DIVISION 2

SECTION 02200 - EARTHWORK AND GRADING

PART 1 – GENERAL

1.01 Section Includes

A. Stockpiling of topsoil

B. Grading to contours within specified tolerances, cutting, and filling.

C. Establishment of subgrades, compacting, and preparing the site for paving and vegetation.

D. Erosion control measures

E. The Contractor shall perform all excavation regardless of the type, nature, or condition of material encountered, as specified or required in order to accomplish the construction.

1.02 Related Sections

A. Section 01290 – Measurement and Payment: requirements applicable to unit prices for the work of this section.

B. Section 01450 – Quality Control and Testing: testing compaction of earth fill areas.

C. Section 02250 – Topsoil.

1.03 Unit Price Measurement and Payment

A. Topsoil: by the percent complete as determined by the schedule of values. Includes removing, stockpiling, and redistributing topsoil.

B. Subsoil: by the percent complete as determined by completed progress topographic surveys.

C. Erosion control: by the percent complete.

1.04 Project Record Documents

A. Submit under provisions of Section 01700.

B. Accurately record actual location of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

C. Accurately document finished grades and other information for use in preparing the City of Fort Collins Drainage Certification.

1.05 Quality Assurance

A. Reference standards listed hereunder and referenced elsewhere in these specifications shall become a part of this specification and are incorporated herein by reference. The latest edition, amendment or supplement thereto in effect thirty days (30) before the date of bid invitation shall apply.

1. American Association of State Highway and Transportation Officials (AASHTO).

2. American Society of Testing and Materials (ASTM).

1.06 Submittals

A. Submit reports of testing service: Contractor shall provide soil testing service for quality control testing of soil compaction during earthwork operations, as required under City rules and regulations. Contractor will coordinate schedules with the Engineer in order to allow for adequate time to conduct tests.

B. Testing Methods and Frequency

Testing shall be done with the following methods and frequency:

Item	AASHTO	ASTM
Sampling	T 87	D 420
Soil Classification	M 145	D 3282
Moisture-Density (Proctor)	T 99 T 180	D 698 D 1557
Density (Nuclear)	T 238	D 2922
Moisture Content (Nuclear)	T 239	D 3017

1.07 City Furnished Materials

A. None, unless otherwise noted on the Bid Schedule.

1.08 Site Conditions

A. A geotechnical investigation may have been performed for the City in order to obtain relative data concerning the character of material in and upon which the project is to be built. If an investigation has been performed, the information will be available to the Contractor for information purposes only. The Contractor shall satisfy himself as to the kind and type of soil to be encountered and any water conditions that might affect the construction of the project.

B. The locations of existing utilities are shown in an approximate way only and not all utilities may be shown. The Contractor shall determine the exact location of all existing utilities prior to commencing work. The Contractor shall be fully responsible for any and all damages that might be occasioned by his failure to exactly locate and preserve any and all utilities. If utilities are to remain in place, the Contractor shall provide adequate means of support and protection during construction.

C. Should drawn, or incorrectly drawn, piping or other utilities be encountered during excavation, the Contractor shall advise the City within thirty (30) minutes of encountering the utility. The Contractor shall cooperate with the City and utility companies in keeping respective services and facilities in operation to the satisfaction of the respective owners. The City reserves the right to perform any and all work required should the Contractor fail to cooperate with the respective companies, and back charge the Contractor for any and all expenses.

D. The Contractor shall provide barricades and signs in accordance with the Uniform Manual of Traffic Control Devices where applicable. The Contractor shall maintain all devices in a working manner.

E. Limit of Operations:

1. The Contractor will limit his operations to only those areas identified on the drawings. If the remaining area of the site is disturbed, in the opinion of the Owner, the Contractor will repair and re-seed the disturbed area. All costs of this work will be borne solely by the Contractor.

2. If unauthorized over-excavation occurs, the Contractor shall be responsible for the repair of the area, backfilling with approved material, and compacting to the specified density.

F. Drainage: Maintain the excavations and site free from water throughout the course of the project.

G. Interruption of Service:

1. Coordinate interruption of utility services with the Owner and the utility operator. Make connections to the existing system requiring the service interruption during the time designated by the Owner (weekends, nights, holidays).

2. Obtain permission to cut and replace existing service lines. Notify affected users two hours in advance of interruption and restore service within four hours after interruption. Repair damage at no additional cost to the Owner.

3. Operate valves or other controls on the existing system only after obtaining Owner approval.

H. Erosion Control: The Contractor will follow the requirements of the Erosion Control Plan. The Contractor's earthwork schedule is to be identified and submitted on the schedule required by the General Conditions of the Contract. The Contractor will implement erosion control measures as described and herein referenced by the City of Fort Collins Erosion Control Manual.

1.09 Material Imports and Exports

A. Waste or demolition material, including rock, gravel, sod, broken concrete or asphalt, plaster, etc., shall be hauled off the site and disposed of in accordance with applicable regulations.

B. Additional fill material, if required, shall be hauled to the site from off the site as a necessary part of the work. Material composition shall be subject to the requirements of the specifications.

PART 2 - MATERIALS

2.01 Soil Materials

A. Coarse-grained soils free from debris, roots, organic material, and non-mineral matter containing no particles larger than 4-inch size and classified as either:

1. Sands with fines (SM, SC) and less than 25 percent of the soil particles passing the No. 200 sieve, or

2. Clean sands (SW, SP)

3. Native soils as determined acceptable by the Engineer.

2.02 Filter Fabric

A. Filter Fabric shall be Typar 3451W, Mirafi 700X or approved equal.

PART 3 - EXECUTION

3.01 Preparation

A. Field measurements: Before commencing work, locate all baselines and coordinates required for control of the work, establish required grade staking for control of excavation, fill and embankment construction. Field verify by excavation the location all utility crossings, service connections, and connections to existing lines before proceeding with earthwork.

B. Layout Lines and Levels:

1. Verify that survey bench mark and intended elevations for the Work are as indicated.

2. The drawings indicate existing elevations and proposed elevations. The existing elevations and proposed are given for the convenience of the Contractor to assist him in arriving at the quantities of excavation, grading, backfilling etc.

3. Before earthwork operations are started, all construction items shall be completely staked out for the Owner's approval. For any area with a two- percent slope or flatter, the Contractor shall lay out a 50-foot on-center grid and calculate the exact elevation at every intersection of the grid lines. These calculations will be approved by the Owner's Representative. For complex grading in the core area of the park, the contractor shall exercise craftsmanship and diligence in the establishment and layout of detailed slopes and precise landform shapes. Additional surveying and smaller equipment are likely to be required to precisely achieve specified convex and concave berm grades in these areas to the specified tolerances.

4. Preliminary grade stakes for subgrade elevations shall be set at 50 feet on center for the center line of walks; all drainage swales; breaks in grade; spot elevations; and as otherwise required to complete the work of this section to the elevations shown on the Drawings or as modified in the field by the Owner.

5. Protect benchmarks, temporary benchmarks, survey control points, sidewalks, paving, curbs, existing above and below grade utilities, and existing vegetation that is to remain from excavating equipment and vehicular traffic.

C. Removal of Topsoil: Strip existing earthen material (topsoil) to a depth of 4 inches over the entire site. Stockpile on site in area approved by Owner's Representative. Keep topsoil segregated. Place, grade, and shape stockpile for proper drainage.

3.02 Excavation

A. Prior to beginning excavation operations, accomplish all site preparation in accordance with these specifications. Perform excavation of every description to the lines and grades indicated on the drawings.

B. Complete excavation work to the grade elevations shown on the drawings for all areas to be paved.

3.03 Clearing the Site

A. All areas underlying new structures, paved areas, site fills and embankments shall be cleared of stumps, shrubs, brush, and other vegetative growth.

B. Any material containing roots, grasses and other deleterious or organic matter generally found in the top four to six inches of undisturbed natural terrain shall be stripped from all areas requiring

excavation, grading, trenching, subgrade preparation for foundations and embankment work. The City will require stripped topsoil deemed suitable for spreading over the finished grades to be stockpiled and preserved until the finished grading operation, at which time it shall be spread uniformly over areas to be seeded or sodded.

C. Upon completion of the project, completion of a particular phase of the project, or termination of the use of any particular area, site, storage yard right-of-way or easement, the Contractor shall promptly and neatly clean up the area and re-establish the ground to the contours required by the project or conditions prior to project commencement.

3.04 Earth Fill Construction

A. Install the work in accordance with the Geotechnical Engineering Report and in accordance with the City of Fort Collins standards.

B. The Contractor shall perform all grading to the lines and grades specified and/or established by the Engineer, with an appropriate allowance for topsoil. All slopes shall be free of all exposed roots and stones exceeding 3-inch diameter, which are loose and liable to fall. Tops of banks shall be rounded to circular curves not less than 6-feet in radius or as shown on the drawings.

C. Rounded surfaces shall be neatly and smoothly trimmed. Topsoil shall be replaced to a depth of 4-inches in areas to be revegetated.

D. The Contractor shall protect the fill against freezing when atmospheric temperature is less than 35 degrees F (1 degree C).

3.05 Compaction

A. The Contractor shall meet minimum percentage density specified for each area classification as follows. Percentage of Maximum Density Requirements: Compact soil to not less than the indicated percentages of maximum density relationship determined in accordance with ASTM D 698.

1. Foundations, Paved Areas, Utilities, and Sidewalks - 95 percent

2. Unpaved Areas - 90 percent

B. Control moisture content within 2% of optimum moisture content as determined by ASTM D 698. Where subgrade or layer of soil material is too dry to permit compaction to the specified density, uniformly apply water to surface of cut area, subgrade, or loosely placed layer of soil material. Mix soil and applied water by blading, disking, or other methods to achieve uniform moisture content throughout the soil mass to be compacted.

C. Remove and replace, or, scarify and air dry, soil material that is too wet to permit compaction to specified density. Soil 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 disking, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

D. Puddling is not an acceptable method of compaction.

3.06 Grading

A. Paved Areas: Immediately prior to placing structural pavements, shape area to the required lines, grades, and limits to enable achievement of the finished elevations indicated and roll with an approved heavy vibratory roller until compacted to the specified density. Maintain moisture content within 2% of optimum during final rolling and until subgrade is covered by subsequent construction. Remove loose material and protect subgrade until covered.

B. Landscape Area and Remainder of Site:

1. Rough grade areas as indicated on grading plan to 4 inches below finish grade. After rough grading is finished, compacted and approved, scarify area to a depth of at least 6 inches.

2. Place previously stockpiled topsoil in all areas within the limits of the project not indicated to receive subsequent foundations, slabs on grade, walks, safety surfacing or other similar materials.

3. Uniformly distribute topsoil on the disturbed area and evenly spread to a thickness of 4 inches deep after light compaction. Perform spreading so that planting can proceed with little additional soil preparation or tillage. Do not place topsoil when subgrade is frozen, excessively wet, extremely dry or in a condition otherwise detrimental to specified grading, seeding and planting specifications.

C. Finish Grading:

1. Grade all excavated sections, filled sections, construction disturbed areas and adjacent transition areas to finish elevation. Make finished surfaces smooth, compacted and free from irregular surface changes. Remove all construction debris.

2. Unless indicated otherwise on drawings, finish grade area adjacent to sidewalks and pavements to ½ inch below finish elevation of sidewalk and pavement.

3. Grades not otherwise indicated shall be uniform levels or slopes between such points and existing finish grade. Abrupt change in slopes shall be rounded.

3.07 Tolerances

A. Tolerances for areas to receive paving shall be plus or minus 0.05 foot. In the areas to receive new vegetation and the remainder of the site, tolerances shall be within plus or minus 0.10 foot.

3.08 Field Quality Control

A. Section 01400 – Quality Assurance: Field inspection and testing.

B. Testing: In accordance with AASHTO T180.

C. Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed. Notify testing service not less than 8 working hours in advance. Testing shall be at the discretion of the Owner.

D. If tests indicate that the Work does not meet the specified requirements, remove work, replace and retest.

E. Verification of grading within allowable tolerances shall be conducted as requested by the Owner. The Contractor shall provide all necessary surveying equipment and a survey crew, if requested

by the Owner. If, in the opinion of the Owner, the grading does not conform to the required grades and tolerances, the Contractor shall regrade the area and bear all costs associated with the regrading and reverification until the specifications are met.

3.09 Settlement

A. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, the Contractor shall scarify the ground surface, re-shape, and compact to required density prior to further construction.

B. Any settlement in backfill, fill, or in structures built over the backfill or fill, which may occur within the guarantee period in the General Conditions will be considered to be caused by improper compaction methods and shall be corrected at no cost to the City. Any structure damaged by settlement shall be restored to their original condition by the Contractor at no cost to the City.

3.10 Disposal of Excess Excavation and Waste Materials

A. The Contractor shall dispose of all excess excavated material not required for fill on-site, as directed by the Engineer. The grading design is intended to balance on site. Utility trench excavation material was not included in the calculation of earthwork balance.

B. The Contractor shall remove and be responsible for legally disposing of excess fill material not placed on-site, waste materials, trash and debris.

C. The Contractor shall conduct all site grading operations and other construction activities to minimize erosion of site soil materials. The contractor shall be responsible to maintain streets/public right-of-way daily by removing any spillage of dirt, rocks or debris from equipment entering or leaving the site.

3.11 Dust Control

A. Obtain Larimer County Fugitive Dust Permit.

B. Control the amount of dust generated from construction to prevent hazardous conditions or public nuisance. Use of water will not be permitted when it will result in hazardous conditions such as ice, flooding, or pollution. Blowing dust will not be permitted.

3.12 Cleaning

During and upon completion of earthwork operations, clean areas within contract limits and within the public rights-of-way. Remove tools and equipment. Provide site clear, clean, free of debris, and suitable for site work operations.

END OF SECTION