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PART 01000 - RIGHT OF WAY DEVELOPMENT AND CONTROL

Section 01030 - Seeding

Description

01030.00 Scope - This work consists of seeding and associated tasks to develop plant growth for erosion control, environmental mitigation, and roadside development.

01030.02 Definitions:

Certified Seed - A grass or legume seed named variety that has been reviewed and accepted into the Oregon Certified Seed program. Currently certified seed is individually sold in bags with a blue-colored Oregon Certification Tag, thus the name commonly used for such seed is "blue tag stock".

Establishment Period - A period when planting work has been performed and initially accepted, and there is a Contract requirement to care for the planted areas in some way until the period ends.

Native Plant (existing) - A variety of plant species occurring in its natural habitat without direct or indirect human actions.

Noxious Weed - All weed designated by the Oregon State Weed Board as injurious to public health, agriculture, recreation, wildlife, or all public or private property. The Oregon Department of Agriculture (ODA) will be the authority in determination of noxious weed species.

Pure Live Seed (PLS) - The amount of living seed in the total quantity of seed when non-viable seed or non-seed material is excluded.

Riparian - Related to the bank, shore, or water-influenced areas of a watercourse or water body.

Sensitive Areas - Defined areas such as wetlands, natural water and riparian resources, special environmental zones, or where certain activities are restricted such as the use of chemicals.

Specified Weeds - All noxious weeds as defined above, and all plant species identified in the Special Provisions or on the plans as a species to be removed.

Waters of the State - See ORS 468B.005 for "Waters of the State" definition.

Weed - A plant that is undesirable where it is growing.

Weed Free - For these Specifications, "Weed Free" is defined as the following maximum amount of living weeds per square yard:

- Zero "Type A" or "Type T" Noxious Weeds
- One "Type B" Noxious Weed
- One of each non-noxious weed listed in the Special Provisions

The ODA Noxious Weed Policy and Classification System lists Type "A", "B", and "T" Noxious Weeds.

Weed Management Area (WMA) - A defined project area with Specified Weeds to remove, including areas where weeds begin growing because of project-associated ground disturbance. A WMA may be the entire project site or any portion, including material source and disposal sites as shown.

Materials

01030.11 Topsoil - Furnish topsoil meeting the requirements of 01040.14.

01030.12 Soil Conditioners, Amendments, and Bio-Amendments - Furnish soil modifiers meeting the requirements of 01040.15, 01040.16, and 01040.17.

01030.13 Seed - Furnish seed meeting the following requirements:

(a) Label - Deliver all seed in standard, sealed containers. Label each container with the following:

- The kind and variety of each seed of 3% or more in a mixture, by weight. Be sure that seed mix labels include the words "mixture" or "mixed seed" when the seed is a mixture
- The country or state where the seed is grown
- The lot number or other lot identification
- The total percentage, by weight, of other crop seed
- The total percentage, by weight, of weed seed
- The total percentage, by weight, of inert matter
- Statement of "No Noxious (weed) Found"
- For each named seed:
 - Percentage of germination
 - Percentage of hard (non-living) seed, if more than 1%
- Percent of PLS for each kind of seed
- Percent and kind of other crop
- Month and year of seed test
- Net weight of contents
- Name and address of seed labeler or seller
- Origin for each seed (state or foreign country)
- If seed inoculant is used, the claimed date that inoculant effectiveness ends
- For treated seeds (if any):
 - Statement that the seeds have been treated
 - Name of all chemical used in the treatment
 - Description process used in the treatment
 - Warning statement for all residual chemicals used
- Net weight of each container
- For seeds listed as native, date and location of collection of source (first generation) seed
- For native seeds specified to be collected for direct use on a project, label containers with the date and location of collection sites for each seed species

Alternate label requirements may be identified in the Special Provisions for certain native plant seeds.

(b) Quality - Furnish seed meeting the following requirements:

- The seed and labeling complies with Oregon Seed Law and Federal Seed Act.
- The seed has been tested within 18 months of the planting date.
- The seed is not sprouted, moldy, or showing evidence of having been wet or otherwise damaged.
- The seed is labeled as "Oregon Certified Seed" or the equivalent from another state when identified in the Special Provisions. Information about certified seed is available from County Extension Offices, Oregon State University, and the Oregon Department of Agriculture.

(c) Pure Live Seed - Obtain the amount of seed to apply by using the purity and germination percentages from the label on actual bags of seed to be used on the Project.

To calculate the amount of seed to be applied:

- Obtain the PLS factor - Multiply the seed label germination percentage times the seed label purity percentage.
- Divide the specified PLS rate by the PLS factor.

Example: A PLS seeding rate of 10 pounds per acre is specified. The seed label shows a purity of 80% and germination is 90%. After converting percentages to decimals, 0.80×0.90 equals a factor of 0.72. The specified PLS rate, 10 pounds per acre, divided by the factor of 0.72 equals 13.88. In order to meet a PLS seeding rate of 10 pounds per acre, about 14 pounds of seed needs to be applied per acre. For a seed mix, make this calculation for every seed to obtain the total amount to be applied.

(d) Inspection - Each lot of seed is subject to inspection upon delivery to the Project. Seed that is not labeled or that does not conform to the Specifications will be rejected and shall be replaced at no additional cost to the Agency.

(e) Mixes - Furnish seed mixes that meet the labeling, quality and inspection requirements stated above. Submit all other proposed seed or seed mixes for consideration and receive written approval before seeding work begins. Replace rejected seed before planting.

(f) Types of Seed Mixes - Seed mixes, quantities, standards, seeding rates, and other information will be included in the Special Provisions for each type of seed mix.

The following are the functional categories of seed mixes that may be included on projects (a category may have multiple functions on a project site):

- **Temporary Seeding** - To provide short-term control of soil erosion until permanent seeding is performed or all potential for erosion is removed.
- **Permanent Seeding** - The final seeding, or only seeding performed for erosion control.
- **Lawn Seeding** - Seeding for areas where finished turf appearance is desired.
- **Wildflower Seeding** - Seeding to develop growth of wildflowers. The seed mix will typically contain grass or other plant seed to provide erosion control.
- **Plant Seeding** - Seeding which typically includes more than just grass species, such as seeds of woody or herbaceous plants.
- **Water Quality Seeding** - For use in water quality facilities such as swales or settling basins.

01030.13(f)

- **Wetland Seeding** - To vegetate existing or constructed wetlands with native plant species.
- **Native Plant Seeding** - Seeding to restore native vegetation.

(g) Availability - Provide a list of seed sources for all specified seeds within 60 calendar days after execution of the Contract. Verify that all specified seed has been located and will be available for use on the Project.

01030.14 Fertilizer - Furnish standard, commercial grade fertilizer meeting the following requirements:

(a) General - Deliver fertilizers in separate or mixture containers that have the percentage of total nitrogen, available phosphoric acid, and water-soluble potash (NPK) in the amounts specified. Label each container with a quality compliance certificate that includes the container weight, the percentage of each ingredient, and the source of each component in the mixture. Ensure that each container is labeled with a quality compliance certificate that meets the applicable requirements of Section 00165.

Furnish fertilizer according to State and federal regulations. Fertilizer is subject to testing by the State Department of Agriculture.

(b) Type of Fertilizer - Provide the following fertilizer:

(1) West of the Cascades - Furnish 22-16-8 inorganic fertilizer analyzing 22% nitrogen, 16% phosphoric acid, 8% soluble potash, and including a minimum of 2% sulfur. Furnish fertilizer containing not less than 50% available water-insoluble, controlled-release nitrogen derived from one of the following sources:

- Urea formaldehyde (Nitroform)
- Isobutylidene Diurea (IBDU)
- Polymer coated urea (no sulfur)

(2) East of the Cascades - Furnish 22-10-5 inorganic fertilizer analyzing 22% nitrogen, 10% phosphoric acid, 5% soluble potash, and including a minimum of 10% sulfur. Furnish fertilizer containing not less than 50% available water-insoluble, controlled-release nitrogen derived from one of the three sources stated for West of the Cascades above.

(3) Statewide, Near Water - For application within 50 feet of open water, furnish 22-2-11 low-phosphorus fertilizer analyzing 22% nitrogen, 2% phosphorus, and 11% potassium which releases slowly over an eight to nine month period. Furnish fertilizer containing a minimum of 60% available water-insoluble, controlled-release nitrogen derived from one of the three sources stated for west of the Cascades above. Furnish phosphorus and potassium that is coated to allow a minimum of 95% controlled-release.

01030.15 Mulch - Furnish mulch materials free of all weed or plant seeds and containing no substances detrimental to plant life. The kind of mulch material(s) acceptable for use will be shown on the plans, listed in the Special Provisions, or will be as approved. Furnish mulch meeting the following requirements:

(a) Hydromulch from Cellulose, Wood, or Straw Fiber - Furnish cellulose fiber produced from virgin wood, straw, or paper fiber product from the QPL. Furnish wood or straw mulch processed so the fibers remain uniformly suspended under agitation in water and the fibers have moisture-absorption and percolation properties. Ship hydromulch in packages of uniform weight, plus or minus 5%, and labeled with the manufacturer's name and air-dry weight.

(b) Straw - Unless otherwise specified, furnish straw mulch for non-hydroseeding applications from bentgrass, bluegrass, fescue or ryegrass singly or in combination. Cereal grain straw from barley, oat or wheat may be allowed upon approval of the Agency. Provide straw that is not moldy, caked, decayed or of otherwise low quality. Submit certification from the supplier that the straw is free of noxious weed seeds or plant parts. Acceptable documentation is any one of the following:

- The straw source is an "Oregon Certified Seed" field.
- The straw is certified by a recognized program accepted by the Oregon Department of Agriculture as being weed free.
- Seed lab test results of seed harvested from the straw meet minimum Oregon Certified Seed quality for weed seed content.

(c) Tracer - For hydromulch application, include enough green dye so applied mulch is easily visible.

01030.16 Tackifier - Furnish a commercial quality tackifier containing no agent toxic to plant life. Furnish tackifier of either a liquid stabilizing emulsion or a dry powder tackifier meeting the following requirements:

(a) Liquid Stabilizer Emulsion - Tackifier with a base material of liquid, polyvinyl acetate polymers, using emulsion resins and containing not less than 55% total solids by weight. Furnish tackifier containing no polyacrylates or polyvinyl acrylics. The emulsion shall, when diluted with water and upon drying, allow exchange of air and moisture to the seeds and have an effective life of one year or more.

(b) Dry Powder Tackifier - Tackifier base consisting of one or more active hydrocolloids from natural plant sources, which hydrates in water and blends with other slurry materials, and upon application and drying tacks the slurry particles to the soil surface, and exhibits no growth or germination inhibiting factors. Provide stabilizing emulsion in a dry powder form that may be re-emulsifiable, and consisting of a processed organic adhesive derivative of one of the following:

- Gumbinder derived from guar (*Cyamopsis tetragonoloba*)
- Gumbinder derived from plantain (*Plantago insularis*)

01030.17 Pesticides - Submit proposed pesticides and receive approval before using. Submit a copy of the manufacturer's federal registered label and, if requested, a Material Safety Data Sheet. The Agency reserves the right to restrict chemicals from being used on Sensitive Areas.

Labor

01030.30 General:

(a) Weed Control Coordinator - Submit certification at the preconstruction conference that the weed control coordinator meets the following minimum requirements:

- Demonstrates ability to identify noxious and other weed species commonly seen in Oregon. Some examples of potentially acceptable credentials are at least one year conducting weed surveys in Oregon or Washington State or a degree in botany or horticulture from an accredited institution.
- Has successful weed control experience, with similar duties to those stated under typical duties below, on at least three construction or vegetation management projects. Two examples of acceptable certification are an Oregon Pesticide Consultant License or Oregon Landscape Contractor's License held in the individual's name.

01030.30(a)

Typical duties of the weed control coordinator include the following:

- Identify Specified Weeds.
- Prepare and update the Weed Control Work Plan (WCWP).
- Coordinate Contractor's weed removal work and records.
- Resolve weed control issues as the Contractor's representative.
- Determine when Specified Weed content exists in disposable materials and ensures the materials are disposed of at an approved off-site facility.

(b) Pesticide Applicator - Submit certification before application of pesticide work begins, that when chemical weed control is used, that each applicator possesses an Oregon Commercial Pesticide Applicator's License held in the individual's name. Submit a certification each time a new applicator begins application work on the Project.

Construction

01030.40 General - Notify the Agency not less than 24 hours in advance of seeding operations. Do not begin seeding until prepared slopes in an area have been approved for seeding. Do not perform seeding during windy weather or when the ground is frozen, excessively wet, or otherwise not tillable.

Do not disturb or damage existing desirable vegetation to be left in place. Do not disturb areas previously seeded and mulched, with the exception of disturbances caused by stage construction. If previously seeded areas are disturbed, rework and reseed as directed, at no additional cost to the Agency.

Remove all non-approved plants resulting from the seed mixes provided for the Project at no additional cost to the Agency, including erosion protection required during reseeding.

01030.41 Area Preparation - Refer to 01040.48 for area preparation for the following kinds of seeding:

- Temporary Seeding - Method E
- Permanent Seeding - Method D
- Wildflower Seeding - Method B
- Plant Seeding - Method B
- Water Quality Seeding - Method B
- Wetland Seeding - Method B
- Lawn Seeding - Method C
- Native Plant Seeding - Method B

01030.42 Weed Control - When the Contract Schedule of Items includes an item for "Weed Control", remove and prevent regrowth of Specified Weeds, weed plant parts, and weed seeds from areas within the Project limits.

Do not harm or disturb existing native or ornamental vegetation, unless directed to do so. Do not compact soil with heavy equipment in areas where soil will not be disturbed for roadway or other construction.

If a pesticide has been approved for use, apply according to federal and State laws, including conditions and requirements of the federal registered pesticide label.

(a) Weed Control Work Plan - Depending on project conditions such as location, sensitive environments, permit requirements, jurisdictional regulations, or other items, there may be limits on

the use of chemicals or other weed control methods. Before submitting the initial WCWP, determine if there are restrictions or all potential for restrictions on weed control methods on project sites. At the preconstruction conference, submit a WCWP with the following:

- Name and contact information for the approved weed control coordinator.
- WMA's with existing Specified Weeds mapped on project plan sheets where possible.
- Botanical and common name of each species of weed to be removed.
- The proposed methods of weed removal and continuing control for each weed species listed.
- Schedule of weed control measures.
- Request to use wheeled or tracked construction equipment in sensitive areas.

If changes of the WCWP are necessary, resubmit a revised WCWP for approval before proceeding.

(b) Weed Control Inspections - Inspect the project for new growth of specified weeds at least monthly and apply weed control measures as appropriate. This requirement may be waived by the Engineer during the period that weeds are fully dormant. To ensure satisfactory weed removal, the last WMA inspection will occur at least 30 days after growing season has begun or as directed.

At a minimum, schedule weed control inspection with the Agency at the following times:

- After approval of WCWP and prior to beginning weed control within a WMA.
- Monthly.
- Upon request by the Agency to discuss non-compliant weed control work.
- After completing weed control at material sources and disposal sites.

(c) Remove and Control of Weeds - Remove and control weeds according to the following:

(1) All areas:

- At least three calendar days prior to beginning weed control activities, walk through each WMA with the Engineer and confirm the identity, location, type, and approximate number of Specified Weeds. Verify that control methods in the WCWP are acceptable as planned for each WMA before proceeding with weed control activities.
- Remove Specified Weeds and receive approval prior to beginning construction or equipment mobilization in that area. As much as practicable, ensure that weed seeds or reproducing plant parts such as vines, runners, or rhizomes don't remain or become disbursed during control activities.
- As soon as practicable, place weeds and related materials in an approved container and transport to an approved offsite disposal facility according to applicable laws and regulations. During transport, ensure that materials are fully enclosed at all times to prevent escape.
- Keep a record of all weed material loads transported off the Project and submit documentation from the approved disposal facilities that a corresponding number of weed material loads were disposed of at that facility.
- Keep WMA's Weed Free including weeds not initially present in the walk through.

(2) Sensitive Areas:

- Unless otherwise approved in writing, use only hand or light mechanical weed control methods within 50 feet of Sensitive Areas. Hand methods include the use of hand tools. Light mechanical methods include the use of hand carried, motorized machinery.

01030.42(c)

- Inside Sensitive Areas, obtain approval before using wheeled or tracked construction equipment. Requests will be approved only when all vegetation in the area will be cleared, such as under new roadways or slopes.
- The Engineer will be the authority in the determination of Sensitive Areas.

(d) Weed Control Corrective Work - If corrective work for areas identified as deficient by the Engineer is not completed within a 15 calendar day period, the Engineer may suspend the work according to 00180.70. If the Contactor's weed control work is determined to be unsatisfactory, the Agency reserves the right to do the work at the Contractor's expense.

01030.43 Temporary and Permanent Seeding:

(a) Temporary Seeding - Temporarily seed disturbed soils and slopes that are not at finished grade and which will be exposed for two months or longer before being disturbed again. Provide fertilizer, mulch, water, and other amendments necessary to ensure establishment. Ensure that temporary seeding work achieves the coverage of live plants required by 01030.60 by the end of the next permanent seeding date stated in 01030.43(b). If this coverage is not achieved, or if the Agency determines that it is not effective in stabilizing the soil from erosion, stabilize the area with other temporary stabilization methods as described in 00280.42 at no additional cost to the Agency.

(b) Permanent Seeding - Perform this seeding during the permanent seeding dates shown below. If work done within the seeding dates does not provide coverage according to 01030.60, re-seed according to 01030.48 and as directed. The dates for permanent, wildflower, plant, water quality, wetland, lawn, and native plant seeding are as follows:

- **West of the Cascades** - March 1 through May 15 and September 1 through October 31. If new lawn areas are regularly watered, they can be seeded from March 1 through November 15.
- **East of the Cascades** - October 1 through February 1. If new lawn areas are regularly watered, they can be seeded from March 1 through October 31.
- **Wetland (Statewide)** - September 1 through October 31 and March 1 through April 30.

Permanent seeding outside the these dates requires written authorization from the Agency. Approval to seed outside these dates will only be given when physical completion of Project work is imminent and environmental conditions are conducive to satisfactory growth. For permanent seeding done outside the seeding dates, ensure that the coverage of live plants required by 01030.60 is achieved no later than three weeks into the next permanent seeding period. If this coverage is not achieved, re-seed and re-fertilize areas of insufficient coverage according to the permanent seeding requirements, at no additional cost to the Agency.

01030.44 Fertilizer:

(a) Inorganic - Apply 22-16-8 or 22-10-5 inorganic fertilizer at the rate of 400 pounds per acre.

(b) Low-Phosphorous - Apply 22-2-11 polymer coated urea low-phosphorus fertilizer at the rate of 200 pounds per acre.

01030.45 Soil Testing - Test soil according to 01040.13.

01030.46 Topsoil and Wetland Topsoil - Construct topsoil areas according to 01040.43 and 01040.44, as appropriate.

01030.47 Soil Amendments and Bio-Amendments - Incorporate soil amendments and bio-amendments into the seeding operation according to 01040.45 and 01040.46, as appropriate.

01030.48 Application - The following application methods are acceptable for both temporary and permanent seeding:

(a) Hydroseeding, Fertilizing, Hydromulching, and Tacking - Apply seed, fertilizer, mulch, and tackifier as follows:

Use hydraulic equipment that continuously mixes and agitates the slurry and applies the mixture uniformly through a pressure-spray system providing a continuous, non-fluctuating delivery. Ensure the equipment and application method provides a uniform distribution of the slurry. Place seed, fertilizer, mulch, and tackifier in the hydroseeder tank no more than 30 minutes prior to application.

(1) Hydroseeding Operation - Perform hydroseeding according to the following:

a. One-step Operation - Apply materials in one step only for the following situations:

- When seeding in conjunction with erosion control matting. Apply seed, fertilizer, and tracer before installing matting.
- When treating small areas according to 01030.48(e). Double the amount of seed to compensate for seed suspended above soil by the mulch.

b. Two-step Operation - Except for the one-step method situations in 01030.48(a-1-a), use the two-step method for all hydroseeding operations:

1. Step 1 - Apply seed, fertilizer, and tracer. The seed and fertilizer may be applied separately or together. If hydromulch is used as a tracer, apply it at a rate of 500 pounds per acre.

2. Step 2 - Apply mulch and tackifier. Hydromulch, if used as a tracer in Step 1, will be included as part of the specified hydromulch rate specified in 01030.48(a-3).

(2) Seed - Thoroughly mix seeds when more than one kind is to be used.

(3) Mulch - Apply hydromulch at the following rates based on dry fiber weight:

a. Slopes Flatter Than 1V:2H - Apply cellulose fiber that includes a tackifier at a rate of 2,000 pounds per acre.

b. Slopes 1V:2H or Steeper - Apply cellulose fiber that includes a tackifier at a rate of 3,000 pounds per acre.

(4) Tackifier for Cellulose Fiber Applications - Use one of the following:

a. Liquid Stabilizer Emulsion - Dilute the emulsion with water at a rate of one part emulsion to 30 parts water. Apply the diluted mixture at the rate of 865 gallons per acre unless the manufacturer recommends a greater rate of application.

b. Dry Powder Tackifier - Apply at the following rates unless the manufacturer recommends a greater rate of application:

1. Slopes flatter Than 1V:2H - 60 pounds per acre mixed with hydromulch fibers at the rate specified.

2. Slopes of 1V:2H or Steeper - 100 pounds per acre mixed with hydromulch fibers at the rate specified.

(b) Seeding, Fertilizing, Dry Mulching, and Tacking - Apply seed and fertilizer separately or together as the first step. Apply dry mulch as the second step. Tackify the mulch as the third step.

(1) Seed and Fertilizer - Apply seed and fertilizer at the specified rates. When fertilizer and seed are to be applied in dry condition, apply them separately. When applied from separate compartments, the application may be done in one operation. Apply seed and fertilizer by one of the following methods:

a. Blower - Blower equipment using air pressure and an adjustable spout that uniformly applies dry fertilizer and dry seed in separate and successive applications at constant measured rates.

b. Helicopter - Helicopter equipped with hoppers and adjustable disseminating mechanisms that separately and successively apply fertilizer and seed in uniform and prescribed quantities.

c. Mechanical Spreaders - Hand or machine operated mechanical spreaders that uniformly apply dry fertilizer and dry seed separately and successively in the prescribed quantities.

d. Hydroseeding - Uniformly apply at the rate specified. Add 500 pounds per acre of hydromulch fiber to the seed and fertilizer mixture to visibly aid uniform application at no additional cost to the Agency.

(2) Dry Mulch - Evenly apply straw mulch within 24 hours after seeding and fertilizing. In areas not accessible to heavy equipment or hose, apply straw mulch by hand or other approved method.

Place straw mulch approximately 2 inches deep, in loose condition, which requires approximately 2 1/2 tons per acre of dry mulch, depending on moisture content. Do not use straw mulch on slopes of 1V:1.5H or steeper.

(3) Tacking - Anchor straw mulch using one of the following methods:

a. Dry Powder Tackifier - Unless the manufacturer recommends a greater rate, apply dry powder tackifier at the rate of 80 pounds per acre mixed with 800 pounds per acre of hydromulch.

b. Mechanical Crimping - Mechanically incorporate the straw into the top 2 inches of the soil forming a uniform surface cover effective at preventing erosion by one of the following:

1. Crimping Disc - A heavy disk with flat scalloped discs approximately 1/4 inch thick, having dull edges and spaced no more than 9 inches apart.

2. Sheep's-Foot Roller - Modified sheep's foot roller equipped with straight studs, made of approximately 3/4 inch steel plate, placed approximately 8 inches apart and staggered. Ensure that the studs are not less than 6 inches long or more than 6 inches wide, and are rounded to prevent withdrawing the straw from the soil. Use a roller with enough weight to incorporate the straw sufficiently into the soil providing a uniform surface cover.

(c) Drill Seeder - Apply seed and fertilizer with a grass seed drill that works fertilizer into the soil and places seed under about a 1/4 inch soil cover.

(d) Seeding Over Mulched Areas - If an area has been previously mulched for erosion control or temporary seed and mulch is present on the soil surface, double the amount of each seed type used.

Apply seed and fertilizer hydraulically and add a green dye to the mixture to visibly aid uniform application. Upon approval, fertilizer and seed may only be applied after mulching if one of the following conditions apply:

- Mulch is punched into the soil by mechanized means.
- It is necessary to hold down mulch with netting or like material.
- The slope is 1V:1.5H or steeper and a slurry mixture would tend to run down the slope.
- Mulch is removed prior to seeding.

(e) Optional Temporary or Permanent Seeding - Upon approval, the following may be used to stabilized disturbed areas that are 1,500 square feet or less and totaling no more than 0.5 acre:

(1) Seed - Seed the disturbed area with the seed mix at the rate of 2 pounds per 1,000 square feet. Seed may be spread by mechanical spreader according to 01030.48 (b-1-c).

(2) Cover - Cover seeded areas with one of the following:

- Straw mulch at a rate of 100 pounds per 1,000 square feet. Spread the mulch uniformly and apply commercial tackifier or netting to hold in place.
- Bark mulch spread uniformly at an approximate depth of 1/2 inch. Use well-decomposed mulch for seed mulching.
- Suitable open-weave, biodegradable erosion control matting installed according to manufacturer's instructions.
- Hydromulch applied in one step according to 01030.48(a).

(3) Fertilizer - Fertilize according to 01030.44.

01030.49 Work Quality:

(a) Drift - Prevent drift and displacement of seed and fertilizer regardless of equipment and methods used. Use protective covering on structures and objects where coverage and stains would be objectionable and when tacking agents are used with mulch. Protect vehicles and people from drifting spray. If equipment and methods of application result in wasting material, make corrections to prevent waste.

(b) Displacement - Prevent seed, fertilizer, and mulch from falling or drifting onto areas occupied by rock base, rock shoulders, plant beds, or other areas where grass is detrimental. Remove material that falls on plants, roadways, gravel shoulders, structures, and other surfaces where material is not specified.

(c) Damage - Prevent damage to prepared areas and to completed fertilizer, seed, and mulch work. Replace all material that becomes displaced before acceptance of the work.

Maintenance

01030.60 General - Ensure that each seeded area has a uniform, healthy and weed-free stand of grass or other seeded plants growing at the end of the establishment period. The minimum living plant coverage standards for acceptance of seeding in a planted area are as follows:

- **Temporary Seeding** - 70% coverage of ground surface.
- **Permanent Seeding** - 90% coverage of ground surface.

- **Wildflower and Wetland Seeding** - 70% coverage of ground surface.
- **Water Quality and Lawn Seeding** - 100% of ground surface.
- **Woody or Other Plant Seeding** - See Special Provisions for minimum living plant coverage.
- **Native Plant Seeding** - See Special Provisions for minimum living plant coverage.

01030.61 Establishment Period - The seeding establishment period is as follows:

(a) Erosion Control Seeding - For temporary and permanent seeding done solely for erosion control, the establishment period begins upon acceptance of the initial seeding work and ends upon satisfactory plant growth and coverage of the seeded areas according to 01030.42 and 01030.60.

(b) All Other Seeding - Establishment periods for wildflower, plant, water quality, lawn, wetland, native plant, and permanent seeding begins upon acceptance of the initial seeding work and ends as follows:

- The seeding establishment period will end 45 days after the beginning of the establishment period, if the area was seeded during the seeding season and all establishment responsibilities have been met.
- If the original seeding construction is completed and accepted outside the permanent seeding dates, the establishment period will end 45 calendar days after all necessary reseeding is completed and accepted during the following seeding season.

01030.62 Establishment Work:

(a) Erosion Control Seeding - Select and provide establishment work for erosion control seeding from 01030.62(b) necessary to provide performance described in 01030.60.

(b) All Other Seeding - Ensure the establishment of wildflower, lawn, plant, water quality, wetland, native plant, and permanent seeding by the following:

(1) Protection - Protect seeded areas from trespass and other hazards of damage. Use protective fences and signs at no additional cost to the Agency. Obtain approval of protective methods used.

(2) Fertilizing and Watering - Apply fertilizer according to 01030.44. Apply water according to good horticultural practice under the prevailing conditions, as required to promote a healthy stand of plants. Obtain water at no additional cost to the Agency.

(3) Weed Control - Remove Specified Weeds prior to plants going to seed and keep WMA's and seeded areas "Weed Free" throughout the establishment period.

(4) Mowing - Mowing is required for lawn seeding and water quality seeding. Do the first mowing of grass when soil is firm enough to prevent rutting and grass is about 3 inches tall. After mowing, leave grass that is approximately 2 inches tall. At each subsequent mowing, leave about 1 1/2 inches of growth. After the second mowing, grass clippings may be left in place upon written approval. The approval may be granted if:

- Mowing is done with a mulching blade.
- There are no weed seeds in the mulch.
- Mulch is not detrimental to the growth of grass.

(5) Repair and Restore - Repair and restore soil grades and re-seed damaged, settled, or unproductive areas to the specified conditions of this Section at no additional cost to the Agency.

Finishing and Clean Up

01030.70 Cleanup - Remove weeds, trash, debris, stones, and other extraneous matter from seeded areas as directed and dispose of according to 00290.20.

01030.71 Waste Disposal - Protective coverings used on structures and all waste materials associated with seeding, fertilizing, mulching, and associated activities become the property of the Contractor at the point of origin. Dispose of these waste materials according to 00290.20.

Measurement

01030.80 Measurement - The quantities of seeding and associated work performed under this Section will be measured according to the following:

- **Unit Basis** - Unit basis items will be measured by actual count.
- **Area Basis** - Area basis items will be measured on the ground surface.

Payment

01030.90 Payment - The accepted quantities of seeding and associated work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Weed Control.....	Acre
(b) Seeding Mobilization.....	Each
(c) Temporary Seeding, _____.....	Acre
(d) Permanent Seeding, _____.....	Acre
(e) Wetland Seeding, _____.....	Acre
(f) Water Quality Seeding, _____.....	Acre
(g) Plant Seeding, _____.....	Acre
(h) Native Plant Seeding, _____.....	Acre
(i) Wildflower Seeding, _____.....	Acre
(k) Lawn Seeding.....	Acre or Square Yard
(l) Fertilizing.....	Acre
(m) Mulching.....	Acre

Item (a) includes all work associated with the WCWP.

Item (b) includes all labor and transportation of materials and equipment, each time the Contractor mobilizes as required for all hydraulically or airborne applied seeding, fertilizing, and mulching.

In items (c) through (i), the type of seed mix, such as Mix No. 1, if applicable, will be inserted in the blank.

Items (c) through (k) include preparing the seed bed, soil preparation, seeding, fertilizing, mulching, applying tacking agent, and all establishment work.

When temporary seeding, applied according to 01030.43(a), is later accepted as permanent seeding according to 01030.43(b), payment will be made only one time under the permanent seeding pay item. No separate payment will be made for the initial seeding.

01030.90

Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for:

- mobilization for application by blowers, mechanical spreaders, or hand spreading
- inspections or maintenance
- seeding mobilization if it is not included in the Contract Schedule of Items

Partial payments for permanent seeding, regardless of type, will be made as follows:

- At completion of seeding70%
- At completion of seeding establishment period.....30%

Section 01040 - Planting

Description

01040.00 Scope - This work consists of planting and associated work as shown or directed.

01040.02 Definitions:

Arborist - A specialist in the care and maintenance of trees.

Certified Arborist - An Arborist certified by the International Society of Arboriculture (ISA).

Consulting Arborist - An Arborist registered with the American Society of Consulting Arborists (ASCA).

Caliper - The diameter of a tree measured at a point 6 inches above the ground. If the measurement is over 4 inches, a new measurement is taken at a point 12 inches above the ground.

Dripline - The area directly under the branch and leaf canopy of trees and large shrubs. This area typically contains the most important of a plant's roots and is sometimes used as an approximate guide to estimate a root protection zone.

Licensed Nursery - Commercial nursery licensed by the Oregon Department of Agriculture to operate as a grower, dealer or agent, or to transport or store nursery stock grown or held for sale.

Native Plant (existing) - See 01030.02 for native plant definition.

Noxious Weed - See 01030.02 for noxious weed definition.

Ornamental Plant - A desirable plant species that is not native, or a plant propagated in such a way that it does not carry genetic characteristics of the species that are native to the area where it is planted.

Plant Establishment Period - A period of time, that is part of the planting work, that ensures satisfactory growth and establishment of plants.

Permanent Wilting Point - The level of soil wetness at which point a plant wilts and can no longer recover its sustainable turgidity when placed in a saturated atmosphere for 12 hours.

Root Protection Zone - A generally circular area around an existing plant to be protected from disturbance or compaction by the use of temporary fencing or other means. The zone as actually staked may exceed the current root area to allow for future growth of the plant. Root Protection Zones will be shown on the plans or staked before construction activities begin.

Weed - See 01030.02 for weed definition.

01040.03 General - Ensure that work meets the following requirements:

(a) Existing Vegetation - Do not disturb existing desirable vegetation that is to remain or is designated for protection, unless approved by the Agency prior to construction.

(b) Pesticide Applicators License and Chemical Registration - Furnish evidence to the Agency that each applicator is licensed for the specific class of chemical being applied. Also, furnish evidence that any chemical is registered for the proposed use by the Oregon Department of Agriculture according to ORS Chapters 452, 561, 570, and 634.

(c) Weather Conditions - Planting work will not be allowed during the following conditions, unless otherwise approved:

- **Cold weather** - When air or ground temperatures are expected to be below 32 °F.
- **Hot weather** - When air or ground temperatures are expected to be above 88 °F.
- **Wet weather** - When the ground reaches saturation, except as approved when planting wetland plants.
- **Windy weather** - When wind velocity exceeds 25 mph.

(d) Work Performed During Unacceptable Conditions - If any work occurs during unacceptable weather conditions, the Contractor may be required to provide the following services at no additional cost to the Agency:

- (1) Expert Consultation** - Consultation with a certified Arborist (for trees) or other expert as approved (for other plants) to determine what plant care measures are required to maintain the plants installed during the unacceptable weather conditions in a healthy and vigorous condition.
- (2) Replacement** - Replacement of all work performed during unacceptable weather conditions.
- (3) Watering and Maintenance** - Watering and maintenance of all plant materials installed during the unacceptable weather conditions and responsibility for all extra costs incurred.

01040.04 Coordination - Coordinate the following elements with the Agency prior to construction:

(a) Planting Work Plan (PWP) - Within 90 calendar days of award of the Contract, submit a PWP for approval. Include or describe the proposed methods for the following:

- Work progress schedule according to 00180.41
- Material submittals according to 01040.10
- Contract Growing Plan according to 01040.19(g)
- Topsoil and/or Wetland Topsoil approvals according to 01040.14
- Plant installation and establishment
- Weed Control Work Plan (WCWP) according to 01030.42(a)
- Emergency contact person, including the Name, telephone and pager numbers, and voice mail and/or email address information

The following are included as part of the PWP, but are required only before the related planting work begins:

- Soil Fertility Test and Soil Amendment Report according to 01040.13.
- Soil Testing and Soil Bio-amendment Report according to 01040.13.

Proceed according to the approved PWP once written approval is received from the Agency. If any part of the PWP become unworkable at any time during construction, notify the Agency, then submit a revised plan. Do not proceed with the planting work until approved by the Agency.

(b) Notice for Inspections - Notify the Agency a minimum of 24 hours prior to each required inspection.

- (c) Site Conditions** - Ensure that the area is properly prepared prior to the start of the planting operation.
- (d) Utility Locate** - Coordinate all existing utility locations according to Section 00150.
- (e) Utility Use** - Provide required water and electricity for planting and plant establishment at no additional cost to the Agency unless an approved Agency source is available.
- (f) Verification** - Verify actual ground dimensions prior to construction. Notify the Agency of any discrepancies before beginning work.

Materials

01040.10 General - Submit a list of Project materials for approval according to 01040.04(a) before arranging for procurement of any materials. For materials not approved, submit a list of alternate materials for approval. Materials installed without approval will be subject to removal and replacement with acceptable material at no additional cost to the Agency.

Substitute materials may be allowed if proof of equivalent quality, suitable product specifications, manufacturer's literature and other detailed information is furnished to the Agency according to 00140.70.

01040.12 Product Delivery, Storage, and Handling - Deliver manufactured products in original, unopened containers, each bearing the manufacturer's guaranteed analysis, name, trade name, and conformance with governing regulations and laws. Protect products against damage or dehydration. Remove unacceptable products as soon as possible from the Project site. If required or requested, provide any manufacturer's literature to the Agency.

01040.13 Soil Testing - Furnish the following kinds of soil testing and reports:

(a) Soil Fertility Test and Soil Amendment Report - Prior to planting, furnish a soil fertility analysis of existing soils performed by a certified testing lab. Prior to planting, adjust soil amendment and fertilizer applications as recommended by the soil amendment report and as approved by the Agency.

(1) Sampling - Take five samples per acre of each soil type. Mix the five samples into one test sample for each soil type. Furnish soil fertility test results that provide information on available nutrient content and fertility status of the soil. Conduct sampling procedures according to the Oregon State University Extension Service handout EC 628, "How to Take a Soil Sample... and Why".

(2) Testing - The test may be performed by any qualified soils testing laboratory. A list of qualified soils testing laboratories is available from the Oregon State University Extension Service. Include testing for levels of acidity (pH), salinity, nitrates, ammonium, phosphates, potassium, calcium, magnesium, and any other tests necessary to determine appropriate fertilization and amendment needs for the type of plants being planted.

(3) Soil Amendment Report - Provide a report from the testing laboratory summarizing sampling locations and procedures with printed results, and which makes recommendations for fertilizers and soil amendments to effectively develop productive soil.

(b) Testing and Soil Bio-Amendment Report - Have soils tested prior to planting by an approved soil ecology lab. Provide information on soil foodweb structure and function, and include total and active bacterial biomass, total and active fungal biomass, protozoan numbers, nematodes,

microarthropods, and mycorrhizal colonization. Adjust the kind and amount of soil conditioners, soil amendments, soil bio-amendments, and fertilizers (if any) as recommended by the soil bio-amendment report, and as approved by the Agency prior to construction.

(1) Sampling - Take five samples per acre of each soil type. Mix the five samples into one test sample for each soil type. Conduct sampling according to the standard procedures for soil organism assessment as recommended by the soil ecology lab.

(2) Testing - Perform the following soil ecology tests and furnish soil meeting these minimum soil organism biomass requirements:

Test	Minimum Requirements
Percent active bacterial and fungal biomass.....	between 5% and 25% activity
Total bacterial biomass	6 X 10 ⁸ per gram of dry soil
Total fungal biomass	100 µg for grasslands
	200 µg for shrubs or perennials
	300 µg for forested areas
Protozoa.....	5000 per gram of soil
Beneficial nematodes.....	20 per gram of soil
	(No root-feeding nematodes)

Determine if anaerobic or compacted conditions are present, based on the assessment of total bacterial biomass, percent bacterial activity, and protozoan biomass.

If the soil contains biomass numbers lower than these levels, apply amendments and inoculates according to the soil ecology lab recommendations in the soil bio-amendment report in 01040.13(b-3).

(3) Soil Bio-Amendment Report - Provide a report summarizing sampling locations and procedures. Include the soil ecology lab report of the soil organism assessment and the recommendations for:

- Inoculation of missing organisms groups to the soil.
- Amendment with food resources for organism groups with too low of a biomass.
- Reduction of undesirable groups, or groups with the biomass too high for the optimal growth of the desired plants.
- Any adjustments to the bio-amendments required for the types of plants being planted.

01040.14 Topsoil - Furnish topsoil containing no substance detrimental to the growth of plants and that is free of plants designated by the Oregon Department of Agriculture as Type "A" or Type "B" weeds. Unsuitable topsoil, or topsoil placed by the Contractor without approval in areas to be planted, may be required to be replaced at no additional cost to the Agency.

20 days before furnishing any type of topsoil, do the following:

- Give the Agency notice of intent to use the source.
- Provide access to the source for Agency inspection.
- Provide one 20 pound representative soil sample of each topsoil type for testing of particle size range and organic matter by the Agency, unless otherwise specified.
- Obtain approval of the source before excavation of topsoil begins.

(a) Selected Topsoil - Furnish native topsoil from the required excavations meeting the requirements of 00330.10 or from other Agency-controlled lands. The general limits of topsoil materials will be indicated on the plans. The Agency will make the final determination of the areas where the most suitable materials exist. Furnish topsoil that is the fertile part of a soil profile commonly referred to as the "A" horizon, typically ranging in depth from 3 inches to 12 inches. Do not take material for topsoil from a depth greater than 12 inches below existing ground, unless approved.

Select only sources that are well-drained and, before stripping, have a healthy crop of vegetative growth. Remove and dispose of all heavy grass or other vegetation before taking materials from the source.

(b) Imported Topsoil - Furnish imported topsoil from non-Agency controlled lands that, when tested according to AASHTO T 88, meeting the following limits:

Standard Sieve Analysis

Particle Size Range	Percent Retained (by Weight)
Larger than 2"	0
2" - 3/4"	0 - 5
3/4" - No. 4	0 - 20
No. 4 or less	0 - 100

Of the fraction passing the No. 4 sieve, excluding organic material, furnish topsoil that conforms to the following limits:

Hydrometer Analysis

Particle Size Range	Percent (by Weight)
No. 4 - No. 200	5 - 70 (Retained)
No. 200 - 2 μ m	20 - 80 (Retained)
Less than 2 μ m	5 - 30 (Passing)

In addition, furnish topsoil that analyzes at least 2 percent organic matter according to ASTM D 2974.

(c) Wetland topsoil - Furnish a native, naturally hydric wetland topsoil consisting of silts, clays, and organic matter in combination that is free from substances detrimental to plant growth, such as noxious weeds, undesirable plant roots, refuse, sticks, or lumps. Provide wetland topsoil that is from a wetland with an existing, well established, healthy growth of the desired wetland plants. Obtain approval of the source before excavation of wetland topsoil begins.

Excavate, at a minimum, the top 24 inch depth of existing wetland soils using standard construction equipment.

01040.15 Soil Conditioners - Soil conditioners are for modifying soil structure and improving soil aeration characteristics, as distinguished from plant foods, mulch, and soil organism amendments. Furnish soil conditioners free of noxious weeds, living plants and rhizomes, and substances detrimental to plant life. Submit a 15 pound sample for approval by the Agency prior to construction. Provide soil conditioners that are free of weed seeds, excessive salts, chemicals detrimental to plant growth, and pest organisms. Soil conditioners proposed for use are subject to testing at any time or place the Agency deems appropriate.

Furnish one or more of the following soil conditioners:

(a) Mushroom Compost - The used bedding material from commercial mushroom production.

(b) Composted Yard Debris - Commercially manufactured material, made from dead plant material such as grass clippings, weeds, green and dead dry leaves, garden and vegetable material, and ground branches of trees and shrubs. Furnish a product that is composted under controlled aerobic decomposition, with the internal temperature reaching 135 °F for 15 days, without exceeding 155 °F. Ensure that it contains a maximum of 10% bacteria and 10% fungus. Additional certification may be required in areas having a certification program.

(c) Peat Moss - Horticultural grade, natural peat moss in air-dry condition, free from woody substances, in bales or bags labeled for content and volume. Only peat moss used in combination with one of the above composts is acceptable.

01040.16 Soil Amendments - Soil amendments are intended to improve soil nutrition. Furnish soil amendments that are free of materials detrimental to plant life. Furnish manufacturer or supplier quality compliance certification according to 00165.35. Ensure that material testing methods meet the requirements of the Oregon Department of Agriculture appropriate to that material. Obtain approval for use before beginning work. Soil amendments may include the following:

- Lime
- Dolomite Lime
- Gypsum
- Rock, Diammonia, or other Phosphate
- Calcium or Potassium Nitrate
- Iron Sulfate

01040.17 Soil Bio-Amendments - Soil bio-amendments are intended to increase beneficial soil organism numbers or soil organic nutrient content. Furnish bio-amendment products or materials that are free of substances or life forms detrimental to plant life and receive approval prior to use on the Project. Furnish manufacturer or supplier quality compliance certification according to 00165.35. Ensure that material testing methods meet the requirements of the Oregon Department of Agriculture appropriate to that material. The following are typical soil bio-amendments that may be identified in the soil bio-amendment report:

(a) Bacterial Food Amendments:

- Simple sugars such as brown sugar, brown syrups, or molasses
- Plant extracts of Yucca or Nettle, usually containing sap of the plant comprised of a combination of simple sugars, proteins, and carbohydrates
- Fulvic acids
- Yeast, including baker's yeast, brewer's yeast, and champagne yeast
- Kelp meal
- Rock dust

(b) Fungal Food Amendments:

- Cellulose
- Lignin
- Humic acids - brown to dark brown products (black is not acceptable)

(c) Protozoa Food Amendments:

- Bacteria
- Hay infusions - A method of growing protozoa for soil inoculation by using hay in water

(d) Nematode Food Resources - Nematodes come as four types: bacterial-feeders, fungal-feeders, root-feeders, and predatory nematodes. Predatory nematodes eat other nematodes, while the name of the other groups indicate what organisms they eat.

The primary source of material containing a wide diversity of beneficial nematodes is good compost. Provide certification that the compost contains beneficial nematodes and does not contain root-feeding or other detrimental nematodes.

(e) Mycorrhizal Inoculates - Commercially produced ectomycorrhizal and endomycorrhizal fungi that improve plant root absorption of soil nutrients.

(f) Microbes - Commercially produced product designed to enhance microbiological activity in the soil by the addition of beneficial and essential microbes. Commercial products may also contain vitamins, amino acids, plant growth hormones, micronutrients, and plant stress relievers.

(g) Earthworms - Common earthworms that are either "Red Wigglers" or "Night Crawlers" delivered in peat moss or other damp medium.

01040.18 Fertilizer - The soil amendment and bio-amendment reports will recommend fertilizer types and application rates. When identified in the report furnish commercial fertilizer meeting the requirements of 01030.14 and the following:

(a) Organic - Organic fertilizer 5-4-3, analyzing 5% nitrogen, 4% available phosphoric acid, and 3% soluble potash.

(b) Plant Bags and Tablets - Plant bags or tablets containing 20-10-5, or approved equal, may be used instead of granular fertilizer in pit planting.

Furnish plant bags or tablets that are controlled-release with a minimum one-year release period. Chemical formulation, rates and use will be approved by the Agency.

01040.19 Plants:

(a) Nomenclature - Botanical identification and nomenclature of plant materials shall be according to the most current edition of "Hortus Third", by Bailey. The Agency may authorize use of other references such as the "Sunset Western Garden Book", the "Flora of the Pacific Northwest", by Hitchcock, or the "Manual of California Plants", by Jepson.

Furnish plants that conform to the applicable requirements of the current issue of the "American Standard for Nursery Stock", published by the American Association of Nurserymen. When a conflict exists between this publication and the Specifications, the Specifications will prevail.

(b) Quality - Provide plants that are healthy, first-class representatives of their species or variety, free from disease and insect pests, with top growth that is well developed and free of disfiguring knots, sun scalds, bark abrasions, wind or frost injury or any other objectionable features.

Furnish plants that are acclimated to the specific project environmental site conditions prior to planting. Store all container-grown and balled and burlapped (B&B) plant materials acquired for fall planting a minimum of three months before planting, at a location north of the 42nd Latitude (Oregon - California border).

Furnish plants that possess top growth and root systems typical to their variety. Provide trees with central leaders that have a symmetrical, well-branched, straight trunk. Trees with a damaged or missing leader, multiple leaders or Y-crotches will be rejected, as will sheared conifer trees.

Protect plants at all times during handling, shipping, storage and planting against such detrimental effects as windburn, extreme weather conditions and drying of roots, root balls and foliage.

(c) Certification - Furnish a State inspection certificate and shipping certificate for each load or lot of plant material that includes the following information:

- Date of shipment
- Name of nursery where grown
- Name of plants (Including all names as specified in the Contract)
- Number of plants
- Grade or classification of plants (Verifying conformance with the Specifications)
- Size (Including height, spread, runner length, caliper and other measurements as required)
- Identify at least one plant (botanical and common name) within each group of like species
- Identify one plant (botanical and common name) within each different size category

(d) Inspection - Plants will be subject to inspection by the Agency, at any time and place. The Agency will make no plant material inspection at the source, except as it may elect. Notify the Agency of each delivery of plants to the Project site no less than 24 hours ahead of delivery. Do no planting until the plants have been inspected and approved for use. Any planting done without prior approval of the plants will be considered in violation of these Specifications.

The presence of noxious weeds in the soil accompanying plants or at the nursery source will be cause for rejection of any or all plants from that source.

(e) Availability - Furnish a list of nursery sources for all specified plants within 90 calendar days after execution of the Contract. Verify, by this list, that all specified plant material has been located and will be available for use on the Project. If applicable, see 01040.19(g) for alternate requirements.

(f) Plant Substitution - No substitution of plant materials will be allowed unless written evidence is submitted that a specified plant or material cannot be obtained and has been unobtainable since the execution of the Contract. If substitution is allowed, it will be by written approval from the Agency for the nearest acceptable variety, size and grade. Make any request for substitution in writing to the Agency with ample time for approval without delaying the work.

(g) Contract Grown Plant Materials - When required by the Special Provisions, include a contract growing agreement between the Contractor and a nursery supplier in order to ensure plant availability or suitability.

If a contract growing agreement is part of the Project, submit a Contract Growing Plan that describes plant material size at delivery, growth environment, name and location of nursery, and the source for each plant (native seed, indigenous cuttings, or commercially grown). Submit this required information as part of the PWP.

(h) Definition of Plants and Descriptive Terms - The following definitions describe the distinctive habit and characteristics of the most common plant materials:

(1) Conifer Trees - Trees with needle or scale-like leaves that maintain live-leaf foliage throughout the year, and that usually bear seed from a woody cone.

(2) Deciduous Trees - Trees with leaves that are shed at the end of the growing season, and which remain leafless throughout dormancy.

(3) Transplanted Specimen Plants - Unique or large plants typically used in low numbers on projects. See the plans for specimen type, size, and location. Deliver trees to the site that are dormant and with buds that have not yet swelled. Furnish plants that have an unbroken root ball sufficient to sustain continued growth. Ensure that the root ball size conforms to the current edition of the "American Standard for Nursery Stock". Provide plants with no broken limbs or bark abrasions, and cleanly cut off any frayed roots or damaged limbs. Deliver trees that are balled and burlapped, boxed or moved by commercial tree spade.

(4) Balled and Burlapped (B&B) Plants - Plants excavated with soil around the root system whose root ball is wrapped for shipping and handling. B&B materials are generally trees or shrubs, such as evergreens, that require a large ball of earth to sustain them after the transplant. Furnish plants that are balled and burlapped meeting the requirements of the latest edition of the "American Standard for Nursery Stock", including minimum size of root balls.

Furnish plants with root balls securely wrapped in burlap or similar mesh fabrics not harmful to plants, and bound with removable twine or wire. Provide root balls that are firm, intact and held solidly together by a fibrous root system consisting of only the earth in which the plant was growing. "Made" balls will be rejected.

(5) Collected Plants - Plant material that is harvested from existing on- or off-site plant populations. Furnish collected plants that conform to all appropriate quality, grade and class requirements of the current issue of the "American Standard for Nursery Stock".

(6) Container Grown Plants - Plants that are grown and delivered in containers which possess well-formed top growth and whose root growth is typical to the variety.

Furnish plants that are resident in their delivery containers long enough to have established new fibrous roots, have a root mass that will retain its shape, and hold 90% (visual estimate) of the root ball material when removed from their containers. Some root growth should be visible along the outer edges of the container. Root-bound container grown plants and "made" container plants will be rejected.

(7) Seedling Trees - Plants that are grown from seed in a nursery and brought to the site in a bare root condition. Provide seedlings labeled with age and certification (class number) which shows the number of seasons grown in a nursery seedbed, followed by the number of seasons grown in a transplant bed. Furnish seedling trees that are a minimum two years old.

Furnish seedling trees that are Oregon Department of Forestry "zoned" (grown) within approximately 500 vertical feet of the Project site elevation. Submit seedling zone information for the proposed plants to the Agency prior to construction.

(8) Bare-root Plants - Small deciduous plant material that is excavated for transplant with exposed roots. Furnish only bare-root plant materials that have dormant buds at the time of planting. Take great care to protect bare root plants against dehydration and sunburn.

(9) Plant Cuttings - Living, freshly cut branches from certain woody shrub or tree species that readily propagate when embedded in damp soil. Furnish plant cuttings of regionally native species and dimensions as shown on the plans. Obtain written approval of the cutting stock sources before taking any cuttings and furnish a brief, written description of the cutting site(s) and the date and time the cuttings were taken to the Agency. Take cuttings in such a manner so as to leave no long-term damage to the source population. If willow species are called for, select the local native shrub variety.

(10) Fascine - Bound, cylindrical bundles of live plant cuttings that are placed in shallow trenches, partially covered with soil, and staked in place, typically used to stabilize stream banks against erosion. Furnish only fascines of regionally native materials having the dimensions shown on the plans.

(11) Brush Mattress - A combination of plant cuttings and fascines installed to cover and protect stream banks and shorelines. Brush mattress dimensions and any material requirements will be shown on the plans.

(12) Tubeling Plants - Plants grown in containers that encourage deep root growth.

(13) Vines - Plants with growth primarily along stems, often having climbing characteristics, and typically attaching to walls by tendrils or other means.

(14) Groundcovers - Low growing or spreading plants.

(15) Wetland Plants - Plants that meet the definition of hydrophyte, which is any macrophyte that grows in water, or on a substrate, that is at least periodically deficient in oxygen as a result of excessive water content.

(16) Bulbs - For the purposes of this section, these will typically include the forms known as bulbs, corms, culms, plantlets, rhizomes, runners, small offsets, stolons and tubers. These plants will be collectively referred to as "Bulbs". The appropriate propagule (plant part that can be separated and used to grow another plant) will vary depending on the plant species.

(17) Sod Lawn - Grass sod grown on agricultural land that is commercially cultivated specifically for turf sod. Furnish sod that is free of weeds, diseases, harmful nematodes and insects. Provide sod that is mature, not less than 10 months old, and machine cut to a uniform thickness of 5/8 inch or more, excluding top growth and thatch. Broken pieces and torn or uneven ends will not be accepted. Plant sod within 36 hours of harvest.

01040.20 Mulch - Furnish plant bed mulch materials free of noxious weed seeds or plants and which contain no substance detrimental to plant life. Mulches are subject to inspection at any time and place at the discretion of the Agency. The following are some types of materials that fall under the category of "mulch", and may be used on projects:

(a) Bark Mulch - Ground, shredded or broken particles from the bark of fir, pine or hemlock trees which is free of non-bark debris, harmful bacteria, disease spores, pests and substances toxic to plant growth. Provide mulch that is the standard trade size known as "medium fine mulch".

(b) Cinder Mulch - Crushed lava cinders, screened to an approximate size between 3/16 inch to 5/8 inch. Furnish cinders free of fines and other non-cinder material.

(c) Straw Mulch - Provide straw mulch according to 01030.15.

(d) Rock Mulch - Round 3/8" - No. 4 pea gravel or round 2" - 3/8" rock. Provide material that is free of fines and other non-gravel material. Rock colors may vary.

(e) Wood Chip Mulch - Mulch that is chipped from cleared site vegetation. Ensure that chipped material is free of any noxious weeds or invasive vegetation. Allowable size range or other qualities may be listed in the Special Provisions.

01040.21 Herbicides - The use of herbicide chemicals will be allowed only upon approval of the Agency. Select and apply chemical herbicides according to all applicable Federal, State and local laws, as well as the WCWP requirements of the PWP. The following are standard herbicide functional categories:

- (a) **Soil Sterilant** - Chemical herbicide that is used to kill all new emergent vegetation, often including seeds or other plant parts.
- (b) **Pre-emergent** - Chemical herbicide that is used to stop the germination of seeds before they grow above the soil level.
- (c) **Post-emergent** - Chemical herbicide that is used to selectively or non-selectively kill vegetation after germination and emergence above ground.

01040.22 Water - When required by the Special Provisions, furnish the following:

- (a) **Pressure Moisture Stress Sensor** - A pressure chamber instrument capable of applying up to 40 bars or 600 psi to a small leaf or shoot in order to determine its water uptake potential. Instrument is to include all accessories necessary to perform a plant moisture stress test.
- (b) **Timed-Release Water** - Containerized moisture retention chemical in the form of a solid gel delivered in biodegradable cartons. Typical ingredients are 97.85% water, 2% cellulose and 0.15% aluminum sulfate.
- (c) **Moisture Retention Chemicals** - Granular chemical that are typically cross-linked potassium based polyacrylate or polyacrylamide copolymers. Provide commercial quality product from the QPL.

01040.23 Miscellaneous Items - Furnish miscellaneous items meeting the following requirements or provide commercial-quality products from the QPL. Obtain approval from the Agency prior to use.

- (a) **Anti-transpirant** - Apply liquid anti-transpirant spray to all appropriate deliverable plant materials, prior to transport.
- (b) **Boulders** - Furnish boulders of indigenous materials, with source, dimensions, and other characteristics as shown.
- (c) **Browsing Protectors** - Flexible, semi-rigid plastic or metal mesh, brown or light green in color, with stake supports.
- (d) **Game Repellent** - A commercial nontoxic spray that makes vegetation unpalatable for animal forage.
- (e) **Root Barrier** - A root barrier designed to contain and control root intrusion into unwanted areas.
- (f) **Tree Grates** - Tree grates complete with frames, all required attachment hardware, and at least one issue of any specialty key or tool that is required to open or move the item for maintenance.
- (g) **Tree Stakes and Ties** - Rough sawn tree stakes of 1 1/2 inches x 1 1/2 inches douglas fir or pine, construction grade or better. Use stakes 6 foot long for trees less than 8 feet tall, and stakes 8 foot long for trees 8 feet or taller. Stain all tree stakes with an approved, dark green penetrating oil stain. Provide tree trunk protection of guying material of either a commercially available tree tie or a section of garden hose. Furnish tree guying material of a commercial product manufactured for this use, such as plastic chain, or stainless steel woven-wire with clamp fasteners. Size the guying material appropriate to the size of the tree and the wind factors of the area.

(h) Trunk Wrap - Typically manufactured of waterproof, crinkled paper and is designed to protect tree trunks against sunscald, loss of moisture and insect attack.

(i) Weed Control Geotextile - Weed control geotextile is typically manufactured of permeable, fibrous synthetic material and is generally for use under material such as mulch or gravel.

(j) Woody Course Debris - Logs or root-wads salvaged from on-site deciduous tree clearing and grubbing activity.

Construction

01040.40 General - Planting areas and plant locations shown on the plans are approximate unless shown with dimensions. Be responsible for layout and staking for plant placement, subject to approval by the Agency before planting. The Agency will make only field measurements necessary to calculate and verify quantities for payment.

Adjust tree locations to avoid possible conflicts with vehicle recovery clear zones, utilities, structures, miscellaneous appurtenances, and signing, as directed. In mowable grass areas, locate trees at least 10 feet from the edge of plant beds, other trees, fences, and ditch bottoms, unless otherwise specified.

01040.41 Planting Season (West of the Cascades) - Perform all plant installation work from September 1 to May 15, unless otherwise specified. Container-grown materials located within irrigated areas may be planted at other times, depending upon written Agency approval.

Do not place lawn sod before March 15 or after September 30 without written Agency approval.

01040.42 Planting Season (East of the Cascades) - Perform all plant installation work from October 15 to November 30, unless otherwise specified. Container-grown materials located within irrigated areas may be planted at other times, depending upon written Agency approval.

01040.43 Topsoil:

(a) Excavation - Prevent fouling of suitable material with subsoil or other detrimental matter. Form stockpiled soil into windrows at least 6 feet high, not to exceed 13 feet high, to maintain and preserve soil organism vitality.

(b) Subsoil Preparation - Grade and finish areas that are to receive topsoil, allowing for the specified amounts of topsoil. Scarify or till subsoil that is not loose and friable to a depth of 6 inches and obtain approval from the Agency before placing topsoil.

(c) Hauling and Spreading - Haul and spread material without compacting the topsoil or areas where it is placed. Protect from damage any surrounding objects, pavement, structures and areas that are traveled, crossed, or mounted by equipment.

Smoothly spread the topsoil over the specified areas to the thickness, grades, and slopes shown or directed. Avoid wasting topsoil and do not place material during wet conditions. Do not work saturated soils in any manner. Material placed contrary to Agency instructions or in undesignated places will not be paid for and removal may be required at the discretion of the Agency.

(d) Finishing and Cleaning Up - Finish areas covered with topsoil to proper grade, contour and cross section. Cultivate all topsoil not in a loose and friable condition to a depth of at least 4 inches. Bring the surface to a condition ready for planting operations.

01040.44 Select Wetland Topsoil:

(a) Excavation - Stage construction so that excavated soils may be moved directly to the wetland mitigation location. If that is not possible, stockpile the material for not more than 28 days. Water stockpiled material twice weekly and keep moist until used. Form stockpiled soil into windrows at least 6 feet high, not to exceed 13 feet high, to maintain and preserve soil organism vitality.

(b) Subsoil Preparation - Excavate or grade areas to receive selected wetland topsoil as shown on the plans and finish as smooth as practicable through one pass of standard construction equipment. Have subsoil preparation inspected and approved by the Agency prior to spreading the selected wetland topsoil.

(c) Hauling and Spreading - Transport select wetland topsoil to the site by any means which meets all applicable regulations related to hauling potentially wet or moist materials. Spread the topsoil to a depth of 6 inches minimum to 24 inches maximum, or to meet the finished elevations as specified on the plans. Make as smooth as practicable without excessive soil compaction. After spreading, have the area inspected and approved by the Agency prior to planting.

01040.45 Soil Amendments - Incorporate soil amendments into the topsoil when required by the soil fertility test and soil amendment report. The application rate will be verified by checking settings on the spreading or application equipment.

01040.46 Soil Bio-Amendments - Incorporate the following soil bio-amendments into the topsoil of areas to be planted, according to the recommendations of the soil bio-amendment report, the supplier, or the following:

- Bacterial Food Amendments
- Fungal Food Amendments
- Protozoa Food Amendments
- Nematode Food Amendments
- Microbes and Biostimulants
- Earthworms - Add nine worms per cubic yard of topsoil (this roughly equates to three worms per 10 square feet of topsoil at 12 inches depth).
- Mycorrhizal inoculation - Incorporate into the planting hole quantities of mycorrhizia sufficient to correct the soil for the type of plants or grasses being grown.
- Mycorrhizal Inoculation (Injection) - Provide pre-measured packets containing live endomycorrhizal and ectomycorrhizal fungi.
- Mycorrhizal Inoculation (Root Dip) - Apply root dip material containing live endomycorrhizal and ectomycorrhizal fungi.

The application rate will be verified by visual inspection of application rates. A one-time application should be adequate, as long as pesticides, fertilizers or other toxic materials are not used at the same time. If it becomes necessary to apply pesticides that have non-target organism effects, or to apply fertilizer at rates greater than 13 pounds per acre, re-inoculate the organisms about one month after the pesticide or fertilizer was applied.

01040.47 Fertilizers - Incorporate fertilizer based upon recommendations of the soil amendment and soil bio-amendment reports or, with Agency approval, at the type and rate as follows:

Plant Bags/Tablets

Plant	Rate	Size
Tree	3 per tree	3/4 ounce
Shrub	2 per shrub	3/4 ounce
Vine/Ground Cover	1 per plant	3/16 ounce

Granular Fertilizer Rate

1 pound per tree per application
 1/2 pound per shrub per application
 1/8 pound per vine/ground cover per application

Evenly space planting bags or tablets around plants after planting pits are two-thirds filled with backfill. Mix granular fertilizer into the upper one-half of plant backfill.

The application rate will be verified by visual inspection. Furnish manufacturer or supplier quality compliance certification according to 00165.35. Ensure that material testing methods meet the requirements of the Oregon Department of Agriculture appropriate to that material.

Do not allow the fertilizer application to conflict with the soil bio-amendments. In case of questions, provide the soil bio-amendment supplier's written recommendations to the Agency.

01040.48 Planting Area Preparation - All planting areas shall be Weed Free before planting or seeding operations begin. Identify, kill, and remove plants according to 01030.62(b-3).

Prepare planting areas according to the following methods, or as otherwise specified:

(a) Method "A" (Cultivated Planting Areas, Non-lawn) - Cultivate plant beds to a depth of 2 inches. Thoroughly mix 52 inches of soil conditioners into the top 12 inches of plant beds. In addition, add soil amendments, soil bio-amendments and fertilizers, as shown or specified, according to the soil amendment and soil bio-amendment reports recommendations, into the top 12 inches of topsoil.

Finish grades by raking to a grade tolerance of plus or minus 1 inch, with a smooth and firm condition, and an even grade that is free of undulations or low areas that could create standing water. Match existing grades at the perimeter. Finish to the proposed grades shown or specified.

On slopes that the Agency determines are too steep to cultivate, plants may be planted in individual planting holes prepared using method "B".

(b) Method "B" (Non-Cultivated Planting Areas) - Spray existing weeds and non-desirable vegetation with herbicide to kill all top growth and roots in areas not requiring cultivation. Use herbicides that have limited residual toxicity to permit safe planting as required under the Contract. Do not spray or otherwise harm plants to be saved. After inspection and approval, remove the dead top growth of plant material within 2 inches of the surface and dispose of according to Section 00320. Replace plants to be saved that are damaged by herbicide application at no additional cost to the Agency.

Add any soil conditioners, soil amendments, soil bio-amendments or fertilizers with the backfill at each plant pit or to the seeding operation.

Finish wetland mitigation planting areas to specified finish elevations, blending to existing ground smoothly, as required and directed. Except for projects that are less than one year in duration and unless otherwise approved, review the seasonal hydrology of the area to be planted for one full winter season (November 15 to February 28) prior to planting any wetland plants. Adjust plant types and planting locations as required or directed, based on the review of site hydrology.

When planting seedling plants, completely scalp vegetation from a 12 inch diameter area around each planting hole. Clear all debris such as wood and rocks from the planting spots, provided debris is not deeper than 12 inches. When debris is deeper, move the planting location. Use herbicides around seedlings only upon written approval of the Agency.

(c) Method "C" (Sod Lawn and Seeded Lawn Areas) - Cultivate existing ground to a depth of 6 inches, achieving a loose and friable condition suitable for fine grading. Remove all vegetation, rocks larger than 2 inch diameter, clods, roots, sticks, debris, and other matter detrimental to the growth of sod.

Uniformly spread soil conditioners, soil amendments, soil bio-amendments, and fertilizer evenly over the area and thoroughly rototill into the soil to a depth of 4 inches. Apply at rates recommended by soil testing, or as follows:

Material	Rate (per 100 square yards)
Soil Conditioner	1/2 cubic yard
Fertilizer	10 pounds
Lime (Western Oregon only)	40 pounds

Fine grade and roll planting areas with a water-filled roller to provide a fine-textured, smooth, firm surface, free of undulations, irregularities or low areas that could create standing water. Grade areas receiving sod to within 1/2 inch of the designed grades, and 1 inch below adjacent walks, curbs and pavement. Since sod thickness varies, adjust initial grades so the final sod soil level is slightly below adjacent hard surface grades. Ensure that final sod grade does not create a pedestrian tripping hazard.

Furnish the Agency with sod mixture information and a quality compliance certificate from the sod grower, certifying sod compliance with mixture requirements, according to 01040.10.

Prior to completion of any sodding and seeding, re-grade ruts, footprints, washouts, or any other irregularities, and re-seed or re-sod repaired areas as originally specified.

(d) Method "D" (Rough Areas Seeded for Revegetation or Erosion Control) - Remove any matter detrimental or toxic to the growth of plants, including weeds, clods, rocks or debris. On slopes 1V:3H or flatter, remove all debris larger than 2 inches in any dimension. On cut slopes 1V:1.5H or flatter, roughen the surface with furrows parallel with slope contours and loosen the soil to a depth between 3 inches and 6 inches.

(e) Method "E" (Temporary Seeding Areas) - If grading is required or directed, make equipment passes at right angles to the slope in order to form seed-holding tracks in the soil.

01040.49 General Planting - Plant trees, shrubs, groundcover, vines, and bulbs using the following practices:

- Inspect plants after arrival at the Project and before planting. Do not install plant materials until each required inspection by the Agency is complete. Replace plants not meeting the requirements of the Specifications with plants as specified or otherwise directed, at no additional cost to the Agency. Initial approval of plant materials for planting by the Agency will not constitute final acceptance.

- Protect all plants during shipping, handling, storage, and planting from windburn or exposure to harmful weather conditions, and root or root ball drying.
- When excavating planting holes, stockpile excavated topsoil separately from subsoil. Do not include alkali soil, subsoil, gravel, debris or rocks in the topsoil. Dispose of any substandard excavated materials in a manner not harmful to plants or planting work. Scarify planting pit sides and bottoms to eliminate glazed surfaces. Dispose of excess soil in a manner that is not harmful to plants or planting work.
- Do not plant in standing water unless approved by the Agency. If standing water is present within a plant pit, notify the Agency prior to planting to determine what corrective measures are required. Perform corrective measures on an Extra Work basis according to Section 00196.
- Excavate tree plant pits a minimum of twice the diameter of the plant root ball or 2 feet larger than the root ball, whichever is greater. Dig shrub plant pits a minimum of 1 foot larger than the root ball diameter. Dig pits to the same depth as the root ball, root mass, or container. Spread root systems of bare root plants and container stock as necessary to keep plants from being root bound.
- Cleanly cut off broken or frayed roots of bare-root plants before planting. Spread out roots in their natural position within the pit and trim only damaged roots as approved by the Agency. Remove all labels, tags and attachment materials from the plants before final inspection.
- Set upright growing plants straight and plumb, and prostrate growing plants level to the ground surface. Set all plants so that, after settlement, they are at the same level as when growing in the nursery or container.
- Place the backfill then add soil amendments, soil bio-amendments, and fertilizers as recommended by the soil amendment and bio-amendment reports. Moisten backfill completely after placing to eliminate air pockets and minimize settlement of the backfill. Form a shallow (2 inch high) water-holding saucer in the soil around the plant unless directed otherwise.
- Balled and burlapped plants may be placed with the root ball wrapping removed or, if all materials are untreated and fully biodegradable, left in place. If the root ball wrapping (burlap) is left around the plant, completely remove all tie wire, string or twine and fold down the burlap from the top half of the root ball.
- Perform any required pruning using good horticultural practice appropriate to the type of plant. Prune to remove all dead, damaged, crossed or rubbing twigs and branches, and to compensate for loss of roots during planting. Make cuts close to the parent stem, but not flush or through the bark "knob" at the branch joint. Do not prune terminal ends of tree leaders without approval of the Agency.
- Apply bark or wood chip mulch of the type and depth as shown. Correct contamination of new mulch due to the Contractor's operations at no additional cost to the Agency. Feather mulch into plant material trunks, stems, canes or root collars, and leave 1 inch below the top of junction and valve boxes, curbs and pavement edges. Any mulch placed to a thickness greater than specified will be at no additional cost to the Agency.
- Do not disturb protected existing vegetation unless approved by the Agency prior to construction.
- Dig pits for street trees that have hard surfaces around them so the crown of the root ball is 3 inches below the finished surface of the surrounding grade.
- Water deciduous trees that are 1 1/2 inches or larger in diameter, conifer trees that are over 4 feet in height, and all shrubs at a minimum frequency identified in the Special Provisions.

01040.50 Special Planting Requirements:

(a) Transplanted Specimen Plants - Use the following methods for transplanting specimen plants, unless otherwise specified:

(1) Mechanical Digging - Use a "Vermeer" type of tree spade or approved equal. Move only during the season that the tree is dormant. Treat deciduous plants with anti-transpirant prior to excavation. Confirm with the Agency that the size of the spade is appropriate to the size and type of tree prior to beginning work. Dig the receiving hole prior to digging the tree to be transplanted. Take care not to damage the tree bark. Refill the original hole after transplanting. Do not move Oregon White Oak (*Quercus garryana*) by this method.

(2) Hand Digging - Before digging, obtain approval from the Agency for the size of container or root ball to be used for each plant. Begin digging at a diameter greater than the expected size of the root ball and remove dirt toward the plant until the surface roots show. When completely dug, secure the root ball with burlap and twine, wire basket or in a wooden box. Take special care to dig deep enough so that the taproot is not cut until it is smaller than 3/8 inch. Take care not to damage the tree bark. Refill the original hole and compact the soil after transplanting.

Install perforated plastic drainpipe as shown. Add fertilizer, soil amendments or bio-amendments to backfill topsoil mixture. Stake or guy the tree as specified.

Provide one application of anti-transpirant before transplanting, and one application of Vitamin B1 growth hormone after planting to each specimen plant according to the manufacturer's recommendations.

Perform all replanting of specimen plants according to 01040.41 and 01040.42.

(b) Staking and Guying Trees - Stake and guy planted trees as shown or directed.

(c) Seedling Trees - Plant seedling trees using one of the following three methods:

- Planting hoe capable of opening a vertical hole broken out on three sides, with a minimum blade length of 12 inches and width of 3 inches.
- Planting shovel capable of opening a vertical hole broken out on three sides and at least 10 inches deep.
- Normal bare-root planting method.

No pre-staking of planting locations will be required. The Agency will be present as planting begins and will approve the spacing, planting method, and areas to be planted before work can begin. Vary plant spacing in order to allow seedlings to be planted in suitable soil. During the planting process, remove one tree at a time from the planting bag or other container to prevent drying of roots.

Place the roots of each seedling in the ground so that they assume a natural arrangement and do not twist, angle, bunch together or turn up at the ends. Plant seedlings so that the root collar is at or above the ground plane by no more than 1/2 inch. During planting, tamp soil around the roots in the lower half of the hole. Then fill the hole to the surrounding soil level and firmly pack so that no air pockets remain around the roots.

Ensure that seedlings do not pull loose with a tug strong enough to detach a small group of needles or small branch ends as applicable. Place a stake at the edge of each planting pit and install browsing protection and browsing repellent.

(d) Tubeling Plants - Place the tubeling into the planting pit without breaking the root mass. Set the top of the root collar 1/2 inch above finish grade, and gently tamp soil around the plant to compact the backfill. Place a stake at the edge of the plant pit and attach a browsing protector around each plant.

(e) Collected Plants - After plants become dormant, excavate collected plants by hand, protecting the root mass against drying, freezing or breaking. If possible, plant all collected stock the same day as gathered, or transport to a local nursery for temporary storage until final planting.

If immediate planting is not possible, place collected plants in heavy paper or plastic with slightly damp peat moss or sterile potting soil. Store dormant plants at 32 °F to 37 °F until planting. Examine stored material frequently for signs of stress or disease and correct storage conditions as necessary. Plant collected plants before dormant bud development.

(f) Bulbs - Plant dormant bulbs at a depth of 1 inch to 2 inches or to the grade they grew naturally. Compact the soil firmly around the bulbs to prevent float-out and ensure good establishment. Dig holes large enough to naturally space bulbs within the planting area.

(g) Plant Cuttings - Collect and plant the cuttings while in winter dormancy, generally between October and March. Notify the Agency if conflicts exist with permit requirements. Store all cut material in ventilated plastic containers that allow free flow of water. Protect root systems from excessive drying at all times. Do not store plants in airtight containers.

Plant stock within four hours of harvest. If plants are a willow species, plant in the riparian zone on that portion of the slope where the plant stem ends will be in contact with year-round moist soil as determined by the Agency. Make planting holes by forcing a steel bar or similar tool into the ground about 12 inches deep. Place the cuttings into the holes and tamp soil firmly around the stems, leaving a minimum of 6 inches showing. Vary these dimensions as required for larger plant cuttings.

01040.51 Planting Wetland Plants - When planting wetland plants, do not use soil amendments, mulch, or fertilizer. Plant rhizomes, tubers and plugs within the upper 2 inches to 3 inches in exposed muddy or moist soils. When the water depth reaches or exceeds 1 inch notify the Agency of the potential need for adjustment to the planting.

01040.52 Placing Sod Lawn - Place sod only after approval of the Agency. Immediately before placing sod, water the soil bed to prevent drying of grass roots. Lay the first sod row in a straight line, then place subsequent rows parallel to and tightly against each other, staggering lateral joints. Do not stretch or overlap the sod. Tightly butt all joints. Do not use sod segments containing less than 2 square feet of surface area.

After placement, diagonally roll and thoroughly water the sod. Apply a second application of fertilizer (22-16-8) at the rate of 510 pounds per 100 square yards and thoroughly water.

01040.53 Mulch - Apply mulch according to the following:

(a) Ornamental Plant Bed Areas - Submit a 15 pound sample of bark mulch to the Agency for visual inspection and approval. The approved sample will be the standard of acceptability for all mulch used on the Project.

Apply bark mulch after beds are made free of weeds and debris, the surface is brought to a smooth finished grade, and all planting work (except for vines and groundcovers) is complete. Uniformly bark mulch planted areas to a nominal depth of 2 inches with bark mulch. Apply bark mulch so that it presents a smooth and even appearance as approved by the Agency (raking may be required).

Keep bark mulch off plants, structures, roadways, shoulders, walks, and lawns. Uncover all plants covered by mulch material as soon as possible and leave the site in a neat, clean and finished appearance. When planting vines or groundcover, rake bark mulch away from planting pits so that the bark is not contaminated. After planting, evenly spread excess soil and rake bark mulch back into place.

Replace bark mulch that is displaced or blown away, and correct to the specified depth any bark mulch placed to a greater than specified depth, at no additional cost to the Agency.

Spread rock or cinder mulch to a depth of 2 inches after planting trees and shrubs.

(b) Non-Ornamental Plant Bed Areas - Apply mulch according to one of the following methods:

(1) Straw Mulch - Spread grass straw mulch to a nominal 2 inch depth and tackify, after planting of tubeling plants and seeding as required.

(2) Wood Chips - Spread wood chips to a nominal depth of 2 inches. Add 15 pounds of Ammonium Nitrate/1000SF to neutralize nitrogen loss.

01040.54 Water - Water all plants at intervals as required to maintain and promote healthy growth. Avoid excessive watering of shrub bed areas that may leach herbicide and damage adjacent lawns or desirable or protected vegetation. Repair all lawn vegetation damage at no additional cost to the Agency.

(a) Pressure Moisture Stress Sensor - When a pressure moisture stress sensor is specified, the Agency will test a 1% to 5% representative sample to ensure that the moisture stress level is below 20 bars of pressure and inform the Contractor if any material exceeds this limit. Any plant material found to have greater than 25 bars of pressure will be considered to be under extreme moisture stress. Provide sufficient water within 24 hours to bring the plant into normal range. The Agency will retest to determine the new representative pressure. Plant material that have 30 bars or greater will be considered to have reached its permanent wilting point. Replace all such material during the next planting period. Testing will occur mid-day at the following times until the end of the establishment period(s):

- After plant delivery, during temporary storage, and before planting.
- At one-month intervals throughout the summer season, up to the first fall rain or snow.
- At weekly intervals during extremely hot or dry summer periods.
- Any time the Agency believes the plant material may be under stress.

(b) Timed-Release Water - Apply timed-release water containers when specified. Cut the bottom from the carton, dig a hole next to the plant and place so the contents touches the root ball or root area approximately 4 inches beneath finish grade, or according to the manufacturer's directions. Fill soil back around the carton to hold it firmly in place. Apply one carton for seedlings and tubelings, two cartons for No. 1 containers, and four cartons for larger plant material.

(c) Moisture Retention Chemicals - Utilize moisture retention chemicals according to the manufacturer's recommendation, depending upon specific applications.

01040.55 Miscellaneous Items - Place or install miscellaneous items as follows:

(a) Boulders - Place boulders in locations as shown. Do not scar or break boulders with equipment. Ensure that one-third to one-half of each rock is buried beneath finish grade. Verify all rock placement with the Agency prior to installation.

(b) Tree Grates - Install grates, frames, and appurtenances as shown and according to the manufacturer's recommendations. Place frames flush at sidewalks and place guards plumb according to the manufactures recommendations.

(c) Weed Control Geotextile - Place weed control geotextile at finish soil grade when planting is complete but before mulch placement begins. Place weed control geotextile with a minimum 4 inch overlap between rolls, turned under edges, and attached to the ground as recommended by the manufacturer.

(d) Woody Course Debris - Place woody course debris within the stream channel, facing upstream at approximately 45 degrees from the stream bank, or as shown or as directed. Anchor woody course debris to the stream channel bottom as shown.

(e) Anti-transpirant - Apply anti-transpirant according to the manufacturer's directions to all exposed foliage surfaces immediately before materials are delivered to the Project, or as otherwise specified. Provide certification of compliance.

(f) Game Repellent - Apply a game repellent to all exposed foliage surfaces immediately after materials are planted, or as otherwise specified. Re-apply to each plant every 120 days, or according to the manufacturer's printed instructions, until the end of the plant establishment period.

(g) Browsing Protectors - Install browsing protectors according to the manufacturer's recommendations.

(h) Root Barrier - Install root barrier according to the manufacturer's recommendation.

(i) Tree Stakes and Ties - Place tree stakes parallel with the prevailing winds and drive vertically into the ground at least 12 inches below the planting hole depth, or as shown. Do not drive stakes through the root ball.

(j) Trunk Wraps - Wrap tree trunks with the specified wrap, covering all exposed trunk between finish ground and the first whorl of tree branches.

01040.56 Cleanup During Construction - Maintain the Project in a neat, orderly condition. Remove unsightly construction materials at the end of each working shift. Clean all pavement surfaces of mud, debris, or other materials that may, in the opinion of the Agency, cause problems. If material is not removed, the Agency reserves the right to have the cleanup work performed and deduct the value of this work from the monies otherwise due the Contractor.

Plant Establishment

01040.70 General - The Contractor is responsible for the survival of all plant material until the end of a plant establishment period of one calendar year. The plant establishment period will begin when all the original planting is complete. The original planting is considered complete when all the plant material has been planted to the satisfaction of the Agency.

Establishment period work includes removing all plants that have reached their permanent wilting point, are dead, dying, or which do not meet Specifications, and replacing them with healthy plants. All plants in place after this replacement will be recognized as the original planting and will be subject to the establishment specifications. Repair, restore, and replace all plantings that have been damaged by vehicles, vandalized, and stolen according to 00170.80.

01040.71 Plant Care and Success Criteria - During the plant establishment period, maintain plants in a vigorous growing condition by regularly doing the following:

- Watering and fertilizing sufficiently to promote growth.
- Weeding, cultivating, pruning, and repairing.
- Adjusting tree stakes and guys.
- Controlling weeds before they seed according to 01040.48.
- Controlling pests and noxious weeds before the reproductive cycle.
- Removing dead or non-vigorous plants.
- Replacing missing plants.
- Re-mulching of plant bed areas.

The determination of a successful plant establishment period will be made at periodic plant establishment inspections. A successful planting establishment for each inspection is defined as follows:

- All plants are surviving and have vigorous growth.
- Plants are free of insects and disease.
- Plants show signs of continuing health.
- Plants have not reached permanent wilting point.

At the discretion of the Agency, certain types of regularly spaced plantings such as groundcovers may be measured using an area sampling method. To determine the rate of survival, set out (delineate) representative plots measuring 100 square feet at the completion of the original planting at random locations in each general planting area. The representative plots will be mutually agreed upon between the Contractor and the Agency. Mark the plot corners with permanent markers such as re-bar, including date and identification. Delineate a minimum of three plots per acre of new planting area.

The use of representative plots is intended to simplify the measurement of planting establishment work. If work within the representative plots does not accurately reflect the condition of the entire planting area(s), the Agency reserves the right to reject all establishment work.

01040.72 Periodic Inspections - During the plant establishment period, the Agency will make three plant establishment inspections jointly with the Contractor at the following times:

- Spring, early May
- Summer, mid July
- Fall, late September

Depending on when the establishment period begins, one of the above inspections will be the final inspection.

During each plant establishment inspection, the Agency may determine, based upon the specified success criteria, that corrective work is required. If so, the Agency will provide the Contractor with a written notice of required corrective work sent by hand-delivery or mail.

01040.73 Corrective Work - Complete all corrective work within 15 calendar days after receiving the written notice of the required corrective work to be taken. The 15 day requirement excludes those days the Agency determines to be impractical for working.

The Contractor will be allowed to replace plants outside the Planting Season to perform corrective work after each periodic inspection.

Provide plant replacements of the same variety, size, and quality as specified for the original plants, unless otherwise approved.

Notify the Agency when the corrective work is complete. When the corrective work has been re-inspected and is completed to the satisfaction of the Agency, the appropriate partial payment due the Contractor will be made.

If the Contractor does not perform the corrective work within the 15 day period after written notification, excluding those days the Agency determines to be impractical for working, the Agency may have the corrective work done by others and deduct the entire cost of the corrective work from monies due or to become due the Contractor under the Contract.

01040.75 Weed Control - Provide weed control according to 01030.42.

01040.77 Plant Establishment (Ornamental Areas) - In addition to these plant establishment requirements, perform the following:

(a) Watering, Fertilizing, and Mulching - Water all plants at the required intervals using the installed permanent or temporary irrigation systems, or such means as has been established for the Project. Avoid excessive watering of shrub areas adjacent to lawns that may leach herbicide and damage the lawn. Repair damaged lawns at no additional cost to the Agency.

If specified for the original planting, re-fertilize plants to promote vigorous growth.

Maintain the plant bed mulch at a 2 inch depth during establishment, unless otherwise specified. Rake to a smooth and even finish grade.

Remove all timed-release water cartons that have not bio-degraded by the end of the establishment period.

(b) Trimming and Pruning - Prune in order to enhance the natural growth of plants, eliminate dead growth and crossing branches, maintain growth within available space, minimize overgrowth onto walks and walls, and minimize tree canopy damage from winds.

Prune during the dormant season unless otherwise specified. Remove and dispose of all dead and critically damaged plant material to maintain the overall appearance of the Project.

(c) Transplanted Specimen Plants - Care for transplanted specimen plants immediately after the planting work is completed. Water, fertilize, and protect specimen plants against disease and infestation as required to ensure the plants remain healthy and vigorous. Final acceptance of transplanted specimen plants will depend on plant health and condition.

(d) Sod Lawn - Mow, cut and fertilize sod lawns as required to maintain a healthy and vigorous condition. A schedule of feeding, mowing, and general treatment, including thatching and aeration will be listed in the Special Provisions. Final acceptance of sod lawn areas will depend on its health and condition. Keep sod lawns mowed to a height between 1 1/2 inches to 2 inches.

Do not perform the first mowing until the sod is firmly rooted and secure in place. Remove no more than one-third of the grass leaf during initial or subsequent cuttings.

01040.78 Plant Establishment (Mitigation or Other Non-Ornamental Areas):

(a) Watering and Mulching - Water all plants as necessary to promote and maintain growth using temporary irrigation methods. Keep planted areas raked to a smooth and even finish grade. Maintain mulch within plant saucers at a 2 inch depth, unless otherwise specified.

(b) Weeding - Perform weed control activities according to 01030.42.

(c) Soil Testing and Corrective Soil Amendments - If specified for the original planting, have a soil test performed by a soil ecology lab between the second and third periodic inspection. Present the recommendations to the Agency at the third inspection. Apply the amendments as recommended by the soil test report and as directed by the Agency.

01040.79 Final Inspection - After plant replacement work and any other required work has been completed, the Agency will make a final inspection. Ensure that all plant materials, planting beds and other facilities are according to the Specifications as a prerequisite for acceptance.

Measurement

01040.80 Measurement - The quantities of plantings and associated work performed under this Section will be measured according to the following:

(a) Soil Testing - Soil testing will be measured on the unit basis for each test that is completed and accepted. Soil testing includes the required sampling, testing, analyses, and reports for one or more of the following:

- Soil particle size range test.
- Soil fertility test and soil amendment report (including chemical analysis, acidity, salinity).
- Soil ecology analysis and soil bio-amendment report.

(b) Topsoil and Wetland Topsoil - Topsoil and wetland topsoil will be measured on the volume basis in the hauling vehicle.

Topsoil taken from the required excavations according to 00330.10 will be measured according to 00330.82.

(c) Soil Conditioners - Soil conditioners will be measured on the volume basis in the hauling vehicle or in containers delivered to the Project site.

(d) Plant Materials - Plant materials will be measured according to one of the following:

- **Unit Basis** - Under this method, plant materials will be measured on a unit basis.
- **Average Area** - This method may be used when a plant bed area is greater than or equal to 3,000 square yards and will be measured as follows:
 - The total plant bed area will be measured along the ground surface by the foot and calculated to the nearest square yard.
 - A total number of 30 square yard plots will be calculated.
 - 1% to 5% of the plant bed area will be selected and staked as 30 square yard representative plots.

- All the plants in each staked representative plot will be counted. Unless otherwise approved, if the number of plants in a plot exceeds the number of required plants of the representative plot, the number of required plants will be used to represent the plot.
- Based on the results of the plant count, the average number of plants per plot will be calculated.
- The quantities of each item will be based on the calculated average number of plants per plot multiplied by the number of plots in the total plant bed area.

(e) Sod Lawn - Sod lawn will be measured on an area basis on the ground surface and calculated to the nearest square yard.

(f) Mulch - Mulch will be measured on the volume basis in the hauling vehicle, or on the weight basis.

(g) Miscellaneous - Miscellaneous items will be measured as follows:

- **Tree Grates** - Tree grates will be measured on a unit basis. One grate includes two half grates, frame, hardware, tree guards, and appurtenances.
- **Woody Course Debris** - Woody course debris will be measure on a unit basis.
- **Boulders** - Boulders will be measured on a unit basis or on the weight basis.
- **Root Barrier** - Root barrier will be measured on the length basis.
- **Weed Control Geotextile** - Weed control geotextile will be measured on the area basis on the ground surface and calculated to the nearest square foot.

Payment

01040.90 Payment - The accepted quantities of plantings and associated work performed under this Section will be paid for according to the following:

(a) Soil Testing - Soil tests will be paid for at the Contract unit price, per each, for the item "Soil Testing".

Payment includes mobilization, soil sampling, testing, analyses, and preparation of the soil amendment and bio-amendment reports.

(b) Topsoil and Wetland Topsoil - Topsoil, not taken from required excavations, will be paid for at the Contract unit price, per cubic yard, for the item "Topsoil".

Wetland topsoil, taken from either the Project excavations or imported from other sites, will be paid for at the Contract unit price, per cubic yard, for the item "Wetland Topsoil".

Topsoil taken from required excavations according to 00330.10 will be paid for according to 00330.94.

No payment will be made for topsoil or wetland topsoil that is placed in nondesignated areas or which is contrary to the Agency's instructions.

(c) Soil Conditioners - Soil conditioners will be paid for at the Contract unit price, per cubic yard, for the item "Soil Conditioner".

(d) Plant Materials - Plants will be paid for at the Contract unit price, per each, for the appropriate items listed in the Contract Schedule of Items. Plant materials will be listed by caliper size, size of container, or other size, or condition shown.

Transplanted plants will be paid for at the Contract unit price, per each, for the item "Transplanted Specimen Plants".

Partial payments for plant materials will be made as follows:

At the time of the original planting.....	30%
After the first plant establishment inspection.....	10%
After the second plant establishment inspection	10%
After the third plant establishment inspection	10%
At completion of the establishment period	40%

Partial payments made throughout the establishment period will be made for all surviving and replaced plants.

Upon completion of the establishment period, full payment will be made for all surviving and replaced plants, except for corrective work performed by others according to 01040.73 The Agency will pay the Contract unit price only once for the specified quantity, whether or not plants are replaced.

If the Contractor requests partial payment for plant materials on hand, payment will be made according to 00195.60.

(e) Sod Lawn - Sod lawn will be paid for at the Contract unit price, per square yard, for the item "Sod Lawn".

(f) Mulch - Mulch will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
Bark Mulch	Cubic Yard
Cinder Mulch.....	Cubic Yard
Wood Chip Mulch.....	Cubic Yard
Grass Straw Mulch.....	Ton
Rock Mulch	Ton

(g) Miscellaneous - The accepted quantities of miscellaneous items will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
Tree Grates.....	Each
Woody Course Debris.....	Each
Boulders.....	Each or Ton
Root Barrier.....	Foot
Weed Control Geotextile.....	Square Foot

01040.90(g)

Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for:

- soil amendments
- lime, gypsum, or trace minerals
- soil bio-amendments
- fertilizer
- herbicides
- anti-transpirants
- game repellent
- browsing protectors
- pesticides
- trunk wraps
- tree stakes and ties
- water
- timed-released water
- pressure moisture stress sensors
- mulch materials required as part of replacement planting
- corrective work during the plant establishment period

Section 01050 - Fences

Description

01050.00 Scope - This work consists of constructing:

- Fences, gates, and gateways of barbed wire, woven wire fabric, chain link fabric, or combinations, to the lines and grades shown or directed.
- Protective fences, on and off structure as shown or directed.

All dimensions shown on the plans are horizontal and vertical measurement. Actual quantities required for the installation may be greater depending on the slope of the terrain.

01050.01 Definitions:

(a) Fences - Fence, gates, gateways, and appurtenances, regardless of kinds and types.

(b) Gates - Swinging units to provide an opening in the fence line.

(1) Single Gate - A unit of 16 feet or less.

(2) Double Gate - Two single gate units used together for an opening of more than 16 feet.

(c) Gateway - Supported fence wire or fabric stretched between gate posts and fastened by bars, wire hinges and locking devices.

(d) Panel - That portion of fence between adjacent posts.

(e) Run - As used in this specification, run is defined as follows:

- **Fences, gates, and gateways** - The length of fence between end posts, intermediate end posts, corner posts, and gate posts.
- **Bridge protective fence** - A section of fence 150 feet or less in length.

Materials

01050.10 Materials - Furnish materials meeting the following requirements:

Bar Reinforcement	02510.10
Barbed Wire	03010.10
Chain Link Fabric	03010.30
Commercial Grade Concrete	00440
Fence Gates	03010.60
Fence Grounding	03010.50(e) and (f)
Fence Posts, Braces, and Appurtenances	02110.30, 03010.50
Guardrail Elements	02820.10
Pickets	03010.31
Protective Fence Materials, On and Off Structures	03010.75
Vinyl Clad Fabric	03010.40
Woven Wire	03010.20

Construction

01050.40 General - Construct the several kinds and types of fences including the assembly and erection of all component parts and materials complete in place at the locations shown or directed. Confine activities and operations to the area immediately adjacent to the right-of-way line and within the highway right-of-way. Arrange for permits required from adjacent property owners to perform the work.

Schedule the installation of fencing or provide temporary fencing or other adequate means to prevent livestock from entering the Project right-of-way, easements and/or adjoining properties according to 00170.92.

At bridges, cattle passes and culverts, if shown or directed, connect the new fence to the structure in a manner that permits free passage of livestock under or through the structure.

01050.41 Lines, Grades, and Preparation Work - Unless otherwise directed, set fences so the fence fabric and wires are on right-of-way lines or Agency property lines, with posts set on Agency property. If directed, center concrete footings and fence posts 1 foot from the right-of-way or property line on Agency property.

Clear, grub and prepare the fence line area. Remove all shrubs, brush, snags, down timber, float rock, and other obstacles, including trees up to 6 inches in diameter which interfere with fence construction. If directed, preserve trees and geographic features on fence lines by varying the fence alignment to miss them.

Fill or excavate ground surface irregularities which interfere with maintaining specified clearance above ground surface of the bottom wire of the fence. Limit the width as necessary to provide a clear way for the fence.

Excavate for concrete footings to reasonably neat lines, but not less than the specified dimensions in soil, or not less than 18 inches deep in rock. Prevent disturbance of original ground at the sides and bottom of the excavation.

Clear and grade gate openings to permit the gate to swing in a horizontal plane according to 01050.48.

Dispose of materials removed under these provisions, including excess excavation, in a satisfactory manner.

01050.42 Optional Posts - Use steel or wood posts in barbed, or barbed and woven wire fence construction according to one of the following options, and once an option has been selected, use that option throughout the Project:

Option 1: Steel posts entirely in all types of fence.

Option 2: Treated wood posts entirely in:

- Type 1 fence
- Type 1-5W fence
- Type 2 fence
- Median fence on median areas exceeding 16 feet in width

Option 3: Steel line post in combination with treated wood end posts, intermediate end posts, corner posts and gate posts in:

- Type 1 fence
- Type 1-5W fence
- Type 2 fence
- Median fence on median areas exceeding 16 feet in width

01050.43 Installing Posts and Braces:

(a) General - Set all metal end posts, intermediate end posts, corner posts, gate posts, and chain link fence posts in concrete footings. Set all other posts firmly in the ground or in concrete footings as the Contractor elects.

Set posts to the depths shown. Reasonable variation in depths will be allowed and posts may be appropriately shortened or left slightly high, as approved by the Engineer, to:

- Avoid unnecessary penetration or excavation in rock or other unusually firm material.
- Obtain desired grades along the fence.

Set all posts vertical, except on curved alignment set posts slightly off vertical, as directed, to offset the pull of the fence fabric and wires.

(1) Driven Posts - Posts which are set by driving shall be free of damage when set. Remove and replace any driven posts which are split, twisted or bent, or have a badly misshapen tops.

(2) Dug Holes - Where rock is encountered, set the posts to depths of not less than 18 inches and backfill with fine granular material. Do not exceed the post height shown by more than 3 inches.

When posts are set in dug holes, backfill in 6 inch layers with each layer separately and thoroughly tamped and compacted.

(3) Concrete Footings - Dimensions of footings shall not be less than shown and shall fill the excavated areas. Place the concrete with contact against firm soil at the sides and bottom and tamp around the posts and brace ends after the posts and braces have been brought to and firmly held in proper position. Strike off, slope or crown and smooth the surface of the concrete at the ground level to shed water. Allow to cure for at least five calendar days before subjecting the posts and braces to strain.

(b) End Posts - Set end posts:

- At the beginning and end of new fence construction that is not terminating at gate posts.
- At the end of the intersecting line of existing fences just outside the line of the new fence.

(c) Intermediate End Posts - Set intermediate end posts in the line of the new fence:

- At each summit and at each valley in the grade of the fence where the algebraic difference in the grades of adjoining panels of fence exceeds 30%.
- At other points located along the new fence line to break the fence construction into approximately equal runs not exceeding the applicable lengths of runs shown.

(d) Corner Posts - Set corner posts as follows:

(1) Barbed and Woven Wire Fences - At angle of deflection exceeding 5° for fences with steel line posts or 15° for fences with wood line posts. Changes in line where the angle of deflection does not exceed the above limitations will be considered alignment angles. The adjacent line posts at alignment angles shall be made fast to the angle post by means of diagonal tension wires.

(2) Chain Link Fences - At angle points in fence alignment where the alignment of adjoining panels of fence changes direction by 20° or more.

(e) Gate Posts - Set gate posts at the beginning or end of runs of fence to provide openings for gates or gateways.

(f) Line Posts - Set line posts along the line of fence, between end, intermediate end, corner, and gate posts, and at the spacings shown. Line posts may be set at spacings not exceeding 25% greater than specified or at closer spacings if approved. Set a line post in the new fence line at a point in alignment with each intersecting fence line approximately 1 foot from the end post of the intersecting fence line.

It is intended that the actual number of line posts will average to the number required for normal spacing.

(g) Braces - Construct braces before placing of fence fabric and wires on the posts.

(1) Metal Braces - Provide corner posts and intermediate end posts with two braces, one each direction from the post in the main fence lines. Provide end posts and gate posts with one brace in the line of the fence as shown.

Attach metal braces to the metal end, intermediate end, corner and gate posts and set in concrete footings.

(2) Wood Braces - Assemble and construct treated wood braces in conjunction with treated wood end posts, intermediate end posts, corner posts and gate posts to form units as shown. Fasten the wire brace guys to posts with three staples in each post. By means of a wood lever, twist together the four strands of wire between the posts until the entire assembly is taut and firm. Leave the lever in place. Drive the staples to provide contact with the wires without indentation of the posts.

01050.44 Barbed and Woven Wire Fence:

(a) Placing Fabric and Wire - Place fabric and wire on the face of the post which is away from the highway or as shown. On curved alignment, place the fabric and wire on the face of the post against which the normal pull of the fabric and wire will be exerted.

Attach fence fabric and barbed wire to each post according to recognized standard practice for fence construction and as shown or directed.

(b) Splicing Fabric and Wire - Splices of fabric and splices of separate lines of wire between posts will be allowed provided that not more than two fabric or separate wire splices, spaced at least 50 feet apart, occur in any one run of fence. Use wrap or telephone type splices for the longitudinal woven wire and barbed wire with each end wrapped around the other wire for not less than six complete turns.

(c) Stretching Fabric - Stretch the barbed wire and woven wire fabric. Use care in stretching woven wire fabric, so the pull is evenly distributed over the longitudinal wires and not more than one-half of the original depth of the tension curves is removed.

(d) Fastening Fabric and Wire:

(1) At End, Intermediate End, Corner, and Gate Posts - Terminate the fence fabric and barbed wire at each end, intermediate end, corner, and gate post in the new fence line. Wrap each line of barbed wire and each longitudinal wire of the fence fabric around the post and then itself with at least four turns.

(2) At Line Posts - Fasten woven wire fabric to the post at top and bottom and at intermediate points not exceeding 12 inches apart. Fasten each line of barbed wire to each line post. Use approved wire ties or clamps to fasten the wires to metal posts. Drive staples, for use with wood posts, crosswise with the grain of the wood and pointed slightly downward. Drive the staples just short of actual contact with the wires to permit free longitudinal movement of those wires and to prevent damage to the protective coating.

(3) At Intersection of New and Existing Fence - Where existing fences intersect the new fence, cut the existing fence materials, or splice basically in kind new materials as necessary, and fasten each longitudinal wire of the fabric and each line of barbed wire to the new end post according to 01050.44(d-1).

(e) Swinging Panels at Waterway Crossings - At waterway crossings subject to floating debris, if directed, construct wood framed swinging panels of fence fabric, barbed wire or combinations. Attach the panels to the lower wire(s) of the fence to provide fenced closure of the waterway so there will be no unfenced side or bottom openings exceeding 6 inches when the waterway is at its lightest flow or is dry.

(f) Additional Panels at Depressions - If depressions in the ground surface leave unfenced openings greater than 12 inches in height beneath the bottom line of the fence, provide additional panels of fence fabric, barbed wire, or combinations between line posts, as approved, across the opening so no side or bottom openings exceeds 6 inches. If the bottom line of the fence leaves an unfenced opening beneath it of 12 inches or less, pull the fabric and wires down between posts and anchor with pins or posts driven at least 18 inches into the ground so there will be no bottom opening at any point along the fence greater than 6 inches in height.

(g) Stay Wires and Final Adjustments - Free the fabric and barbed wire in final position from warp and sag with stay wires placed approximately vertical to the grade of the fence. Appearance shall reflect first-class work. Retighten brace guys and leave the lever restrained against the fence fabric or fence wires.

01050.45 Chain Link Fence:

(a) Concrete Footings - Construct concrete footings according to 01050.43(a-3).

(b) Chain Link Fence Rails and Tension Wires - Place longitudinal rails and longitudinal tension wires along the line of chain link fence, except at gates.

(1) Rails - Attach rails to end, gate and corner posts by clamps and sockets, and thread through loop caps on the end of line posts. Provide expansion sleeves or couplings at spacings not exceeding 200 feet in longitudinal top and bottom rails.

01050.45(b)

(2) Tension Wire - Attach tension wire to end, gate and corner posts by bands and clamps. Either thread the top tension wire through line post loop caps or hold in open slots in a manner to limit vertical movement. Tie or attach the bottom tension wire to the bottom of line posts by ties or clamps in a manner that prevents vertical movement. Provide tension wires with one turnbuckle or one ratchet take-up in each run of fence.

(c) Chain Link Fence Fabric and Wire - Assemble and install chain link fence fabric and wire according to 01050.44 and the following:

(1) Splicing Fabric - Use spiral pickets of specified chain link fabric material for fabric splices. Use wrap or telephone type splices for tension wire and barbed wire with each end wrapped around the other wire for not less than six complete turns.

(2) Fastening Fabric - Fasten fabric to end, gate and corner posts and to gate frames as shown. Attach fabric to line posts with wire ties at top and bottom and at intermediate spacings not exceeding 18 inches. Fasten fabric to top and bottom rails and to longitudinal tension wires with metal bands or tie wires spaced as shown, but in no case greater than 24 inches apart.

(3) Screening Pickets - If shown, insert the screening pickets vertically in each diamond.

01050.46 Protective Fence for Bridges - If welding of special connections for protective fence is required, pre-qualification of welders will not be required and inspection of welding will be visual.

01050.47 Fence Grounding:

(a) General - Except for bridge protective fence, provide at least one "ground" for each run of fence and place at any post within the run according to 00960.50(b). Fence grounding for bridge protective fence is not required.

Fasten each line of barbed wire, alternate longitudinal wires of fence fabric, and the rails and tension wire of chain link fences to the ground wire by clamps. Clamp the ground wires to the grounding rods.

(b) At Electrical Lines - Ground the fence directly below the point of crossing at each location where an electric transmission, distribution or secondary line crosses over the fence.

Ground the fence at each end or gate post or at intervals not to exceed 500 feet when an electric transmission, distribution or secondary line runs parallel or nearly parallel to and within 100 feet of the fence.

01050.48 Gate Installation:

(a) Metal Gates - Install metal gates and fittings between gate posts previously set as specified. Firmly attach the fittings to the posts and gates. Hinge each single gate in a manner which will prevent removal of the gate without tools. Set the gate in an approximately horizontal plane to swing freely inward and outward, and so it can be fastened securely in its latch holder, or in the case of double gates, in its latch holder and gate stops. Set double gates on their respective hinge pintles to provide a common horizontal plane in which each single gate swings.

Gates shall swing open at least of 90° in each direction.

(b) Gateways - Construct gateways of the same material as the fence and as shown. Construct wire splices according to 01050.44(b). Provide a taut and well-aligned closure of the opening, capable of being readily opened and closed by hand.

01050.49 Removing and Rebuilding Fence - Remove and rebuild existing fences as shown or directed. Construct fences to approximately the same condition as the original fence. Salvage the materials in existing fences to be removed and rebuilt and incorporate in the rebuilt fences. Replace fence materials damaged beyond reuse at no additional cost to the Agency. Firmly reset posts to the staked alignment. Post spacing and the number of wires to be strung and stapled to the posts shall be the same as the original fence. Furnish and use new staples or clips to fasten the wires to the posts.

Measurement

01050.80 Measurement - The quantities of fences, protective fences, gates, and associated items performed under this Section will be measured according to the following:

(a) Barbed and Woven Wire Fence and Gateways - Barbed wire fence, woven wire fence, and barbed and woven wire fence will be measured on the length basis. Gateways will be considered as fence of the type which adjoins them, and will be measured as a continuing part of that type of fence. Measurement will be from center to center of posts, measured along the line and grade of each separate continuous run of fence as constructed, exclusive of gates. Where existing fences are extended to intersect the new fence, the length of extension, from point of joining to the center of the new end post, will be measured and included for payment, if similar in design or type to a Pay Item, otherwise this work will be paid for according to 00140.60.

(b) Metal Gates for Barbed and Woven Wire Fence - Metal gates for barbed and woven wire fence will be measured on a unit basis of each size of single gate and of each size of double gate, respectively. The size designation of gates for barbed wire and woven wire fence gates will be by width. The width will be the width of opening the gate is to fit.

(c) Chain Link Fence - Chain link fence will be measured on the length basis. Measurement will be from center to center of posts, measured along the line and grade of each separate continuous run of fence as constructed, exclusive of gates.

(d) Metal Gates for Chain Link Fence - Chain link fence metal gates will be measured on a unit basis of each size of single gate and of each size of double gate, respectively. The size designation of chain link fence gates will be by width and height. The width will be the width of opening the gate is to fit.

(e) Protective Fence for Bridges - Bridge protective fence will be measured on the length basis. Measurement will be between beginning and ending locations as shown.

(f) Removing and Rebuilding Fence - Removing and rebuilding existing fence will be measured on the length basis, including gates. Measurement will be from center to center of posts, measured along the line and grade of fence removed and reconstructed.

Payment

01050.90 Payment - The accepted quantities of fences, protective fences, gates, and associated items performed under this Section will be paid for according to the following:

(a) Barbed and Woven Wire Fence - Barbed and woven wire fence and gates will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Type ____ Fence	Foot
(b) ____ Foot Single Gates	Each
(c) ____ Foot Double Gates	Each

In item (a) the type of fence will be inserted in the blank.

In items (b) and (c) the width of the gate opening will be inserted in the blank.

(b) Chain Link Fence - Chain link fence and gates will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) ____ Chain Link Fence	Foot
(b) ____ Chain Link Fence with ____	Foot
(c) ____ Foot x ____ Inch Chain Link Single Gates	Each
(d) ____ Foot x ____ Inch Chain Link Double Gates.....	Each

In item (a) the type of fence will be inserted in the blank.

In item (b) the type of fence will be inserted in the first blank and the type of material or pickets used for screening will be inserted in the second blank.

In items (c) and (d) the width of the gate opening will be inserted in the first blank and the height of gate be inserted in as the second blank.

(c) Protective Fence for Bridges - Bridge protective fence will be paid for at the Contract unit price, per foot, for the item " ____ Foot Type ____ Protective Fence".

The height of the fence will be inserted in the first blank. The type of fence will be inserted in the second blank.

(d) Removing and Rebuilding Fence - Removing and rebuilding fence will be paid for at the Contract unit price, per foot, for the item "Removing and Rebuilding Fence".

New material necessary to complete the rebuilding of fence will be included in payment made for the removing and rebuilding fence item.

Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

Payment for materials, equipment, and labor involved in constructing panels of fence additional to normal fence construction at waterways and at ground surface depressions, according to 01050.44(e) and (f), will be paid for according to Section 00196.

Section 01070 - Mailbox Supports

Description

01070.00 Scope - This work consists of removing and maintaining mailboxes and supports at temporary locations during construction, and installing mailboxes and newspaper boxes affected by construction on new supports at permanent locations as shown or directed.

Materials

01070.10 Reinforcement - Furnish reinforcement for concrete collars meeting the requirements of Section 00530.

01070.11 Concrete - Furnish concrete for concrete collars meeting the requirements of Section 00440.

01070.12 Tube Support Frame - Furnish tube support frames meeting either of the following requirements:

- Requirements of ASTM A 500, Grade B, and galvanized according to AASHTO M 111 (ASTM A 123).
- Tensile requirements of ASTM A 53, Grade B, and galvanized with a minimum 0.9 ounce per square foot coating, as tested according to ASTM A 90, on the exterior surface followed by a chromate conversion coating and a cross link polyurethane acrylic coating. A zinc base corrosive resistant interior coating shall also be applied.

01070.13 Mounting Brackets and Hardware - Furnish mailbox mounting brackets, angles, adapter plates, and hardware as shown and galvanize according to AASHTO M 232 (ASTM A 153). Furnish mounting brackets for newspaper boxes as shown on the standard drawings.

01070.14 Post Mounting Socket - Furnish Flush V-Wing Post Mounting Socket manufactured by Foresight Industries of Cheyenne, Wyoming, or an approved equal.

Construction

01070.40 General - Protect and maintain mailboxes and supports at locations accessible to the delivery agent and as convenient as possible for the public being served. This may require removing and relocating the mailboxes and supports more than once to maintain service. When roadway construction is completed, install the mailboxes and newspaper boxes on new supports in their permanent locations as shown or directed.

Repair damaged galvanized surfaces, such as the cut end of the tube support frame or drilled holes, according to 02420.10(d), except add 1 1/2 ounces of leafing aluminum powder to each quart of high zinc dust content paint.

Install mounting brackets of the proper size to fit each existing mailbox.

If multiple supports are furnished for fewer than five mailboxes, install on the support Size 1 mounting brackets for the empty spaces.

If property owners want to keep the original mailbox support, place the support on the owner's property adjacent to the work. Otherwise, dispose of the original mailbox support according to 00290.20.

Measurement

01070.80 Measurement - The quantities of mailbox supports and concrete collars will be measured on the unit basis of each kind of mailbox support and the number of concrete collars, regardless of size, installed in permanent locations.

Payment

01070.90 Payment - The accepted quantities of mailbox supports and collars will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Single Mailbox Supports	Each
(b) Multiple Mailbox Supports	Each
(c) Mailbox Concrete Collars	Each

Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for:

- removing existing mailbox supports
- providing temporary installations
- installing new supports in permanent locations
- installing owner-furnished mailboxes and newspaper boxes

Section 01090 - Gravel Beds and Blankets

Description

01090.00 Scope - This work consists of preparing areas for gravel beds and gravel blankets, and furnishing and placing soil sterilant, weed control geotextile, and gravel bed aggregates or gravel blanket aggregates at locations shown or directed.

Materials

01090.10 Soil Sterilant - Furnish products with current legal labels listing active ingredients, which may include simazine, diuron, bromacil, sulfometuron-methyl, or from the QPL. Submit a sample of the proposed soil sterilant's registered label to the Engineer for approval before using.

01090.11 Weed Control Geotextile - Furnish the following weed control geotextiles:

- "Weed-Chek Landscape Mat"
- 3 ounce, UV stabilized, non-woven, polypropylene fabric
- 3.75 ounce, UV stabilized, needle-punched, polypropylene fabric
- Weed control geotextile from the QPL

01090.12 Aggregates - Furnish clean, uncrushed, nearly round rock for gravel beds and gravel blankets meeting the following gradation requirements:

Sieve Size	Gravel Bed 3/4" - 1/2" Percent Passing (by Weight)	Gravel Blanket 1 1/2" - 1/2"
2"		100
1 1/2"		80 - 100
1"	100	0 - 15
3/4"	80 - 100	-
1/2"	0 - 10	0 - 5

The Engineer may accept aggregates by visual inspection.

Construction

01090.40 General - Prepare gravel bed and gravel blanket areas, and furnish and place soil sterilant, geotextile, and aggregates as follows:

- (a) Excavation** - Excavate and shape the areas for gravel beds and gravel blankets as shown or directed and according to Section 00330.
- (b) Soil Sterilant** - Furnish and place the approved soil sterilant at a rate of application recommended by the Manufacturer. During use of soil sterilant strictly adhere to label cautions, especially those concerning existing plants or waterways in the immediate area.
- (c) Geotextile** - After the area has been treated with soil sterilant, place the weed control geotextile over the prepared ground surface according to 00350.41(a). Extend or lap the geotextile as follows:
 - **Gravel Beds** - Extend the geotextile approximately 2 inches up the sides of the bed and overlap at least 12 inches.

01090.40(c)

- **Gravel Blankets** - Lap the ends of the sheets 18 inches and the sides 12 inches.

(d) Aggregates - Place aggregate cover as follows:

- **Gravel Beds** - Cover the geotextile with gravel bed aggregates to the depth specified then level and roll with a water-filled landscape roller for a minimum of two complete coverages.
- **Gravel Blankets** - Cover the geotextile with gravel blanket aggregates to the depth specified or directed.

Measurement

01090.80 Measurement - The quantities of gravel beds will be measured on the volume basis.

The quantities of gravel blankets will be measured on the area basis by surface measurement of the material in place, limited to the established neat lines and grades.

Payment

01090.90 Payment - The accepted quantities of gravel beds and gravel blankets will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Gravel Beds	Cubic Yard
(b) Gravel Blanket	Square Yard

Payment will be payment in full for furnishing and placing all materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for excavation, soil sterilant, or weed control geotextile.