SECTION 805

SEEDING

805-1 DESCRIPTION

The work under this Section shall consist of furnishing all materials, preparing the soil and applying seed to all areas designated on the project plans or established by the Engineer. Seeding shall be Class I, Class II, or Class III, and shall be performed where indicated on the project plans and in conformance with the requirements of these specifications.

805-2 MATERIALS

805-2.01 General. Certificates of Compliance conforming to the requirements of Subsection 106-5.02 shall be submitted.

805-2.02 Seed. The species, strain or origin of seed shall be as designated herein unless the species, strain or seed origin is otherwise noted on the project plans or in the Special Provisions in which case that seed shall be used.

(A) Seed Mix No. 1: High Growing Mix

Botanical Name	**Common Name**	**PLS/ACRE**
Grasses		
Aristida purpurea	Purple Threeawn	3.0
Bouteloua curtipendula "Vaughn"	Sideoats Grama	3.0
Setaria macrostachya	Plains Bristle Grass	2.0
Sporobolus cryptandrus	Sand Drop Seed	1.0
Forbs		
Baileya multiradiata	Desert Marigold	1.5
Cassia covesii	Desert Senna	2.0
Eschscholtzia mexicana	Mexican Poppy	3.0
Sphaeralcea ambigua	Globe Mallow	2.0
Plantago Insularis	Desert Indian Wheat	4.0
Shrubs		
Encelia farinose	Brittlebush	3.0
Larrea Tridentata	Creosote Bush	4.0
Trees		
Acacia constricta	White Thorn Acacia	1.0
Acacia greggii	Cat Claw Acacia	1.5
Cercidium floridum	Blue Palo Verde	1.5
Prospis velutina	Velvet Mesquite	1.0

(B) Seed Mix No. 2: Low Growing Mix

Botanical Name	Common Name	PLS/ACRE
Aristida purpurea	Purple Threeawn	3.0
Baileya multiradiata	Desert Marigold	1.5
Bouteloua curtipendula "Vaughn"	Sideoats Grama	3.0
Cassia covesii	Desert Senna	2.0
Dyssodia acerosa	Scrubby Dogweed	1.0
Encelia farinose	Brittlebush	2.0
Eschscholtzia California	California Poppy	2.0
Eschscholtzia Mexicana	Mexican Poppy	2.0
Lupinus sparsiflorus	Desert Lupine	2.0
Phacelia campanularia	Bluebells	2.0
Sphaeracea ambigua	Globe Mallow	2.0
Plantago Insularis	Desert Indian Wheat	4.0

No substitution of species, strain, or origin of seed will be allowed unless evidence, showing that the specified materials are not reasonably available during the contract period, is submitted, in writing, by the contractor to the Engineer. The substitution of species, strains, or origins shall be made only with the written approval of the Engineer, prior to making said substitution.

The seed shall be delivered to the project site in standard, sealed, undamaged containers. Each container shall be labeled in conformance with Arizona Revised Statues and the U.S. Department of Agriculture rules and regulations under the Federal Seed Act. Labels shall indicate the variety of strain of seed, the percentage of germination, purity and weed content, and the date of analysis which shall not be more than nine months prior to the delivery date.

Legume seed shall be inoculated with appropriate bacteria cultures approved by the Engineer, in conformance with the culture manufacturers' instructions.

Seed that has become moldy, wet, or otherwise damaged, will not be acceptable. Seed shall be called for in pounds of pure, live seed (PLS), where PLS is defined as the product of seed germination (G) and seed Purity (P) all divided by 100.

(C) Hydroseed Mix: Hydroseed mix shall be comprised of the following:

Component	Application Rate (per acre)
Native Plant Seed (Pure Live Seed (PLS) for Class II Seed)	Lbs (per Special Provisions)
Wood Fiber Mulch	2000 lbs
Ammonium Phosphate Fertilizer (16-20-0)	200 lbs

805-2.03 Mulch.

(A) General. The type and application rate of mulch shall be as specified in the Special Provisions.

(B) Irrigated Areas. The slurry mix of seed, fertilizer, and wood cellulose fiber mulch for irrigated areas shall consist of or meet the following proportions:

Material	Rate
Seed	As noted on list
Fertilizer	300 lbs/acre
Wood Fiber Mulch	1,800 lbs/acre
Tacking Agent	120 lbs. Active ingredient/acre
Gro-Power or equal	1,000 lbs/acre

(C) Un-irrigated Areas: The slurry mix and soil amendments for un-irrigated areas shall be as follows:

(1) Site Preparation

Material	Rate
Gro-Power: 5-3-1 slow release fertilizer	1,000 lbs/acre
Ammonium phosphate (16-20-0)	200 lbs/acre

(2) Slurry Mix

Material	Rate
Hydrofiber: Cellulose fiber-mulch, Silva or equal	800 lbs/acre
Tackifier	80 lbs/active ingredient/acre
Starter Fertilizer: Ammonium Phosphate 16-20-0	100lbs/acre
Seed Mix	as specified

(3) Straw Mulch

Material	Rate
Straw (clean barley or wheat straw)	1.5 tons/acre
Hydrofiber	400 lbs/acre
Tackifier	150lbs./active ingredient/acre

(D) Wood Cellulose Fibers. Natural wood cellulose fiber shall have the property of dispersing readily in water and shall have no toxic effect when combined with seed or other materials. A colored dye which is non-injurious to plant growth may be used.

The wood cellulose fibers shall be manufactured such that:

After addition and agitation in slurry tanks containing fertilizers, seed, water, and other approved additives the fibers in the material will become uniformly suspended to form a homogeneous mixture.

When hydraulically sprayed on the ground the material will form a blotter like cover which is uniformly impregnated with seed.

The cover will allow the absorption of moisture and allow rainfall or applied water to percolate to the underlying soil.

(E) Straw. Straw shall be from oats, wheat, rye or other grain crops of current season as approved by the Engineer and shall be free from noxious weeds, molds or other objectionable material. Straw mulch shall be from the current season's crop and in an air dry condition suitable for placing with mulch blower equipment.

805-2.04 Water. Water shall be free of oil, acid, salts or other substances harmful to plants. The source shall be approved by the Engineer prior to use.

805-2.05 Tacking Agent. Unless the tacking agent is specified in the Special Provisions, the contractor shall submit the type and specifications of the tacking agent to the Engineer for approval. An approved tacking agent will have strong adhesive characteristics as well as imparting lubrication to the mixture to allow for the uniform dispersion of the hydroseed slurry. The tacking agent shall also have gelling properties to inhibit the tendency of water and fiber to move downhill as they are sprayed on steep slopes. The stabilizer should be soluble and readily disperse in water without the formation of gel balls or other coagulation or sedimentation. The tacking agent shall contain a plantago organic mucilard base with the active ingredient comprising 70 percent to 80 percent of the agent. The properties of the tacking agent shall not be adversely affected by the addition of fertilizers or other additives to the slurry mix.

805-2.06 Chemical Fertilizer. Chemical fertilizer shall be a commercially produced, pelleted, granular form derived from inorganic sources. Chemical fertilizer shall be furnished in standard containers with the name, weight, and analysis of the contents clearly marked. Chemical fertilizer shall be State inspected to meet 16-20-0 percentages where the first number represents the minimum percent of soluble nitrogen, the second number represents the minimum percent of available phosphoric acid, and the third number represents the minimum percent of water soluble potash.

805-2.07 Soil Conditioner. Soil conditioner (Gro-Power or equal) shall be derived from organic materials such as decomposed animal, vegetable, and mineral matter; shall be composted, relatively dry, friable, and pass a 1 inch sieve; shall not contain poultry, animal or human waste, pathogenic viruses, fly larvae, insecticides, herbicides, fungicides, or poisonous chemicals that would inhibit plant growth, and shall have the following certified chemical analysis:

Ingredient	Percentages (Minimum)
Nitrogen	5
Phosphoric Acid	3
Water Soluble Potash	1
Humus	50
Humic Acids	15
Soluble Metallic Iron	1
Ingredient	**Percentages (Minimum)**
Nitrogen	5
Phosphoric Acid	3
Water Soluble Potash	1
Humus	50
Humic Acids	15
Soluble Metallic Iron	1

805-3 CONSTRUCTION DETAILS

805-3.01 General. Seed shall be of the class and variety specified, and shall be applied at the rate specified in the Special Provisions.

The contractor shall notify the Engineer at least two days prior to commencing seeding operations.

Seeding operations shall not be performed when wind would prevent uniform application of materials or would carry seeding materials into areas not designated to be seeded.

Preparation of the areas for seeding shall be as specified herein and in the Special Provisions.

Equipment and methods of distributing seeding materials shall be such as to provide an even and uniform application of the seed, mulch and/or other materials in conformance with the specified rates.

Unless specified otherwise in the Special Provisions, seeding operations shall not be performed on undisturbed soil outside the clearing and grubbing limits of the project or on steep rock cuts.

805-3.02 Classes of Seeding.

(A) Seeding (Class I). Seeding (Class I) shall consist of furnishing and planting lawn seed.

Immediately before seeding, the surface area shall be raked or otherwise loosened to obtain a smooth friable surface free of earth clods, humps and depressions. Loose stones having a dimension greater than 1 inch and debris brought to the surface during cultivation shall be removed and disposed of by the contractor in a manner approved by the Engineer.

Where indicated on the project plans or specified in the Special Provisions, topsoil shall be placed and allowed to settle for at least 1 week prior to seeding. The topsoil shall be thoroughly watered at least twice during the settlement period.

Seed shall be uniformly applied in two directions at right angles to each other with one-half the specified application rate applied in each direction.

Immediately after seeding, the area shall be uniformly covered with screened manure at the rate of 1 cubic yard per 1,000 square feet and then watered until the ground is wet to a minimum depth of 2 inches.

Seeding areas flooded or eroded as a result of irrigation shall be repaired, reseeded and refertilized by the contractor at no additional cost to the Agency.

(B) Seeding (Class II). Seeding (Class II) shall consist of furnishing and planting range grass seed, flower seed and/or shrub seed, and includes mulching.

Where equipment can operate, the area to be seeded shall be prepared by disking, harrowing or by other approved methods of loosening the surface soil to an average depth of 6 inches. On slopes too steep for equipment to operate, the area shall be prepared by hand raking to the specified depth. On sloping areas, all disking, harrowing and raking shall be directional along the contours of the areas involved. Loose stones having a dimension greater than 4 inches brought to the surface during cultivation shall be removed and disposed of in a satisfactory manner prior to grading and seeding. All areas which are eroded shall be restored to the specified condition, grade and slope as directed prior to seeding.

On cut and fill slopes the operations shall be conducted in such a manner as to form minor ridges thereon to assist in retarding erosion and favor germination of the seed.

The contractor shall submit a batch (tank) mix for the Engineer's approval prior to mixing any seed/mulch slurry. Batch mixing and coverage will be monitored throughout seeding operations.

Care shall be taken during the seeding operations to prevent damage to existing trees and shrubs in the seeding area in conformance with the requirements of Subsection 107-12. Seed shall be drilled, broadcast or otherwise planted in the manner and at the rate specified in the Special Provisions.

The type of mulch, and the manner and rate of application shall be as specified in the Special Provisions.

Mulch material which is placed upon trees and shrubs, roadways, structures and upon any areas where mulching is not specified or is placed in excessive depths on mulching areas shall be removed as directed. Mulch materials which are deposited in a matted condition shall be loosened and spread uniformly over the mulching areas to the specified depth.

During seeding and mulching operations, care shall be exercised to prevent drift and displacement of materials. Any unevenness in materials shall be immediately corrected by the contractor.

Mulch shall be immediately affixed by crimping and tacking after application. The Engineer shall determine which areas are not conductive to anchoring by crimping and will direct the contractor to anchor such mulch by tacking only. No mulch shall be applied to seeding areas which cannot be crimped and/or tacked by the end of each day. Any drifting or displacement of mulch before crimping and/or tacking shall be corrected by the contractor, at no additional cost to the Agency.

If a tacking agent is specified in order to bind the straw and mulch in place, the type, rate and manner of application shall be as specified in the Special Provisions. Prior to the application of a tacking agent, protective covering shall be placed on all structures and objects where stains would be objectionable. All necessary means shall also be taken to protect the traveling public and vehicles from damage due to drifting spray.

Unless otherwise specified in the Special Provisions, Class II seeding areas shall not be watered after planting.

(C) Seeding (Class III). Seeding (Class III) shall consist of furnishing and planting range grass seed, flower seed and/or shrub seed, all without mulching.

Seeding (Class III) shall conform to the requirements specified under Subsection 805-3.02 (B), except that mulching will not be required.

Unless specified in the Special Provisions, Class III seeded areas shall not be watered after planting.

805-3.03 Hydroseeding. Hydroseeding (hydraulic seeding), using 1,500 pounds per acre of wood cellulose fiber, shall be an acceptable alternate for planting and mulching Seeding (Class I, II or III).

All machines used for hydroseeding shall be an approved type capable of continuous agitation of the slurry mixture during the seeding operation. Pump

pressure shall be such as to maintain a continuous non-fluctuating spray capable of reaching the extremities of the seeding area with the pump unit located on the roadbed. The sprayer shall be equipped to use the proper type of nozzles to obtain a uniform application on the various slopes and at the distance to be covered.

The seed, fertilizer, mulch, tacking agent (when required) and water shall be combined in the proportions of the various materials as provided in the Special Provisions and allowed to mix a minimum of 5 minutes prior to starting the application of the slurry. Seed shall be applied within 30 minutes after mixing with water.

Two hydroseed applications shall be required with both applications occurring within a 12-month period. The first hydroseed application shall occur within the contract time, in conformance with the construction schedule approved by the Engineer, and such that optimal application conditions exist. The second application shall be scheduled so as to again take full advantage of optimal seasonal application periods. The second application shall occur approximately six months after the first application but in no case more than 12 months. The second application shall require the same rate of hydroseed mix as the first application with its focus being on areas having little to no seed mix germination and other areas as directed by the Engineer.

The surface area to be seeded shall be prepared in conformance with Subsection 805-3.02 (B) Seeding (Class II).

Hydroseed deposited on adjacent trees and shrubs, roadways, in drainage ditches, on structures and on any areas where seeding is not specified or is placed in excessive depths on seeding areas shall be removed.

805-3.04 Preservation of Seeded Areas. The contractor shall protect seeded areas from damage by traffic or construction equipment. Surfaces eroded or otherwise damaged following seeding and prior to final acceptance shall be repaired by re-grading, reseeding and re-mulching as directed by the Engineer.

805-4 METHOD OF MEASUREMENT

Seeding (Class I), will be measured for payment by the square foot of ground surface measured to the nearest 1,000 square feet or as a single complete unit of work for each completed seeding application.

Application of Class I seeding using hydroseeding methods shall be measured for payment as provided above.

Seeding (Class II) and Seeding (Class III) will be measured for payment by the square foot of ground surface to the nearest 1,000 square feet seeded, by the acre to the nearest 0.1 acre or as a single complete unit of work for each completed seeding application.

Application of Class II and Class III seeding using hydroseeding methods shall be measured for payment as provided above.

805-5 BASIS OF PAYMENT

The accepted quantities of seeding, measured as provided above, will be paid for at the contract unit price indicated in the bidding schedule and will be considered as compensation, in full, for the item complete in place including all labor, equipment, materials, tools, supplies and incidentals necessary of the work in conformance with the requirements of this Section, the project plans, Special Provisions or as may be directed by the Engineer.

No separate payment will be made for the preservation or repair of seeded areas.