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**CHAPTER 2**  
**EARTHWORK, EROSION CONTROL, AND SEEDING**

**2.00.00**      **EARTHWORK AND GRADING**

All earthwork operations shall be executed in a manner which will minimize dust, noise, excessive accumulation of debris, danger to the public, and interference with other construction. Positive drainage and adequate erosion control shall be provided at all times during the earthwork operations.

Earthwork operations shall be executed to provide compaction to a minimum 85-percent Standard Proctor density at  $\pm 3$  percent of optimum moisture in areas to be eventually turfed or planted and compaction to minimum 95 percent Standard Proctor density at  $\pm 2$  percent of optimum moisture under all walks, trails, streets, structures, and other site improvements. Testing, if required by the City to demonstrate compliance with this specification, shall be performed per AASHTO T-180 by a Professional Engineer registered in the State of Colorado and practicing in the field of soils mechanics. All costs for such testing shall be paid by the contractor/developer. Refer to the applicable section in these STANDARDS AND SPECIFICATIONS for compaction requirements within the public right-of-way.

Upon completion of earthwork operations, the contractor shall leave the site and soil clean to allow for proper installation of irrigation, plantings, and related site improvements. Completed grades shall be smoothly and uniformly sloped, properly compacted, and shall provide drainage away from site improvements. All banks or slopes constructed shall be maintained in a stable condition by approved methods to prevent slips, washouts, or erosion. No area to be seeded or sodded shall be steeper than a 4:1 maximum slope (4 horizontal: 1 vertical), nor flatter than a 2-percent minimum slope. Final grades shall conform to the final drainage study and grading plans.

**2.10.00**      **EROSION CONTROL**

The primary goal of all erosion control systems is to prevent unacceptable erosion and maintain water quality at acceptable levels. This shall be accomplished by analyzing pertinent environmental factors and applying technical procedures which result in a workable plan.

There are two major elements in developing an erosion and sedimentation control plan. The first is an investigation and analysis of the natural characteristics of a site (such as soil type, steepness of slopes, and available vegetation) that will help the developer anticipate where erosion problems might occur. Detailed information on soils, vegetation, topography, geologic, and hydrologic conditions shall be obtained for the site. The second element is use of effective control measures. Attention shall be given to identify and evaluate problems that may cause serious erosion during and after construction. Runoff from the site, as well as runoff from the watershed above, shall be controlled and discharged safely. Measures shall be taken to prevent erosion and sediment deposition on downstream properties.

**2.10.01**      **Limitations**

No person shall clear or grade land without implementing soil erosion and sediment controls in accordance with the requirements of these STANDARDS AND SPECIFICATIONS, and the City of Fort Lupton's Municipal Code.

### **2.10.02 Exemptions**

- (A) Agricultural land management practices and construction of agricultural structures;
- (B) Clearing or grading activities that disturb less than 2 acres of land area and disturb less than 200 cubic yards of earth, provided the existing grades are less than 8 percent and the effected property does not abut public lands.
- (C) Clearing or grading activities that are subject exclusively to State approval and enforcement under State law and regulations.

## **2.11.00 EROSION AND SEDIMENT CONTROL PLANS**

### **2.11.01 Review and Approval**

- (A) A person may not clear or grade land without first preparing an erosion and sediment control plan which has been approved by the City.
- (B) The applicant shall submit an erosion and sediment control plan and any supporting computations to the City for review and approval. The erosion and sediment control plan shall contain sufficient information, drawings, and notes to describe how soil erosion and off-site sedimentation will be minimized. The City shall review the plan to determine compliance with these STANDARDS AND SPECIFICATIONS, and the City of Fort Lupton's Municipal Code prior to approval. The plan shall serve as a basis for all subsequent grading and stabilization.
- (C) In approving the plan, the City may impose such conditions thereto as may be deemed necessary to ensure compliance with the provisions of these STANDARDS AND SPECIFICATIONS, and the City of Fort Lupton's Municipal Code for the preservation of public health and safety.
- (D) The erosion and sediment control plan shall not be considered approved without the inclusion of the signature and date of signature of the City Engineer.
- (E) Approved plans may remain valid for one year from the date of approval unless renewed by the City.
- (F) Approved plans will become an exhibit to the City's Land Disturbance Permit. In addition, the developer/contractor will be required to execute an improvements agreement and provide surety in a form outlined by City Code prior to beginning earthwork operations.

### **2.11.02 Modifications to Approved Erosion and Sediment Control Plans**

When inspection of the site indicates the approved erosion and sediment control plan needs modification, the modification shall be made in compliance with the erosion and sediment control criteria contained in these STANDARDS AND SPECIFICATIONS, and the City of Fort Lupton's Municipal Code.

- (A) The permittee shall submit requests for major modifications to approved erosion and sediment control plans, such as the addition or deletion of a sediment basin, to the City to be processed appropriately. This processing includes modifications due to plan inadequacies at controlling erosion and sediment as revealed through inspection.
- (B) The City may approve minor modifications to approved erosion and sediment control plans in the field if conditions so merit.

### **2.11.03 Grading and Erosion Control Notes**

The following minimum grading and erosion control notes shall be stated on, as well as incorporated into the overlot grading and erosion control plan:

#### **GRADING AND EROSION CONTROL NOTES**

- (A) All site grading (excavation, embankment, and compaction) shall conform to the recommendations of the latest soils investigation for this property and shall further be in conformance with the City of Fort Lupton's "**STANDARDS AND SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC IMPROVEMENTS,**" latest edition.
- (B) Natural vegetation shall be retained and protected wherever possible. Exposure of soil to erosion by removal or disturbance of vegetation shall be limited to the area required for immediate construction operation and for the shortest practical period of time.
- (C) Topsoil shall be stockpiled to the extent practicable on the site for use on areas to be revegetated. Any and all stockpiles shall be located and protected from erosive elements.
- (D) Temporary vegetation shall be installed on all disturbed areas where permanent surface improvements are not scheduled for installation within three months. Vegetation shall be a vigorous, drought tolerant, native species mix. (Refer to Section 2.26.00 of these STANDARDS AND SPECIFICATIONS for seeding mix.) Project scheduling should take advantage of spring or fall planting seasons for natural germination, but seeded areas shall be irrigated, if conditions so merit.
- (E) At all times, the property shall be maintained and/or watered to prevent wind-caused erosion. Earthwork operations shall be discontinued when fugitive dust significantly impacts adjacent property. If earthwork is complete or discontinued and dust from the site continues to create problems, the owner/developer shall immediately institute mitigative measures and shall correct damage to adjacent property.
- (F) Temporary cut/fill slopes shall not exceed a steepness of 2:1 (2H:1V). Permanent slopes shall not exceed 4:1 (4H:1V) in areas to be seeded or sodded.

- (G) Utility construction is not approved under this plan.
- (H) The owner/developer shall provide any additional dust abatement and erosion control measures deemed necessary by the City, should conditions merit them.
- (I) Temporary fences shall be installed along all boundaries of the construction limits or property lines as shown on the approved erosion control plan, to prevent grading on property not owned by the developer. In addition, the City may require additional temporary fences if field conditions so merit them.

**2.11.04 Standard Erosion Control Details**

In the Appendix of these STANDARDS AND SPECIFICATIONS are the standard erosion control details which are acceptable to the City of Fort Lupton.

**2.20.00 LANDSCAPING**

For the purpose of this chapter, the term “landscaping” refers to ground cover only. “Formal” landscaping requirements are specified in a separate document titled City of Fort Lupton Landscape Regulations. Final drawings, specifications, and details shall be submitted to the City for review and approval prior to construction.

**2.21.00 SOIL PREPARATION**

**2.21.01 Materials**

Soil preparation shall be provided on all areas to be seeded, sodded, or otherwise planted. Organic matter for soil amendment shall be well aged dairy cattle manure, thoroughly composted organic material, and other organic matter as approved by the City, and shall contain a minimum of 60-percent organic matter. The mixture shall be free from clay subsoil, stones, lumps, plants or their roots, sticks, weed stolons and seeds, high salt content, and other materials harmful to plant life. The materials shall be coarsely ground and thoroughly mixed together to insure an even composition. The mix shall have an acidity no greater than pH 7.5 and shall meet the following mechanical analysis:

	<u>% PASSING</u>	<u>% RETAINED</u>
1-1/2 Inch Screen	100	0
1-Inch Screen	90-100	0-10
1/2 Inch Screen	50-80	20-50
#100 Mesh Sieve	0-15	85-100

If testing is required, it shall be done by a Professional Engineer registered in the State of Colorado and practicing in the field of soil mechanics. Testing shall be at the contractor’s/ developer’s expense.

**2.21.02 Placement**

Upon establishment of approved grades, the soil surface shall be loosened by rototilling to a minimum of 8 inches, and all materials over 2 inches in diameter shall be removed. The organic matter shall be evenly spread over the entire surface at the rate of 5 cubic yards per 1,000 square feet and shall be mixed thoroughly into the soil surface to a depth of 8 inches by means of a rototiller, soil mixer or similar equipment. The surface shall then be finish-graded and compacted to the approved elevations. Prior to seeding or sodding, D1-ammonium phosphate (18-46-0) shall be spread evenly over the entire surface at the rate of 15 pounds per 1,000 square feet.

**2.22.00 TOPSOILING**

Topsoiling is not considered a portion of the ordinary soil preparation operations as described in these STANDARDS AND SPECIFICATIONS. However, the use of good topsoil is desirable, and may help in reducing water consumption and encouraging plant growth. When topsoil exists on the project site, the contractor shall strip and stockpile the topsoil and redistribute the topsoil over the open space areas after the overlot grading is complete. The City has the prerogative of deleting all or a portion of the soil preparation requirements when topsoil is provided, depending on topsoil quality and quantity.

**2.2201 Material**

Topsoil shall be fertile sandy loam topsoil, taken from a well-drained site and free from clay subsoil, stones, lumps, plants or their roots, sticks, weed stolons and seeds, high salt content, and other materials harmful to plant life. The topsoil shall have an acidity in the range of pH 5.5 to pH 8.5, and shall be screened and meet the following mechanical analysis:

	<u>% PASSING</u>	<u>% RETAINED</u>
1 Inch Screen	100	0
1/2 Inch Screen	97-100	0-3
#100 Mesh Sieve	60-40	40-60

If soil testing is required, it shall be by a Professional Engineer registered in the State of Colorado and practicing in the field of soil mechanics and in accordance with “Methods of Soils Analysis -- Agronomy No. 9” as published by the American Society of Agronomy. Testing shall be at the contractor’s expense.

**2.22.02 Placement**

Upon establishment of the approved grade, the subsoil surface shall be loosened to a minimum depth of 8 inches by tilling and all objects over 2 inches in diameter shall be removed. The topsoil shall be spread over the area to a minimum of 6 inches compacted depth, and mixed lightly into the subsoil by means of a rototiller, soil mixer, or similar equipment. The surface layer shall then be finish graded and compacted to the approved elevations.

**2.23.00 FERTILIZATION**

A booster fertilizer with the chemical analysis of Nitrogen-12, Potash-12, Phosphorous-4 with 4 percent iron and 8 percent sulphur shall be applied on the prepared soil at the rate of 5 pounds per 1,000 square feet immediately prior to seeding. If a soil analysis indicates sufficient amounts of the above elements the City may, at its discretion, waive the requirement to fertilize.

**2.24.00 MULCHING**

A mulch may be needed to conserve moisture, prevent crusting, reduce runoff and erosion and help establish a plant cover. The need for mulch will be at the sole discretion of the City. Mulching material shall be applied immediately before or immediately after seeding. One of the mulching methods listed below will be acceptable:

- (A) Application of hydro-mulch (wood fibers in a water slurry) -- minimum rate of 2,000 lbs/acre. Tackifier, fertilizer, etc. will be included in the hydro-mulch.
- (B) Weed and seed grass hay or grain straw shall be used at an application rate of 4,000 lbs/acre of air dried material. At least 50-percent of the mulch by weight shall be 10 inches or more in length. Mulch shall be anchored immediately after distributing with a mulch crimper, and tackifier.
- (C) Mulch netting shall be firmly held in place with pins spaced not more than ten linear feet apart. In sandy or extremely loose soil, the pins shall be located not more than 5 linear feet apart.
- (D) Jute netting, enkamat, and similar approved materials shall be installed according to the manufacturer's recommendations.
- (E) Excelsior mat shall be installed according to the manufacturer's recommendations.

**2.25.00 SEEDING - GENERAL**

Seeding of grasses or ground cover plants is required for either of two purposes:

- (A) Temporary erosion control.
- (B) Permanent seeding for erosion control and appearance

Temporary seeding for erosion control shall be in accordance with Sections 2.11.03 and 2.26.00 of these STANDARDS AND SPECIFICATIONS.

**2.26.00 DRY LAND SEEDING**

Prior to any seeding, a depth of tillage sufficient to establish a seed bed will be done based on specific site conditions.

Germination Standard

The minimum standard for any dryland grass is 5 seedlings of the seeded species per square foot. This count/inspection shall be taken four (4) weeks after germination by a qualified botanist. Any area not meeting the specifications on germination will be touch up seeded in one of the following methods:

- Hand Broadcast and Incorporation
- Mechanical Broadcast and Incorporation
- Interseeding with Seed Drilling Equipment

Dry land seeding, sometimes referred to as “native” seeding, shall be accomplished with mechanical power-drawn drills which have depth bands set to maintain a planting depth of at least 1/4-inch and shall be set to space the rows not more than 7 inches apart. Seed that is extremely small shall be sowed from a separate hopper adjusted to the proper rate of application. When requested by the contractor and approved by the City, seeding may be accomplished by means of approved broadcast or hydraulic-type seeders. Seed shall not be drilled or sown during windy weather or when the ground is frozen or otherwise untillable.

All seed sown by broadcast-type seeders shall be “raked in” or otherwise covered with soil to a depth of at least 1/4-inch. Hand method of broadcasting seed will be permitted only on small areas not accessible to machine methods. Water shall be applied as necessary to establish the cover crop. Hydraulic seeding equipment and accessories shall conform to that described in Section 2.28.00 of these STANDARDS AND SPECIFICATIONS. If inspections indicate that strips wider than the specified space between the rows planted have been left or other areas skipped, the City may require immediate resowing of seed in such areas at the developer’s expense. Dry land seed shall be applied at the following rate:

Dry Land Seeding Rates

<u>Species</u>	<u>C-W-N</u>	<u>Variety</u>	<u>Lbs. Per Acre PLS</u>	
			<u>Drilled</u>	<u>Broadcast</u>
Western Wheatgrass	N	Barton	25	50
Blue Grama	N	Lovington	2.5	5
Buffalo Grass	N	Sharps	20	40
		Improved		
Alkali Sacaton	N	**	2.5	5
Pubescent	C	Lune	7.5	15
Wheatgrass				
Kentucky Bluegrass	C	Merion	1.25	2.5

\*\* = Seed source should come from within 150 miles of an area to be seeded.

PLS = Pure Live Seed is the amount of seed expected to grow based on the purity and germination rate of the bulk seed.

C = Cool season grass

W = Warm season grass

N = Native species