL

- A. Compaction Testing:
 1. Perform density tests at locations and frequency as required by the geotechnical engineer and governing authorities.
 2. Provide copies of test reports to Architect/Engineer promptly.
 3. Areas failing to meet compaction requirements shall be reworked and retested.
- B. Observation and Verification:
 1. Testing agency shall observe fill placement, moisture conditioning, and compaction operations.
- C. Correct deficiencies immediately upon discovery.

3.5 PROTECTION

- A. Protect finished grading from traffic, erosion, and weather damage until subsequent construction or landscaping.
- B. Repair settlement, erosion, or other damage to finished grading at no cost to Owner.
- C. Maintain erosion and sediment controls until permanent vegetation or other stabilization measures are established.

3.6 CLEANING

- A. Remove surplus materials, debris, and equipment from site.
- B. Leave site clean and ready for subsequent construction activities.

END OF SECTION