

## DIVISION 16 EROSION CONTROL AND ROADSIDE DEVELOPMENT

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### SECTION 1605 TEMPORARY SILT FENCE

#### 1605-1 DESCRIPTION.

Furnish material, construct, maintain, and remove temporary silt fence in locations shown on the plans or in locations that require surface drainage to be filtered.

#### 1605-2 MATERIALS.

##### (A) Posts:

Provide wood or steel post meeting the following requirements:

- Wood post:
  - ◆ Minimum 6 feet (1.8 meters) long.
  - ◆ Minimum 3 inches (76.2mm) in nominal diameter.
  - ◆ Straight enough to provide a fence without noticeable misalignment.
  - ◆ Structurally sound enough to support fence loading.
- Steel post:
  - ◆ Minimum 5 feet (1.5 meters) long.
  - ◆ Minimum 1 3/8 inches (34.9 mm) wide measured parallel to the fence.
  - ◆ Minimum weight of 1.25 lb/ft (1.86 kg/m) of length.
  - ◆ Equipped with an anchor plate with minimum area of 14.0 square inches (9032.1 square mm).
  - ◆ Have a means of retaining wire and fabric in the desired position without displacement.

##### (B) Woven Wire Fence:

Provide woven wire fence meeting the following requirements:

- Minimum 32 inches (812.8 mm) high.
- Minimum 5 horizontal wires.
- Vertical wires spaced 12 inches (304.8 mm) apart.
- Minimum 10 gage top and bottom wires.
- Minimum 12 1/2 gage all other wires.

##### (C) Filter Fabric:

Provide Type 3 engineering fabric, Class A or B meeting the requirements of Section 1056.

##### (D) Attachment Device:

Provide No. 9 staple with a minimum length of 1 1/2 inches (38.1 mm) or other approved attachment device (eg., Plastic tie)

#### 1605-3 INSTALLATION.

- Install in locations as shown on the plans or as directed.
- Install wire and fabric as shown in Standard Drawings.

Class B synthetic filter fabric may be used without the woven wire fence backing, subject to the following conditions:

1. Maximum post spacing of 6 feet (1.8 m).
2. Fabric is approved by the Engineer.
3. Post spacing is inclined toward the runoff source, at an angle of not more than 20 degrees from vertical.

- Install post with no more than 3 feet (0.9 m) of the post appearing above ground.
- Attach filter fabric to the wire fence with wire or other acceptable methods.
- Overlap filter fabric a minimum of 18 inches (457.2mm) at splice joints.
- Install fabric that is free of defects, rips, holes, flaws, deterioration, or damage.

**1605-4 MAINTENANCE AND REMOVAL.**

- Maintain the silt fence until the project is accepted or until the fence is removed.
- Remove and replace deteriorated or ineffective filter fabric.
- Remove and dispose of silt accumulations in accordance with Section 1630 when necessary or as directed.
- Leave silt fence in place until site stabilization and remove at project completion.
- Removed silt fence becomes the property of the contractor.
- Dress and seed and mulch all areas where silt fence is removed in accordance with Section 1660.

**1605-5 METHOD OF MEASUREMENT**

Temporary silt fence will be measured by the linear foot (linear meter), as accepted in place, along the ground line of the fence.

Removal and disposal of silt accumulations will be measured as provided in Section 1630.

Seeding and mulching will be measured as provided in Section 1660.

**1605-6 BASIS OF PAYMENT.**

Payment will be made for quantities as measured in Article 1605-5, for the pay items listed below. The provisions of Article 104-5 pertaining to revised contract prices for overrunning minor items will not apply to this item. No revision in the contract unit price will be allowed because of any overrun or underrun.

Payment will be made under:

Temporary Silt Fence.....Linear Foot (Linear Meter)

**SECTION 1610  
STONE FOR EROSION CONTROL**

**1610-1 DESCRIPTION.**

Furnish, stockpile if directed, place, and maintain an approved stone for construction of erosion control devices at ditches, diversions, swales, pipe inlets, pipe outlets, drainage turnouts, and at other locations designated on the plans or as directed. The work includes but is not limited to furnishing, weighing, stockpiling, rehandling, placing, and maintaining stone; and disposal of any stone not incorporated into the project when necessary.

**1610-2 MATERIALS.**

Refer to Division 10:

Stone for erosion control ..... Article 1042-1  
Sediment control stone .....Section 1005

**1610-3 CONSTRUCTION METHODS.**

Place stone, in locations and to the thickness, widths, and lengths as shown on the plans or as directed. Construct erosion control devices in accordance with the plans neatly and uniformly with an even surface and meeting the requirements of the plans.

**1610-4 METHOD OF MEASUREMENT.**

The quantity of stone to be paid for will be the actual number of tons (metric tons) of each class of stone which has been incorporated into the work, or has been delivered to and stockpiled on the project as directed. Stone placed in the stockpile will not be measured a second time. Measure stone by weighing in trucks on certified platform scales or other certified weighing devices.

**1610-5 BASIS OF PAYMENT.**

The quantity of stone, measured as provided in Article 1610-4, will be paid for at the contract unit price per ton (metric ton) for "Stone for Erosion Control, Class\_\_\_\_\_."

The quantity of sediment control stone, measured as provided in Article 1610-4, will be paid for at the contract unit price per ton (metric ton) for Sediment Control Stone.

Payment will be made under:

Stone for Erosion Control, Class \_\_\_\_\_..... Ton (Metric Ton)  
 Sediment Control Stone ..... Ton (Metric Ton)

**SECTION 1615  
 TEMPORARY MULCHING**

**1615-1 DESCRIPTION.**

Furnish, place, and secure mulch material to prevent excessive soil erosion during construction operations where it is impossible or impractical to perform permanent seeding and mulching.

The actual conditions which occur during the construction of the project will determine the quantity of mulching. The quantity of mulching may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of work.

**1615-2 MATERIALS.**

Refer to Division 10:

Mulch for erosion control..... Article 1060-5

Use an undiluted emulsified asphalt for tacking material.

**1615-3 APPLICATION.**

Place temporary mulch promptly at locations on temporarily seeded or non-seeded areas when so directed.

Spread mulch uniformly over the area by hand or by means of appropriate mechanical spreaders or blowers to obtain a satisfactory uniform cover. A satisfactory application of temporary mulch on non-seeded areas consists of a sufficient amount to completely and uniformly cover the ground.

When temporary mulching is performed in conjunction with temporary seeding, apply mulch in accordance with Article 1660-6. Complete mulching and tacking within 24 hours. Exercise care to prevent displacement of soil and seed or other damage to areas where temporary seeding is done.

Apply a sufficient amount of asphalt or other type binding material when using grain straw to assure that the temporary mulch is properly held in place. Take adequate precautions to prevent damage to traffic, structures, guardrails, traffic control devices, or

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any other appurtenances during the application of binding material. Provide adequate covering or change methods of application as required to prevent such damage. Repair any damage that occurs, including any necessary cleaning.

Take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and promptly remove any blockage to drainage facilities.

**1615-4 METHOD OF MEASUREMENT.**

The quantity of temporary mulching to be paid for will be the number of acres (hectare), measured along the surface of the ground over which temporary mulch has been placed as directed and accepted.

**1615-5 BASIS OF PAYMENT.**

The quantity of temporary mulching is to be paid for at the contract unit price per acre (hectare) for "Temporary Mulching".

Payment will be made under:

Temporary Mulching .....Acre (Hectare)

**SECTION 1620  
TEMPORARY SEEDING**

**1620-1 DESCRIPTION.**

Seed and mulch selected areas in advance of the permanent seeding and mulching operations to minimize erosion of graded areas during construction operations. The work includes preparing seedbeds; furnishing, placing, and covering fertilizer and seed; furnishing and placing mulch; and other operations necessary for seeding the required areas.

Perform temporary seeding promptly at the locations and under any of the following conditions when directed:

1. When it is impossible or impractical to bring an area to the final line, grade, and finish so that permanent seeding and mulching operations can be performed without subsequent serious disturbance by additional grading;
2. When erosion occurs or is considered to be potentially substantial on areas of graded roadbed where construction operations are temporarily suspended or where the grading of the roadbed has been completed substantially in advance of the paving construction;
3. During seasons of the year when permanent seeding and mulching is prohibited by the special provisions;
4. When an immediate cover would be desirable to minimize erosion, siltation, or pollution on any area.

The actual conditions which occur during the construction of the project will determine the quantity of seed or fertilizer to be used. The quantity of seed or fertilizer may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1620-2 MATERIALS.**

Refer to Division 10:

Fertilizer ..... Article 1060-2  
 Seed ..... Article 1060-4  
 Mulch for Erosion Control ..... Article 1060-5

See the special provisions for analysis of fertilizer and the kinds of seed.

**1620-3 SEEDBED PREPARATION.**

Scarify areas to be seeded to a depth of not less than 5 inches (127 mm) unless directed otherwise. The soil conditions and topography will determine the required depth of the seedbed.

Prepare the surface to be seeded with adequate furrows, ridges, terraces, trenches, or other irregularities in which seeding materials can lodge with reasonable assurance that the materials will not be easily displaced by wind, rain, or surface runoff.

**1620-4 APPLYING AND COVERING FERTILIZER AND SEED.**

The analysis of fertilizer, the kinds of seed, and the rates of application of fertilizer and seed must be as stated in the special provisions.

Apply no fertilizer or seed when the Engineer determines that conditions are unfavorable for such operations.

Distribute the fertilizer or seed uniformly over the seedbed at the required rates of applications.

Cover fertilizer and seed unless otherwise directed. If covering is required, provide it to the depth acceptable to the Engineer for the prevention of displacement by wind, rain, or surface runoff.

Mulch all areas temporarily seeded, in accordance with Section 1615, unless otherwise indicated in the special provisions or as directed.

The provisions of Article 1660-5 will be applicable to the approval of equipment; the use of liquid fertilizer; and the protection of traffic, structures, guardrails, traffic control devices, and other appurtenances.

**1620-5 MOWING AND REPAIR OF TEMPORARY SEEDING.**

Maintain areas where temporary seeding is performed in a satisfactory condition, including mowing at the locations and times as directed.

Repair areas of temporary seeding which have been damaged or have failed. Repair includes reshaping or the placing of additional earth material and repeating the seeding process.

**1620-6 METHOD OF MEASUREMENT.**

**(A) Seed:**

The quantity of seed to be paid for will be the actual number of pounds (kg) of seed which have been applied in accordance with these specifications. The weight of seed will be determined by bag count of standard weight bags or by weighing the seed on certified platform scales or other certified weighing devices.

**(B) Fertilizer:**

The quantity of fertilizer to be paid for will be the actual number of tons (metric tons) of fertilizer which have been applied in accordance with these specifications.

The weight of dry fertilizer will be determined by bag count of standard weight bags, or by weighing the fertilizer in trucks on certified platform scales or other certified weighing devices.

The weight of liquid fertilizer will be the equivalent weight in tons (metric tons) of dry fertilizer based on available plant food.

**(C) Mulching:**

The quantity of mulching to be paid for will be measured as provided in Section 1615-4.

**(D) Mowing:**

The quantity of mowing to be paid for will be measured as provided in Subarticle 1660-8(B).

**1620-7 BASIS OF PAYMENT.**

**(A) Seed:**

The quantity of seed, measured as provided in Subarticle 1620-6(A), will be paid for at the contract unit price per pound (kg) for "Seed for Temporary Seeding."

**(B) Fertilizer:**

The quantity of fertilizer, measured as provided in Subarticle 1620-6(B), will be paid for at the contract unit price per ton (metric ton) for "Fertilizer for Temporary Seeding."

**(C) Mulching:**

Mulching will be paid for as provided in Section 1615-5.

**(D) Mowing:**

Mowing will be paid for as provided in Article 1660-9(B) for "Mowing."

**(E) Compensation:**

Where earthwork and temporary seeding have been adequately constructed, completely drained, and properly maintained, and damage occurs due to natural causes, the Contractor will be paid at the contract unit price for the excavated material required for repairs to the damaged earthwork, and the contract unit prices for "Seed for Temporary Seeding" and "Fertilizer for Temporary Seeding" for correcting the damaged temporary seeding.

Repair, at no cost to the Department, any damage to earthwork or temporary seeding which is due to carelessness or neglect on the part of the Contractor.

**(F) Pay Items:**

Payment will be made under:

- Seed for Temporary Seeding.....Pound (kg)
- Fertilizer for Temporary Seeding..... Ton (Metric Ton)

**SECTION 1622  
TEMPORARY SLOPE DRAINS**

**1622-1 DESCRIPTION.**

Furnish, place, maintain and remove temporary slope drains at the locations shown on the plans and at locations as directed. Work includes but is not limited to furnishing all pipe, tees, elbows and compacted earth; installation and removal of the slope drain; furnishing and installation of asphalt plant mix and stone; constructing the sump, earth shoulder berm and earth berm ditch block; constructing the outlet protection; and dressing, seeding, and mulching the disturbed area after the slope drain and berm have been removed.

The actual conditions during the construction of the project will determine the quantity of temporary slope drains.

The quantity of temporary slope drains may be increased, decreased, or eliminated entirely at the direction of the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1622-2 MATERIALS.**

Provide temporary slope drains with pipe of sufficient size to carry the anticipated volume of water with a minimum diameter of 12 inches (304.8 mm). Provide plastic pipe and fittings meeting the requirements of AASHTO M294.

Refer to Division 10:

Asphalt plant mix ..... Articles 1012-1, 1020-2, 1020-8  
 Stone ..... Article 1042-1

**1622-3 CONSTRUCTION METHODS.**

**(A) Temporary Slope Drains:**

Install temporary slope drains in accordance with the Standard Drawings during all phases of grading operations and adjust as needed to properly direct water flow.

Construct an earth berm at the top of cut and fill sections to direct water flow into temporary slope drains.

At locations of single direction waterflow, locate temporary slope drain inlets in a sump along the earth berm. Construct an earth berm ditch block perpendicular to the direction of the waterflow on the downstream side of the temporary slope drain. Construct ditch blocks of sufficient height to block the flow of water but at no higher elevation than the earth shoulder berm.

Join multiple pipe sections using an approved pipe coupling.

Remove temporary slope drains as directed. Temporary slope drains become the property the Contractor when removed. Dress the area to blend with existing contours, and seed and mulch in accordance with Section 1660.

**(B) Inlet Protection at Temporary Slope Drain:**

Protect the inlet by placement of a tee section and compacted earth material or by lining the inlet area with Class B stone, asphalt plant mix, or other acceptable material in accordance with the details in the plans.

Provide asphalt plant mix meeting the requirements of Section 610 for Type S9.5A, S9.5B, S9.5C, S12.5B, S12.5C, and S12.5D, except as otherwise provided herein. The asphalt plant mix meeting the requirements of any job mix formula for Type S9.5A, S9.5B, S9.5C, S12.5B, S12.5C, and S12.5D issued by the Department for a project currently under contract is acceptable.

Produce, transport, and place asphalt plant mix in accordance with the applicable requirements of Section 610, except as otherwise provided herein.

A prime coat or tack coat is not required.

Pavers are not required for spreading and finishing.

The rolling equipment and rolling sequences required by Article 610-10 do not apply. Compact mix to an acceptable degree.

**(C) Outlet Protection at Temporary Slope Drain:**

Protect outlet locations subject to scour by placing Class B stone or a silt detention device. Construct outlet protection devices as shown on the plans and at other locations as directed.

**1622-4 METHOD OF MEASUREMENT.**

The quantity of temporary slope drains will be measured by the actual number of linear feet (linear meter) of pipe including inlets, measured along the invert of the temporary slope drain, which has been completed and accepted.

The quantity of inlet protection will be measured by the actual number of inlets where protection has been constructed and accepted.

**1622-5 BASIS OF PAYMENT.**

The quantity of temporary slope drains, measured as provided in Article 1622-4, will be paid for at the contract price per linear foot (linear meter) for "Temporary Slope Drains."

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The quantity of inlet protection at temporary slope drains, measured as provided in Article 1622-4, will be paid for at the contract unit price each for "Inlet Protection at Temporary Slope Drain."

The quantity of structural stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (metric ton) for "Stone for Erosion Control, Class \_\_\_\_" as provided in Article 1610-5.

No payment will be made for temporary slope drains or inlet protection which were required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work scheduled.

The items of "Temporary Slope Drains" and " Inlet Protection at Temporary Slope Drain" are considered to be minor items. The provisions of Article 104-5 pertaining to revised contract unit prices for overrunning minor items will not apply as no revision in the contract unit prices for "Temporary Slope Drains" or "Inlet Protection at Temporary Slope Drain" will be made as a result of any overrun regardless of the quantities of these items actually performed.

Payment will be made under:

Temporary Slope Drains .....	Linear Foot (Linear Meter)
Inlet Protection at Temporary Slope Drain .....	Each

**SECTION 1630  
CONSTRUCTION AND MAINTENANCE OF SILT  
DETENTION DEVICES**

**1630-1 DESCRIPTION.**

Excavate and satisfactorily dispose of all materials excavated in the construction, cleaning out, and maintenance of silt basins, silt ditches, and other silt detention devices. Work includes but is not limited to excavation, shaping of the basins or ditches, cleaning out and maintaining the basins or ditches, disposal of all materials, and backfilling.

**1630-2 GENERAL.**

Excavate silt basins, silt ditches, or other silt detention devices to the dimensions and at the locations shown on the plans or as directed for the purpose of siltation control. Clean out silt detention devices, when so directed, in order to maintain their effectiveness. Backfill and shape for seeding and mulching silt detention basins and silt ditches prior to completion of the project unless otherwise directed.

**1630-3 DISPOSAL OF MATERIALS.**

Utilize all excavated materials in the construction of roadway embankments except where otherwise directed. Dispose of materials which are not utilized in the construction of roadway embankments in waste areas in accordance with Section 802.

**1630-4 METHOD OF MEASUREMENT.**

The quantity of excavation will be the volume in cubic yards (cubic meters), measured in the original position, of all materials excavated within the limits established by the plans or directed by the Engineer. If in the opinion of the Engineer it is not feasible to measure the excavated material in its original position, the volume will be determined by truck measurement in accordance with Subarticle 230-5(C), except that no deduction for shrinkage will be made.

**1630-5 BASIS OF PAYMENT.**

The quantity of excavation of all materials excavated in the construction, cleaning out, and maintaining detention devices, measured as provided in Article 1630-4, will be paid for at the contract unit price per cubic yard (cubic meter) for "Silt Excavation."

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The filling of silt basins or silt ditches will be paid for as provided in Article 225-8 for "Unclassified Excavation" or in Article 230-6 for "Borrow Excavation", depending on the source of the material used to fill the basins or ditches.

Payment will be made under:

Silt Excavation ..... Cubic Yard (Cubic Meter)

**SECTION 1631  
DITCH LINER AND EROSION CONTROL  
BLANKETS**

**1631-1 DESCRIPTION.**

Furnish, place, and maintain a ditch liner and/or erosion control blanket of synthetic roving or matting for erosion control on previously shaped and seeded drainage ditches, slopes, or other areas at locations shown on the plans or in the special provisions, or as directed by the Engineer. Work includes providing all materials; excavation and backfilling; placing synthetic roving; applying asphalt material; placing and securing matting; and maintaining the drainage ditch.

The conditions which occur during the construction of the project will determine the quantity of synthetic roving and matting placed. The quantity of matting may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1631-2 MATERIALS.**

Refer to Division 10:

Synthetic Roving ..... Article 1054-5  
Matting for Erosion Control ..... Article 1060-8  
Staples ..... Article 1060-8

Provide wooden stakes meeting the following requirements:

- Minimum 12 inches (304.8 mm) long.
- Minimum 1 inch x 2 inch (25.4 mm x 50.8 mm) nominal dimension.

Use an undiluted emulsified asphalt for tacking material on synthetic roving.

**1631-3 CONSTRUCTION METHODS.**

**(A) Synthetic Roving:**

Place synthetic roving immediately following seeding. Provide a smooth soil surface free from stones, clods, or debris which will prevent the contact of the fibers with the soil. Preserve the required line, grade, and cross section of the area covered.

Apply synthetic roving uniformly over the designated area to form a random mat of continuous fibers at the rate of 0.25 to 0.35 pounds per square yard (0.14 to 0.19 kilograms per square meter) of fiberglass roving or 0.15 to 0.20 pounds per square yard (0.08 to 0.11 kg per square meter) of polypropylene roving. Apply tacking material over the fibers immediately after the roving is placed at a rate of 0.25 to 0.35 gallons per square yard (1.13 to 1.59 liters per square meter).

Bury roving to a depth of 5 inches (127 mm) at the upgrade end and at maximum intervals of 50 feet (15.2 m) along the ditches. Install wooden stakes at the upgrade end and in an irregular pattern to securely hold the roving, no more than 10 feet (3 meters) apart, throughout the ditch.

**(B) Matting:**

Place matting immediately following seeding. Provide a smooth soil surface free from stones, clods, or debris which will prevent the contact of the matting with the soil. Take care to preserve the required line, grade, and cross section of the area covered.

Unroll matting in the direction of the flow of water, and apply without stretching so that it will lie smoothly but loosely on the soil surface. Bury the up-channel or top of slope end of each piece of matting in a narrow trench at least 5 inches (127 mm) deep and tamp firmly. Where one roll of matting ends and a second-roll begins, overlap the end of the upper roll over the buried end of the second roll so there is a 6 inch (152.4 mm) overlap. Construct check trenches at least 12 inches (304.8 mm) deep every 50 feet (15.2 meters) longitudinally in the matting or as directed. Fold over and bury matting to the full depth of the trench, and close and tamp firmly. Overlap matting at least 4 inches (101.6 mm) where 2 or more widths of matting are laid side by side.

Place staples across matting at ends, junctions, and check trenches approximately 10 inches (254 mm) apart.

Place staples along the outer edges and down the center of each strip of matting 3 feet (1 meter) apart. Place staples along all lapped edges 2 to 3 inches (50.8 to 76.2 mm) apart.

Install product with netting on the top side when excelsior or straw matting is used.

The Engineer may require adjustments in the trenching or stapling requirements to fit individual cut or fill slope conditions.

**1631-4 METHOD OF MEASUREMENT.**

The quantity of synthetic roving or matting measured will be the number of square yards (square meters) of roving or matting, as measured along the surface of the ground, over which synthetic roving or matting has been acceptably placed.

**1631-5 BASIS OF PAYMENT.**

The quantity of synthetic roving, measured as provided in Article 1631-4, will be paid for at the contract unit price per square yard (square meter) for "Synthetic Roving".

The quantity of matting for erosion control, measured as provided in Article 1631-4, will be paid for at the contract unit price per square yard (square meter) for Matting for Erosion Control

Payment will be made under:

Synthetic Roving .....	Square Yard (Square Meter)
Matting for Erosion Control .....	Square Yard (Square Meter)

**SECTION 1632  
ROCK INLET SEDIMENT TRAP**

**1632-1 DESCRIPTION.**

Construct, maintain and remove devices around catch basins and/or drop inlets to reduce water velocity and contain sediment. Work includes furnishing all fence posts, hardware cloth, hardware, stone and other materials; installing and maintaining the 1/4 inch (6.4 mm) hardware cloth.

The actual conditions which occur during the construction of the project will determine the quantity of rock inlet sediment traps constructed. The quantity of inlet sediment traps may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1632-2 MATERIALS.**

**(A) Posts:**

Provide wood or steel post meeting the following requirements:

- Wood post:
  - ◆ Minimum 6 feet (1.8 meters) long.
  - ◆ Minimum 3 inches (76.2mm) in nominal diameter.
  - ◆ Straight enough to provide a fence without noticeable misalignment.
  - ◆ Structurally sound enough to support fence loading.
- Steel post:
  - ◆ Minimum 5 feet (1.5 meters) long.
  - ◆ Minimum 1 3/8 inches (34.9 mm) wide measured parallel to the fence.
  - ◆ Minimum weight of 1.25 lb/ft (1.86 kg/m) of length.
  - ◆ Equipped with an anchor plate with minimum area of 14.0 square inches (9032.1 square mm).
  - ◆ Have a means of retaining wire in the desired position without displacement.

**(B) Wire Staples:**

Provide No. 9 staple with a minimum length of 1 1/2 inches (38.1 mm).

**(C) 1/4 inch hardware cloth:**

Provide hardware cloth having 1/4 inch (6.35 mm) openings constructed from 24 gage wire (0.026 inch (0.66 mm) diameter) or larger, and having a minimum width of 24 inches (609.6 mm) as specified in ASTM A-740.

**(D) Other Materials:**

Refer to Division 10:

Stone for Erosion Control, Class \_\_\_\_ ..... Article 1042-1  
 Sediment Control Stone .....Section 1005

**1632-3 CONSTRUCTION.**

**(A) Type A:**

Place structural stone (Class B stone) around the outside perimeter of the inlet structure with approximately 2:1 side slopes and plate the upstream side with sediment control stone.

**(B) Type B:**

Place structural stone (Class A stone) around the outside perimeter of the inlet structure with approximately 2:1 side slopes and plate the upstream side with sediment control stone.

**(C) Type C:**

Construct rock inlet sediment trap type-C devices as shown on the plans and at other locations as directed.

**1632-4 MAINTENANCE AND REMOVAL.**

Maintain the rock inlet sediment trap, and remove and dispose of silt accumulations at the inlet sediment traps when necessary or as directed in accordance with Section 1630.

Remove rock inlet sediment traps as the project nears completion, or as directed. Dress the area to blend with existing contours, and seed and mulch the area in accordance with Section 1660.

**1632-5 METHOD OF MEASUREMENT.**

Rock inlet sediment traps will not be measured for payment under this article.

The quantity of 1/4 inch (6.4 mm) hardware cloth will be measured by the actual number of linear feet (linear meters) of hardware cloth, measured in place from end post to end post at each separate installation which has been completed and accepted.

**1632-6 BASIS OF PAYMENT.**

Payment for rock inlet sediment traps will be as follows:

The quantity of structural stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (MT) for "Stone for Erosion Control, Class \_\_\_\_" as provided in Article 1610-5.

The quantity of sediment control stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (MT) for "Sediment Control Stone" as provided in Article 1610-5.

The removal and disposal of silt accumulations will be paid for as provided in Section 1630.

The quantity of hardware cloth, measured as provided above, will be paid for at the contract unit price per linear foot (linear meter) for "1/4 Inch Hardware Cloth" (6.4 mm Hardware Cloth).

Payment will be made under:

1/4" (6.4 mm) Hardware Cloth.....Linear Foot (Linear Meter)

**SECTION 1633  
TEMPORARY ROCK SILT CHECKS**

**1633-1 DESCRIPTION.**

Construct, maintain, and remove devices placed in ditches, diversions or swales to reduce water velocity and contain sediment.

The actual conditions which occur during the construction of the project will determine the quantity of temporary rock silt checks constructed. The quantity of silt check dams may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1633-2 MATERIALS.**

Refer to Division 10:

Stone for Erosion Control, Class \_\_\_\_ ..... Article 1042-1  
Sediment Control Stone .....Section 1005

**1633-3 CONSTRUCTION.**

**(A) Type A:**

Place structural stone in the channel, ditch, diversion or swale with approximately 2:1 side slopes. Place sediment control stone, approximately 12 inches (304.8 mm) thick on the upstream side.

**(B) Type B:**

Construct temporary rock silt check type-B devices as shown on the plans and at other locations as directed.

**1633-4 MAINTENANCE AND REMOVAL.**

Maintain the temporary rock silt checks, and remove and dispose of silt accumulations at the silt checks when so directed in accordance with Section 1630.

Remove temporary rock silt checks as the project nears completion. The actual time of removal will be as directed. After removal of silt checks, dress the area to blend with existing contours and seed and mulch the area in accordance with Section 1660.

**1633-5 METHOD OF MEASUREMENT.**

Temporary rock silt checks will not be measured for payment under this article.

**1633-6 BASIS OF PAYMENT.**

Payment for temporary rock silt checks will be as follows:

The quantity of structural stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (metric ton) for "Stone for Erosion Control, Class \_\_\_\_" as provided in Article 1610-5.

The quantity of sediment control stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (metric ton) for "Sediment Control Stone" as provided in Article 1610-5.

The removal and disposal of silt accumulations will be paid for as provided in Section 1630.

**SECTION 1634  
TEMPORARY ROCK SEDIMENT DAMS**

**1634-1 DESCRIPTION.**

Construct, maintain, and remove devices placed in ditches, diversions, swales, or drainage turnouts to reduce water velocity and contain sediment.

The actual conditions which occur during the construction of the project will determine the quantity of temporary rock sediment dams constructed. The quantity of rock sediment dams may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1634-2 MATERIALS.**

Refer to Division 10:

Stone for Erosion Control, Class \_\_\_\_ ..... Article 1042-1  
Sediment Control Stone .....Section 1005

**1634-3 CONSTRUCTION.**

**(A) Type-A:**

Place structural stone in the channel, ditch diversion, swale, or drainage turnouts with 2:1 side slope on the upstream side and 3:1 side slope on the downstream side. Plate the upstream side with sediment control stone approximately 12 inches (304.8 mm) thick.

Provide a weir section approximately 2/3 of the channel width and with an 8 foot (2.4 meters) maximum height from the bottom of the channel. Place the weir section approximately 12 inches (304.8 mm) lower than the sides of the device or the top of the channel (whichever is lower) located in the center of the device.

**(B) Type-B:**

Place structural stone in the channel, ditch diversion, swale, or drainage turnouts with 2:1 side slopes and plate the upstream side with sediment control stone approximately 12 inches (304.8 mm) thick.

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Provide a weir section with a 4 foot (1.2 meters) minimum width constructed 18 inches (457.2 mm) lower than the sides of the device or the top of the channel (whichever is lower) located in the center of the device.

Construct the temporary rock sediment dam type-B with a 5 foot (1.5 meters) minimum thickness measured along the top of the dam structure. Construct the structural stone apron approximately 8 foot (2.4 meters) long with a 2 foot (0.6 meter) depth.

Use earthen backfill material to extend dam width and create a larger sediment storage volume for the temporary rock sediment dam type-B where needed.

**1634-4 MAINTENANCE AND REMOVAL.**

Maintain the temporary rock sediment dams, and remove and dispose of silt accumulations at the sediment dams when so directed.

Remove temporary rock sediment dams as the project nears completion, or at such time as the Engineer deems the device to be no longer useful. The Engineer will direct the actual time of removal. Dress seed and mulch the area in accordance with Section 1660.

**1634-5 METHOD OF MEASUREMENT.**

Temporary rock sediment dams will not be measured for payment under this article.

**1634-6 BASIS OF PAYMENT.**

Payment for temporary rock sediment dams will be as follows:

The quantity of structural stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (metric ton) for "Stone for Erosion Control, Class \_\_\_\_" as provided in Article 1610-5.

The quantity of sediment control stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (metric ton) for "Sediment Control Stone" as provided in Article 1610-5.

The removal and disposal of silt accumulations will be paid for as provided in Section 1630.

**SECTION 1635  
ROCK PIPE INLET SEDIMENT TRAP**

**1635-1 DESCRIPTION.**

Construct, maintain and remove devices placed around outside perimeters of pipe structures, to reduce water velocity and trap sediment.

The conditions which occur during the construction of the project will determine the quantity of temporary rock pipe inlet sediment traps to be constructed. The quantity of inlet sediment traps may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1635-2 MATERIALS.**

Refer to Division 10:

Stone for Erosion Control, Class \_\_\_\_ ..... Article 1042-1  
Sediment Control Stone .....Section 1005

**1635-3 CONSTRUCTION.**

**(A) Type A:**

Construct rock pipe inlet sediment trap type-A devices at locations shown on the plans or as directed.

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Place structural stone (class-B stone) around the outside perimeter of the inlet of the pipe with approximately 2:1 side slopes and plate on the upstream side with sediment control stone approximately 12 inches (304.8 mm) thick.

Construct the rock pipe inlet sediment trap type-A with a minimum height of 30 inches (762 mm) and a minimum of 12 inches (304.8 mm) below the roadway shoulder or diversion point.

### **(B) Type B:**

Construct rock pipe inlet sediment trap type-B devices at locations shown on the plans or as directed.

Place structural stone (class-A stone) around the outside perimeter of the inlet of the pipe with approximately 2:1 side slopes and plate the upstream side with sediment control stone approximately 12 inches (304.8 mm) thick.

Construct the rock pipe inlet sediment trap type-B with a minimum height of 18 inches (457.2 mm) and a minimum of 12 inches (304.8 mm) below the roadway shoulder or diversion point.

### **1635-4 MAINTENANCE AND REMOVAL.**

Maintain the rock pipe inlet sediment traps, and remove and dispose of silt accumulations at the pipe inlet sediment traps as directed in accordance with Section 1630.

Remove rock pipe inlet sediment traps as the project nears completion, or as directed. Dress the area to blend with existing contours and seed and mulch in accordance with Section 1660.

### **1635-5 METHOD OF MEASUREMENT.**

Rock pipe inlet sediment traps will not be measured for payment under this article.

### **1635-6 BASIS OF PAYMENT.**

Payment for temporary rock pipe inlet sediment traps will be as follows:

The quantity of structural stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (metric ton) for "Stone for Erosion Control, Class \_\_\_\_" as provided in Article 1610-5.

The quantity of sediment control stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (metric ton) for "Sediment Control Stone" as provided in Article 1610-5.

The removal and disposal of silt accumulations will be paid for as provided in Section 1630.

## **SECTION 1636 TEMPORARY ROCK SILT SCREEN**

### **1636-1 DESCRIPTION.**

Construct, maintain, and remove low level rock structures placed in streams below construction sites to contain sediment.

The actual conditions which occur during the construction of the project will determine the quantity of temporary rock silt screens constructed. The quantity of silt screens may be increased, decreased, or eliminated entirely as directed. Such variation in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1636-2 MATERIALS.**

Refer to Division 10:

Stone for Erosion Control, Class \_\_\_\_ ..... Article 1042-1  
Sediment Control Stone .....Section 1005

**1636-3 CONSTRUCTION.**

Place structural stone in the stream below the construction site with approximately 2:1 side slopes, and plate on the upstream side with sediment control stone approximately 12 inches (304.8 mm) thick.

**1636-4 MAINTENANCE AND REMOVAL.**

Maintain the rock silt screens, and remove and dispose of silt accumulations at the rock silt screens in accordance with Section 1630.

Remove sediment from the rock silt screen as directed.

**1636-5 METHOD OF MEASUREMENT.**

Rock silt screens will not be measured for payment under this article.

**1636-6 BASIS OF PAYMENT.**

Payment for rock silt screens will be as follows:

The quantity of structural stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (metric ton) for "Stone for Erosion Control, Class \_\_\_\_" as provided in Article 1610.

The quantity of sediment control stone measured as provided in Article 1610-4 will be made at the contract unit price per ton (metric ton) for "Sediment Control Stone" as provided in Article 1610-5.

The removal and disposal of silt accumulations will be paid for as provided in Section 1630.

**SECTION 1637  
RISER BASIN**

**1637-1 DESCRIPTION.**

Construct, maintain, and remove riser basin devices to reduce water velocity and contain sediment.

The actual conditions which occur during the construction of the project will determine the quantity of riser basin devices constructed. The quantity of riser basins may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1637-2 MATERIALS.**

All materials shall meet the following requirements:

Perforated C.S. pipe tee riser .....Section 310  
Sediment Control Stone .....Section 1005

**1637-3 CONSTRUCTION.**

Work includes constructing earth embankments and overflow spillways, and installing outlet pipe, perforated tee-riser sections, trash racks, and anti-flotation devices in silt basins. Use either anti-flotation method shown on the plans.

Construct earth embankments with 2:1 side slopes with material meeting roadway embankment specifications. Maximum height of earth embankments is 12 feet (3.7 m). Excavate when required to provide minimum surface area and/or minimum storage volume area measured below the top of the principal spillway (top of the riser pipe).

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Install a perforated C.S. pipe tee riser as specified on the plans. Place 3/8 inch (95.3 mm) holes on 3 inch (76.2 mm) centers on the riser pipe and face the riser pipe with sediment control stone. Additional C.S. pipe may be required to obtain the required riser pipe height (crest elevation) as indication on the plans. Construct a trash rack and an anti-flotation device on the riser pipe.

Construct an overflow spillway outlet, on natural ground, 1 foot (0.3 meter) above riser pipe. Plate overflow spillway with Erosion Control Stone Class B as specified on the plans.

Stabilize the embankment and surrounding areas with vegetation after installation.

**1637-4 MAINTENANCE AND REMOVAL.**

Place a marker in the basin indicating the 50% volume level. Clean out riser basin when sediment volume reaches 50% of the storage volume in accordance with Section 1630.

Remove riser basin devices as the project nears completion, or as directed. Dress, seed and mulch the area in accordance with Section 1660 after removal of the riser basin.

**1637-5 METHOD OF MEASUREMENT.**

Measurement for excavation will be made in accordance with Section 1630.

The measurement of perforated C.S. pipe tee risers will be the actual number of tee risers, including furnishing and installing any additional pipe required for correct riser height, the trash rack, and the anti-flotation device, which have been installed and accepted.

Measurement of outlet pipe will be in accordance with section 310.

**1637-6 BASIS OF PAYMENT.**

Payment will not be made for any work performed under this section that is solely for the convenience of the Contractor or that is made necessary due to negligence of the Contractor.

Payment for excavation will be made in accordance with Section 1630.

Payment for the outlet pipe will be made in accordance with Section 310.

Payment for the Sediment Control Stone and Erosion Control Stone Class B will be made in accordance with Section 1610.

The quantity of perforated C.S. pipe tee risers measured as provided for above will be paid for at the contract unit price each for \_\_\_\_ x \_\_\_\_ x \_\_\_\_ Perforated C.S. Pipe Tee Riser \_\_\_\_ Thick.

Payment will be made under:

\_\_" (mm) x \_\_" (mm) x \_\_" (mm) Perforated C.S. Pipe Tee Riser,  
\_\_" (mm) Thick .....Each

**SECTION 1638  
STILLING BASIN**

**1638-1 DESCRIPTION.**

Construct, maintain, and remove earth embankments used to trap sediment from dewatering construction sites. Work includes providing permeable stone drain, furnishing and installing overflow pipe, cleaning out, maintaining, removing and disposing of the stilling basins and all components and reshaping the area.

The actual conditions which occur during the construction of the project will determine the quantity of stilling basins constructed. The quantity of stilling basins may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will

not be considered as alterations in the details of construction or a change in the character of the work.

**1638-2 MATERIALS.**

Utilize suitable excavated materials, as specified in Section 225, 230, and 240, in the construction of earth embankments for stilling basins, except where otherwise specified.

Use D.O.T. approved pipe materials for the overflow pipe.

Refer to Division 10:

Stone for Erosion Control Class \_\_\_\_\_ Article 1042-1  
Sediment Control Stone .....Section 1005

**1638-3 CONSTRUCTION**

Construct stilling basins at the locations shown on the plans and at other locations as directed.

Construct earth embankment with a permeable stone drain in a rectangular form adjacent to the stream and culvert following the applicable requirements of Section 235. The maximum height allowed for earth dikes is four feet (1.2 m). Excavate below the natural ground for greater depths of basins.

Use Class B stone for a baffle and an 8 inch (203.2 mm) minimum diameter overflow pipe installed at the permeable stone drain.

**1638-4 MAINTENANCE AND REMOVAL.**

Maintain the stilling basins, and remove and dispose of silt accumulations at the stilling basins in accordance with Section 1630.

Remove the stilling basins as the project nears completion, or at such time the Engineer deems the device to be no longer useful. Dress and seed and mulch the area after removal of the stilling basin in accordance with Section 1660.

**1638-5 METHOD OF MEASUREMENT.**

Stilling basin quantities will be measured in place and computed by the average-end-method for the actual number of cubic yards of basin capacity. The measurements will be the internal measurements of the basin measured up to the invert of the overflow pipe. The quantity of materials used to construct the basin that originates from another payment item (i.e. unclassified excavation, borrow excavation) will not be deducted from the volume of that original pay item.

**1638-6 BASIS OF PAYMENT.**

The quantity of stilling basins, measured as provided above, will be paid for at the contract unit price per cubic yard (cubic meter) for Stilling Basins.

Payment will be made under:

Stilling Basins ..... Cubic Yard(Cubic Meter)

**SECTION 1650  
WOODED AREA CLEANUP**

**1650-1 DESCRIPTION.**

Remove and satisfactorily dispose of debris and of dead, partially dead, or broken vegetation from wooded areas of the right of way outside clearing limits, and from other areas outside construction limits on which seeding and mulching is not to be performed. Work includes treating stumps with herbicide, and repairing any damage to vegetation.

Cut-over timberland, reforested areas, or thickets of young native volunteer vegetation will be considered to be wooded areas.

**1650-2 MATERIALS.**

Refer to Division 10:

Herbicide ..... Article 1060-13

**1650-3 CONSTRUCTION REQUIREMENTS.**

Remove all logs, stumps, snags, loose roots, down timber, slabs, tree laps, lumber, dead or partially dead trees, broken trees or brush, dead brush, sawdust piles, discarded fences, leaf piles, brick, tile masonry, and other debris from the cleanup areas. Cut, all dead trees, stumps, snags, broken or partially dead trees, and brush, flush with the ground. Remove vegetation which dies between initial cleanup and completion of the project prior to final acceptance. Hand raking of areas or removal of a normal leaf layer is not required unless stated in the special provisions.

Treat partially dead stumps or broken vegetation with a herbicide immediately after cutting. Use the herbicide and the method and rate of application, specified in the special provisions. Follow all applicable instructions, warnings, and safety precautions stated on the manufacturer's label, and comply with all laws and regulations governing herbicides that are in effect at the time of use.

Dispose of all material cleaned up under this item in accordance with the applicable requirements of Article 200-5 and Article 802-2.

**1650-4 DAMAGE TO REMAINING VEGETATION.**

Conduct operations in such a manner as to prevent injury to trees, shrubs, or other types of vegetation that are to remain growing, and also to prevent damage to adjacent property.

Remove broken branches and rough edges of scarred trees or shrubs. Prune and shape these areas in accordance with the International Society of Arboriculture pruning techniques. Cut and dispose of any plants that are damaged beyond their value for landscape purposes and seed and mulch vegetation that is damaged by the Contractor at no cost to the Department when so directed.

**1650-5 METHOD OF MEASUREMENT.**

The quantity of wooded area cleanup to be paid for will be the actual number of acres (hectare) of wooded area cleanup, measured horizontally, which has been completed and accepted.

**1650-7 BASIS OF PAYMENT.**

The quantity of wooded area cleanup, measured as provided in Article 1650-5, will be paid for at the contract unit price per acre (hectare) for "Wooded Area Cleanup."

Payment will be made under:

Wooded Area Cleanup .....Acre (Hectare)

**SECTION 1651  
SELECTIVE VEGETATION REMOVAL**

**1651-1 DESCRIPTION.**

Remove selected living trees and undesirable living undergrowth from areas of the right of way outside clearing limits in accordance with these specifications. Work includes treating stumps with herbicide, and repairing any damage to vegetation.

**1651-2 MATERIALS.**

Refer to Division 10:

Herbicide ..... Article 1060-13

**1651-3 CONSTRUCTION REQUIREMENTS.****(A) Trees:**

Remove trees shown on the plans or designated. Measure all tree diameter sizes at a height of 4 feet 6 inches (1.4 meters) above the ground.

**(B) Undergrowth:**

Remove all undergrowth from areas shown on the plans, described in the special provisions, or designated; except for those plants designated to be preserved. All plants less than 4 inches (101.6 mm) in diameter, measured at a height of 4 feet 6 inches (1.4 m) above the ground, shall be classified as undergrowth.

**(C) General:**

Treat stumps with a herbicide immediately after cutting to prevent sprouting. Use the herbicide, and the method and rate of application specified in the special provisions. Follow all applicable instructions, warnings, and safety precautions stated on the manufacturer's label, and comply with all laws and regulations governing herbicides that are in effect at the time of use.

When work is performed properly in accordance with these specifications, no subsequent recutting of sprouts or seedling growth will be required.

Dispose of all trees and undergrowth cut in accordance with the applicable requirements of Article 200-5.

**1651-4 DAMAGE TO REMAINING VEGETATION.**

Conduct operations so as to prevent injury to trees, shrubs, or other types of vegetation that are to remain growing, and also to prevent damage to adjacent property.

Remove broken branches and rough edges of scarred trees or shrubs. Shape and make smooth these areas in accordance with generally accepted horticultural practice. Cut and dispose of any plants that are damaged beyond their value for landscape purposes and seed and mulch vegetation that is damaged by the Contractor at no cost to the Department.

**1651-5 METHOD OF MEASUREMENT.**

The quantities of selective tree removal to be paid for will be the number of trees which have been removed as specified herein.

The quantity of selective undergrowth removal to be paid for will be the actual number of acres (hectares) of undergrowth removal, measured horizontally, which has been completed and accepted.

**1651-6 BASIS OF PAYMENT.**

The quantities of selective tree removal, measured as provided in Article 1651-5, will be paid for at the various contract unit prices for "Selective Tree Removal, \_\_\_\_\_Inch. (\_\_\_\_\_mm)" Each tree removed will be paid for at the contract unit price for the pay item size applicable to the actual tree diameter, measured at a height of 4 feet 6 inches (1.4 m) above the ground, as indicated in Table 1651-1 below.

**TABLE 1651-1  
PAY ITEM SIZES**

Pay Item Size	Actual Tree Diameter
6 inch(152.4 mm)	4 inches up to 8 inches (101.6 mm up to 203.2 mm)
10 inch(254 mm)	8 inches up to 12 inches (203.2 mm up to 304.8 mm)
15 inch(381 mm)	12 inches up to 18 inches (304.8 mm up to 457.2 mm)
18 inches(457.2 mm)	18 inches and over (457.2 mm and over)

The quantity of selective undergrowth removal, measured as provided in Article 1651-5, will be paid for at the contract unit price per acre (hectare) of "Selective Undergrowth Removal."

Payment will be made under:

Selective Tree Removal, 6" (152.4 mm).....	Each
Selective Tree Removal, 10" (254 mm).....	Each
Selective Tree Removal, 15" (381 mm).....	Each
Selective Tree Removal, 18" (457.2 mm).....	Each
Selective Undergrowth Removal .....	Acre (Hectare)

**SECTION 1660  
SEEDING AND MULCHING**

**1660-1 DESCRIPTION.**

Prepare seedbed; furnish, place, and incorporate limestone, fertilizer, and seed; compact seedbed; furnish, place, and secure mulch; mow; and perform other operations necessary for the permanent establishment of vegetation from seed on shoulders, slopes, ditches, or other roadside areas.

Perform seeding and mulching on all earth areas disturbed by construction and on portions of areas seeded under previous contracts as directed where there is unsatisfactory vegetative cover.

Adapt operations to variations in weather or soil conditions as necessary for the successful establishment and growth of the grasses or legumes.

Take care to preserve the required line, grade, and cross section of the area treated.

The actual conditions which occur during the construction of the project will determine the quantity of mowing. The quantity of mowing may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1660-2 MATERIALS.**

Refer to Division 10:

Fertilizer .....	Article 1060-2
Limestone .....	Article 1060-3
Seed .....	Article 1060-4
Mulch for erosion control.....	Article 1060-5

Use an undiluted emulsified asphalt for tacking material.

The analysis of fertilizer and the kinds of seed will be as stated in the special provisions.

**1660-3 COORDINATION WITH GRADING OPERATIONS.**

Perform seeding and mulching operations on a section by section basis immediately upon completion of earthwork sections in accordance with the provisions of Article 225-2.

When grading operations have been suspended, and seeding and mulching has been performed on areas where work has been suspended, include in the work of seeding and mulching of the adjacent sections any necessary overlapping of operations on previously established vegetative cover.

When the Contractor fails or neglects to coordinate grading with seeding and mulching operations and to diligently pursue the control of erosion and siltation, the Engineer may suspend the Contractor's grading operations until such time as the work is coordinated in a manner acceptable to the Engineer. Such suspension will be in accordance with the provisions of Article 108-7.

**1660-4 SEEDBED PREPARATION.**

Cut and satisfactorily dispose of weeds or other unacceptable growth on the areas to be seeded. Shape and smooth uneven and rough areas outside of the graded section, such as crop rows, farm contours, ditches and ditch spoil banks, fence line and hedgerow soil accumulations, and other minor irregularities which cannot be obliterated by normal seedbed preparation operations, to provide for more effective seeding and for ease of subsequent mowing operations.

Scarify or otherwise loosen the soil to a depth of not less than 5 inches (127 mm) except as otherwise provided below or otherwise directed. Break clods and work the top 2 to 3 inches (50.8 to 76.2 mm) of soil into an acceptable seedbed by the use of soil pulverizers, drags, or harrows; or by other approved methods. Remove all rock and debris 3 inches (76.2 mm) or larger on median, shoulder, and ditch cut or fill slopes which are 3:1 or flatter, prior to the application of seed and fertilizer. Remove rock 6 inches (152.4 mm) and larger displaced during seeding operations.

Scarify, groove, trench, or puncture all slope surfaces. The depth of preparation and the degree of smoothness of the seedbed may be reduced on cut slopes that are 2:1 and steeper, as permitted by the Engineer.

On cut slopes that are either 2:1 or steeper, the Engineer may permit the preparation of a partial or complete seedbed during the grading of the slope. If at the time of seeding and mulching operations such preparation is still in a condition acceptable to the Engineer, additional seedbed preparation may be reduced or eliminated.

Limit seedbed preparation to within 2 feet (0.6 meter) of the edge of any pavement to a depth of 2 to 3 inches (50.8 to 76.2 mm).

Do not prepare seedbed when the soil is frozen, extremely wet, or when the Engineer determines that it is an otherwise unfavorable working condition.

**1660-5 APPLYING AND COVERING LIMESTONE, FERTILIZER, AND SEED.****(A) General:**

The special provisions will state the seasonal limitation for seeding operations; the kinds of grades of fertilizers; the kinds of seed; and the rates of application of limestone, fertilizer, and seed.

Obtain approval from the Engineer before using equipment for the application, covering, or compaction of limestone, fertilizer, and seed. Approval may be revoked at any time if equipment is not maintained in satisfactory working condition, or if the equipment operation damages the seed.

Apply limestone, fertilizer, and seed within 24 hours after completion of seedbed preparation unless otherwise permitted by the Engineer. When the Engineer determines that weather and soil conditions are unfavorable, do not distribute any limestone or fertilizer and do not sow any seed.

Take adequate precautions to prevent damage to traffic, structures, guardrails, traffic control devices, or any other appurtenances during the application of fertilizer. Provide adequate covering or change methods of application as required to avoid such damage. Repair any damage that occurs, including any cleaning that may be necessary.

**(B) Limestone and Fertilizer:**

Limestone may be applied as a part of the seedbed preparation, provided it is immediately worked into the soil. If not so applied, distribute limestone and fertilizer uniformly over the prepared seedbed at the specified rate of application and then harrow, rake, or otherwise thoroughly work or mix into the seedbed.

If liquid fertilizer is used, locate storage containers for the liquid fertilizer on the project and equip for agitation of the liquid prior to its use. Equip the storage containers with approved measuring or metering devices which will enable the Engineer to record at any time the amount of liquid that has been removed from the container. Calibrate application equipment for liquid fertilizer, other than a hydraulic seeder, to ensure that the required rate of fertilizer is applied uniformly.

**(C) Seed:**

Distribute seed uniformly over the seedbed at the required rate of application, and immediately harrow, drag, rake, or otherwise work so as to cover the seed with a layer of soil. Cover to a depth as directed by the Engineer. If 2 kinds of seed are to be used which require different depths of covering, sow separately.

When a combination seed and fertilizer drill is used, drill fertilizer with seed after applying and incorporating limestone into the soil. If using two kinds of seed requiring different depth of cover, the seed requiring the lighter cover may be sown broadcast or with a special attachment to the drill, or drilled lightly following the initial drilling operation.

When using a hydraulic seeder for application of seed and fertilizer, do not allow the seed to remain in water containing fertilizer for more than 30 minutes prior to application unless otherwise permitted.

Compact the seedbed immediately after seed has been properly covered in the manner and degree approved by the Engineer.

**(D) Modifications:**

When adverse seeding conditions are encountered due to steepness of slope, height of slope, or soil conditions, the Engineer may direct or permit that modifications be made in the above requirements which pertain to incorporating limestone into the seedbed; covering limestone, seed, and fertilizer; and compaction of the seedbed.

Such modifications may include but not be limited to the following:

1. The incorporation of limestone into the seedbed may be omitted on
  - (a) cut slopes steeper than 2:1
  - (b) on 2:1 cut slopes when a seedbed has been prepared during the excavation of the cut and is still in an acceptable condition; or
  - (c) on areas of slopes where the surface of the area is too rocky to permit the incorporation of the limestone.
2. The rates of application of limestone, fertilizer, and seed on slopes 2:1 or steeper or on rocky surfaces may be reduced or eliminated.
3. Compaction after seeding may be reduced or eliminated on slopes 2:1 or steeper, on rocky surfaces, or on other areas where soil conditions would make compaction undesirable.

**1660-6 MULCHING.****(A) General:**

Mulch all seeded areas unless otherwise indicated in the special provisions or directed by the Engineer.

Use grain straw as mulch at any time of the year. If permission to use material other than grain straw is requested and the use of such material is approved by the Engineer, the seasonal limitations, the methods and rates of application, the type of binding material, or other conditions governing the use of such material will be established by the Engineer at the time of approval.

**(B) Applying Mulch:**

Apply mulch within 24 hours after completion of seeding unless otherwise permitted. Exercise care to prevent displacement of soil or seed or other damage to the seeded area during the mulching operations.

Spread mulch uniformly by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate but also partially shade the ground, reduce erosion, and conserve soil moisture.

**(C) Holding Mulch:**

Hold mulch in place by applying a sufficient amount of undiluted emulsified asphalt or other approved binding material. The Engineer will approve the rate and method of application of binding material. Apply the binding material directly with the mulch or immediately following the mulch application.

Take adequate precautions to prevent damage to traffic, structures, guardrails, traffic control devices, or any other appurtenances during the application of asphalt binding material. Provide adequate covering or change methods of application as required to avoid such damage. Repair any damage that occurs, including any cleaning that may be necessary.

Take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and promptly remove any blockage to drainage facilities which may occur.

**1660-7 MAINTENANCE OF SEEDING AND MULCHING.**

Maintain areas where seeding and mulching have been performed in a satisfactory condition until final acceptance of the project.

Mow at the location and times as directed.

Correct areas of damage or failure due to any cause by repairing or completely reworking as directed.

Repair in accordance with Section 1661 where extensive seedbed preparation is unnecessary.

Rework seeding and mulching in accordance with this section where correction requires extensive seedbed preparation, or where earthwork repairs or complete reshaping are necessary.

As an exception to the above, repair areas of damage or failure resulting either from negligence on the part of the Contractor in performing subsequent construction operations or from not taking adequate precautions to control erosion and siltation as required throughout the various sections of the specifications, at no cost to the Department.

**1660-8 METHOD OF MEASUREMENT.**

**(A) Seeding and Mulching:**

The quantity of seeding and mulching paid for will be the actual number of acres (hectares) of seeding and mulching, measured along the surface of the ground, which has been completed and accepted.

**(B) Mowing:**

The quantity of mowing paid for will be the actual number of acres (hectares), measured along the surface of the ground, which has been mowed as directed. Where an area has been mowed more than once at the direction of the Engineer, separate measurement will be made each time the area is mowed.

**1660-9 BASIS OF PAYMENT.**

**(A) Seeding and Mulching:**

The quantity of seeding and mulching, measured as provided in Subarticle 1660-8(A), will be paid for at the contract unit price per acre (hectare) for "Seeding and Mulching."

**(B) Mowing:**

The quantity of mowing, measured as provided in Subarticle 1660-8(B), will be paid for at the contract unit price per acre (hectare) for "Mowing."

**(C) Limestone and Fertilizer:**

No direct payment will be made for furnishing and applying the limestone and fertilizer as such work and materials will be considered to be incidental to be the work covered by "Seeding and Mulching".

**(D) Compensation:**

Corrective work will be compensated where seeding and mulching has been damaged or has failed to establish a satisfactory stand of vegetation.

Where correction can be made without extensive seedbed preparation, the work will be paid for as provided in Article 1661-6 for "Seed for Repair Seeding" and "Fertilizer for Repair Seeding".

Where earthwork and seeding and mulching has been damaged to the extent that earthwork repairs or complete reshaping are necessary, the Contractor will be paid at the contract unit price for the excavated material required for repairs to the damaged earthwork, and at the contract unit price for "Seeding and Mulching" for correcting the damaged seeding and mulching.

As an exception to the above, repair, at no cost to the Department, any damage to earthwork or seeded and mulched areas which is due to carelessness or neglect on the part of the Contractor.

**(E) Pay Items:**

Payment will be made under:

Seeding and Mulching .....	Acre
(Hectare)	
Mowing.....	Acre
(Hectare)	

**SECTION 1661  
REPAIR SEEDING**

**1661-1 DESCRIPTION.**

Repair areas which have been previously seeded and mulched in accordance with Section 1660 but which have been damaged or have failed to successfully establish a stand

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of vegetation. This work does not include repair seeding made necessary by negligence on the part of the Contractor as described in Article 1660-7, nor does it include repairs to temporary seeding constructed in accordance with Section 1620.

Repair damage or failure in accordance with this section where correction can be made without extensive seedbed preparation.

Where correction will require extensive seedbed preparation, or where earthwork repairs or complete reshaping are necessary, repair in accordance with Section 1660.

Repair seeding includes minor seedbed preparation; the furnishing, placing, and covering of fertilizer and seed; and mulch as required, all in accordance with these specifications.

Perform repair seeding promptly at the locations and times as directed.

The actual conditions which occur during the construction of the project will determine the quantity of seed or fertilizer used. The quantity of seed or fertilizer may be increased, decreased, or eliminated entirely at the discretion of the Engineer. Such variation in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1661-2 MATERIALS.**

Refer to Division 10:

Fertilizer .....	Article 1060-2
Seed .....	Article 1060-4
Mulch for erosion control.....	Article 1060-5

The analysis of fertilizer and the kinds of seed shall be as stated in the special provisions.

**1661-3 SEEDBED PREPARATION.**

Seedbed preparation will be required unless otherwise permitted.

A seedbed preparation as extensive as that performed for the original seeding and mulching will not be required. The degree of preparation must be sufficient to retain the seed against displacement by wind, rain, or surface runoff, and be acceptable to the Engineer. The acceptable degree of seedbed preparation will depend on the location, soil conditions, and drainage conditions at the site.

**1661-4 APPLICATION OF FERTILIZER, SEED AND MULCH.**

The analysis of fertilizer, the kinds of seed, and the rates of application of seed and fertilizer is the same as specified in the project special provision for seeding and mulching, unless otherwise directed, but in no case will the total rate of seed and fertilizer vary more or less than 25 percent of that specified for seeding and mulching.

Do not distribute fertilizer or sow seed when the Engineer determines that conditions are unfavorable for such operations.

Cover fertilizer and seed and secure mulch in place to prevent displacement by wind, rain, or surface runoff.

The provisions of Article 1660-5 will be applicable to the approval of equipment; the use of liquid fertilizer; and the protection of traffic, structures, guardrails, traffic control devices, and other appurtenances.

**1661-5 METHOD OF MEASUREMENT.**

**(A) Seed:**

The quantity of seed to be paid for will be the actual number of pounds (kg) of seed which have been applied in accordance with these specifications. The weight of seed will be determined by bag count of standard weight bags or by weighing the seed on certified platform scales or other certified weighing devices.

**(B) Fertilizer:**

The quantity of fertilizer to be paid for will be the actual number of tons (metric tons) of fertilizer which have been applied in accordance with these specifications.

The weight of dry fertilizer will be determined by bag count of standard weight bags, or by weighing the fertilizer in trucks on certified platform scales or other certified weighing devices.

The weight of liquid fertilizer will be the equivalent weight in tons (metric tons) of dry fertilizer.

**1661-6 BASIS OF PAYMENT.**

**(A) Seed.**

The quantity of seed, measured as provided in Subarticle 1661-5(A), will be paid for at the contract unit price per pound (kg) for "Seed and Repair Seeding."

**(B) Fertilizer:**

The quantity of fertilizer, measured as provided in Subarticle 1661-6(B), will be paid for at the contract unit price per ton (metric ton) for "Fertilizer for Repair Seeding."

**(C) Mulch:**

No direct payment will be made for furnishing and applying mulch and all materials used to hold mulch in place, as such work and materials will be considered to be incidental to the work covered by "Seed for Repair Seeding."

**(D) Compensation:**

The above prices and payments will be full compensation for all work.

**(E) Pay Items:**

Payment will be made under:

Seed for Repair Seeding.....	Pound(kg)
Fertilizer for Repair Seeding.....	Ton (Metric Ton)

**SECTION 1662  
SUPPLEMENTAL SEEDING**

**1662-1 DESCRIPTION.**

Apply additional seed to areas which have been previously seeded with permanent seed but on which there is an unsatisfactory cover of vegetation.

This work is only to provide an additional amount of seed to areas that have an insufficient stand of vegetation but which are too well established to require repair seeding. Work covered by this provision does NOT include seedbed preparation, fertilizer, or mulch.

Perform supplemental seeding promptly at the locations and times as directed.

The actual conditions which occur during the construction of the project will determine the quantity of seed used. The quantity of seed may be increased, decreased, or eliminated entirely as directed. Such variation in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1662-2 MATERIALS.**

Refer to Division 10:

Seed ..... Article 1060-4

Use the kinds of seeds as stated in the special provisions.

**1662-3 APPLICATION.**

Seedbed preparation will not be required.

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The special provisions will state the kinds and rates of application of seed. Sow no seed when the Engineer determines that conditions are unfavorable.

The provisions of Article 1660-5 will be applicable to the approval of equipment; and the protection of traffic, traffic control devices, and other appurtenances.

**1662-4 METHOD OF MEASUREMENT.**

The quantity of seed to be paid for will be the actual number of pounds (kg) of seed which have been applied in accordance with these specifications. The weight of seed will be determined by bag count of standard weight bags or by weighing the seed on certified platform scales or other certified weighing devices.

**1662-5 BASIS OF PAYMENT.**

The quantity of seed, measured as provided in Article 1662-4, will be paid for at the contract unit price per pound (kg) for "Seed for Supplemental Seeding."

Payment will be made under:

Seed for Supplemental Seeding .....Pound (kg)

**SECTION 1663  
SPRIGGING**

**1663-1 DESCRIPTION.**

Prepare soil, furnish and place limestone, fertilizer, sprigs, seed, and water; and other operations necessary for the permanent establishment of vegetation from sprigs on shoulders, slopes, ditches, or other roadside areas.

Adapt operations to variations in weather and soil conditions so as to assure the successful establishment and growth of grasses.

Take care to preserve the required line, grade, and cross section of the area treated.

The actual conditions which occur during the construction of the project will determine the quantity of water used and mowing required. The quantity of water or mowing may be increased, decreased or eliminated entirely at the direction of the Engineer. Such variations in quantity will not be considered alterations in the details of construction or a change in the character of the work.

**1663-2 MATERIALS.**

Refer to Division 10:

Fertilizer .....	Article 1060-2
Limestone .....	Article 1060-3
Seed .....	Article 1060-4
Sprigs.....	Article 1060-6
Water .....	Article 1060-9

The special provisions will state the analysis of fertilizer and the kinds of seed and sprigs.

**1663-3 SPRIGGING.**

**(A) Soil Preparation:**

Prepare soil in the area to be sprigged in accordance with the applicable requirements of Article 1660-4.

**(B) Application of Limestone, Fertilizer, Sprigs, and Seed:**

The special provisions will state the seasonal limitations for sprigging operations; the kinds and grades of fertilizer; the kinds of sprigs and seed; the rates of application of limestone, fertilizer; and seed; and the spacing of sprigs.

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Apply limestone, fertilizer, sprigs, seed, and water within 24 hours after completion of soil preparation. Distribute no limestone or fertilizer, plant sprigs nor sow seed when the Engineer determines that weather and soil conditions are unfavorable for such operations.

Apply limestone and fertilizer in accordance with the applicable requirements of Article 1660-5.

Keep all sprigs moist until planted. Plant within 24 hours after digging. Time may be extended when weather or other uncontrollable conditions interrupt the operation provided the sprigs are kept live, moist, and viable.

Plant sprigs by hand or by mechanical means, to a depth normal for the particular kind of sprigs being planted. Sprigs may be broadcast over the areas to be planted and then forced into the soil by means of a straight spade, straight bladed disc harrow, or by other acceptable means. Water sprigs not later than 30 minute after planting.

After sprigs have been planted but before watering, apply seed uniformly over the entire sprigged area if seeding is required by the special provisions. No covering of seed will be required.

Compact sprigged area when so directed by the Engineer.

Conduct seeding, compacting, watering, and all other operations so as to minimize dislodging of the planted sprigs.

### **(C) Watering Sprigs:**

Water sprigs during and after planting operations until final acceptance. Application of water may be made by the use of hydraulic seeding equipment, farm type irrigation equipment, or by other acceptable means.

## **1663-4 MAINTENANCE OF SPRIGGING.**

Maintain areas of sprigging in a satisfactory condition until final acceptance of the project. Maintenance includes mowing at the locations and times directed by the Engineer.

## **1663-5 METHOD OF MEASUREMENT.**

### **(A) Sprigging:**

The quantity of sprigging to be paid for will be the actual number of square yards (square meters) of sprigging, measured along the surface of the ground, which has been completed and accepted.

### **(B) Water:**

The quantity of water to be paid for will be the actual number of 1,000 gallon (liter) units of water which have been applied any time, as directed by the Engineer, to areas of sprigging. Measurement of water will be made by means of an approved metering device at the source of supply, or by determining the volumetric capacity of tank trucks used to deliver water to the project and recording the number of loads delivered by each truck.

### **(C) Mowing:**

The quantity of mowing to be paid for will be measured as provided in Article 1660-8(B).

## **1663-7 BASIS OF PAYMENT.**

### **(A) Sprigging:**

The quantity of sprigging, measured as provided in Article 1663-6(A), will be paid for at the contract unit price per square yard (square meter) for "Sprigging."

### **(B) Water:**

The quantity of water, measured as provided in Article 1663-6(C), will be paid for at the contract unit price per 1,000 gallons (liters) for "Water."

**(C) Mowing:**

Mowing will be paid for as provided in Article 1660-9(B) for "Mowing."

**(D) Limestone, Fertilizer, and Seed:**

No direct payment will be made for furnishing and applying limestone, fertilizer, and seed, this will be incidental to the work covered by "Sprigging."

**(E) Compensation:**

The above prices and payment will be full compensation for all work covered by this section.

**(F) Pay Items:**

Payment will be made under:

Sprigging .....	Square Yard (Square Meter)
Water .....	1,000 Gallons (Liters)

**SECTION 1664  
SODDING**

**1664-1 DESCRIPTION.**

Prepare soil, furnish and place limestone, fertilizer, sod, and water; and other operations necessary for the permanent establishment of vegetation from sod on shoulders, slopes, ditches, or other roadside areas.

Adapt operations to variations in weather and soil conditions so as to assure the successful establishment and growth of grasses.

Take care to preserve the required line, grade, and cross section of the area treated.

The actual conditions which occur during the construction of the project will determine the quantity of water used and mowing required. The quantity of water or mowing may be increased, decreased or eliminated entirely at the direction of the Engineer. Such variations in quantity will not be considered alterations in the details of construction or a change in the character of the work.

**1664-2 MATERIALS.**

Refer to Division 10:

Fertilizer .....	Article 1060-2
Limestone .....	Article 1060-3
Sod.....	Article 1060-7
Water .....	Article 1060-9

The special provisions will state the analysis of fertilizer and the kinds of sod.

**1664-3 SODDING.**

**(A) Handling and Storing Sod:**

Exercise extreme care during all operations of loading, transporting, unloading, storing, placing, tamping, and staking sod, to prevent breaking the sod sections and to prevent the sod from drying out. Any sod that is torn, broken, or too dry will be rejected. Torn or broken sod, if kept moist, may be used for filling unavoidable small gaps in sod cover as permitted.

Place sod on the designated areas within 48 hours after being cut unless otherwise directed.

**(B) Soil Preparation:**

Remove litter and other debris. Mow and satisfactorily dispose of weeds or other unacceptable growth on the areas to be sodded.

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Bring the area to be sodded to a firm uniform surface at such elevation that the surface of the complete sodding conforms to the finished grade and cross section as shown on the plans.

Scarify or otherwise loosen soil to a depth of not less than 5 inches (130mm). Break clods and work the top 2 to 3 inches (52 to 78 mm) of soil into an acceptable soil bed by using soil pulverizers, drags, or harrows.

Place limestone and fertilizer prior to placing the sod. The special provisions will state the kind and grade of fertilizer, and the rates of application of limestone and fertilizer. Distribute the limestone and fertilizer uniformly over the area and thoroughly mix in the top five inches (130 mm) of the soil by discing, harrowing, or other approved methods.

Prepare the area by harrowing, dragging, raking, or other approved methods to give a lawn type finish. Remove all trash, debris and stones larger than 1-1/2 inch (38 mm) in diameter or other obstructions that could interfere with the placing of the sod. Moisten the finished surface with water prior to placing the sod.

### **(C) Placing Sod:**

The special provisions will state the seasonal limitations for sodding and the kind of sod to use.

Sod handling and placement will be a continuous process of cutting, transporting, and installing without appreciable delays. Install sod within 48 hours after being cut and water immediately after installation.

Place sod firmly and carefully by hand within 24 hours after soil preparation is completed and accepted by the Engineer. Pack each piece of sod tightly against the edge of adjacent pieces so that the fewest possible gaps will be left between the pieces. Close unavoidable gaps with small pieces of sod.

When placing sod on a slope, begin at either the top or the toe of the slope. Place sod with the long edge horizontal and with staggered vertical joints. Turn the edge of the sod slightly into the ground at the top of a slope and place a layer of earth over it and compact so as to divert the surface water over and onto the top of the sod.

Stake sod in place by driving stakes flush with the sod, on all slopes 2:1 or steeper, in drainage channels, on other areas shown on the plans, and on any areas that are in such condition that there is danger of sod slipping. Perform staking concurrently with sod placement and prior to tamping with sound wooden stakes which are approximately 1 inch square (645.2 square mm) or 1 inch (25.4 mm) in diameter and not less than 12 inches (304.8 mm) in length. Place enough stakes to prevent slipping or displacement of the sod. Drive stakes perpendicular to the slope. Where backfill is necessary on cut slopes to obtain a uniform sodding area, provide stakes of sufficient length to reach a minimum of 3 inches (76.2 mm) into the solid earth underneath the backfill.

On all other areas, use metal staples in place of wooden stakes. The metal staples should be 12 inches (305 mm) long, made of 11 gauge (3.0 mm diameter) new steel wire so as not to bend when pinned or driven through the sod. Shorter staples may be used with the approval of the Engineer.

Place, stake, and staple the sod where necessary, then tamp or roll carefully and firmly by acceptable means. If rolled, roller shall weigh 150#/ft (224kg/m) of roller width. Take extreme care to prevent the installed sod from being torn or displaced.

Do not place sod when the atmospheric temperature is below 32°F (0°C). Do not use frozen sod nor place on frozen soil.

### **(D) Watering Sod:**

Water carefully and thoroughly after sod has been placed and tamped. Perform watering as directed until final acceptance. Application of water may be made by the use of hydraulic seeding equipment, farm type irrigation equipment, or by other acceptable means.

**1664-4 MAINTENANCE**

Maintain sod in a satisfactory and live condition until final acceptance of the project. Maintenance includes watering and mowing at the locations and times as directed.

**1664-5 METHOD OF MEASUREMENT**

**(A) Sodding:**

The quantity of sodding to be paid for will be the actual number of square yards (square meters) of sodding, measured along the surface of the ground, which has been completed and accepted.

**(B) Water:**

The quantity of water to be paid for will be the actual number of 1,000 gallon (liter) units of water which have been applied any time, as directed, to areas of sodding. Measurement of water will be made by means of an approved metering device at the source of supply, or by determining the volumetric capacity of tank trucks used to deliver water to the project and recording the number of loads delivered by each truck.

**1664-6 BASIS OF PAYMENT**

**(A) Sodding:**

The quantity of sodding, measured as provided in Article 1663-6(B), will be paid for at the contract unit price per square yard (square meter) for "Sodding."

**(B) Water:**

The quantity of water, measured as provided in Article 1663-6(B), will be paid for at the contract unit price per 1,000 gallons (liters) for "Water."

**(C) Mowing:**

Mowing will be paid for as provided in Article 1660-9(B) for "Mowing."

No direct payment will be made for mowing the sodding areas prior to soil preparation as such work will be considered to be incidental to sodding.

**(D) Limestone and Fertilizer:**

No direct payment will be made for furnishing and applying limestone and fertilizer, this will be incidental to the work covered by "Sodding."

**(E) Compensation:**

The above prices and payment will be full compensation for all work covered by this section.

**(F) Pay Items:**

Payment will be made under:

Sodding..... Square Yard (Square Meter)  
 Water ..... 1,000 Gallons (Liters)

**SECTION 1665  
 FERTILIZER TOPDRESSING**

**1665-1 DESCRIPTION.**

Furnish and uniformly distribute fertilizer as a topdressing to areas on which seeding and mulching, sprigging, or sodding are completed and a vegetative cover is established. Topdress previously seeded, sprigged, or sodded areas under other contracts when so stated in the special provisions or where so directed.

The actual conditions that occur during the construction of the project will determine the quantity of fertilizer topdressing used. In the event that a vegetative cover has not had

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sufficient time to develop to a size suitable for topdressing before completion of the project, the work of fertilizer topdressing will be decreased or eliminated entirely. Where the use of additional fertilizer topdressing would be beneficial to the establishment of grasses or legumes, the work of fertilizer topdressing will be increased. The quantity of fertilizer topdressing may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of work.

**1665-2 MATERIALS.**

Use fertilizer containing no urea for topdressing.

Refer to Division 10:

Fertilizer ..... Article 1060-2

The analysis of fertilizer shall be as stated in the special provisions.

**1665-3 APPLICATION OF FERTILIZER TOPDRESSING.**

Apply fertilizer topdressing at the locations and times as directed, regardless of whether or not other seeding, sprigging, or sodding operations are underway at the time.

The special provisions will state the rate of application and analysis of fertilizer. Distribute fertilizer uniformly without any type of soil disturbance.

Refer to the provisions of 1660-5 for the approval of equipment; the use of liquid fertilizer; and the protection of traffic, structures, guardrails, traffic control devices, and other appurtenances.

**1665-4 METHOD OF MEASUREMENT.**

The quantity of fertilizer topdressing, principle and sequential, to be paid for will be the actual number of tons (metric ton) of fertilizer which have been uniformly distributed as topdressing in accordance with these specifications.

The weight of dry fertilizer will be determined by bag count of standard weight bags, or by weighing the fertilizer in trucks on certified platform scales or other certified weighing devices.

In the event that an alternative analysis of fertilizer topdressing is approved and used, the quantity of fertilizer topdressing to be paid for will be the actual equivalent number of tons (metric ton) of fertilizer, of the specified analysis, based on nutrient value.

The weight of liquid fertilizer will be the equivalent weight in tons (metric ton) of dry fertilizer.

**1665-5 BASIS OF PAYMENT.**

The quantity of fertilizer topdressing, measured as provided in Article 1665-4, will be paid for at the contract unit price per ton (metric ton) for "Fertilizer Topdressing."

Payment will be made under:

Fertilizer Topdressing ..... Ton (Metric Ton)

**SECTION 1670  
PLANTING**

**1670-1 DESCRIPTION.**

Furnish, deliver, and plant trees, shrubs, vines, ground covers, bedding plants, and seedlings at locations shown on the plans or as directed, in accordance with these specifications.

The work of planting includes plant bed preparation, initial planting, plant establishment, and replacement planting.

Perform the operations in a careful, workmanlike manner that will promote the continued life and healthy growth of all plants in their final location.

The actual conditions that occur during the construction of the project will determine the quantity of plant bed fumigation or post-emergence and pre-emergence herbicidal treatment for plant beds. The quantities of plant bed fumigation and post-emergence and pre-emergence herbicidal treatment for plant beds may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

**1670-2 MATERIALS.**

Refer to Division 10:

Fertilizer .....	Article 1060-2
Water .....	Article 1060-9
Plant materials --nursery grown.....	Article 1060-10
Mulch for planting.....	Article 1060-11
Materials for staking or guying.....	Article 1060-12
Herbicide .....	Article 1060-13

Furnish nursery grown plant materials.

Use methyl bromide as fumigant consisting of a mixture of 80% methyl bromide and 20% chloropicrin. A different ratio of fumigant containing methyl bromide and chloropicrin may be used provided that the amount of active ingredient specified in Article 1670-7 is provided.

Use a 2 mil. polyethylene agricultural plastic sheeting free of holes, punctures, and tears to cover the fumigated plant beds. Use an appropriate width of plastic for the width of the plant bed, and obtain approval prior to fumigation.

The special provisions will state the kind of herbicides to be used.

**1670-3 WEATHER AND SEASONAL LIMITATIONS.**

Perform planting operations only between the dates shown in the special provisions except where otherwise permitted in writing.

Do not plant when the temperature is below 32°F (0°C), when the plant hole is frozen or when soil to excavate and fill the plant hole is frozen, or too wet.

Perform fumigation during or within 2 weeks prior to the time allowed for planting as shown in the special provisions. Fumigate when the soil temperature is at least 55°F (12.8°C) at a depth of 5 inches (127 mm) and moderately moist (50-85% of field capacity).

Apply post-emergence herbicide when the weeds are near maturity but not when the weeds are under stress from drought, disease, insect damage, or any other cause.

Do not apply post-emergence herbicide when rain is likely within the next 6 hours or as restricted on the product label.

**1670-4 CARE AND HANDLING PLANTS.**

**(A) General:**

Exercise utmost care in digging, loading, transporting, unloading, planting, or otherwise handling plants, and use adequate precautions to prevent injury to or drying out of the trunk, branches, or roots; and to prevent freezing of the plant roots. Heel-in plants within 48 hours of delivery from the nursery, if they can not be planted within that time.

Properly maintain all heeled-in plants until planted. Do not have plants remain heeled-in for more than 30 days. Open plants immediately when delivered in boxes or wrapped in bundles or other forms of closed packages and inspect and dampen if necessary.

**(B) Balled and Burlapped Plants:**

Protect the roots of balled and burlapped plants, if not immediately planted after delivery, by adequately covering with a soil, mulch, or sawdust that is kept moist

constantly in an acceptable manner appropriate to weather or seasonal conditions. Preserve the solidity of the plant ball carefully.

**(C) Bare Rooted Plants:**

Refrigerate or immediately heel-in all plants, if not promptly planted, in moist soil, mulch, or sawdust in an acceptable manner corresponding to generally accepted horticultural practice.

Protect the plants from drying out by means of wet canvas, burlap, or straw, or by other means acceptable while being transported or planted.

**1670-5 PLANT LOCATION.**

Locate and mark on the ground locations for plants and outlines for areas to be planted or reforested and obtain approval prior to digging plant holes for beds.

Where so directed, furnish and install standard identification wires with plastic flags to designate individual plants in major planting areas.

Flags will not necessarily be needed for all plants required by the contract, but use these flags on portions of the project until plant locations in these portions are approved.

Unforeseen conditions may make it necessary to make minor adjustments in plant locations due to utility lines, traffic signs, rock, drainage, etc., and such adjustments will be permitted subject to approval.

**1670-6 PRUNING.**

Prune shrubs and trees after planting as shown on the plans or as directed by the Engineer. Pruning done at any time in no way alters the Department's right to reject plant material. Prune in accordance with the International Society of Arboriculture pruning techniques, and according to shape, size, and condition of the individual plant.

**1670-7 PLANT BED TREATMENT.**

**(A) General:**

Treat plant beds by fumigation or by application of herbicides where called for by the plans or directed.

**(B) License:**

Make pesticide applications by or under the direct supervision of an applicator licensed by the North Carolina Department of Agriculture and Consumer Services.

**(C) Fumigation:**

Fumigate the plant beds with methyl bromide in preparation for planting.

Prior to fumigation, level the plant bed to a proper planting grade. Till the bed to a depth of 5 to 8 inches (127 to 203.3 mm). Prepare soil in good tilth with no dry clods over 1 inch (25.4 mm) in diameter present. Cover with plastic tarp within 24 hours of soil preparation completion.

Apply the methyl bromide gas under plastic sheets at a rate of 1 pound active ingredient per 100 square feet (0.05 kg per square meter). Use envelope folds at the edges of the bed with the edge of the plastic buried 4 to 6 inches (101.6 to 152.4 mm) deep.

Keep the plastic over the bed for a period of 48 to 72 hours. Reform the bed to the required shape, after removal of the plastic, with little or no soil inversion. Pursue continuous planting within 24 hours of plastic cover removal.

**(D) Post-Emergence Herbicidal Treatment:**

Post-emergence herbicidal treatment includes applications of a systemic post-emergence total vegetation control herbicide.

The special provisions will state the rates of application of the post-emergence herbicides.

Apply all herbicides in accordance with the manufacturer's instructions on the product label.

Apply post-emergence herbicide when the weeds are near maturity but not when the weeds are under stress from drought, disease, insect damage, or any other cause. If cloudy weather or other poor growing conditions are present, extend this 7 day period until there are visible signs of herbicidal activity. Reapply if necessary to achieve a thorough control.

Post-Emergence Application for Plant Bed Preparation:

Apply a systemic post-emergence total vegetation control herbicide to the bed area before any tilling or mowing is performed. Perform no tilling or mowing for at least 7 days after the application. Thoroughly till the bed after the waiting period, or when injury to the vegetation appears. Prepare the soil in good tilth with no clods over 1 inch (25.4 mm) present and prior to planting.

Post-Emergence Application for Plant Bed Maintenance:

Apply a systemic post-emergence herbicidal treatment in accordance with product label in a manner to ensure no damage to planted material. Perform no mowing or vegetation removal by other means for at least 7 days after the application.

**(E) Pre-Emergence Herbicidal Treatment:**

Pre-emergence herbicidal treatment includes the application of a pre-emergence herbicide.

Apply a pre-emergence herbicide to the plant bed after the existing vegetation has been completely controlled by a post-emergence herbicide application as specified in Article 1670-7 (D) and after installation of planting and mulching as described in Article 1670-9 and Article 1670-10. Apply pre-emergence herbicide following planting and mulching of plant bed prior to germination of weed seeds. An additional application of post-emergence herbicidal treatment may be necessary to control emerged weeds, as directed, if sufficient time has lapsed between tillage and installation of plant material and mulch. No direct payment will be made for additional post-emergence herbicidal work if such work is due to carelessness or neglect on the part of the Contractor.

Apply herbicide evenly over the soil surface with properly calibrated equipment at the specified rate.

If a minimum of 0.5 inch (12.7 mm) of rainfall does not occur within 15 days of application of pre-emergence herbicidal treatment, apply a minimum of 0.5 inch of water (2.8 gallons per square yard (13 liters per square meter)) uniformly over the planting area to activate the herbicide.

**1670-8 EXCAVATION OF PLANT HOLES.**

Provide cylindrical shaped plant hole excavations for plants other than reforestation plants, with the plant location stake marking the center of the circle and with the sides of the hole being approximately vertical. When mechanical means are used which make digging of cylindrical holes impractical, the complete hole must have the minimum dimensions as shown on the plans.

When plants are to be grouped together in a plant bed as contrasted to widely separated individual plants, and when so indicated on the plans, loosen and pulverize clods to a depth of not less than 5 inches (127 mm) for the entire area of the plant bed by means of a scarifier, disc, spade, or other appropriate means before plant holes are dug.

Plant reforestation plants in holes made by a planting spade, planting bar, or other means which meet the approval of the Engineer. Make the hole of sufficient size to accommodate the entire extended root system of the plant without cramping.

**1670-9 PLANTING, BACKFILLING, AND WATERING.****(A) General:**

The plans will state the kind and rate of application of fertilizer. Apply fertilizer during backfilling operations in a manner that will ensure proper placement of the fertilizer and avoid injury to the roots.

Scarify the walls and floor of the plant hole after the plant hole is dug. Place the plant in the prepared plant hole at the proper position as regards to depth, alignment, final grade of the surrounding ground level, and vertical placement of the trunk. Maintain this position during all subsequent backfilling and watering operations. Set plants with the root collar at the same depth as grown in the nursery or raise above grade as indicated on the plans.

Moisten the soil with water after one-half to two-thirds of the backfilling and tamping has been completed, if the soil in the plant holes is not sufficiently moist. Apply water to moisten all soil but not a quantity that will saturate the soil to the extent of excluding all air from around the roots. Place the remainder of the backfill after complete absorption of water.

Construct water rings around all plants, except reforestation plants, in accordance with details shown on the plans. A water ring consists of a ridge of firmed soil in a ring around the plant and of a minimum inside diameter equal to the diameter of the plant hole. This ridge is approximately 6 inches (152.4 mm) high and is compacted firmly enough to hold water.

**(B) Balled and Burlapped Plants:**

Handle balled and burlapped plants by the ball and place in the plant hole so that the soil of the ball will not be loosened from the roots. After the hole has been almost completely backfilled and the soil thoroughly firmed under and around the ball, cut the burlap away and remove from around the stem of the plant. Complete backfilling so as to avoid loosening of the soil of the root ball.

**(C) Container Grown Plants:**

Planting requirements for container grown plants are the same as applicable to balled and burlapped plants. Remove container immediately before planting. During the removal of the container sufficient precautions shall be taken so as to ensure that the soil and roots inside the container are undisturbed. Scarify roots when directed.

**(D) Bare Rooted Plants:**

Before the plant is placed in the plant hole, cut off smoothly any bruised or broken parts of roots. Place the plant in its proper position in the hole and backfill. Carefully place the backfill material, worked around and under the roots, and compacted in a manner that avoids bruising or breaking the roots.

**(E) Reforestation Plants:**

Reforestation includes tree reforestation and shrub reforestation. Type, mixture, size, furnish description, and spacing will be as shown on the reforestation detail sheet in the plans.

Prior to beginning reforestation, each area to be reforested will be measured by the Engineer to determine the exact number of acres (hectares) for tree reforestation or square yards (square meters) for shrub reforestation therein, and the quantity of each species of seedling to be planted within the area.

Where structures or plantings do not adequately delineate the outline of the area to be reforested, stake the outline of the area as directed by the Engineer. Furnish cypress, cedar, oak, locust, or other wood stakes approved by the Engineer. Provide stakes with a minimum industry standard of 2" x 2" (50.8 mm x 50.8 mm)(nominal) size and approximately 30 inches (762 mm) in length with a 15 inch (381 mm) white top. Drive

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stakes in the ground with approximately 18 inches (457.2 mm) remaining above the ground line, and place as necessary to define and delineate the reforestation outline.

Have sample stock of reforestation seedlings inspected by the Engineer, for general health and moisture content, within 24 hours prior to planting.

After the plant hole has been prepared, place the plant upright in the hole at the correct depth without crowding or bunching the roots. Firm the soil around the root system from the bottom of the plant hole to natural ground elevation.

Upon completion of planting the required number of seedlings within all areas to be reforested, the Contractor will be relieved of further responsibility in connection with reforestation except for damage caused directly by the Contractor.

### **1670-10 MULCH FOR PLANTING.**

Place mulch within 7 days of initial planting as a top layer on the backfilled plant hole and water ring. Place mulch approximately 4 inches (101.6 mm) deep, as shown on the plans or as directed. Place additional mulch as directed during establishment.

No mulching required for reforestation plants.

### **1670-11 WATER FOR PLANTING.**

Water at the time of planting as specified in Article 1670-9 and at the Contractor's election and the Engineer's approval. Water with gravity flow or low pressure applicators which have been approved, and which will not erode soil around the plant root system or damage to plants. Saturate the soil around each plant thoroughly at each watering.

### **1670-12 STAKING OR GUYING.**

Stake or guy plants as shown on the plans or as directed to prevent damage.

Take care to ensure that the plant is attached and held rigid to the support in a manner that will prevent chafing or other injury to the bark, and that will permit normal development of the trunk or branch.

### **1670-13 INITIAL PLANTING.**

Initial planting will be considered complete when the plants have been placed in the plant hole, backfilled, fertilized, watered, mulched, staked, and guyed, and the plants are in an acceptable condition.

### **1670-14 ESTABLISHMENT.**

Begin establishment for all initial or replacement plants immediately after they are planted. Maintain trees, shrubs, vines, and groundcovers, and the area of planting until final acceptance of the project. Mow and maintain the area around trees and shrubs for a distance of 6 feet (1.8 m) beyond the outside limits of water rings or 6 feet (1.8 m) beyond the limits of the guy stakes, whichever is greater; within shrub beds; and for a distance of 6 feet (1.8 m) outside the perimeter of the shrub beds. Establishment includes cutting of grass and control of weeds; watering; fertilization; replacement of mulch; repair or replacement of guy stakes, guy wires, and water rings; and other work as directed to ensure the survival and growth of plant material and the satisfactory appearance of the project. Remove dead plant material from the project during the establishment period.

All work required for establishment except for "Water" and "Mulch for Planting" will be considered incidental to planting pay items,

### **1670-15 REPLACEMENT PLANTING.**

Replacement planting of trees, shrubs, and ground cover consists of replacing those plants which are not in a living, healthy condition or do not conform to the specifications contained in the edition of "American Standard for Nursery Stock" that is in effect on the date of advertisement, or which have been damaged or stolen. Replacement of reforestation plants will not be required.

Perform replacement planting within the planting season specified in the project special provisions.

**1670-16 FINAL INSPECTION.**

All planting must be completed and all plants must be in a living and healthy condition at the time of final inspection.

**1670-17 METHOD OF MEASUREMENT.**

The quantity of planting to be paid for will be the actual number of plants of each species and size called for in the contract, other than reforestation plants, which have been planted and accepted.

The quantity of reforestation to be paid for will be the actual number of acres (hectares) of land, measured along the surface of the ground, which has been acceptably planted with seedlings in accordance with these specifications.

The quantity of wetland reforestation to be paid for will be the actual number of acres (hectares) of land, measured along the surface of the ground, which has been acceptably planted with seedlings in accordance with these specifications.

The quantity of plant bed fumigation to be paid for will be the actual number of square yards (square meters) of plant bed, measured along the surface of the ground, which has been acceptably treated by fumigation.

The quantity of post-emergence herbicidal treatment to be paid for will be the actual number of square yards (square meters) of plant bed, measured along the surface of the ground, over which an acceptable application of post-emergence herbicide has been made.

The quantity of pre-emergence herbicidal treatment to be paid for will be the actual number of square yards (square meters) of plant bed, measured along the surface of the ground, over which an acceptable application of pre-emergence herbicide has been made.

The quantity of mulch to be paid for will be the actual number of cubic yards (cubic meters) of mulch furnished and placed around plants according to the plans, specifications and/or as directed. Where mulch is furnished in bales or bags, the number of cubic yards (cubic meters) in each bale or bag will be determined and then multiplied by the number of bales or bags of the same size which have been acceptably furnished and placed. Where mulch is furnished in trucks, each truck will be measured by the Engineer and must bear a legible identification mark indicating its capacity. Load each truck to at least its measured capacity at the time it arrives at the site of the work.

The quantity of water to be paid for will be the actual number of 1,000 gallon (1 kiloliter) units of water which have been furnished and applied to plants according to the plans, specifications and/or as directed. Measurement of water will be made by means of an approved metering device at the source of supply, or by determining the volumetric capacity of tank trucks used to deliver water to the project and recording the number of loads delivered by each truck.

**1670-18 BASIS OF PAYMENT.**

Quantities of planting, measured as provided in Article 1670-17, will be paid for at the contract unit prices each for the various plant species and sizes indicated in the contract.

No payment will be made for plant bed preparation, tillage, staking or guying, and fertilization, for this work will be considered incidental to other work in the contract.

The quantity of tree reforestation, measured as provided in Article 1670-17, will be paid for at the contract unit price per acre (hectare) for "Reforestation".

The quantity of Wetland reforestation, measured as provided in Article 1670-17, will be paid for at the contract unit price per acre (hectare) for "Wetland Reforestation".

The quantity of plant bed fumigation, measured as provided in Article 1670-17, will be paid for at the contract unit price per square yard (square meter) for "Plant Bed Fumigation."

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The quantity of post-emergence herbicidal treatment, measured as provided in Article 1670-17, will be paid for at the contract unit price per square yard (square meter) for "Post-emergence Herbicidal Treatment for Plant Beds".

The quantity of pre-emergence herbicidal treatment, measured as provided in Article 1670-17, will be paid for at the contract unit price per square yard (square meter) for "Pre-emergence Herbicidal Treatment for Plant Beds".

The quantity of mulch, measured as provided in Article 1670-17, will be paid for at the contract unit price per cubic yard (cubic meter) for "Mulch For Planting".

The quantity of water, measured as provided in Article 1670-17, will be paid for at the contract unit price per 1,000 gallons (1 kiloliter) for "Water For Planting".

Payment will be made under:

(Plant species and size indicated in contract) .....	Each
Reforestation .....	Acre (Hectare)
Wetland Reforestation.....	Acre (Hectare)
Plant Bed Fumigation.....	Square Yard (Square Meter)
Post-emergence Herbicidal Treatment for Plant Beds.....	Square Yard (Square Meter)
Pre-emergence Herbicidal Treatment for Plant Beds .....	Square Yard (Square Meter)
Mulch for Planting .....	Cubic Yard (Cubic Meter)
Water for Planting .....	1000 Gallons (1 kiloliter)

**SECTION 1675  
RESPONSE FOR EROSION CONTROL**

**1675-1 DESCRIPTION.**

The work covered by this section consists of preparatory work and operations, including but not limited to those necessary for the movement of personnel, equipment, and supplies to the project necessary for the pursuit of the work of seeding and mulching, temporary seeding, repair seeding, supplemental seeding, sprigging and sodding, matting for erosion control, fertilizer topdressing, temporary mulching, silt cleanout or repair of temporary erosion control devices.

**1675-2 METHOD OF MEASUREMENT.**

The quantity of responses for erosion control to be paid for will be the actual number of times the erosion control contractor moves onto the project, including borrow and waste areas, to perform work related to seeding and mulching, temporary seeding, repair seeding, supplemental seeding, sprigging and sodding, matting for erosion control, fertilizer topdressing, temporary mulching, silt cleanout, or repair of temporary erosion control devices provided:

- a. The Engineer gives notice to the prime contractor authorizing the move in, and
- b. the response is not the initial mobilization for erosion control for the project, and
- c. the last time the erosion control contractor was on the project, the erosion control contractor completed all work that was available to be completed and was released by the Engineer,
- d. the erosion control contractor responded to the Engineer's request from a location which is off the site of the project, and
- e. the erosion control contractor responded with adequate equipment, personnel, and supplies so as to begin work within 54 hours of the Engineer's notification to the prime contractor.

**1675-3 COMPENSATION.**

The quantity of responses for erosion control, measured as provided above, will be paid at the contract unit price per each for "Response for Erosion Control."

The provisions of Article 104-5 will not be applicable to this item of work.

Payment will be made under:

Response for Erosion Control .....Each

**NOTES:**

