Appendix A

Seeding Specifications

730.1 DESCRIPTION

This work consists of preparing a seedbed and furnishing and planting seed on disturbed areas, except roadbeds, within the limits of the work.

730.2 MATERIALS

A. General: The seed shall comply with the requirements of the South Dakota Seed Law.

B. Origin Limitations: Grass seed furnished shall be the grass species listed in the plans. The Contractor may use one of the grass varieties listed in the plans for the specified grass species or the Contractor may use a different grass variety of the same grass species specified. If the Contractor uses a grass variety listed in the plans for the specified grass species, the grass seed origin limitations will not apply. If the Contractor uses a grass variety not listed in the plans for the specified grass species, the grass seed furnished must originate in South Dakota, North Dakota, Montana, Wyoming, Nebraska, Iowa, Minnesota, Kansas, Colorado, or Wisconsin. Grass seed grown outside this area may be approved after the Contractor has furnished written certification from three seed suppliers confirming seed grown within this area is not readily available.

Forb, sedge, rush, shrub, and wildflower seed must originate in the United States or Canada. Forb, sedge, rush, shrub, and wildflower seed grown outside the United States and Canada may be approved after the Contractor has furnished written certification from three seed suppliers confirming seed grown within the two countries is not readily available.

C. Seed Testing: Seed shall be tested within 9 months prior to planting, exclusive of the calendar month in which the test was completed. Testing shall be performed by a State Seed Lab, Commercial Seed Testing Lab, or a registered member of the Society of Commercial Seed Analysts (Registered Seed Technologist). A certified test report shall be furnished prior to the start of seeding operations. If the seed is not planted within the 9 month period, the Contractor shall have the seed retested for germination, as described above, and a current germination report with the certified test report shall be furnished prior to starting seeding operations. The retest will be based on a sample obtained from the seed out of compliance.

D. Labeling: Each bag of seed delivered to the project shall bear a tag which shows the following information:

1. Name and address of supplier.

2. County and project number for which seed is to be used.

3. Suppliers lot number for each kind of seed in the mixture.

4. Origin (where grown) for each kind of seed.

5. Purity, germination, and other information required by South Dakota Seed Law, for each kind of seed.

6. Pounds of bulk seed of each kind of seed in each bag.

7. Total pounds of bulk seed mixture in each bag.

8. Pounds of pure live seed (PLS) of each kind of seed in each bag.

9. Total pounds of PLS mixture in each bag.

10. Dormant seed and hard seed.

When bulk seed is referred to, it is defined as total seed, including PLS, inert matter, crop seed, and weed seed.

E. Inoculation of Legumes: Prior to seeding, legumes (alfalfa, clovers, etc.) shall be inoculated with fresh culture of the appropriate nitrogen fixing bacteria in accordance with instruction accompanying the inoculant. A certification of the inoculation shall be furnished.

730.3 CONSTRUCTION REQUIREMENTS

A. General Requirements: Within seasonal limitations, seeding shall be done as soon as finish grading and placing topsoil on each section have been completed.

Seeding or related work shall not be done when the ground is frozen or the condition of the soil is such that a satisfactory seedbed or uniform seed placement cannot be obtained. Seed shall not be sown, when the wind interferes with uniform seed application, or on areas under water.

Slopes shall be worked longitudinally, on contour, during the preparation of areas, drilling, and after seeding.

Fertilizing and mulching shall be provided as specified in Sections 731 and 732.

The Engineer may approve necessary adjustments in the requirements outlined to obtain the most satisfactory results under varying conditions.

B. Seasonal Limitations: Permanent seeding shall not be done between June 1 and August 1, without written authorization from the Region Engineer.

C. Application Rate: The seed mixture shall be applied at the plan specified rate of pounds of PLS per acre. If a retest of the seed mixture shows a reduction in PLS, adjustment of the seed mixture rate will not be made. Measurement will be reduced as set forth in Section 730.4.

The Contractor will be required to calibrate the drill or hydroseeder on each project. Calibration runs may be performed on areas to be seeded.

D. Cover Crop Seeding: When specified in the plans or directed by the Engineer, cover crop shall be seeded. Exception to the cover crop seeding may include areas where curb and gutter will be placed and areas as determined by the Engineer.

Cover crop seed shall consist of 56 pounds of oats, spring wheat, or winter wheat (minimum 75% PLS) per acre.

Cover crop seeding may be done at any time when the soil and weather conditions are suitable, as determined by the Engineer. Oats or spring wheat shall be used April through July and winter wheat shall be used August through November.

E. Equipment and Methods:

1. **Seedbed Preparation:** The Contractor shall work areas to be seeded to a depth of approximately 3 inches. The Contractor shall take every effort to obtain this depth on the first pass with tillage equipment. The Contractor shall remove and dispose of logs, stumps, brush, weeds, cobbles, and other foreign material which interferes with the proper operation of drills and other implements. After the initial seedbed preparation, the Contractor shall prepare seedbeds according to the type of grass seed mixture to be planted.

   a. **Turf Grass Seed Mixtures:** The Contractor shall remove rocks larger than 3/4 inch. The Contractor shall construct the surface to be seeded to the required cross section. The Contractor shall shape the surface to remove mounds and low spots to provide a smooth even surface to match grade and cross section as shown in the plans. After seeding and fertilizing, the seedbed shall be rolled or otherwise worked by a method approved by the Engineer to firm the seedbed and break up lumps and clods so they are no larger than 3/4 inch in size.

   b. **All Other Grass Seed Mixtures:** Lumps and clods exposed by the initial pass of tillage equipment over 3 inches in diameter shall be broken up. The implement used shall be a tool carrier with rigid shanks with sweeps or chisels, or a heavy duty disk as appropriate to the conditions. The implement shall have positive means of controlling depth of penetration. The number of passes required to break up lumps and clods shall be kept to a minimum. Working the soil to a fine pulverized condition shall be avoided. The final prepared seedbed shall be left in a roughened condition consisting mainly of lumps 2 to 3 inches in diameter, for maximum resistance to erosion. After seedbed preparation has been completed, the Contractor shall pick up and dispose of all loose stones and boulders having a vertical projection of 3 inches or more above the soil surface.

2. **Reseeding of Previously Seeded Areas:** Existing vegetation and cover crop shall be preserved for mulch. The seed shall be drilled directly into existing cover if possible, or by mowing and disking to permit penetration of drill openers and placement of seed to the specified depth.

3. Drilling: The specified seed mixture shall be uniformly drilled using a press drill equipped with individually mounted, adjustable, spring loaded, double disk furrow openers fitted with depth control bands or drums.

The depth control bands or drums shall be of a size to provide a final planting depth of 1/4 to 1/2 inch behind the press wheel.

The press drill shall be mounted on rear press wheels, which carry a major portion of the weight of the drill, and shall have no weight carrying wheels at the ends of the seedbox. The press wheels shall be mounted independently of the furrow openers. A press wheel shall follow directly behind each opener to compact the soil over the drill row.

Seeding may be done with drills other than press drills provided they are equipped with baffles, partitions, agitators, or augers which keep the seed distributed throughout the seed box. They must also have packer wheels which follow directly behind double disk furrow openers and provide compaction of the seeded drill rows similar to the compaction obtained by a press drill. No-till drills will be allowed for seeding into cover crop or existing vegetation as long as the seed is planted to the required depth.

The seedbox shall be equipped with positive feed mechanisms which will accurately meter the seed, and agitators which will prevent bridging in the seedbox and keep the seed uniformly mixed during drilling. The drill shall conform to the following:

Drill Width Maximums:

a. Single units.....10 feet
b. Flex coupled side by side units .....16 feet
(maximum two 8 foot members)
c. Max. drill row (openers) spacing .....8 inches

Each drill shall be equipped with a metering device which will measure the area covered by the drill.

Each drill shall be equipped with fabricated baffles or partitions mounted a maximum of 2 foot on centers and flush with the top of the seedbox and extending downward to within 4 inches of the bottom of the seedbox.

On areas where a press drill cannot be operated satisfactorily, hydraulic, cyclone or knapsack hand operated, or other broadcast type seeders may be used.

The Contractor shall rake or drag (incorporate) all seed broadcast within the top 1/4 to 1/2 inch of topsoil. The Engineer may waive this requirement when raking or dragging is deemed, in the Engineer’s sole discretion, not feasible by conventional methods.

4. **Hydroseeding:** The equipment shall be designed specifically for hydroseeding. The nozzle shall be adaptable to hydraulic seeding requirements. Storage tanks shall have a means of estimating the volume used or remaining in the tank.

F. Care during Construction and Final Inspection: Dirt ridges which result from seeding operations or from traffic shall be smoothed so they will not interfere with future mowing operations.

Following completion of seeding operations, foot, vehicular, or equipment traffic over the seeded area shall be avoided. Areas damaged from such traffic shall be reworked and reseeded.

Before the Acceptance of Field Work is made by the Area Office, any area on which the original seed has been lost or displaced shall be reseeded.

G. Excluded Areas: Certain areas outside the right-of-way widths which are devoted to cultivation, and undisturbed areas within the right-of-way widths which have a good growth of grass may be excluded from seeding operations.

730.4 METHOD OF MEASUREMENT

Permanent seed will be measured to the nearest pound of PLS furnished and planted. Unauthorized increases in the specified rate of seeding will not be measured for payment. Seed required for calibration of the drill will be measured. Reseeding of areas damaged from causes beyond the control of the Contractor will be measured and added to the original quantities used.

The weight of PLS is computed by multiplying the purity, times the sum of the germination and dormant seed value, times the weight of bulk seed applied. The purity, dormant seed, and germination values will be as shown on the bag tag. If the seed has been retested based on Section 730.2 C, the retested value will be used in determining PLS.

Cover crop seeding shall be measured per bushel. For purposes of measurement, one bushel of cover crop seed shall be considered to be 56 pounds of bulk seed regardless of whether oats, spring wheat, or winter wheat is used.

730.5 BASIS OF PAYMENT

Pure live seed will be paid for at the contract unit price per pound of permanent seed. Payment will be full compensation for the preparation of the seedbed, labor, tools, equipment, inoculant and its application, and incidentals necessary.

Cover crop seeding shall be paid for at the contract unit price per bushel. Payment will be full compensation for the preparation of the seedbed, labor, tools, equipment, inoculant and its application, and incidentals necessary.

731.1 DESCRIPTION

This work consists of furnishing and applying fertilizer material on areas to be seeded or sodded.

731.2 MATERIALS

A. Requirements: Fertilizer shall be a dry standard commercial product conforming to the South Dakota Fertilizer Law and subsequent amendments or revisions. Each brand and grade of fertilizer must be registered with the State Department of Agriculture. Each bag or container shall clearly show the net weight of the contents, the name and address of the manufacturer, the brand and grade, the guaranteed analysis of the contents showing the minimum percentages of total nitrogen, phosphoric acid, and water soluble potash available, in that order.

B. Condition: Fertilizer shall be in a condition which permits proper distribution.

C. Testing: Testing of fertilizer will not be required. Before fertilizer is approved for use, the Contractor shall submit a certified statement from the manufacturer stating that the fertilizer is registered for sale in South Dakota and complies with the South Dakota Fertilizer Law. The certified statement shall include the name of the Contractor, the project number, the county, and all information that appears on the containers, as listed in Section 731.2 A.

731.3 CONSTRUCTION REQUIREMENTS

A. Application: Fertilizer shall be applied not more than 48 hours prior to seeding. Fertilizer shall be applied by one of the following methods:

1. With a fertilizer attachment on the drill, which will place the fertilizer in a band on or near the drill row behind the openers during the drilling operations (preferred method).

2. By drilling in with an approved drill prior to seeding.

3. By spreading the fertilizer uniformly over the areas to be seeded prior to or during seedbed preparation (before final pass). This method will not be acceptable when seedbed preparation is not required.

4. Where the seed is sown by a hydraulic seeder, the required amount of fertilizer may be placed in the tank, mixed together with the water and the seed, and applied in the seeding operation.

5. By hand operated broadcaster following sod installation.

6. By equipment mounted broadcast spreaders on slopes flatter than 6:1.

B. Cleanup: The Contractor shall sweep all fertilizer misplaced on adjacent pavement onto the seedbed. The Contractor shall remove and dispose of all logs, stumps, brush and other foreign material exposed during fertilizer application including rocks larger than 3/4 inch in areas to be seeded with turf grass mixtures and rocks and clods having a vertical projection of 3 inches or more above the soil surface in all other areas.

C. Refertilizing: Before the Acceptance of Field Work is made by the Area Office, any area on which the original fertilizer has been lost or displaced shall be refertilized.

731.4 METHOD OF MEASUREMENT

Fertilizing will be measured to the nearest 0.01 ton or as specified in the plans.

Refertilizing of areas damaged by causes beyond the control of the Contractor will be measured and added to the original quantity used.

731.5 BASIS OF PAYMENT

Fertilizing will be paid for at the contract unit price per ton or as specified in the plans. Payment will be full compensation for furnishing, hauling, placing, labor, equipment, materials, tools, and incidentals necessary.

732.1 DESCRIPTION

This work consists of placing a mulch cover on slopes or other designated areas following seeding and fertilizing operations.

732.2 MATERIALS

A. Grass Hay or Straw Mulch: Grass hay or straw mulching material shall be free of noxious weed seeds and objectionable foreign matter. The mulch shall have been baled dry, in bales of approximately equal weight and shall be relatively dry when applied. Materials with noxious weed contamination or materials with characteristics unsuitable for the purpose intended will be rejected and the Contractor shall remove the contaminated material from the project.

Bromegrass is not an acceptable mulch.

B. Fiber Mulch: Fiber mulch shall contain no germination or growth inhibiting factors and shall have the property of becoming evenly dispersed and suspended when agitated in water. Fiber mulch that is blended with recycled paper is not allowed. When sprayed uniformly with hydraulic seeding equipment on the surface of the soil, the fibers shall form a blotter like ground cover, which will readily absorb water and allow infiltration to the underlying soil without restricting emergence of seedlings. Weight specification from suppliers, and for all applications, shall refer only to air dry weight of the fiber, considered to be 10% moisture.

The fiber mulch material shall be supplied in packages marked by the manufacturer to show the air dry weight content. Suppliers shall certify that laboratory and field testing of their product has been accomplished, and that it meets all of the foregoing requirements.

C. Bonded Fiber Matrix: Bonded fiber matrix shall consist of a continuous layer of elongated fiber strands held together by a water resistant bonding agent. The bonded fiber matrix shall be uniformly applied and shall have no gaps between the product and the seeded soil. The product shall be 100% biodegradable and composed of 90% wood fiber, 9% natural binder, and 1% organic and mineral activators (all by weight). The treatment shall be installed with hydraulic seeding equipment.

D. Fiber Reinforced Matrix: Fiber reinforced matrix shall consist of thermally processed fiber, crimped interlocking fibers, cross-linked hydrocolloidal polymer tackifiers, and activators. Fiber reinforced matrix shall form an intimate bond with the soil surface. The fiber reinforced matrix shall form a continuous, flexible, and lofty interlocking matrix that creates air spaces and water absorbing cavities to improve seed germination, reduce the impact of raindrop energy, and minimize soil loss. The treatment shall be installed with hydraulic seeding equipment.

732.3 CONSTRUCTION REQUIREMENTS

During mulching operations, suitable warning signs shall be provided in accordance with Section 7.10.

A. Grass Hay or Straw Mulch:

1. **Placing:** The mulch shall be placed within 48 hours after the seeding has been completed. Mulching operations shall not be performed during periods of high winds, which preclude the proper placing of the mulch. The placing of mulch shall begin on the windward side of the areas to be covered.

   The mulch shall be machine blown to uniformly distribute mulch over the seeded areas. The machine shall blow or eject mulch, by a constant air stream, that controls the amount of mulch. The machine shall cause a minimum of cutting or breakage of the mulch.

   Mulch containing excessive moisture, which prevents uniform feeding through the machine, shall not be used.

   Mulch shall be placed uniformly over the seeded areas at a rate of 2 tons per acre. Approximately 10% of the soil surface shall be visible through the mulch blanket prior to mulch tiller (punching) operation.

   Excessive cover, which will smother seedlings, shall be avoided. The Engineer may order the placement of mulch on any area where protection is necessary to forestall erosion or encourage turf establishment.

2. **Punching:** Immediately following application, the mulch, shall be punched into the soil by a mulch tiller consisting of a series of dull, flat disks with notched or cutout edges. The disks shall be approximately 20 inches in diameter, 1/4 inch thick, spaced approximately 8 inches apart and fitted with scrapers.

   Working width of the tiller shall not exceed 6 feet per member, but may be operated in gangs of not over three members. The tiller shall be operated on contour, except those on slopes 3:1 or steeper diagonal operation will be permitted.

   Tiller members shall be ballasted; to push mulch into the soil approximately 3 inches with ends exposed above the soil surface.

   The mulch tiller shall follow as closely as possible behind the mulcher. Mulch shall not be blown when wind velocity causes appreciable displacement before it can be anchored by the mulch tiller. More than one pass of the mulch tiller may be required to ensure adequate anchoring.

B. Fiber Mulch: Rate of application shall be 2,000 pounds per acre unless otherwise specified in the plans or by the Engineer. Excessive thickness of mulch, which will smother grass seedlings, shall be avoided.

Mulch shall be placed on a given area as soon as possible or within 48 hours after seeding as a separate operation. The Contractor shall allow the fiber mulch to cure a minimum of 18 hours prior to watering.

C. Bonded Fiber Matrix: Rate of application shall be 3900 pounds per acre and the mix shall consist of 50 pounds bonded fiber matrix to 125 gallons water unless otherwise specified in the plans or by the Engineer. Bonded fiber matrix shall be placed on a given area as soon as possible, or within 48 hours after seeding as a separate operation.

D. Fiber Reinforced Matrix: Fiber reinforced matrix shall not be placed in channels. Fiber reinforced matrix shall be placed on a given area as soon as possible and within 48 hours after seeding as a separate operation. Fiber reinforced matrix is effective upon application therefore does not require a curing time.

E. Care during Construction until Acceptance of Field Work: Traffic, either foot, equipment, or vehicle shall be avoided over the seeded and mulched areas.

Before the Acceptance of Field Work is made by the Area Office, any area on which the original mulch has been displaced shall be remulched.

732.4 METHOD OF MEASUREMENT

A. Grass Hay or Straw Mulch: Grass hay or straw mulching material will be measured to the nearest 0.1 ton of mulch applied. Reapplication in areas damaged from causes beyond the control of the Contractor will be measured and added to the original quantities used.

B. Fiber Mulch: Fiber mulch shall be measured to the nearest pound or ton, as specified in the plans, of mulch applied. Reapplication in areas damaged from causes beyond the control of the Contractor will be measured and added to the original quantities used.

C. Bonded Fiber Matrix: Bonded fiber matrix shall be measured to the nearest pound or ton, as specified in the plans, of matrix applied. Reapplication in areas damaged by means beyond the control of the Contractor will be measured and added to the original quantities used.

D. Fiber Reinforced Matrix: Fiber reinforced matrix shall be measured to the nearest pound or ton, as specified in the plans of matrix applied. Reapplication in areas damaged by means beyond the control of the Contractor will be measured and added to the original quantities used.

732.5 BASIS OF PAYMENT

A. Grass Hay or Straw Mulch: Grass hay or straw mulch will be paid for at the contract unit price per ton. Payment will be full compensation for furnishing, hauling, placing, punching, and for materials, equipment, labor, tools, and incidentals necessary.

B. Fiber Mulch: Fiber mulch will be paid for at the contract unit price per pound or ton, as specified in the plans. Payment will be full compensation for furnishing, hauling, and placing and for materials, equipment, labor, tools, and incidentals necessary.

C. Bonded Fiber Matrix: Bonded fiber matrix will be paid for at the contract unit price per pound or ton, as specified in the plans. Payment will be full compensation for furnishing, hauling, and placing and for materials, equipment, labor, tools, and incidentals necessary.

D. Fiber Reinforced Matrix: Fiber reinforced matrix will be paid for at the contract unit price per pound or ton as specified in the plans. Payment will be full compensation for furnishing, hauling, and placing and for materials, equipment, labor, tools, and incidentals necessary.

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This work consists of preparing a seedbed and furnishing and planting seed on disturbed areas, except roadbeds, within the limits of the work.

730.2 MATERIALS

A. General: The seed shall comply with the requirements of the South Dakota Seed Law.

B. Origin Limitations: Grass seed furnished shall be the grass species listed in the plans. The Contractor may use one of the grass varieties listed in the plans for the specified grass species or the Contractor may use a different grass variety of the same grass species specified. If the Contractor uses a grass variety listed in the plans for the specified grass species, the grass seed origin limitations will not apply. If the Contractor uses a grass variety not listed in the plans for the specified grass species, the grass seed furnished must originate in South Dakota, North Dakota, Montana, Wyoming, Nebraska, Iowa, Minnesota, Kansas, Colorado, or Wisconsin. Grass seed grown outside this area may be approved after the Contractor has furnished written certification from three seed suppliers confirming seed grown within this area is not readily available.

Forb, sedge, rush, shrub, and wildflower seed must originate in the United States or Canada. Forb, sedge, rush, shrub, and wildflower seed grown outside the United States and Canada may be approved after the Contractor has furnished written certification from three seed suppliers confirming seed grown within the two countries is not readily available.

C. Seed Testing: Seed shall be tested within 9 months prior to planting, exclusive of the calendar month in which the test was completed. Testing shall be performed by a State Seed Lab, Commercial Seed Testing Lab, or a registered member of the Society of Commercial Seed Analysts (Registered Seed Technologist). A certified test report shall be furnished prior to the start of seeding operations. If the seed is not planted within the 9 month period, the Contractor shall have the seed retested for germination, as described above, and a current germination report with the certified test report shall be furnished prior to starting seeding operations. The retest will be based on a sample obtained from the seed out of compliance.

D. Labeling: Each bag of seed delivered to the project shall bear a tag which shows the following information:

1. Name and address of supplier.

2. County and project number for which seed is to be used.

3. Suppliers lot number for each kind of seed in the mixture.

4. Origin (where grown) for each kind of seed.

5. Purity, germination, and other information required by South Dakota Seed Law, for each kind of seed.

6. Pounds of bulk seed of each kind of seed in each bag.

7. Total pounds of bulk seed mixture in each bag.

8. Pounds of pure live seed (PLS) of each kind of seed in each bag.

9. Total pounds of PLS mixture in each bag.

10. Dormant seed and hard seed.

When bulk seed is referred to, it is defined as total seed, including PLS, inert matter, crop seed, and weed seed.

E. Inoculation of Legumes: Prior to seeding, legumes (alfalfa, clovers, etc.) shall be inoculated with fresh culture of the appropriate nitrogen fixing bacteria in accordance with instruction accompanying the inoculant. A certification of the inoculation shall be furnished.

730.3 CONSTRUCTION REQUIREMENTS

A. General Requirements: Within seasonal limitations, seeding shall be done as soon as finish grading and placing topsoil on each section have been completed.

Seeding or related work shall not be done when the ground is frozen or the condition of the soil is such that a satisfactory seedbed or uniform seed placement cannot be obtained. Seed shall not be sown, when the wind interferes with uniform seed application, or on areas under water.

Slopes shall be worked longitudinally, on contour, during the preparation of areas, drilling, and after seeding.

Fertilizing and mulching shall be provided as specified in Sections 731 and 732.

The Engineer may approve necessary adjustments in the requirements outlined to obtain the most satisfactory results under varying conditions.

B. Seasonal Limitations: Permanent seeding shall not be done between June 1 and August 1, without written authorization from the Region Engineer.

C. Application Rate: The seed mixture shall be applied at the plan specified rate of pounds of PLS per acre. If a retest of the seed mixture shows a reduction in PLS, adjustment of the seed mixture rate will not be made. Measurement will be reduced as set forth in Section 730.4.

The Contractor will be required to calibrate the drill or hydroseeder on each project. Calibration runs may be performed on areas to be seeded.

D. Cover Crop Seeding: When specified in the plans or directed by the Engineer, cover crop shall be seeded. Exception to the cover crop seeding may include areas where curb and gutter will be placed and areas as determined by the Engineer.

Cover crop seed shall consist of 56 pounds of oats, spring wheat, or winter wheat (minimum 75% PLS) per acre.

Cover crop seeding may be done at any time when the soil and weather conditions are suitable, as determined by the Engineer. Oats or spring wheat shall be used April through July and winter wheat shall be used August through November.

E. Equipment and Methods:

1. **Seedbed Preparation:** The Contractor shall work areas to be seeded to a depth of approximately 3 inches. The Contractor shall take every effort to obtain this depth on the first pass with tillage equipment. The Contractor shall remove and dispose of logs, stumps, brush, weeds, cobbles, and other foreign material which interferes with the proper operation of drills and other implements. After the initial seedbed preparation, the Contractor shall prepare seedbeds according to the type of grass seed mixture to be planted.

   a. **Turf Grass Seed Mixtures:** The Contractor shall remove rocks larger than 3/4 inch. The Contractor shall construct the surface to be seeded to the required cross section. The Contractor shall shape the surface to remove mounds and low spots to provide a smooth even surface to match grade and cross section as shown in the plans. After seeding and fertilizing, the seedbed shall be rolled or otherwise worked by a method approved by the Engineer to firm the seedbed and break up lumps and clods so they are no larger than 3/4 inch in size.

   b. **All Other Grass Seed Mixtures:** Lumps and clods exposed by the initial pass of tillage equipment over 3 inches in diameter shall be broken up. The implement used shall be a tool carrier with rigid shanks with sweeps or chisels, or a heavy duty disk as appropriate to the conditions. The implement shall have positive means of controlling depth of penetration. The number of passes required to break up lumps and clods shall be kept to a minimum. Working the soil to a fine pulverized condition shall be avoided. The final prepared seedbed shall be left in a roughened condition consisting mainly of lumps 2 to 3 inches in diameter, for maximum resistance to erosion. After seedbed preparation has been completed, the Contractor shall pick up and dispose of all loose stones and boulders having a vertical projection of 3 inches or more above the soil surface.

2. **Reseeding of Previously Seeded Areas:** Existing vegetation and cover crop shall be preserved for mulch. The seed shall be drilled directly into existing cover if possible, or by mowing and disking to permit penetration of drill openers and placement of seed to the specified depth.

3. Drilling: The specified seed mixture shall be uniformly drilled using a press drill equipped with individually mounted, adjustable, spring loaded, double disk furrow openers fitted with depth control bands or drums.

The depth control bands or drums shall be of a size to provide a final planting depth of 1/4 to 1/2 inch behind the press wheel.

The press drill shall be mounted on rear press wheels, which carry a major portion of the weight of the drill, and shall have no weight carrying wheels at the ends of the seedbox. The press wheels shall be mounted independently of the furrow openers. A press wheel shall follow directly behind each opener to compact the soil over the drill row.

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The seedbox shall be equipped with positive feed mechanisms which will accurately meter the seed, and agitators which will prevent bridging in the seedbox and keep the seed uniformly mixed during drilling. The drill shall conform to the following:

Drill Width Maximums:

a. Single units.....10 feet
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(maximum two 8 foot members)
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4. **Hydroseeding:** The equipment shall be designed specifically for hydroseeding. The nozzle shall be adaptable to hydraulic seeding requirements. Storage tanks shall have a means of estimating the volume used or remaining in the tank.

F. Care during Construction and Final Inspection: Dirt ridges which result from seeding operations or from traffic shall be smoothed so they will not interfere with future mowing operations.

Following completion of seeding operations, foot, vehicular, or equipment traffic over the seeded area shall be avoided. Areas damaged from such traffic shall be reworked and reseeded.

Before the Acceptance of Field Work is made by the Area Office, any area on which the original seed has been lost or displaced shall be reseeded.

G. Excluded Areas: Certain areas outside the right-of-way widths which are devoted to cultivation, and undisturbed areas within the right-of-way widths which have a good growth of grass may be excluded from seeding operations.

730.4 METHOD OF MEASUREMENT

Permanent seed will be measured to the nearest pound of PLS furnished and planted. Unauthorized increases in the specified rate of seeding will not be measured for payment. Seed required for calibration of the drill will be measured. Reseeding of areas damaged from causes beyond the control of the Contractor will be measured and added to the original quantities used.

The weight of PLS is computed by multiplying the purity, times the sum of the germination and dormant seed value, times the weight of bulk seed applied. The purity, dormant seed, and germination values will be as shown on the bag tag. If the seed has been retested based on Section 730.2 C, the retested value will be used in determining PLS.

Cover crop seeding shall be measured per bushel. For purposes of measurement, one bushel of cover crop seed shall be considered to be 56 pounds of bulk seed regardless of whether oats, spring wheat, or winter wheat is used.

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A. Requirements: Fertilizer shall be a dry standard commercial product conforming to the South Dakota Fertilizer Law and subsequent amendments or revisions. Each brand and grade of fertilizer must be registered with the State Department of Agriculture. Each bag or container shall clearly show the net weight of the contents, the name and address of the manufacturer, the brand and grade, the guaranteed analysis of the contents showing the minimum percentages of total nitrogen, phosphoric acid, and water soluble potash available, in that order.

B. Condition: Fertilizer shall be in a condition which permits proper distribution.

C. Testing: Testing of fertilizer will not be required. Before fertilizer is approved for use, the Contractor shall submit a certified statement from the manufacturer stating that the fertilizer is registered for sale in South Dakota and complies with the South Dakota Fertilizer Law. The certified statement shall include the name of the Contractor, the project number, the county, and all information that appears on the containers, as listed in Section 731.2 A.

731.3 CONSTRUCTION REQUIREMENTS

A. Application: Fertilizer shall be applied not more than 48 hours prior to seeding. Fertilizer shall be applied by one of the following methods:

1. With a fertilizer attachment on the drill, which will place the fertilizer in a band on or near the drill row behind the openers during the drilling operations (preferred method).

2. By drilling in with an approved drill prior to seeding.

3. By spreading the fertilizer uniformly over the areas to be seeded prior to or during seedbed preparation (before final pass). This method will not be acceptable when seedbed preparation is not required.

4. Where the seed is sown by a hydraulic seeder, the required amount of fertilizer may be placed in the tank, mixed together with the water and the seed, and applied in the seeding operation.

5. By hand operated broadcaster following sod installation.

6. By equipment mounted broadcast spreaders on slopes flatter than 6:1.

B. Cleanup: The Contractor shall sweep all fertilizer misplaced on adjacent pavement onto the seedbed. The Contractor shall remove and dispose of all logs, stumps, brush and other foreign material exposed during fertilizer application including rocks larger than 3/4 inch in areas to be seeded with turf grass mixtures and rocks and clods having a vertical projection of 3 inches or more above the soil surface in all other areas.

C. Refertilizing: Before the Acceptance of Field Work is made by the Area Office, any area on which the original fertilizer has been lost or displaced shall be refertilized.

731.4 METHOD OF MEASUREMENT

Fertilizing will be measured to the nearest 0.01 ton or as specified in the plans.

Refertilizing of areas damaged by causes beyond the control of the Contractor will be measured and added to the original quantity used.

731.5 BASIS OF PAYMENT

Fertilizing will be paid for at the contract unit price per ton or as specified in the plans. Payment will be full compensation for furnishing, hauling, placing, labor, equipment, materials, tools, and incidentals necessary.

732.1 DESCRIPTION

This work consists of placing a mulch cover on slopes or other designated areas following seeding and fertilizing operations.

732.2 MATERIALS

A. Grass Hay or Straw Mulch: Grass hay or straw mulching material shall be free of noxious weed seeds and objectionable foreign matter. The mulch shall have been baled dry, in bales of approximately equal weight and shall be relatively dry when applied. Materials with noxious weed contamination or materials with characteristics unsuitable for the purpose intended will be rejected and the Contractor shall remove the contaminated material from the project.

Bromegrass is not an acceptable mulch.

B. Fiber Mulch: Fiber mulch shall contain no germination or growth inhibiting factors and shall have the property of becoming evenly dispersed and suspended when agitated in water. Fiber mulch that is blended with recycled paper is not allowed. When sprayed uniformly with hydraulic seeding equipment on the surface of the soil, the fibers shall form a blotter like ground cover, which will readily absorb water and allow infiltration to the underlying soil without restricting emergence of seedlings. Weight specification from suppliers, and for all applications, shall refer only to air dry weight of the fiber, considered to be 10% moisture.

The fiber mulch material shall be supplied in packages marked by the manufacturer to show the air dry weight content. Suppliers shall certify that laboratory and field testing of their product has been accomplished, and that it meets all of the foregoing requirements.

C. Bonded Fiber Matrix: Bonded fiber matrix shall consist of a continuous layer of elongated fiber strands held together by a water resistant bonding agent. The bonded fiber matrix shall be uniformly applied and shall have no gaps between the product and the seeded soil. The product shall be 100% biodegradable and composed of 90% wood fiber, 9% natural binder, and 1% organic and mineral activators (all by weight). The treatment shall be installed with hydraulic seeding equipment.

D. Fiber Reinforced Matrix: Fiber reinforced matrix shall consist of thermally processed fiber, crimped interlocking fibers, cross-linked hydrocolloidal polymer tackifiers, and activators. Fiber reinforced matrix shall form an intimate bond with the soil surface. The fiber reinforced matrix shall form a continuous, flexible, and lofty interlocking matrix that creates air spaces and water absorbing cavities to improve seed germination, reduce the impact of raindrop energy, and minimize soil loss. The treatment shall be installed with hydraulic seeding equipment.

732.3 CONSTRUCTION REQUIREMENTS

During mulching operations, suitable warning signs shall be provided in accordance with Section 7.10.

A. Grass Hay or Straw Mulch:

1. **Placing:** The mulch shall be placed within 48 hours after the seeding has been completed. Mulching operations shall not be performed during periods of high winds, which preclude the proper placing of the mulch. The placing of mulch shall begin on the windward side of the areas to be covered.

   The mulch shall be machine blown to uniformly distribute mulch over the seeded areas. The machine shall blow or eject mulch, by a constant air stream, that controls the amount of mulch. The machine shall cause a minimum of cutting or breakage of the mulch.

   Mulch containing excessive moisture, which prevents uniform feeding through the machine, shall not be used.

   Mulch shall be placed uniformly over the seeded areas at a rate of 2 tons per acre. Approximately 10% of the soil surface shall be visible through the mulch blanket prior to mulch tiller (punching) operation.

   Excessive cover, which will smother seedlings, shall be avoided. The Engineer may order the placement of mulch on any area where protection is necessary to forestall erosion or encourage turf establishment.

2. **Punching:** Immediately following application, the mulch, shall be punched into the soil by a mulch tiller consisting of a series of dull, flat disks with notched or cutout edges. The disks shall be approximately 20 inches in diameter, 1/4 inch thick, spaced approximately 8 inches apart and fitted with scrapers.

   Working width of the tiller shall not exceed 6 feet per member, but may be operated in gangs of not over three members. The tiller shall be operated on contour, except those on slopes 3:1 or steeper diagonal operation will be permitted.

   Tiller members shall be ballasted; to push mulch into the soil approximately 3 inches with ends exposed above the soil surface.

   The mulch tiller shall follow as closely as possible behind the mulcher. Mulch shall not be blown when wind velocity causes appreciable displacement before it can be anchored by the mulch tiller. More than one pass of the mulch tiller may be required to ensure adequate anchoring.

B. Fiber Mulch: Rate of application shall be 2,000 pounds per acre unless otherwise specified in the plans or by the Engineer. Excessive thickness of mulch, which will smother grass seedlings, shall be avoided.

Mulch shall be placed on a given area as soon as possible or within 48 hours after seeding as a separate operation. The Contractor shall allow the fiber mulch to cure a minimum of 18 hours prior to watering.

C. Bonded Fiber Matrix: Rate of application shall be 3900 pounds per acre and the mix shall consist of 50 pounds bonded fiber matrix to 125 gallons water unless otherwise specified in the plans or by the Engineer. Bonded fiber matrix shall be placed on a given area as soon as possible, or within 48 hours after seeding as a separate operation.

D. Fiber Reinforced Matrix: Fiber reinforced matrix shall not be placed in channels. Fiber reinforced matrix shall be placed on a given area as soon as possible and within 48 hours after seeding as a separate operation. Fiber reinforced matrix is effective upon application therefore does not require a curing time.

E. Care during Construction until Acceptance of Field Work: Traffic, either foot, equipment, or vehicle shall be avoided over the seeded and mulched areas.

Before the Acceptance of Field Work is made by the Area Office, any area on which the original mulch has been displaced shall be remulched.

732.4 METHOD OF MEASUREMENT

A. Grass Hay or Straw Mulch: Grass hay or straw mulching material will be measured to the nearest 0.1 ton of mulch applied. Reapplication in areas damaged from causes beyond the control of the Contractor will be measured and added to the original quantities used.

B. Fiber Mulch: Fiber mulch shall be measured to the nearest pound or ton, as specified in the plans, of mulch applied. Reapplication in areas damaged from causes beyond the control of the Contractor will be measured and added to the original quantities used.

C. Bonded Fiber Matrix: Bonded fiber matrix shall be measured to the nearest pound or ton, as specified in the plans, of matrix applied. Reapplication in areas damaged by means beyond the control of the Contractor will be measured and added to the original quantities used.

D. Fiber Reinforced Matrix: Fiber reinforced matrix shall be measured to the nearest pound or ton, as specified in the plans of matrix applied. Reapplication in areas damaged by means beyond the control of the Contractor will be measured and added to the original quantities used.

732.5 BASIS OF PAYMENT

A. Grass Hay or Straw Mulch: Grass hay or straw mulch will be paid for at the contract unit price per ton. Payment will be full compensation for furnishing, hauling, placing, punching, and for materials, equipment, labor, tools, and incidentals necessary.

B. Fiber Mulch: Fiber mulch will be paid for at the contract unit price per pound or ton, as specified in the plans. Payment will be full compensation for furnishing, hauling, and placing and for materials, equipment, labor, tools, and incidentals necessary.

C. Bonded Fiber Matrix: Bonded fiber matrix will be paid for at the contract unit price per pound or ton, as specified in the plans. Payment will be full compensation for furnishing, hauling, and placing and for materials, equipment, labor, tools, and incidentals necessary.

D. Fiber Reinforced Matrix: Fiber reinforced matrix will be paid for at the contract unit price per pound or ton as specified in the plans. Payment will be full compensation for furnishing, hauling, and placing and for materials, equipment, labor, tools, and incidentals necessary.