

SECTION 02924

SEEDING & REVEGETATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Soil preparation, topsoil, fertilizing, seeding, mulching, erosion control products, watering and initial care, and final inspection and acceptance.
 - 2. Plantings and landscaping.
 - 3. Maintenance & Warranty.

1.2 REFERENCES

- A. City of Cañon City Grading, Erosion, & Sedimentation Control (GESC) Plan Manual.
- B. Urban Drainage and Flood Control District (UDFCD) Criteria Manual.
- C. 2017 CDOT Standard Specifications for Road and Bridge Construction.
- D. 2012 CDOT M&S Standard Plans
- E. Erosion Control Technology Council (ECTC).
 - 1. Standard Specification for Rolled Erosion Control Products
 - 2. Standard Specification for Hydraulic Erosion Control Products
- F. American Society for Testing and Materials (ASTM).
- G. National Resources Conservation Service- Colorado (NRCS)
- H. Colorado State University (CSU) Extension Office

1.3 SUBMITTALS

- A. Product Data: Submit product information and design.

1. Submittals shall include seed mixes and certification of seed testing dated within 6 months prior to seeding; guaranteed analysis or manufacturers certified test results for mulches, soil amendments, compost, tackifiers, etc.; certified topsoil analysis from an independent soils laboratory prior to topsoil delivery; rolled erosion control products (RECP), and any other appurtenances . The Contractor shall also submit an irrigation plan.
 2. If specified materials are not obtainable, submit non-availability to City, together with a proposal for use of equivalent material.
- B. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Developer/Contractor shall have a soil sample tested by a licensed, certified soil testing company for a report that will address fertilization needs, pH balance, and agricultural chemical analysis including micro nutrients and salt content data.
- B. Specific fertilizer and amendments recommendations shall be provided by a licensed, certified soil-testing company.
- C. All products shall be installed according to the manufactures recommendation and/or industry accepted horticultural practices.
- D. Seed, soil conditioner, mulch, and fertilizer shall not be applied during inclement weather including rain and high winds, when soil is frozen, or when moisture content of soil is too high to evenly incorporate the applied materials.

1.5 QUALIFICATIONS

- A. Manufacturer/Installer: Company specializing in performing work of this section with documented experience.

PART 2 MATERIALS

- 2.1 Quality: All materials shall be new and without flaws or defects of any kind.
- 2.2 Handling and Storage: Protect all materials from damage, deterioration, or loss of any kind while in transit, storage, and during installation. All materials shall be stored, transported, and applied in accordance with Federal, State, and local regulations.
- 2.3 Topsoil: Topsoil shall consist of loose friable, fertile, natural loam soil from the zone of major root development and be reasonably free of subsoil, refuse and other litter, stumps, woody roots, brush, noxious weed seeds and plant parts from current State and county weed lists, clay lumps, stones larger than 2 inches in any dimension, and other extraneous or toxic matter which would be detrimental to its use on the project.
- 2.4 Seed: All seed shall be furnished in containers clearly labeled to show name and address of supplier, the seed name, the lot number, net weight, origin, the percent of weed seed content, guaranteed percentage of purity and germination, pounds of pure live seed (PLS) of each species, and the total pounds of PLS in the container. All seeds shall be free from noxious weed seed in accordance with current State and local lists. Seed shall be labeled in accordance with U.S. Department of Agriculture rules and regulations and Colorado State Seeding laws. Seed that has become wet, moldy, or otherwise damaged in transit or in storage shall not be accepted.

A. Seed Mixes

- 1. Seed mixes will be approved by the Engineer depending on location, site condition, soil conditions, availability of water, and other factors. Seed mix shall be submitted to the Engineer for approval. The Engineer may require a custom seed mix based on the conditions and desired results. Seed shall be applied at a minimum rate of 15 pounds per acre (15lbs/ac).
 - a. Areas deemed Critical Planting Areas (CPA’s) are areas that have, or expected to have, high rates of erosion due to soil conditions and topography or sites that have physical or biological conditions that prevent establishment of vegetation with normal practices. These areas include, but not limited to, non-irrigated areas, road construction sites, banks of channels, and slopes. Species selected for planting in CPA’s shall be suited to current site conditions and intended uses, and be resistant to diseases or insects common to the site or location. Unless noted seed submittal, seed rates for CPA’s will be doubled.
- 2. Approved, preferred seed mixes(Alternative seed mixes may be submitted for approval:
 - a. Saline, Alkali, and Salt (Critical Planting Area Rate)

Common Name	Scientific/Botanical Name	PLS per Acre
Alkali sacaton	<i>Sporobolus airoides</i>	1
Western wheatgrass	<i>Pascopyrum smithii v. Arriba</i>	8
Galleta	<i>Pleuraphis jamesii v. Viv</i>	6
Blue Grama	<i>Bouteloua gracillis v. Hachita</i>	2

Alkaligrass	<i>Puccinellia distans</i>	1
Blacksamson echinacea	<i>Echinacea augustifolia</i>	1
American Vetch	<i>Vicia americana</i>	2
Cover/Nurse Crop	<i>Secale cereale</i>	4
	TOTAL	25

b. Dry Land(Critical Planting Area Rates)

Common Name	Scientific/Botanical Name	PLS per Acre
Western wheatgrass	<i>Pascopyrum smithii</i> v. <i>Arriba</i> or <i>Barton</i>	12.4
Blue Grama	<i>Bouteloua gracillis</i> v. <i>Hachita</i> or <i>Lovington</i>	1.2
Sideoats Grama	<i>Bouteloua curtipendula</i> v. <i>Vaughn</i> or <i>Butte</i>	3.6
Indian Ricegrass	<i>Achnatherum hymenoides</i> v. <i>Paloma</i>	4.0
	TOTAL	21.2

c. Wet Land- T.B.D.

- 2.5 Fertilizer: Fertilizer (plant nutrients) shall conform to the applicable State fertilizer laws. It shall be a commercial product, uniform in composition, dry, free flowing, and be delivered to the site in the original, unopened containers each bearing the manufacturers guaranteed analysis. Fertilizer that becomes caked or otherwise damaged will not be accepted. Application rates shall be based on upon recommendations of soils laboratory and shall be reviewed by the Engineer.
- 2.6 Soil Conditioner: Soil Conditioner shall consist of compost, biological nutrient or culture, or humate conditioners. Compost shall be weed free, totally organic product that has been aerobically and naturally processed in a facility permitted by the Colorado Department of Public Health and Environment (CDPHE). Soil conditioners shall generally conform to 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 212.02.
- 2.7 Sod: Sod shall be nursery grown and 99 percent weed free. Species shall be approved by the Engineer. Sod that was cut more than 24 hours prior to installation shall not be used. Each load of sod shall be accompanied by a certificate from the grower stating the type of sod and the date and time of cutting.
- 2.8 Herbicide: Where site conditions warrant or as determined by the Engineer, an approved herbicide shall be applied in accordance with the manufacturers label and Federal, State, and local regulations.
- 2.9 Erosion Control Products:
- A. Rolled Erosion Control Products (RECP's) shall be used in areas with slopes equal to 3:1 or steeper and in swale bottoms, areas of concentrated flows, or as otherwise directed by the Engineer. RECP's shall meet the specifications of ASTM D1117, D1388, D6525, D6475, D6567, and D6818. RECPs shall meet the guidelines of the *Erosion Control Technology Council (ECTC) Standard Specification for Temporary Rolled Erosion Control Products* for Type 2 (12 month longevity) or Type 3 (24 month longevity) as approved by the Engineer. Applications that do not fall under the guidelines of those outlined for Type 2 and Type 3 RECPs shall be submitted to the Engineer for approval on a case-by-case basis. RECP's shall be installed according to manufacturer's requirements and in a way that is not detrimental to the seeding and germination process. A product and installation submittal shall be delivered to Engineer for approval prior to installation of RECP's.
- B. Hydraulic Erosion Control Products (HECP's) shall be selected in accordance with *ECTC Standard Specification for Hydraulic Erosion Control Products* based on longevity, slope grade, and slope length. HECPs will be installed in accordance with this standard and the manufacturer's application instructions and machinery recommendations. Use of HECP's shall be approved by the Engineer. A product and installation submittal shall be delivered to Engineer for approval prior to installation of HECP's

2.10 Mulch:

- A. Hay or Straw Mulch: Mulch shall be clean, certified weed free, long stem grass hay or cereal grain straw. At least sixty percent (60%) of the stubble, by weight, shall have fibers 10 inches (10”) or longer upon the completion of the crimping process. Hay or straw mulch shall be used in areas with slopes flatter than 3:1 and shall not be used in drainage swales, areas of anticipated concentrated flows, or other special situations as identified by the Engineer. Hay or straw in a state of decomposition (discolored, brittle, rotten moldy) as to smother or retard the growth of grass or old, dry mulch which breaks during the crimping process will not be accepted. Hay or straw mulch shall be anchored into the soil a minimum of four inches (4”) by a mechanical crimper. Areas that cannot be accessed by mechanical methods will be hand crimped. Crimping shall be performed on the contour. Application of tackifier to crimped mulch will be at the discretion of the Engineer.
- B. Hydraulic Mulch: Hydraulic mulch material shall consist of at least ninety percent (90%) virgin wood cellulose fiber and shall be clean, free of seeds of noxious weeds or undesirable grasses, and free of any substance that might inhibit the germination or growth of vegetation. Hydraulic mulch shall be dyed (green preferred) to allow visual metering of the application. The dye shall be biodegradable and not inhibit plant growth. The wood fiber mulch shall conform to 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 231.02. Tackifier shall be added to the water and wood cellulose material to form a homogenous slurry.

2.11 Tackifier: Mulch tackifier shall be applied to all areas areas where the mulch is not mechanically anchored or as directed by the Engineer. The tackifier shall consist of a free-flowing, non-corrosive powder produced from the natural plant gum of *Plantago Insularis* (Desert Indian Wheat). The powder shall possess the following properties:

Protein Content	1.6 ± 0.2%
Ash Content	2.7 ± 0.2%
Fiber Content	4.0 ± 0.4% %
pH (1% solution)	6.5 – 8.0%
Settleable Solids	5.0%

Follow manufacturers written recommendations for application rates and procedures. The tackifier requires 12 to 18 hour drying time. Alternative tackifier agents may be used upon approval by the Engineer.

- 2.12 Plantings: Plantings shall consist of trees, shrubs, and other plant material, hereinafter referred to as “plants” of the species or variety designated by the Engineer. Plants shall be in healthy condition, free of plant diseases and insect pests; with normal, well-developed branch and roots systems; and shall conform to the requirements 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 214. Installation shall conform to 2011 CDOT Standard Specifications for Road and Bridge Construction, Section 214; 2012 CDOT M&S Standards; and industry approved horticulture standards.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify placement, techniques, and materials with Engineer.
- B. All disturbed areas within the extents of the project and any disturbances outside the designated area shall be reclaimed, reseeded, mulched, or otherwise permanently stabilized according the Plans and Specifications.
- C. A satisfactory stand of plantings not requiring reseeding shall be defined as a minimum of 50 grass seedlings per square foot or 70% of the prior disturbed landscaped growth.

3.2 SITE PREPARATION

- A. Landscape work shall proceed as rapidly as portions of the site become available, within season limitations. Work the soil only when moisture conditions are suitable.
- B. Rip existing soil on slopes 3:1 or flatter to a minimum depth of 6 inches in one direction using an agricultural ripper with tines spaced at no greater than 18 inches. Soil shall be worked until no clods of soil greater than 2 inches remain.
- C. Slopes 3:1 and steeper shall be raked or otherwise worked so that the top 1inch (1”) of soil is loose and friable before seeding.
- D. Remove all rubble, stones and extraneous material over 2 inches in diameter.
- E. Spread the amendment over the entire area to be landscaped and incorporate into the top 2 inches (2”) of soil by use of a harrow or rake until a uniform mixture is obtained with no pockets of soil or amendments remaining.
- F. Correct irregularities in the ground surface resulting from soil preparation operations and slope to drain. Confirm that all work is returned to final grade, per construction plans, prior to seeding.
- G. Developer/Contractor shall all materials and equipment to complete the seeding and revegetation operations.

3.3 SEEDING

- A. Apply seed at recommended rates.
- B. Seeding shall occur after spring thaw and before consistent ground freeze. At no time will seed be sown when the surface of the ground is frozen, during periods of high wind, or at times when the moisture content of the soil is deemed excessive.
- C. Seeding shall occur within 24 hours after soil preparation. All seeded areas must be mulched within 24 hours of seed application. Areas not mulched within 24 hours must be reseeded at the expense of the contractor.
- D. Methods:
 - 1. Seeding shall be accomplished by mechanical power drawn “Grass” drills equipped with agitator in the seed box, double disc opener, and depth bands followed by packer wheels. Drills shall have a depth of $\frac{1}{2}$ - $\frac{3}{4}$ inch and shall be set to space the rows not more than 7 inches apart. Seed that is extremely small shall be sown from a separate hopper adjusted to the proper rate of application.
 - 2. Areas not accessible to mechanical power-drawn seeders and slopes steeper than 3:1 may be seeded by broadcasting by hand, by mechanical spreaders, or other approved mechanical means and then cultipacked or rolled to provide good seed-to-soil contact. Broadcasting and manual spreaders will require seeding rates double that required of drill seeding. Distribute seed as evenly as possible. Rake in or otherwise cover seed with soil to a depth of one eighth inch ($\frac{1}{8}$ ”) to one quarter inch ($\frac{1}{4}$ ”).
 - 3. Hydraulic seeding will not be allowed unless the area to be seeded is permanently irrigated or otherwise approved by the Engineer.

3.4 MULCHING

- A. Mulch shall be required for all seeded areas. Mulch must be applied within 24 hours of seeding. Areas that are not mulched within 24 hours of seeding must be reseeded the expense of the contractor.
- B. Methods:
 - 1. Hay or straw mulch shall be applied uniformly at a rate of two tons per acre (2t/ac) in accordance with Section 02924.
 - 2. Hydraulic mulches shall be applied uniformly at a rate of one ton per acre (1t/ac) with a minimum tackifier rate of 100 pounds per acre (100lb/ac) or as recommended by the manufacturer. Hydraulic mulching shall not be done in the presence of free surface water and shall be in accordance Section 02924.

3. Slopes steeper than 3:1 shall be treated with and erosion control product in accordance with Section 02924.

3.5 MAINTENANCE & WARRANTY

- A. Maintenance and irrigation of seed and established plants is the responsibility of the Developer/Contractor for the full warranty period of two years. The Developer/Contractor shall be responsible for all maintenance and repairs necessary within the warranty period. At any time, during the maintenance period, that the City determines corrective work and replacement materials are necessary in accordance with the Contract, the Contractor shall take corrective measures within 10 days of notice by the City. Maintenance and repairs shall include:
 1. Control of weed competition by mowing (at proper times and to proper heights to control many annual weeds).
 2. Application of herbicide, when deemed necessary and directed by the Engineer, to control noxious weeds, some annual weeds, and perennial weeds.
 3. Protection of seeded areas from unnecessary vehicle or pedestrian traffic until the vegetation is well established through the use of fences, barricades, signage, or other approved methods.
 4. Installation and maintenance of any additional erosion control measures which are necessary for the successful establishment of vegetation.
 5. Installation and maintenance of an irrigation system. The Developer/Contractor shall submit a plan for irrigation, which may include pumps, temporary sprinkler pipes, sprinklers, siphon pipes, gate pipe, etc.
- B. A warranty bond in the amount of line item prices for the seeding for the two-year warranty period may be required for assurance that the seed will be grown and maintained. This warranty bond shall be received by the City prior beginning any work.

END OF SECTION