

DIVISION 200. EARTHWORK, LANDSCAPING, AND EROSION CONTROL**EARTHWORK****SECTION 201. CLEARING, TREE REMOVAL AND PROTECTION, CARE AND REPAIR OF EXISTING PLANT MATERIAL**

201.01 Description. This work shall consist of performing the following items wherever they occur within the right-of-way, or within the limits of construction, including the areas of borrow pits furnished by the Department.

- (a) **Clearing.** Clearing shall consist of the removal and disposal of all obstructions such as fences, walls, foundations, buildings, accumulations of rubbish of whatever nature and existing structures, the removal of which is not otherwise provided for in Article 501.07; all logs, shrubs, bushes, saplings, grass, weeds, other vegetation and stumps of a diameter less than 6 in. (150 mm).
- (b) **Tree Removal.** Tree Removal shall consist of the cutting, grubbing, removal, and disposal of trees and stumps, as hereinafter defined.
- (c) **Protection of Existing Plant Material.** Protection of existing plant material shall consist of directing work activity away from and protecting trees, shrubs, turf, and herbaceous plants on and adjacent to the right-of-way.
- (d) **Care of Existing Plant Material.** Care of existing plant material shall consist of pruning, fertilizing, and watering existing plant material to maintain health and vigor during and following construction activity.
- (e) **Repair or Replacement of Existing Plant Material.** Repair or replacement of existing plant material damaged by the Contractor shall consist of restoring to original condition specific plant material that was designated to be saved within the limits of construction, or restoring plant material outside the limits of construction that was damaged by the Contractor.

201.02 Definitions. Tree - A woody, perennial plant having a single main stem or trunk, the diameter of which is 6 in. (150 mm) or more at a point 4.5 ft (1.3 m) above the highest ground level at the base of the tree. Those having a diameter less than 6 in. (150 mm) will be considered saplings. A multiple-stem tree that forks below the 4.5 ft (1.3 m) point of measurement will be considered a cluster of individual trees. A tree that forks at or above the 4.5 ft (1.3 m) point of measurement will be considered a single tree.

A tree stump with a diameter at cut off of 6 in. (150 mm) or more will be considered as a tree for purposes of measurement and removal.

Limits of Construction - A boundary line, not necessarily the right-of-way line, extending along each side of the centerline of the improvement as shown on the plans or cross sections, or as designated by the Engineer.

Root Zone - An area around a plant extending at least as far from the base as the longest horizontal branches.

CONSTRUCTION REQUIREMENTS

201.03 Removal of Obstructions and Other Materials. All items defined as clearing in Article 201.01(a) shall be removed and disposed of as required by these Specifications.

201.04 Tree Removal. Prior to beginning tree removal, all requirements of Article 201.05(a) shall be completed. All trees, except those designated to be saved, and all stumps, shall be cut and disposed of according to Article 202.03. Trees and stumps within the slope limits of embankments 2 ft (600 mm) or more in depth shall be cut off at ground level. All other trees and stumps within the right-of-way shall be removed to a depth of not less than 12 in. (300 mm) below the elevation of the subgrade, the finished earth surface, or the ground line. Trees of Osage Orange shall not be cut off as specified above, but shall be pulled or grubbed in such a manner as to insure complete removal.

201.05 Protection of Existing Plant Material. All plant material designated to be saved, or outside of the limits of construction, shall be protected prior to beginning any clearing or removal work and shall remain protected during subsequent construction work.

Parking or maneuvering of machinery, stockpiling of materials, or any other use will not be allowed upon unpaved areas within 10 ft (3 m) of the root zone of trees or plants designated to be protected.

If requested by the Contractor, the Engineer will stake or otherwise mark these protection limits.

- (a) Temporary Fencing. The Contractor shall manually erect a temporary fence as designated on the plans or where directed by the Engineer. The temporary fence shall be similar to plastic or wood lathe snow fence, and shall be a minimum of 4 ft (1.2 m) high with stakes placed a maximum of 15 ft (4.5 m) apart.
- (b) Tree Trunk Protection. The Contractor shall provide 2 in. x 8 in. x 8 ft (50 mm x 200 mm x 2.4 m) boards banded continuously around each trunk to prevent scarring of trees shown on the plans or designated by the Engineer. For multistem trees, saplings, and shrubs to be protected within the area of construction, temporary fencing may be used for trunk protection.
- (c) Pruning for Safety and Equipment Clearance. All pruning shall be done according to the National Arborist Association's Pruning Standards for Shade Trees Class II - Standard pruning specifications. Plant material shall be pruned to provide a minimum vertical clearance of 20 ft (6 m) from the finished surface of the road bed and shoulders. Pruning for sight distance and other safety purposes shall be as shown on the plans or as directed by the Engineer. Branches on existing plant material to remain that need to be removed for safety or equipment clearance shall be pruned prior to or during

the clearing operation. Breaking off branches of plant material to remain during clearing or construction operations will not be allowed.

201.06 Care of Existing Plant Material. Root and tree pruning shall be performed as follows.

- (a) **Root Pruning.** If construction is to occur within the root zone of existing plant material, root pruning and special plant care will be required. All pruning shall be performed by a professional arborist.

Root pruning using an approved mechanical root pruning saw shall be performed prior to digging where noted on the plans, or directed by the Engineer. Whenever roots of plant material to remain are exposed during construction, the damaged root ends are to be removed by cutting them off cleanly.

Pruning shall be done in the presence of the Engineer and in such a manner as to preserve the natural growth habit of each plant.

Any damage to the root zone, as determined by the Engineer, shall be compensated by pruning an equivalent amount of the top vegetative growth of the plant material within one week following root damage.

The procedure of "drop crotch" pruning shall be employed for all trimming of branches in excess of 2 in. (50 mm) in diameter.

Fertilizing and watering after root pruning shall be as follows.

- (1) **Fertilizer Nutrients.** Fertilizer nutrients shall be applied within 48 hours after root damage occurs. A fertilizer with a 1:1:1 ratio shall be applied at the rate of 5 lb (2 kg) of nutrients per 1000 sq ft (90 sq m).

Application shall be accomplished by placing dry fertilizer in holes in the soil. The holes shall be 8 to 12 in. (200 to 300 mm) deep and spaced 2 ft (600 mm) apart in an area beginning 30 in. (750 mm) from the base of the plant. Holes shall be punched with a punch bar, dug with a spade, drilled with an auger, or any other method approved by the Engineer. Approximately 0.02 lb (10 g) of fertilizer nutrients shall be placed in each hole [250 holes/1000 sq ft (250 holes/90 sq m)].

If the Engineer determines that the hole method of fertilizer placement is not practical or desirable, an approved method of uniform surface application will be allowed.

- (2) **Supplemental Watering.** In case of inadequate rainfall, as determined by the Engineer, supplemental water shall be applied within 48 hours of any root damage. The water shall be applied at the rate of 2 gal/sq yd (9 L/sq m) of surface area within the root zone of plant material having sustained damage to the root zone. Subsequent weekly waterings shall be applied if deemed necessary by the Engineer.

- (b) Tree Pruning. Tree pruning shall consist of pruning branches, for aesthetic and structural enhancement, of existing trees as shown on the plans or as directed by the Engineer. The National Arborist Association's Pruning Standards for Shade Trees Class II - Standard Pruning specifications shall be followed. All branch pruning shall be done between October 15 and April 15, when the trees are dormant.

201.07 Repair or Replacement of Existing Plant Material. The Contractor shall repair or replace any and all damage, deemed unnecessary by the Engineer to any existing or newly installed plant material. Unnecessary damage to ground cover or turf shall be repaired or replaced as specified for restoration of similar areas within the plans, or as directed by the Engineer.

All replacement planting under this Article shall be according to Section 253 and Article 1081.01; and shall be barerooted, or balled and burlapped according to the transplanting requirements of the plants.

Replacement, if required, shall be as follows.

- (a) Trees. Furnish, deliver, and plant a tree of the same species and variety and of the same size; or furnish, deliver, and plant at locations designated by the Engineer, a number of saplings of the same species and variety, each having a minimum diameter of 2 in. (50 mm), with the sum of the inch (millimeter) - diameters of saplings equaling the inch (millimeter) diameter of the tree to be replaced.
- (b) Shrubs, Small Trees or Evergreens. Furnish, deliver, and plant a plant of the same species and variety, and of the same size in height or width; or furnish, deliver and plant at locations designated by the Engineer, a number of plants of the same species and variety whose total measurements shall equal the measurement of the plant to be replaced, measured as above.

201.08 Removal of Saplings, Bushes and Roots. Prior to beginning removal of saplings, bushes, and roots, all requirements of Article 201.05(a) shall be completed. All saplings and bushes, except those designated to be saved, and all roots within the slope limits of embankments 2 ft (600 mm) or more in depth shall be cut off at the ground level. All other saplings, bushes and roots within the right-of-way shall be removed to a depth of not less than 12 in. (300 mm) below the elevation of the subgrade, the finished earth surface, or the ground line, and at least below the bottom of the subbase material. Bushes of Osage Orange shall not be cut off as specified above, but shall be pulled or grubbed in such a manner as to insure complete removal.

201.09 Disposal of Materials. Materials shall be disposed of according to Article 202.03.

201.10 Method of Measurement. This work will be measured for payment as follows.

- (a) Clearing. Clearing will not be measured for payment.

(b) Tree Removal.

- (1) Unit Diameter. Trees to be removed as a payment item, but not measured in acres (hectares), will be measured per unit of diameter where one unit is equal to 1 in. (25 mm). The diameter will be measured at a point 4.5 ft (1.3 m) above the highest ground level at the base of the tree and will be determined by dividing the measured circumference of the tree by 3.1416. Stumps will be measured at the elevation of cut off. A multiple stem tree's branches having a diameter of 6 in. (150 mm) or more at a point 4.5 ft (1.3 m) above the highest ground level at the base of the tree will be measured for payment as individual trees. The accumulated total number of units will be the pay quantity.
- (2) Acre (Hectare) as Unit.
 - a. Contract Quantities. The requirements for the use of contract quantities shall be according to Article 202.07.
 - b. Measured Quantities. Trees to be removed will be measured by the acre (hectare) when included in the contract as a payment item and shown at definite locations on the plans or staked for removal by the Engineer. The entire area shown on the plans, and directed by the Engineer, will be used in computing the acres (hectares). No deductions will be made for bare areas and existing roads occurring within these limits. Any removal of bushes or saplings within such areas will not be measured separately for payment.
- (3) When it is necessary to remove trees in connection with borrow pits furnished by the Contractor, trees will not be measured for payment.

(c) Protection of Existing Plant Material.

- (1) Temporary Fencing. Temporary fencing will be measured for payment in feet (meters) in place.
- (2) Tree Trunk Protection. Tree trunk protection will be measured for payment as each per tree. A tree with from one to three stems with one stem having a diameter of 6 in. (150 mm) or more or a sapling shall be measured as one tree. Tree trunk protection shall include furnishing, installing and removing this item.
- (3) Pruning for Safety and Equipment Clearance. Pruning for safety and equipment clearance will not be measured for payment.

(d) Care of Existing Plant Material.

- (1) Tree Root Pruning. Tree root pruning will be measured for payment as each per tree. Roots pruned on trees with one to three stems with one stem having a diameter equal to or greater than 6 in. (150 mm) will be measured as individual items. All pruning, including top pruning

necessary to maintain the vigor of the tree, shall be completed prior to measurement for payment.

Trimming of roots exposed during excavation will not be measured for payment.

- (2) Fertilizer Nutrients. Fertilizer will be measured by weight (mass) in pounds (kilograms) of actual nutrients used.
- (3) Supplemental Watering. Supplemental watering will be measured for payment in units of 1000 gal (1000 L) of water applied to the root zones of plant material.
- (4) Tree Pruning. Tree pruning for trees and saplings 1 to 10 in. (25 to 250 mm) in diameter will be measured for payment as each per tree or sapling. Tree pruning for trees over 10 in. (250 mm) in diameter will be measured for payment as each per tree. Measurement of trunk diameters will be according to Article 201.10(b)(1).

201.11 Basis of Payment. This work will be paid for as follows.

- (a) Tree Removal. Tree removal will be paid for at the contract unit price per unit diameter for TREE REMOVAL (6 to 15 UNITS DIAMETER); TREE REMOVAL (OVER 15 UNITS DIAMETER); TREE REMOVAL, SPECIAL (6 to 15 UNITS DIAMETER); or TREE REMOVAL, SPECIAL (OVER 15 UNITS DIAMETER); and per acre (hectare) for TREE REMOVAL, ACRES (HECTARES).

If the contract includes a payment item for Tree Removal, Acres (Hectares) but does not include a payment item for Tree Removal, Units Diameter, any tree removal not paid for as Tree Removal, Acres (Hectares), will be paid for according to Article 109.04.

- (b) Protection of Existing Plant Material. This work will be paid for at the contract unit price per foot (meter) for TEMPORARY FENCE and at the contract unit price per each for TREE TRUNK PROTECTION.

If no pay items have been established in the contract for the protection of existing plant material, this work will be paid for according to Article 109.04.

- (c) Care of Existing Plant Material. This work will be paid for at the contract unit price per each for TREE ROOT PRUNING, TREE PRUNING (1 TO 10 IN. DIAMETER) (25 TO 250 MILLIMETERS DIAMETER), or TREE PRUNING (OVER 10 IN. DIAMETER) (OVER 250 MILLIMETERS DIAMETER); at the contract unit price per pound (kilogram) for NITROGEN FERTILIZER NUTRIENT, POTASSIUM FERTILIZER NUTRIENT, or PHOSPHORUS FERTILIZER NUTRIENT; and at the contract unit price per unit for SUPPLEMENTAL WATERING.

Top pruning necessary to maintain the vigor of the tree will not be paid for as a separate item, but shall be included in the bid price for TREE ROOT PRUNING.

If no pay items have been established in the contract for the care of existing plant material, this work will be paid for according to Article 109.04.

SECTION 202. EARTH AND ROCK EXCAVATION

202.01 Description. This work shall consist of the excavation and transportation of suitable excavated material to embankment locations throughout the limits of the contract, or the excavation, transportation, and disposal of excavated material. This work does not include excavation for structures or channel excavation.

CONSTRUCTION REQUIREMENTS

202.02 Clearing, Tree Removal, and Protection of Existing Plant Material. Prior to starting excavation operations in any area, all clearing, tree removal, and protection of existing plant material in that area shall be performed according to Section 201.

202.03 Removal and Disposal of Surplus, Unstable, and Unsuitable Materials and Organic Waste. Suitable excavated materials shall not be wasted without permission of the Engineer. The Contractor shall dispose of all surplus, unstable, and unsuitable materials and organic waste, in such a manner that public or private property will not be damaged or endangered.

Suitable earth, stones and boulders naturally occurring within the right-of-way may be placed in fills or embankments in lifts and compacted according to Section 205. Broken concrete without protruding metal bars, bricks, rock stone, reclaimed asphalt pavement with no expansive aggregate, or uncontaminated dirt and sand generated from construction or demolition activities may be used in embankment or in fill. If used in fills or embankments, these materials shall be placed and compacted to the satisfaction of the Engineer; shall be buried under a minimum of 2 ft (600 mm) of earth cover (except when the materials include only uncontaminated dirt); and shall not create an unsightly appearance or detract from the natural topographic features of an area. Broken concrete without protruding metal bars, bricks, rock, or stone may be used as riprap as approved by the Engineer. If the materials are used for fill in locations within the right-of-way but outside project construction limits, the Contractor must specify to the Engineer, in writing, how the landscape restoration of the fill areas will be accomplished. Placement of fill in such areas shall not commence until the Contractor's landscape restoration plan is approved by the Engineer.

Aside from the materials listed above, all other construction and demolition debris or waste shall be disposed of in a licensed landfill, recycled, reused, or otherwise disposed of as allowed by State or Federal solid waste disposal laws and regulations and solid waste determinations of the IEPA.

A permit shall be obtained from IEPA and made available to the Engineer prior to open burning of organic waste (i.e., plant refuse resulting from pruning or removal of trees or shrubs) or other construction or demolition debris. Organic waste originating within the right-of-way limits may be chipped or shredded and placed as mulch

around landscape plantings within the right-of-way when approved by the Engineer. Chipped or shredded material to be placed as mulch shall not exceed a depth of 6 in. (150 mm).

When the Contractor proposes to dispose of surplus excavated material off the right-of-way, the Contractor shall obtain and file with the Engineer permission in writing, from the property owner, for the use of the property for this purpose. The approval of the proposed disposal site shall be according to Article 107.22. Any such disposal shall not create an unsightly or objectionable appearance or detract from the natural topographic features, nor be placed at an elevation higher than that of the adjacent roadway without permission from the Engineer.

All unstable and unsuitable material, including excavated material from sewer trenches or other underground construction, shall be excavated or removed and replaced with material as shown on the plans. Unstable and unsuitable material shall not be used in embankments. If unsuitable material is present at or below the finished grade, it shall be removed and replaced with subbase granular material, Type A or Type B, according to Section 311. Unsuitable material shall be placed as directed by the Engineer within the right-of-way or disposed of by the Contractor outside of the right-of-way.

202.04 Classification. Excavation material will be classified by the Engineer. All excavation will be classified as earth excavation, except those materials provided for in rock excavation, excavation for structures, channel excavation, and rock excavation in channel.

Rock excavation shall consist of the excavation from the roadway of boulders 1/2 cu yd (0.5 cu m) in volume or greater and all rock in ledges, bedded deposits and conglomerate deposits exhibiting the physical characteristics and difficulty of rock removal as determined by the Engineer.

Rock shall be excavated to a minimum 3 in. (75 mm) below the subgrade of the proposed pavement, surface course, or base course, and backfilled with subbase granular material, Type A or Type B to the elevations shown on the plans. The surface of the rock excavation shall be free from projecting points, ribs, crevices or undrained pockets. The method of rock removal shall be the option of the Contractor. However, excessive blasting or overshooting will not be permitted.

202.05 Drainage. The excavation shall be maintained so that positive drainage is provided at all times. Ditches and waterways shall be constructed and maintained to the lines, grades, and cross sections shown on the plans. The Contractor shall also excavate a ditch at the toe of slope for fills and at the top of slope for cuts at locations designated by the Engineer at the earliest opportunity during construction to control runoff from the embankment or cut section. Material excavated from ditches at the top of slope of cuts shall be placed in a windrow between the ditch and top of slope.

If during the prosecution of the work, it is necessary to interrupt existing sewer or under drainage to complete contract requirements, temporary drainage facilities shall be provided until the permanent drainage work has been completed. The Contractor shall preserve and protect all existing sewer and drainage facilities within the limits of the contract. The Contractor shall be responsible for all cost associated with the

repair of sewer or drainage facilities damaged due to negligence on the Contractor's part.

202.06 Excavation for Base Course Widening and Hot-Mix Asphalt Shoulders for Pavement Resurfacing. Excavation for the construction of base course widening and for hot-mix asphalt (HMA) shoulders when the existing pavement is not to be widened shall be performed according to the details shown on the plans or as directed by the Engineer. The excavated material shall be used to backfill the remaining portion of the widening trench after the widening has been constructed and to grade and reshape the shoulders to the new gradeline shown on the plans after the pavement resurfacing has been completed. Backfill shall be completed within 24 hours. The excavated material shall be deposited on the shoulders in such a manner that it will not interfere with drainage or the construction of the base course widening or shoulders and the pavement resurfacing until it can be bladed into final position.

Any surplus excavation not needed for the shoulder reshaping or any unsuitable material shall be disposed of according to Article 202.03.

If sufficient material is not obtained from the excavation for the widening or HMA shoulder to complete the shoulder grading, the additional material shall be obtained as follows.

- (a) From Within the Right-of-Way. The additional material shall be obtained from ditches within the right-of-way as directed by the Engineer. The foreslopes, backslopes and ditches in areas from which the additional material is obtained shall be shaped and finished as directed by the Engineer. The longitudinal haul shall not exceed 3 miles (5 km). If material obtained from the ditches is wet and/or difficult to handle, the Contractor may be required to disk and harrow the shoulder after placement of the material.
- (b) From an Outside Source. If additional material is not available within the existing right-of-way, the Contractor, when authorized by the Engineer, may secure material from a source of his/her own choosing provided the material conforms to the requirements of Article 204.02.

202.07 Method of Measurement. This work will be measured for payment as follows.

- (a) Contract Quantities. When the project is constructed essentially to the lines, grades, or dimensions shown on the plans, and the Contractor and the Engineer have agreed in writing that the plan quantities are accurate, no further measurement will be required and payment will be made for the quantities shown in the contract for the various items involved, except that if errors are discovered after work has been started, appropriate adjustments will be made.

When the plans have been altered or when disagreement exists between the Contractor and the Engineer as to the accuracy of the plan quantities, either party shall, before any work is started which would affect the

measurement, have the right to request in writing and thereby cause the quantities involved to be measured.

- (b) **Measured Quantities.** Earth and rock excavation will be measured in their original positions, and the volumes in cubic yards (cubic meters) computed by the method of average end areas. The volume of any unstable or unsuitable material removed will be measured for payment in cubic yards (cubic meters).

In rock excavation, the Contractor shall strip ledge rock of overburden so that necessary cross sections for measurement may be taken. Vertical measurements for determining end areas shall extend from the surface of the rock to an elevation not more than 6 in. (150 mm) below the subgrade of the proposed pavement structure, as shown on the plans, or to the bottom of the rock where that point is above the subgrade of the proposed pavement structure. Horizontal measurements for determining end areas shall extend not more than 6 in. (150 mm) beyond the slope lines fixed by the Engineer for the work. Boulders and rocks 1/2 cu yd (0.5 cu m) or more in volume will be measured individually and the volume computed from average dimensions taken in three directions.

Subbase granular material used for replacement will be measured in tons (metric tons) or in cubic yards (cubic meters) according to Article 311.08.

Subbase granular material used for replacement of rock excavation more than 6 in. (150 mm) below the subgrade of the proposed pavement structure, will not be measured for payment.

Earth moved more than once due to either stage construction or by written authorization of the Engineer will be measured for payment each time it is moved.

Earthwork required for the construction of base course widening for pavement resurfacing will be measured for payment to the neat lines as shown on the plans and the volume computed in cubic yards (cubic meters).

Earthwork required for the construction of HMA shoulders for pavement resurfacing will be measured for payment in units of 100 ft (30 m) along each edge of the pavement.

Additional material needed to reshape the shoulders that is obtained from within the right-of-way will be measured for payment as specified above for earth excavation.

202.08 Basis of Payment. Earth and rock excavation will be paid for at the contract unit prices per cubic yard (cubic meter) for EARTH EXCAVATION and ROCK EXCAVATION, respectively, which prices shall include other items of work included under the general heading of Earthwork for which no payment item is included in the contract.

Removal and disposal of unstable and/or unsuitable material will be paid for at the contract unit price per cubic yard (cubic meter) for REMOVAL AND DISPOSAL OF UNSUITABLE MATERIAL.

Subbase granular material will be paid for according to Article 311.09.

When the contract does not contain a pay item for removal and disposal of unstable and/or unsuitable material and this item is required, it will be paid for according to Article 109.04.

When the contract does not contain pay items for rock excavation or subbase granular material, and these items are required, they will be paid for according to Article 109.04.

Earthwork required for the construction of base course widening for pavement resurfacing will be paid for at the contract unit price per cubic yard (cubic meter) for EARTH EXCAVATION (WIDENING).

Earthwork required for the construction of HMA shoulders for pavement resurfacing will be paid for at the contract unit price per unit for EXCAVATING AND GRADING EXISTING SHOULDER.

Additional material required in reshaping the shoulders to the new grade line for pavement resurfacing that is obtained from within the right-of-way will not be paid for separately, but shall be included in the contract unit price per cubic yard (cubic meter) for EARTH EXCAVATION. Additional material required in reshaping the shoulders to the new grade line for pavement resurfacing that is obtained from an outside source will be paid for according to Article 109.04.

Temporary drainage facilities required during the course of construction will be paid for according to Article 109.04 unless otherwise provided for in the contract.

SECTION 203. CHANNEL EXCAVATION

203.01 Description. Channel excavation shall consist of the removal and satisfactory disposal of all materials encountered in the construction of new stream channels and in widening, deepening, or straightening existing stream channels.

CONSTRUCTION REQUIREMENTS

203.02 Classification. Excavation in channel will be classified as channel excavation and rock excavation in channel, according to Article 202.04.

203.03 Clearing, Tree Removal, and Protection of Existing Plant Material. Prior to starting excavation operations, all clearing, tree removal, and protection of existing plant material shall be performed according to Section 201.

203.04 Excavation. The Contractor shall notify the Engineer, at least three days in advance of starting excavation operations, to permit the completion of

accurate measurements for volume determinations. Any material excavated before such measurements have been taken will not be paid for.

Channels shall be excavated according to the lines, grades, and cross sections shown on the plans; there shall be no deviation from the dimensions shown without the written consent of the Engineer. Excavated materials shall be disposed of as shown on the plans or as directed by the Engineer.

Where piles are to be driven as a part of the permanent improvement, any channel excavation at the location of such piles shall be completed to the final elevation before the piles are driven.

203.05 Method of Measurement. Channel excavation and rock excavation in channel will be measured for payment according to Article 202.07.

203.06 Basis of Payment. Channel excavation will be paid for at the contract unit prices per cubic yard (cubic meter) for CHANNEL EXCAVATION and ROCK EXCAVATION IN CHANNEL.

When the contract does not contain a unit price for rock excavation in channel, and such excavation is required, it will be paid for according to Article 109.04.

SECTION 204. BORROW AND FURNISHED EXCAVATION

204.01 Description. Borrow excavation and furnished excavation shall consist of excavating suitable materials obtained from locations approved by the Engineer and transporting the materials to various locations throughout the limits of the contract.

204.02 Borrow Pits. The Contractor shall furnish and pay for all borrow sites or other sources of borrow and obtain from the property owners the necessary agreements for the removal of the material. Neither borrow nor furnished excavation shall be placed in the embankment until the site location, excavation plan, and material have been approved by the Engineer in writing. The material used shall have a Standard Dry Density of not less than 90 lb/cu ft (1450 kg/cu m) when tested according to AASHTO T 99 (Method C) and shall not possess an organic content greater than ten percent when tested according to AASHTO T 194.

At the Contractor's option, commercial borrow sites may be used. When commercial borrow sites are used, the following conditions will not be required.

Under no condition shall borrow sites detract from the appearance of the natural topographic features nor increase the potential hazard to a vehicle that has inadvertently left the roadway. In selecting sites for borrow acquisition, preference shall be given to knobs, hills and rises to reduce the extent of pit development. No portion of any borrow pit shall be located within 50 ft (15 m) or 10 ft (3 m) plus 1 1/2 times the depth of the excavation, whichever is the greater, from any highway right-of-way, except when borrow is obtained above pavement elevation. In order to ensure an aesthetically acceptable borrow site, the steepest slopes used in excavating borrow shall be 1:4 (V:H).

Borrow pits shall not change the general pattern of existing drainage and shall be well drained unless suitable for development as ponds or lakes. Pertinent drainage information shall be shown on the excavation plan or topographic map submitted by the Contractor.

Where the Contractor proposes a borrow site, any portion of which is located within 150 ft (45 m) of any highway right-of-way, the Contractor's request for approval shall be accompanied by a topographic map showing the original and the proposed final conditions of the entire borrow site. The topographic map shall be drawn to a minimum horizontal scale of 1:500, and 2 ft (600 mm) contour intervals shall be indicated.

When a borrow pit is to be developed as a pond or lake, the Contractor shall submit to the Engineer a written statement from the owner that such a development is planned. Slopes of 1:4 (V:H) shall be provided along the periphery of the shoreline. Slopes of 1:2 (V:H) will be permitted below a point where the proposed water depth will be 8 ft (2.5 m) or greater. In cases where a dam is necessary to impound water within a borrow pit to be used as a pond, slopes of 1:3 (V:H) will be permitted on the water face of the dam. Seeding will not be required below the proposed water elevation.

Borrow sites shall be seeded according to Section 250. The class of seeding and the application rate of fertilizer nutrients and/or ground limestone will be determined by the Engineer. If the proposed borrow site is to revert to agricultural purposes, the Contractor shall submit to the Engineer a written statement from the owner that seeding will not be required. All work in connection with seeding at borrow sites will not be paid for separately.

After the borrow site excavation is completed, the Contractor shall shape the borrow site to conform to the approved topographic map.

204.03 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Steel Based Plate	1006.04
(b) Steel Pipe	1006.18
(c) Threaded Malleable Iron Floor Flanges	1006.16

All materials furnished to construct settlement platforms will be visually inspected by the Engineer at the job site prior to installation and no other inspection or certification will be required.

CONSTRUCTION REQUIREMENTS

204.04 Clearing, Tree Removal, and Protection of Existing Plant Material.

Before any material is excavated from a borrow pit, clearing, tree removal and protection of existing plant material over the area included within the limits of the pit shall be performed according to Section 201.

204.05 Excavation. Excavation throughout the borrow pit area shall be as uniform as possible. Upon completion of the excavation operations, all stumps and

roots shall be cut off and disposed of according to Article 202.03, and the pits shall be trimmed and cleaned.

204.06 Settlement Platforms. When called for on the plans or should the Contractor request credit for the placement of any additional embankment due to possible settlement during construction, settlement platforms shall be erected at the locations shown on the plans or as directed by the Engineer and as hereinafter specified. Notification by the Contractor shall be made to the Engineer in writing prior to the start of construction.

The settlement platforms shall be placed on natural soil, where practical, after the roadway area has been cleared, disked and compacted. Compacted granular bedding material up to 6 in. (150 mm) thick may be used to properly seat the platform. Granular material to be used for bedding may consist of any fine aggregate meeting the approval to the Engineer. The subgrade or bedding shall be prepared and leveled in such a manner that the platform makes uniform contact.

A 3/4 in. (19 mm) diameter steel pipe shall be attached to a 1/8 in. (3 mm) thick by 4 ft (1.2 m) square steel plate with a threaded malleable iron floor flange welded to the plate. 4 ft (1.2 m) lengths of 3/4 in. (19 mm) diameter pipe shall be added as the height of the embankment increases. The tip of the grade pipe shall at no time extend more than 4 1/2 ft (1.4 m) or less than 6 in. (150 mm).

The Contractor shall exercise extreme caution when placing material adjacent to the settlement plates and no equipment shall pass within 5 ft (1.5 m) of the settlement plate until the height of fill is 3 ft (1 m) above the plate.

A casing of 2 1/2 in. (64 mm) diameter steel pipe (standard) shall be installed around the vertical pipe.

Settlement platforms shall be maintained by the Contractor in the required positions at all times during the construction of the embankment. All movement or disturbance, other than normal settlement, of the settlement platforms shall be immediately corrected by the Contractor by repairing or replacing them as directed by the Engineer. All extensions to the grade pipes shall be added under the supervision of the Engineer.

Settlement readings will be taken by the Engineer as required prior to and after construction of the embankment. The final readings will be taken after the top grade of the embankment has been constructed and has been approved by the Engineer.

When the settlement platform has served its purpose, the pipe extensions shall be removed to at least 2 ft (600 mm) below subgrade, the pipe capped, and the area backfilled and compacted.

204.07 Method of Measurement. Borrow excavation will be measured in its original position by taking cross sections before the work is started and again after it has been completed. The volume, in cubic yards (cubic meters), of material moved will be computed by the method of average end areas.

Furnished excavation will be measured for payment as follows.

- (a) Contract Quantities. The use of contract quantities shall conform to the requirements of Article 202.07(a) and to the following.
- (1) If the Contractor so requests, the Engineer will reestablish the existing ground line after the clearing and tree removal over the entire embankment areas have been performed according to Section 201 and the top 6 in. (150 mm) of the existing ground surface has been disked and compacted to the satisfaction of the Engineer. Contract quantities will be recalculated based on the difference between the existing ground line shown on the plans and the new ground line established after the clearing, disking and compacting.
 - (2) If the settlement platforms are erected, the Engineer will reestablish the Existing ground line after the embankment is complete from elevations taken on the grade pipes of the settlement platforms. In reestablishing the existing ground line, no change in elevation from that shown on the plan cross sections will be assumed to have occurred at the intersection of the embankment side slopes and the existing ground. Contract quantities will be recalculated based on the difference between the existing ground line shown on the plans and the new ground line established from the settlement platforms.
- (b) Measured Quantities. Furnished excavation will be computed for payment in cubic yards (cubic meters) as follows.

$$\text{Furnished Ex.} = \text{Embankment} - [\text{Suitable Ex.} \times (1 - \text{Shrinkage Factor})]$$

Where:

Embankment = the volume of fill in its final position computed by the method of average end areas and based upon the existing ground line as shown on the plans, except as noted in (1) and (2) below;

Suitable Excavation = earth excavation, rock excavation, and other on-site excavation suitable for use in embankments as shown in the Earthwork Schedule on the plans;

Shrinkage Factor = 0.25 unless otherwise shown on the plans.

- (1) If the Contractor so requests, the Engineer will reestablish the existing ground line after the clearing and tree removal have been performed according to Section 201 and the top 6 in. (150 mm) of the existing ground surface has been disked and compacted.
- (2) If settlement platforms are erected, the Engineer will reestablish the existing ground line after the embankment is complete as specified in Article 204.07(a)(2).

The quantity for furnished excavation will not be recalculated when surplus, suitable materials are utilized in embankments according to Article 202.03.

204.08 Basis of Payment. Borrow and furnished excavation will be paid for at the contract unit prices per cubic yard (cubic meter) for BORROW EXCAVATION and FURNISHED EXCAVATION.

SECTION 205. EMBANKMENT

205.01 Description. This work shall consist of the construction of embankments by depositing, placing, and compacting earth, stone, gravel, or other materials of acceptable quality above the natural ground or other surface.

205.02 Equipment. Equipment shall be according to the following.

Item	Article/Section
(a) Disk Harrow	1101.02

CONSTRUCTION REQUIREMENTS

205.03 Preparation of Existing Ground Surface. Before any embankment is placed, all clearing and tree removal over the entire roadway area shall be performed according to Section 201, and the top 6 in. (150 mm) of the existing ground surface shall be disked and then compacted. Snow and ice shall be removed from the area to be covered by the embankment. Embankment shall not be placed on frozen earth. When construction is resumed after any winter shutdown period, the top 8 in. (200 mm) of all partially completed embankments shall be reprocessed and compacted to the minimum specified density prior to placing more fill material on the embankment.

When embankments are to be constructed on hillsides or slopes, or if existing embankments are to be widened or included in new embankments, the existing slopes shall be plowed deeply. If additional precautions for binding the fill materials together are justified, steps shall be cut into the existing slopes before the construction of the embankment is started.

When embankments are to be constructed over an existing pavement, the following shall govern.

- (a) Flexible Pavement (Aggregate Surface, Hot-Mix Asphalt Surface Treatment Over Aggregate Base). When the surface of the pavement is within 6 in. (150 mm) of the elevation of the subgrade, it shall be plowed, disked, or otherwise broken up to a depth of not less than 6 in. (150 mm).
- (b) Full-Depth and Rigid Pavement (Full-Depth Hot-Mix Asphalt Concrete and Portland Cement Concrete Pavement), and Portland Cement Concrete Base Course.
 - (1) When the distance between the existing pavement and the proposed subgrade is between 3 in. (75 mm) and 3 ft (1 m), the existing pavement shall be broken into pieces not to exceed 3 sq ft (0.3 sq m) in surface area. At the option of the Contractor, the broken roadway may stay in place unless otherwise directed by the Engineer.

- (2) When the distance between the existing pavement and the proposed subgrade is less than 3 in. (75 mm), the existing pavement shall be removed.

205.04 Placing Material. Embankments shall be constructed of materials that will compact and develop stability. No sod, frozen material, or any material which, by decay or otherwise, might cause settlement shall be placed or allowed to remain in embankments within the area of the roadbed. Embankments shall be constructed to the height and width deemed necessary to provide for shrinkage during compaction. Upon completion, the embankments shall be according to the lines, grades, and cross sections shown on the plans. When embankments are constructed of materials specified in Article 202.03, such materials shall be well distributed, and sufficient earth, or other fine material shall be incorporated with them when they are deposited to fill the interstices and provide solid embankment. No rock, stones or broken concrete more than 4 in. (100 mm) in largest dimension shall be permitted within a vertical distance of 12 in. (300 mm) from the surface of the finished earth grade, or finished earth shoulders. When the contract includes pavement, surface course or base course, the vertical distance may be 3 in. (75 mm) from the finished surface of the subgrade for such construction.

Pieces of concrete, not exceeding 2 sq ft (0.2 sq m) for any area of surface, and large rocks and boulders may be placed in fills without being broken up, provided they are well embedded, and the interstices filled with smaller pieces or smaller material in a manner to give a density satisfactory to the Engineer. The lifts of the smaller pieces or smaller material shall not exceed 12 in. (300 mm) in depth.

So far as practicable, each lift of material shall extend the entire length and width of the embankment. The material shall be leveled by means of bulldozers, blade graders or other equipment approved by the Engineer. Each lift shall be not more than 8 in. (200 mm) thick when in loose condition, uniform in cross section, and thoroughly compacted before the next lift is started.

The use of drag line excavators or similar equipment which excavate and deposit material in large unit masses will not be permitted, unless all materials excavated in this manner are spread as provided herein and compacted according to Article 205.06, or as directed by the Engineer.

205.05 Placing Material Adjacent to Structures. When bridges and culverts are not completed in advance of grading operations, an omission in the embankment of not less than 100 ft (30 m) on each side of each structure shall be made, until such omitted embankment shall be placed later according to the requirements of these Specifications. As an alternate method, an omission in the embankment of sufficient length to permit the completion of the structure and the necessary backfills may be made, provided all backfills and omitted embankments are constructed with granular material furnished and placed at no additional cost to the Department. The granular material shall be according to Article 1004.05, and shall be compacted according to Article 205.06.

Embankment behind abutments or around structures shall not be constructed until test specimens show that the concrete has attained a modulus of rupture of 650 psi (4500 kPa), and at least seven days have elapsed after the completion of the

abutment or structure affected. In the absence of tests to determine the modulus of rupture, the minimum length of time between the completion of the abutment or structure and the placing of the embankment shall be at least 14 days exclusive of days in which the temperature falls below 45 °F (7 °C).

Embankment, behind abutments held at the top by the superstructure, shall not be placed until the superstructure has been completed and the false work removed. Embankment, behind such abutments and behind the walls of culverts having a clear height of more than 5 ft (1.5 m), shall be carried up simultaneously at both ends of the structure, and at no time shall the embankment at one end be more than 2 ft (600 mm) higher than at the other.

Backfill shall not be placed in water at closed abutments, culverts or retaining walls. The excavated area around these structures shall be pumped dry, and any mud or loose material within the excavated space shall be removed. Sloping sides of the excavated space shall be removed. Sloping sides of the excavated space, that would be liable to cause objectionable wedging action of the backfill against the structure, shall be stepped or serrated to prevent such action. At piers, backfill may be placed in water, provided that both the water level and backfill are kept at approximately the same elevation on opposite sides of the pier. A time interval, approved by the Engineer, shall elapse before placing additional fill on one side of the pier above the water surface.

A cubical deposit of porous coarse aggregate, at least 2 ft (600 mm) in each dimension, shall be placed in back of each drain hole in abutment and wing walls and culvert side walls. The bottom of this deposit shall be 2 in. (50 mm) below the drain hole. All form boards or other obstructions shall be removed from the drains before the embankment is constructed.

205.06 Compaction. Each lift of the embankment material shall be disked sufficiently to break down oversized clods, mix the different materials, secure a uniform moisture content, and ensure uniform density and compaction. Disking may be omitted if the fill material consists of sand or gravel.

If the roadway embankment is less than 1 1/2 ft (450 mm), all lifts shall be compacted to not less than 95 percent of the standard laboratory density. If the embankment height is between 1 1/2 ft and 3 ft (450 mm and 900 mm) inclusive, the first lift shall be compacted to not less than 90 percent, and the balance to a minimum of 95 percent of the standard laboratory density. If the embankment exceeds 3 ft (900 mm) in height, the lower 1/3 of the embankment, but not to exceed the lower 2 ft (600 mm), shall be compacted in a manner that will yield a minimum of 90 percent of standard laboratory density to the uppermost lift of that portion of the embankment. The next 1 ft (300 mm) of embankment shall be compacted to not less than 93 percent, and the balance of the embankment compacted to not less than 95 percent of the standard laboratory density.

The top 2 ft (600 mm) of all embankments shall not contain more than 120 percent of the optimum moisture determined according to AASHTO T 99 (Method C). The Contractor will be permitted the use of an approved additive to effect a quicker drying time.

The standard laboratory density shall be the maximum dry density determined according to AASHTO T 99 (Method C). A coarse particle correction according to AASHTO T 224 shall be used.

The dry density of the compacted embankment will be determined by the Engineer at regular intervals according to AASHTO T 191, Illinois Modified AASHTO T 310 (Direct Transmission Density/Backscatter Moisture), or by other methods approved by the Engineer.

The embankment shall be sprinkled with water when it is necessary to increase the moisture content of the soil to permit the embankment to be constructed to the densities indicated above.

Compacting equipment and compacting operations shall be coordinated with the rate of placing embankment so that the required density is obtained.

Special care shall be exercised in compacting embankments adjacent to structures and in sharp depressions. Where such areas are inaccessible to the compacting equipment being used, the material shall be placed in 8 in. (200 mm) horizontal lifts and uniformly compacted with suitable mechanical equipment. Embankment placed adjacent to a structure shall not contain more than 110 percent of the optimum moisture determined according to AASHTO T 99 (Method C).

205.07 Maintaining and Trimming Embankments. The Contractor shall replace any portions of the embankment which have been damaged or displaced by reason of carelessness or negligence on the Contractor's part. After the embankments have been constructed, their sides shall be trimmed to the proper slopes where required, and shall be maintained by the Contractor to the proper elevation and cross section until acceptance.

205.08 Method of Measurement. Embankment will not be measured for payment. Mechanical compaction will not be measured for payment.

205.09 Basis of Payment. Embankment and any additive or water applied will not be paid for directly but shall be considered as included in the various items of excavation, and their construction shall be included in the unit prices for these items.

SECTION 206. GRANULAR EMBANKMENT, SPECIAL

206.01 Description. This work shall consist of the construction of granular embankment by placing and compacting gravel or crushed stone on an existing pavement or surface course.

206.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate (Note 1)	1005.01

Note 1. The aggregate shall have a bearing ratio of not less than 80. For crushed gravel, crushed stone, and crushed slag, the bearing ratio

requirement shall not apply. The bearing ratio will be determined according to the Standard Methods adopted by the Department.

206.03 Equipment. Equipment shall be according to the following.

Item	Article/Section
(a) Tamping Roller	1101.01
(b) Pneumatic-Tired Roller	1101.01
(c) Three-Wheel Roller (Note 1)	1101.01
(d) Tandem Roller (Note 1)	1101.01
(e) Vibratory Machine (Note 2)	

Note 1. The three-wheel or tandem roller shall weigh from 6 to 10 ton (5.5 to 9 metric ton) and shall weigh not less than 200 lb/in. (35 N/mm) nor more than 325 lb/in. (57 N/mm) of width of the roller.

Note 2. The vibratory machine shall meet the approval of the Engineer.

CONSTRUCTION REQUIREMENTS

206.04 Placing and Compacting Aggregate. The Contractor shall submit to the Engineer a sample of the aggregate to be used for granular embankment at least 15 days prior to starting construction. The sample so submitted will be tested by the Department for acceptance.

The aggregate shall be placed and compacted according to Article 351.05(a) and (b), except that construction shall be alternated on each lane width so that at no time will there be a difference of more than 4 in. (100 mm) in elevation. Construction operations shall be carried on in such a manner that the elevation of adjacent traffic lanes shall be the same when work is suspended at nights and over weekends or holidays.

206.05 Construction of Earth Berm. Prior to allowing traffic on the newly constructed lift, the adjacent earth berm shall be built flush with the top of the aggregate and the edges of the aggregate base compacted to the required density. The cost of constructing the earth berm in this manner will be considered as included in the contract unit price bid for earth excavation, borrow excavation, or furnished excavation.

206.06 Surface Treatment. Immediately following the final shaping and compacting operation, calcium chloride shall be applied to the surface at the rate of 2 to 4 lb/sq yd (1 to 2 kg/sq m) according to Section 663. After the top lift has been completed, it shall be opened to two-way traffic and shall be maintained by the Contractor for traffic until the entire contract is completed and accepted. In no case shall the maintenance period be less than ten days.

206.07 Method of Measurement. This work will be measured for payment in tons (metric tons) or cubic yards (cubic meters) according to Article 311.08.

Aggregate required for maintenance will be measured for payment in tons (metric tons) or cubic yards (cubic meters) according to Article 311.08.

Calcium chloride will be measured for payment according to Article 663.04.

206.08 Basis of Payment. This work will be paid for at the contract unit price per ton (metric ton), or cubic yard (cubic meter) for GRANULAR EMBANKMENT, SPECIAL.

Aggregate required for maintenance will be paid for at the contract unit price per ton (metric ton) or cubic yard (cubic meter) for GRANULAR EMBANKMENT, SPECIAL.

Calcium chloride will be paid for according to Article 663.05.

SECTION 207. POROUS GRANULAR EMBANKMENT

207.01 Description. This work shall consist of furnishing, transporting, and placing porous granular material. For the purpose of this specification, the embankment may be above the original ground line, or it may be below the water elevation.

207.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate	1004.05
(b) Fine Aggregate	1003.04

CONSTRUCTION REQUIREMENTS

207.03 General. The aggregate shall be placed in 6 in. (150 mm) lifts, loose measurement, and compacted in a manner approved by the Engineer, except that if the desired results are being obtained, the compacted thickness of any lift may be increased to a maximum of 8 in. (200 mm).

207.04 Method of Measurement. This work will be measured for payment in tons (metric tons) according to Article 311.08(b), or in cubic yards (cubic meters) compacted in place and the volume computed by the method of average end areas.

207.05 Basis of Payment. This work will be paid for at the contract unit price per ton (metric ton) for POROUS GRANULAR EMBANKMENT, or at the contract unit price per cubic yard (cubic meter) for POROUS GRANULAR EMBANKMENT.

SECTION 208. TRENCH BACKFILL

208.01 Description. This work shall consist of furnishing aggregate for backfilling all trenches made in the subgrade of the proposed improvement, and all trenches where the inner edge of the trench is within 2 ft (600 mm) of the proposed edge of pavement, curb, gutter, curb and gutter, stabilized shoulder, or sidewalk.

This work also includes the disposal of the surplus excavated material which is replaced by trench backfill. Such disposal shall be made according to Article 202.03.

208.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Fine Aggregate (Note 1)	1003.04
(b) Coarse Aggregate (Note 2)	1004.05

Note 1. The fine aggregate shall be moist.

Note 2. The coarse aggregate shall be wet.

208.03 Method of Measurement. This work will be measured for payment as follows.

- (a) Contract Quantities. The requirements for the use of Contract Quantities shall conform to Article 202.07(a).
- (b) Measured Quantities. Trench backfill shall be furnished for backfilling to the full width of the trench. It will be measured in cubic yards (cubic meters) in place, except that the quantity for which payment will be made shall not exceed the volume of the trench as computed by using the maximum width of trench permitted by the Specifications and the actual depth of the completed trench backfill above the center of the pipe, with a deduction for the volume of one-half of the pipe.

Any material conforming to the requirements of Articles 1003.04 or 1004.05 which has been excavated from the trenches shall be used for backfilling the trenches. No compensation will be allowed as trench backfill for the portion of the trench backfilled with excavated material.

208.04 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) for TRENCH BACKFILL.

SECTION 209. POROUS GRANULAR BACKFILL

209.01 Description. This work shall consist of furnishing and placing porous granular material for backfilling tile or pipe in trenches.

209.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate	1004.05
(b) Fine Aggregate	1003.04

CONSTRUCTION REQUIREMENTS

209.03 General. The porous granular material shall be placed around the tile or pipe for the full width of the trench. This material shall be carried to the top of all water bearing strata intercepted by the trench or to a minimum of 1 ft (300 mm) above the tile or pipe, as directed by the Engineer. The material shall be placed in lifts not exceeding 6 in. (150 mm) in thickness and compacted in a manner approved by the Engineer. The balance of the trench shall be backfilled with approved natural soil.

Surplus excavated material shall be disposed of according to Article 202.03.

209.04 Method of Measurement. Porous granular backfill will be measured for payment in cubic yards (cubic meters) in place, except that the quantity for which payment will be made shall not exceed the volume of the trench as computed by using the maximum width of trench permitted by the Specifications and the actual depth of the completed porous granular backfill above the invert of the pipe, with a deduction for the volume of the pipe. Any porous granular backfill used for the purpose of filling the trench in excess of the maximum quantity specified shall be furnished and placed by the Contractor at his/her own expense.

209.05 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) for POROUS GRANULAR BACKFILL.

SECTION 210. FABRIC FOR GROUND STABILIZATION

210.01 Description. This work shall consist of furnishing and installing geotechnical fabric in subgrades or as embankment foundations.

210.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Geotextile Fabric	1080.02
(b) Coarse Aggregate (Note 1)	1004.04

Note 1. The coarse aggregate shall be that specified for granular embankment special.

CONSTRUCTION REQUIREMENTS

210.03 Installation Requirements. Fabric shall be delivered to the job site in such a manner as to facilitate handling and incorporation into the work without damage. Material shall be stored in such a manner as to prevent exposure to direct sunlight and damage by other construction activities.

Prior to the installation of the fabric, the application surface shall be cleared of debris, sharp objects and trees. Tree stumps shall be cut to the level of the ground surface. If the stumps cannot be cut to the ground level, they shall be completely removed. In the case of subgrades, all wheel tracks or ruts in excess of 3 in. (75 mm) in depth shall be graded smooth or otherwise filled with soil to provide a reasonably smooth surface.

Fabric may be installed on the application surface either by hand or by mechanical methods, provided that the fabric is not torn or the surface rutted.

Fabric of insufficient width or length to fully cover the specified area shall be lapped, or sewn. The minimum laps for lap only areas are 2 ft (600 mm) and for sewn areas are 4 in. (100 mm). If sewn, the seam strength shall be equal to or exceed the minimum grab tensile strength of the fabric when tested wet.

210.04 Placement of Granular Blanket. The granular blanket shall be constructed to the width and depth required on the plans. Granular embankment, special shall be used in conjunction with the geotechnical fabric. The material shall be back dumped on the fabric in a sequence of operations beginning at the outer edges of the treatment area with subsequent placement towards the middle.

Placement of material on the fabric shall be accomplished by spreading dumped material off of previously placed material with a bulldozer blade or endloader, in such a manner as to prevent tearing or shoving of the cloth. Dumping of material directly on the fabric will only be permitted to establish an initial working platform. No vehicles or construction equipment shall be allowed on the fabric prior to placement of the granular blanket.

The granular material shall be placed to the full required thickness and compacted before any loaded trucks are allowed on the blanket.

Fabric which is damaged during installation or subsequent placement of granular material, due to failure of the Contractor to comply with these provisions, shall be repaired or replaced.

Torn fabric may be patched in place by cutting and placing a piece of the same fabric over the tear. The dimensions of the patch shall be at least 2 ft (600 mm) larger than the tear in each direction, and shall be weighted or otherwise secured to prevent the granular material from causing lap separation.

210.05 Method of Measurement. Geotechnical fabric will be measured for payment in place and the area computed in square yards (square meters). Granular blanket will be measured for payment in tons (metric tons) or in cubic yards (cubic meters) according to Article 311.08.

210.06 Basis of Payment. Geotechnical fabric will be paid for at the contract unit price per square yard (square meter) for GEOTECHNICAL FABRIC FOR GROUND STABILIZATION.

The granular blanket will be paid for at the contract unit price per ton (metric ton) for GRANULAR EMBANKMENT, SPECIAL, or at the contract unit price per cubic yard (cubic meter) for GRANULAR EMBANKMENT, SPECIAL.

SECTION 211. TOPSOIL AND COMPOST

211.01 Description. This work shall consist of furnishing, excavating, and placing topsoil, special types of topsoil, or compost.

211.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Topsoil (Furnished from outside of the R.O.W.)	1081.05(a)
(b) Compost	1081.05(b)

CONSTRUCTION REQUIREMENTS

211.03 Furnishing and Excavating Topsoil. Topsoil shall be obtained from within the limits of the right-of-way at the locations and to the depths designated on the plans or approved by the Engineer. This topsoil shall be stockpiled at locations approved by the Engineer. When special types of topsoil are specified, each type shall be handled separately and not allowed to mix with any other material. When special types of topsoil (Hydric, Prairie or Woodland) are specified, the seeds and plants within the excavated special topsoils are desirable to maintain. To keep these seeds and plants viable, the topsoil shall be excavated then placed as directed by the Engineer or as specified in the contract. If stockpiling cannot be avoided, special measures, such as watering the stockpile and planting a cover crop on the stockpile will be required as directed by the Engineer.

If additional topsoil is required to complete the contract to the lines, grades and the minimum thickness shown on the plans, the Contractor shall furnish any additional topsoil from areas outside the limits of the right-of-way. This additional topsoil obtained from outside the right-of-way shall be approved by the Engineer prior to its use.

In lieu of furnishing additional topsoil from areas outside the limits of the right-of-way, the Contractor may request permission to obtain the additional topsoil from areas within the limits of the right-of-way other than those shown on the plans.

211.04 Placing Topsoil and Compost. Topsoil shall not be placed until the area to be covered has been shaped, trimmed, and finished according to Section 212. All irregularities or depressions in the surface due to weathering or other causes shall be filled or smoothed out before the topsoil is placed. If the existing surface has become hardened or crusted, it shall be disked or raked or otherwise broken up so as to provide a bond with the lift of topsoil to be applied.

When compost is specified, it shall be placed at the specified depth on top of the topsoil. The Engineer will verify that the proper topsoil and compost depths have been applied. After verification of proper depth, the Contractor shall completely incorporate the compost into the topsoil by disking or tilling.

211.05 Finishing. The surface of the topsoil or compost/topsoil blend shall be free from clods, stones, sticks and debris and shall be according to the lines, grades and the minimum thickness shown on the plans. If required by the Engineer, one rolling of the entire surface shall be made.

211.06 Clearing Area and Disposal of Surplus Material. Upon completion of the work, all areas shall be cleared of equipment, debris, and excess material. Surplus or waste material resulting from construction operations shall be disposed of according to Article 202.03.

211.07 Method of Measurement. This work will be measured for payment as follows.

- (a) Contract Quantities. The requirements for the use of contract quantities shall conform to Article 202.07(a).
- (b) Measured Quantities. Material excavated in excess of that required for the contract will not be measured for payment.

Topsoil excavation and placement shall be that material obtained from within the limits of the right-of-way and will be measured in cubic yards (cubic meters) in its original position. The volume will be computed by the method of average end areas. In no case will the width or depth used for the computations be greater than the dimensions shown on the plans unless such changes have been approved in writing by the Engineer. Topsoil excavation shall include the excavating, hauling, and stockpiling of the material in the locations approved by the Engineer. If the Contractor requests and the Engineer approves additional areas within the limits of the right-of-way for topsoil excavation other than shown on the plans, these added quantities will be deducted from the item of borrow excavation, furnished excavation, or earth excavation.

Topsoil furnish and place, and compost furnish and place shall be that material obtained from outside the right-of-way and will be measured in square yards (square meters).

Excavation and embankment quantities for the roadway have been computed on the basis of cut and fill to the subgrade of the topsoil.

211.08 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) for TOPSOIL EXCAVATION AND PLACEMENT; per square yard (square meter) for TOPSOIL FURNISH AND PLACE, of the thickness specified; and per square yard (square meter) for COMPOST FURNISH AND PLACE, of the thickness specified.

SECTION 212. FINAL SHAPING, TRIMMING, AND FINISHING

212.01 Description. This work shall consist of the final shaping, trimming, and finishing of the roadway, the final finishing and cleaning up of the right-of-way, and completing the work for acceptance. This work is in addition to the requirements of Article 104.06.

CONSTRUCTION REQUIREMENTS

212.02 Grading Sections. When the contract does not include a surface or base course, the ditches shall be cleaned, all irregularities in the roadbed shall be smoothed out, depressions shall be filled, and the entire roadway shall be shaped, trimmed, and finished uniformly to the lines, grades, and cross sections shown on the plans, and the right-of-way cleaned up for final acceptance. The finished surface of the roadbed shall not vary from the lines, grades, and cross sections shown on the plans by more than 2 in. (50 mm).

212.03 Full Depth and Rigid Type Surface Sections. The roadway for concrete pavement, full-depth hot mix asphalt, or pavement with concrete base course and any hot mix asphalt shall be shaped, trimmed, and finished as follows.

- (a) Sections Not Previously Graded. The ditches shall be cleaned, and the entire roadway shall be shaped, trimmed, and finished uniformly to the lines, grades, and cross sections shown on the plans, and the right-of-way cleaned up for final acceptance.
- (b) Sections Previously Graded. Where it is not necessary to secure material from the backslopes of cuts and ditches to complete the earthwork in the roadbed; or where no work is indicated on the plans which will interfere with such slopes; or where the Contractor's operations do not disturb such slopes, no further work on the slopes will be required. If such slopes are disturbed by the Contractor's operations, the Contractor shall trim and reshape them.

In reshaping existing shoulders and medians, widening existing embankments, or raising existing low shoulders and medians, the Contractor shall construct or reshape the shoulders and medians according to Section 480.

Side slopes of fills shall be trimmed and shaped for a distance of 4 ft (1.2 m), measured from the edge of the shoulder toward the toe of the fill slope. The ditches shall be cleaned, and the right-of-way cleaned up for final acceptance.

212.04 Nonrigid Type Surface and Base Course Sections. The roadway for nonrigid type surfacings, such as aggregate surface course or any hot-mix asphalt surface course not built on a portland cement concrete base course, shall be shaped, trimmed, and finished.

After the surface or base course material has been placed, all additional construction operations shall be performed in such a manner that earth or other

objectionable substances will not be deposited on the surface or base course material.

- (a) **Sections Not Previously Graded.** When the base course is constructed in a trench, all final shaping, trimming, and finishing of ditches, backslopes of cuts, and sideslopes of fills shall be completed to the lines, grades, and cross sections shown on the plans, and all shoulder material shall be roughed in before the base course material is placed.

All final shaping, trimming, and finishing of the roadbed shall be completed to the lines, grades, and cross sections shown on the plans, before the surfacing material is placed.

- (b) **Sections Previously Graded.** The backslopes of cuts and ditches and the sideslopes of fills shall be finished according to Article 212.03(b) before the base course material is placed.

When base course is constructed in a trench, all shoulder material shall be roughed in before the surface or base course material is placed.

All final shaping, trimming, and finishing of the roadbed shall be completed before the surfacing material is placed.

212.05 Finishing. All unsuitable material, debris, and rubbish, resulting from construction operations, or occurring within the right-of-way, and all stones or boulders more than 3 in. (75 mm) in largest dimension, shall be removed from the right-of-way and disposed of according to Article 202.03. The degree of finish for graded slopes outside of the roadbed shall be that which can be obtained by use of suitable mechanical equipment, with only such hand labor as special conditions may require.

Where the roadway has been resurfaced and as directed by the Engineer, any high areas in the existing earth shoulders that remain after resurfacing is complete which would entrap water adjacent to the pavement edge shall be bladed off. The existing earth shoulders shall be sloped to drain, but grading which requires additional material to conform to a uniform cross section will not be required. Immediately prior to final inspection, mowing of the right-of-way will be required at locations as directed by the Engineer.

212.06 Basis of Payment. Except for blading off high spots in the existing earth shoulders where the roadway has been resurfaced and for mowing immediately prior to final inspection, this work will not be measured or paid for separately, but shall be considered as included in the contract unit price for the particular type of surface course, base course or widening included in the contract. If surface course, base course or widening items are not included in the contract, the cost of final shaping, trimming and finishing shall be considered as included in the contract unit prices for the various items of earthwork.

Blading off high spots in the existing earth shoulders where the roadway has been resurfaced and mowing required immediately prior to final inspection will be paid for according to Article 109.04.

SECTION 213. EXPLORATION TRENCH

213.01 Description. This work shall consist of constructing a trench for the purpose of locating existing farm underdrains within the construction limits of the proposed improvement.

CONSTRUCTION REQUIREMENTS

213.02 General. The exploration trench shall be constructed at the locations shown on the plans or as directed by the Engineer.

The trench shall be not less than 52 in. (1.3 m) in depth, measured from the existing ground elevation. The width of the trench shall be sufficient to allow proper investigation of the entire trench.

When an existing farm underdrain is encountered, another trench shall be excavated on the opposite side of the proposed improvement to establish the line and grade of the existing farm underdrain. Broken tile shall be repaired immediately and no surface runoff shall be allowed to enter any tile.

After the trench has been inspected by the Engineer, the excavated material shall be used to backfill the trench. Any excess material shall be disposed of according to Article 202.03, and the area shall be shaped and trimmed according to Section 212.

When approved by the Engineer, the Contractor may use other means of locating existing farm underdrains.

213.03 Method of Measurement. The exploration trench will be measured for payment in feet (meters) of actual trench constructed.

213.04 Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for EXPLORATION TRENCH, of the depth specified.

Other means of locating existing farm underdrains approved by the Engineer will be paid for according to Article 109.04.

SECTION 214. GRADING AND SHAPING DITCHES

214.01 Description. This work shall consist of grading and shaping existing ditches.

CONSTRUCTION REQUIREMENTS

214.02 General. All surplus, unstable, and unsuitable material shall be disposed of according to Article 202.03.

214.03 Method of Measurement. This work will be measured for payment in feet (meters) along the centerline of the ditch.

The volume of any unstable and/or unsuitable material removed will be measured for payment according to Article 202.07.

214.04 Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for GRADING AND SHAPING DITCHES.

Removal and disposal of unstable and/or unsuitable material will be paid for according to Article 202.08.

LANDSCAPING

SECTION 250. SEEDING

250.01 Description. This work shall consist of preparing the seed bed and placing the seed and other materials required in seeding operations on the shoulders, slopes, and other areas.

250.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Seeds	1081.04
(b) Agricultural Ground Limestone	1081.07
(c) Fertilizer	1081.08

250.03 Equipment. Equipment shall be according to the following.

Item	Article/Section
(a) Disk	1101.08(a)
(b) Slope Harrow	1101.08(b)
(c) Hydraulic Seeder	1101.08(c)
(d) Cultipacker	1101.08(d)
(e) Broadcast Seeders	1101.08(e)
(f) Tractor Drawn or Tractor Mounted Drop Seeders	1101.08(f)
(g) Rangeland Type Grass Drill and Interseeding Attachment	1101.08(g)
(h) Slit Seeder	1101.08(h)

CONSTRUCTION REQUIREMENTS

250.04 Fertilizer and Agricultural Ground Limestone Application. When specified for bare earth areas, fertilizer nutrients and agricultural ground limestone shall be uniformly spread over the designated areas immediately prior to seed bed preparation.

When specified for existing turf areas, fertilizer nutrients and agricultural ground limestone shall be uniformly spread over the designated areas during the spring, late summer, or early fall seasons. The Contractor shall restore any existing turf areas damaged by improper application of fertilizer nutrients or agricultural ground limestone.

When fertilizer is specified, 270 lb (300 kg) of fertilizer nutrients per acre (hectare) shall be applied at 1:1:1 ratio as follows.

Nitrogen Fertilizer Nutrients	90 lb/acre (100 kg/ha)
Phosphorus Fertilizer Nutrients	90 lb/acre (100 kg/ha)
Potassium Fertilizer Nutrients	90 lb/acre (100 kg/ha)

When agricultural ground limestone is specified, it shall be applied at a rate of 2 tons/acre (4.5 metric tons/ha) multiplied by the source correction factor.

250.05 Seed Bed Preparation. For bare earth seeding, seed bed preparation shall not be started until all stones, boulders, debris, and similar material larger than 3 in. (75 mm) in diameter have been removed and all other requirements of Section 212 have been completed. The area to be seeded shall be worked to a minimum depth of 3 in. (75 mm) with a disk tiller or other equipment approved by the Engineer, reducing all soil particles to a size not larger than 2 in. (50 mm) in the largest dimension. The prepared surface shall be relatively free from weeds, clods, stones, roots, sticks, rivulets, gullies, crusting, and caking. No seeds shall be sown until the seed bed has been approved by the Engineer.

Seed bed preparation will not be required for Class 7 Seeding if the soil is in a loose condition. Light disking shall be done if the soil is hard or caked.

For areas in which a stand of winter wheat exists, as a result of temporary erosion control seeding, disking will be required.

250.06 Seeding Methods. No seed shall be sown during high winds or when the ground is not in a proper condition for seeding, nor shall any seed be sown until the purity test has been completed for the seeds to be used, and shows that the seed meets the noxious weed seed requirements. All equipment shall be approved by the Engineer prior to being used. Prior to starting work, seeders and interseeders shall be calibrated and adjusted to sow seeds at the required seeding rate. Equipment shall be operated in a manner to ensure complete coverage of the entire area to be seeded or interseeded. The Engineer shall be notified 48 hours prior to beginning the seeding operations so that the Engineer may determine by trial runs that a calibration of the seeder will provide uniform distribution at the specified rate per acre (hectare). When seed or fertilizer is applied with a hydraulic seeder, the rate of application shall be not less than 1000 gal (9500 L) of slurry per acre (hectare). This slurry shall

contain the proper quantity of seed or fertilizer nutrients specified per acre (hectare). When using a hydraulic seeder, the fertilizer nutrients and seed shall be applied in two separate operations.

All legumes (clover and alfalfa) shall be inoculated with the proper bacteria in the amounts and manner recommended by the manufacturer of the inoculant before sowing or being mixed with other seeds for sowing. The inoculant shall be furnished by the Contractor and shall be approved by the Engineer. The seed shall be sown as soon as possible after inoculation. Seed that has been standing more than 24 hours after inoculation shall be reinoculated before sowing. If legumes are applied by a hydraulic seeder, three times the normal amount of inoculant shall be used.

- (a) Bare Earth Seeding. Bare earth seeding shall be done using the following methods unless otherwise specified or directed by the Engineer.
 - (1) Seeding Classes 1, 2, and 6 shall be sown with a machine that mechanically places the seed in direct contact with the soil, packs, and covers the seed in one continuous operation.
 - (2) Seeding Class 4 shall be sown with a rangeland type grass drill.
 - (3) Seeding Class 3 may be sown with a hydraulic seeder.
 - (4) Seeding Classes 5 and 7 shall be sown with a hydraulic seeder or rangeland type grass drill.

Broadcasting or hydraulic seeding will be allowed as approved by the Engineer on steep slopes (over 1:3 (V:H)) or in inaccessible areas where use of the equipment specified is physically impossible. When broadcast seeders are used for Seeding Class 3 or 4, the individual seeds comprising the seeding mixture shall be sown separately. When Seeding Class 7 is used as an erosion control measure to establish temporary cover, hand broadcasting of the seed or other methods approved by the Engineer will be allowed.

- (b) Interseeding. Interseeding is the seeding of areas of existing turf. Prior to interseeding, all areas of existing turf to be interseeded, except as listed below, shall be mowed one or more times to a height of not more than 3 in. (75 mm). The equipment used shall be capable of completely severing all growth at the cutting height and distributing it evenly over the mowed area. The cut material shall not be windrowed or left in a lumpy or bunched condition. Additional mowing may be required, as directed by the Engineer, on certain areas in order to disperse the mowed material and allow penetration of the seed. The Contractor will not be required to mow within 1 ft (300 mm) of the right-of-way fence, continuously wet ditches and drainage ways, slopes 1:3 (V:H) and greater, or areas which may be designated as not mowable by the Engineer.

Debris encountered during the mowing and interseeding operations which hamper the operation or are visible from the roadway shall be removed and disposed of according to Article 250.05. Damage to the right-of-way and

turf, such as ruts or wheel tracks more than 2 in. (50 mm) in depth, shall be repaired to the satisfaction of the Engineer prior to the time of interseeding.

All seeding classes shall be interseeded using a rangeland type grass drill with an interseeding attachment, except the following.

- (1) When specified in the plans or directed by the Engineer, a slit seeder shall be used to interseed Class 1 or Class 2 seed.
- (2) Broadcasting or hydraulic seeding will be allowed as approved by the Engineer on steep slopes (1:3 (V:H) or steeper) or in inaccessible areas where use of the equipment specified is physically impossible. Sufficient water shall be applied to these areas to wash the seed down to the soil.

When broadcast seeders are used for Seeding Class 3 or 4, the individual seeds comprising the seeding mixture shall be sown separately.

250.07 Seeding Mixtures. The classes of seeding mixtures and combinations of mixtures will be designated in the plans.

When an area is to be seeded with two or more seeding classes, those mixtures shall be applied separately on the designated area within a seven day period. All seeding shall occur prior to placement of mulch cover. A Class 7 mixture can be applied at any time prior to applying any seeding class or added to them and applied at the same time.

TABLE 1 - SEEDING MIXTURES		
Class - Type	Seeds	lb/acre (kg/hectare)
1 Lawn Mixture 7/	Ky Bluegrass	100 (110)
	Perennial Ryegrass	60 (70)
	Creeping Red Fescue	40 (50)
1A Salt Tolerant Lawn Mixture 7/	Bluegrass	60 (70)
	Perennial Ryegrass	20 (20)
	Audubon Red Fescue	20 (20)
	Rescue 911 Hard Fescue	20 (20)
	Fults Salt Grass 1/	60 (70)
1B Low Maintenance Lawn Mixture 7/	Fine Leaf Turf-Type Fescue 3/	150 (170)
	Perennial Ryegrass	20 (20)
	Red Top	10 (10)
	Creeping Red Fescue	20 (20)
2 Roadside Mixture 7/	Inferno Tall Fescue or Tarheel II Tall Fescue	100 (110)
	Perennial Ryegrass	50 (55)
	Creeping Red Fescue	40 (45)
	Red Top	10 (10)
2A Salt Tolerant Roadside Mixture 7/	Inferno Tall Fescue or Tarheel II Tall Fescue	60 (70)
	Perennial Ryegrass	20 (20)
	Audubon Red Fescue	30 (35)
	Rescue 911 Hard Fescue	30 (35)
	Fults Salt Grass 1/	60 (70)
3 Northern Illinois Slope Mixture 7/	Elymus Canadensis (Canada Wild Rye)	5 (5)
	Perennial Ryegrass	20 (20)
	Alsike Clover 2/	5 (5)
	Desmanthus Illinoensis (Illinois Bundleflower) 2/, 5/	2 (2)
	Andropogon Scoparius (Little Bluestem) 5/	12 (12)
	Bouteloua Curtipendula (Side-Oats Grama)	10 (10)
	Fult Salt Grass 1/	30 (35)
	Oats, Spring	50 (55)
	Slender Wheat Grass 5/	15 (15)
	Buffalo Grass (Cody or Bowie) 4/, 5/, 9/	5 (5)
	3A Southern Illinois Slope Mixture 7/	Perennial Ryegrass
Elymus Canadensis (Canada Wild Rye) 5/		20 (20)
Panicum Virgatum (Switchgrass) 5/		10 (10)
Andropogon Scoparius (Little Blue Stem) 5/		12 (12)
Bouteloua Curtipendula (Side-Oats Grama) 5/		10 (10)
Petalostemum Candidum (White Prairie Clover) 5/		5 (5)
Rudbeckia Hirta (Black-Eyed Susan) 5/		5 (5)
Oats, Spring		50 (55)

Class - Type	Seeds	lb/acre (kg/hectare)
4 Native Grass 6/, 8/	Andropogon Gerardi (Big Blue Stem) 5/	4 (4)
	Andropogon Scoparius (Little Blue Stem) 5/	5 (5)
	Bouteloua Curtipendula (Side-Oats Grama) 5/	5 (5)
	Elymus Canadensis (Canada Wild Rye) 5/	1 (1)
	Panicum Virgatum (Switch Grass) 5/	1 (1)
	Sorghastrum Nutans (Indian Grass) 5/	2 (2)
	Annual Ryegrass	25 (25)
	Oats, Spring	25 (25)
	Perennial Ryegrass	15 (15)
	4A Low Profile Native Grass 6/, 8/	Andropogon Scoparius (Little Blue Stem) 5/
Bouteloua Curtipendula (Side-Oats Grama) 5/		5 (5)
Elymus Canadensis (Canada Wild Rye) 5/		1 (1)
Sporobolus Heterolepis (Prairie Dropseed) 5/		0.5 (0.5)
Annual Ryegrass		25 (25)
Oats, Spring		25 (25)
Perennial Ryegrass		15 (15)
4B Wetland Grass and Sedge Mixture 6, 8/	Annual Ryegrass	25 (25)
	Oats, Spring	25 (25)
	Wetland Grasses (species below)	6 (6)
<u>Species:</u>	<u>% By Weight 5/</u>	
Calamagrostis Canadensis (Blue Joint Grass)	12	
Carex lacustris (Lake-Bank Sedge)	6	
Carex slipata (Awl-Fruited Sedge)	6	
Carex stricta (Tussock Sedge)	6	
Carex vulpinoidea (Fox Sedge)	6	
Eleocharis acicularis (Needle Spike Rush)	3	
Eleocharis obtusa (Blunt Spike Rush)	3	
Glyceria striata (Fowl Manna Grass)	14	
Juncus effusus (Common Rush)	6	
Juncus tenuis (Slender Rush)	6	
Juncus torreyi (Torrey's Rush)	6	
Leersia oryzoides (Rice Cut Grass)	10	
Scirpus acutus (Hard-Stemmed Bulrush)	3	
Scirpus atrovirens (Dark Green Rush)	3	
Scirpus fluviatilis (River Bulrush)	3	
Scirpus validus (Softstem Bulrush)	3	
Spartina pectinata (Cord Grass)	4	

Class - Type	Seeds	lb/acre (kg/hectare)
5	Forb with Annuals Mixture	1 (1) 10 (10)
Annuals Mixture - Mixture not exceeding 25 % by weight of any one species, of the following:		
<ul style="list-style-type: none"> Coreopsis lanceolata (Sand Coreopsis) Chrysanthemum maximum (Shasta Daisy) Gaillardia pulchella (Blanket Flower) Ratibida columnitera (Long-Headed Coneflower) Rudbeckia hirta (Black-Eyed Susan) 		
Forb Mixture - Mixture not exceeding 5 % by weight PLS of any one species, of the following:		
<ul style="list-style-type: none"> Amorpha canescens (Lead Plant) 2/ Anemone cylindrica (Thimble Weed) Asclepias tuberosa (Butterfly-Weed) Aster azureus (Sky Blue Aster) Aster laevis (Smooth Aster) Aster novae-angliae (New England Aster) Baptisia leucantha (White Wild Indigo) 2/ Coreopsis palmata (Prairie Coreopsis) Echinacea pallida (Pale Purple Coneflower) Eryngium yuccifolium (Rattlesnake Master) Helianthus mollis (Downy Sunflower) Heliopsis helianthoides (Ox-Eye) Liatris aspera (Rough Blazing Star) Liatris pycnostachya (Prairie Blazing Star) Monarda fistulosa (Prairie Bergamont) Parthenium integrifolium (WildQuinine) Petalostemum candidum (White Prairie Clover) 2/ Petalostemum purpureum (Purple Prairie Clover) 2/ Physostegia virginiana (False Dragonhead) Potentilla arguta (Prairie Cinquefoil) Ratibida pinnata (Yellow Coneflower) Rudbeckia subtomentosa (Fragrant Coneflower) Silphium laciniatum (Compass Plant) Silphium terebinthinaceum (Prairie Dock) Solidago rigida (Rigid Goldenrod) Tradescantia ohiensis (Spiderwort) Veronicastrum virginicum (Culver's Root) 		

Class - Type	Seeds	lb/acre (kg/hectare)
5A Large Flower Native Forb Mixture 6/, 8/	Forb Mixture (see below)	5 (5)
	<u>Species:</u>	<u>% By Weight 5/</u>
	Aster novae-angliae (New England Aster)	5
	Echinacea pallida (Pale Purple Coneflower)	10
	Helianthus mollis (Downy Sunflower)	10
	Heliopsis helianthoides (Ox-Eye)	10
	Liatris pycnostachya (Prairie Blazing Star)	10
	Ratibida pinnata (Yellow Coneflower)	5
	Rudbeckia hirta (Black-Eyed Susan)	10
	Silphium laciniatum (Compass Plant)	10
	Silphium terebinthinaceum (Prairie Dock)	20
	Solidago rigida (Rigid Goldenrod)	10
5B Wetland Forb	Forb Mixture (see below) 6/, 8/	2 (2)
	<u>Species:</u>	<u>% By Weight 5/</u>
	Acorus calamus (Sweet Flag)	3
	Angelica atropurpurea (Angelica)	6
	Asclepias incarnata (Swamp Milkweed)	2
	Aster puniceus (Purple Stemmed Aster)	10
	Bidens cernua (Beggarticks)	7
	Eupatorium maculatum (Spotted Joe Pye Weed)	7
	Eupatorium perfoliatum (Boneset)	7
	Helenium autumnale (Autumn Sneeze Weed)	2
	Iris virginica shrevei (Blue Flag Iris)	2
	Lobelia cardinalis (Cardinal Flower)	5
	Lobelia siphilitica (Great Blue Lobelia)	5
	Lythrum alatum (Winged Loosestrife)	2
	Physostegia virginiana (False Dragonhead)	5
	Polygonum pensylvanicum (Pennsylvania Smartweed)	10
	Polygonum lapathifolium (Curlytop Knotweed)	10
	Pycnanthemum virginianum (Mountain Mint)	5
	Rudbeckia laciniata (Cut-leaf Coneflower)	5
	Solidago riddellii (Riddell Goldenrod)	2
	Sparganium eurycarpum (Giant Burreed)	5
6 Conservation Mixture	Andropogon scoparius (Little Blue Stem) 5/ Elymus canadensis (Canada Wild Rye) 5/ Buffalo Grass (Cody or Bowie) 4/, 5/, 9/ Vernal Alfalfa 2/ Oats, Spring	5 (5) 2 (2) 5 (5) 15 (15) 48 (55)
6A Salt Tolerant Conservation Mixture	Andropogon scoparius (Little Blue Stem) 5/ Elymus canadensis (Canada Wild Rye) 5/ Buffalo Grass (Cody or Bowie) 4/, 5/, 9/ Vernal Alfalfa 2/ Oats, Spring Fults Salt Grass 1/	5 (5) 2 (2) 5 (5) 15 (15) 48 (55) 20 (20)
7 Temporary Turf Cover Mixture	Perennial Ryegrass Oats, Spring 4/	50 (55) 64 (70)

Notes:

- 1/ Fults pucinnellia distans.
- 2/ Legumes - inoculation required.
- 3/ Specific variety as shown in the plans or approved by the Engineer.
- 4/ Other seeds may be used if approved by the Engineer.
- 5/ PLS = Pure Live Seed to be used.
- 6/ Fertilizer not required.
- 7/ In Districts 1 through 6, the planting times shall be April 1 to June 15 and August 1 to November 1. In Districts 7 through 9, the planting times shall be March 1 to June 1 and August 1 to November 15. Seeding may be performed outside these dates provided the Contractor guarantees a minimum of 75 percent uniform growth over the entire seeded area(s) after one growing season. The guarantee shall be submitted to the Engineer in writing prior to performing the work. After one growing season, areas not sustaining 75 percent uniform growth shall be interseeded or reseeded, as determined by the Engineer, at no additional cost to the Department.
- 8/ Planting times May 15 to June 30 and October 15 to December 1.
- 9/ Seed shall be primed with KNO_3 to break dormancy and dyed to indicate such.

Variation in the Class 4 or 5 seed quantities or varieties will be allowed in the event of a crop failure or other unforeseen conditions. The Contractor shall provide for the approval of the Engineer a written description of the changed Class 4 or 5 Mixture, the reasons for the change, and the name of the seed supplier.

250.08 Selective Mowing Stakes. Selective mowing stakes shall be installed to delineate areas to be seeded or interseeded with Class 4 or 5 mixtures. Selective mowing stakes shall be steel posts as described in Article 1081.13(a). The selective mowing stakes shall be driven into the ground to a height of 3 1/2 ft (1.1 m) above the ground at locations shown on the plans and as directed by the Engineer.

250.09 Method of Measurement. This work will be measured for payment as follows.

- (a) Contract Quantities. The requirement for use of contract quantities shall be according to Article 202.07(a).
- (b) Measured Quantities. Seeding of the class specified and mowing will be measured in acres (hectares) of surface area seeded or mowed.

The exact locations of seeding and mowing will be determined in the field by the Engineer, and the quantities will be adjusted accordingly. Fertilizer will be measured by weight in pounds (kilograms) of actual nutrients. The percent of nutrients equals the guaranteed analysis on the bag. The following formula will be used to determine the pounds (kilograms) of fertilizer nutrients applied.

$$\begin{aligned}
 & \text{(Total pounds (kilograms) of mixed fertilizer)} \\
 & \quad \times \\
 & \text{(Percentage of each nutrient in the fertilizer applied)} \\
 & = \text{pounds (kilograms) of each fertilizer nutrient}
 \end{aligned}$$

Agricultural Ground Limestone will be measured by weight in tons (metric tons) of Agricultural Ground Limestone having an effective neutralizing value of 67.5 (four year base, a source correction factor of 1.0). Applied quantity shall be the plan quantity multiplied by the source correction factor. The pay quantity will be the applied quantity divided by the source correction factor.

Payment will not be made for fertilizer nutrients in excess of 103 percent or agricultural ground limestone in excess of 108 percent of the amounts specified by the Engineer.

Selective mowing stakes will be measured as each in place.

250.10 Basis of Payment. This work will be paid for at the contract unit price per acre (hectare) for SEEDING or INTERSEEDING of the Class specified; at the contract unit prices per pound (kilogram) for NITROGEN FERTILIZER NUTRIENT, PHOSPHORUS FERTILIZER NUTRIENT and POTASSIUM FERTILIZER NUTRIENT; and at the contract unit price per ton (metric ton) for AGRICULTURAL GROUND LIMESTONE.

Mowing will be paid for at the contract unit price per acre (hectare) for MOWING. Only the initial mowing will be paid for. Any subsequent mowing required to obtain a height of not more than 3 in. (75 mm) or to disperse mowed material will be considered as included in the cost of the initial mowing.

Selective Mowing Stakes will be paid for at the contract unit price per each for SELECTIVE MOWING STAKES.

SECTION 251. MULCH

251.01 Description. This work shall consist of furnishing, transporting, and placing mulch or erosion control blanket over seeded areas.

251.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Compost	1081.05(b)
(b) Mulch	1081.06(a)
(c) Chemical Mulch Binder	1081.06(a)(3)
(d) Chemical Compost Binder	1081.06(a)(4)
(e) Excelsior Blanket	1081.10(a)
(f) Knitted Straw Mat	1081.10(b)
(g) Heavy Duty Erosion Control Blanket	1081.10(c)
(h) Wire Staples	1081.10(d)
(i) Wood Stakes	1081.10(e)
(j) Coconut Fiber	1081.10(f)

CONSTRUCTION REQUIREMENTS

251.03 Mulching Seeded Areas. Within 24 hours from the time seeding has been performed, the seeded area shall be given a covering of mulch by one of the following methods as designated on the plans. On slopes steeper than 1:3 (V:H), mulch shall be applied the same day as seeded. Mulch shall be applied uniformly at the rate specified.

- (a) Method 1. This method shall consist of hand or machine application of straw mulch at the rate of 2 tons/acre (4.5 metric tons/ha). The mulch shall be loose enough to permit air to circulate but compact enough to reduce erosion. If baled mulch material is used, care shall be taken that the material is in a loosened condition and contains no lumps or knots of compacted material.
- (b) Method 2. This method shall consist of placing and stabilizing straw at the rate of 2 tons/acre (4.5 metric tons/ha) over seeded areas. All requirements of Method 1 must be met plus the mulch shall be thoroughly stabilized. The Contractor has the option of any of the following procedures for stabilizing the straw.
 - (1) Procedure 1. This procedure shall consist of anchoring the straw into the soil by means of a mechanical stabilizer with dull blades or disks. These blades or disks shall be without camber, approximately 20 in. (500 mm) in diameter, notches spaced at approximately 8 in. (200 mm) intervals and equipped with scrapers. The stabilizer shall be approximately 1000 lb (450 kg), have a working width not exceeding 72 in. (1.8 m), and shall be equipped with a ballast compartment, so that when directed, the weight (mass) can be increased.
 - (2) Procedure 2. This procedure shall consist of stabilizing the straw with an approved mulch blower followed immediately by an overspray application of hydraulic mulch. The hydraulic mulch shall be applied as a slurry of 750 lb (850 kg) of mulch and 1000 gal (9500 L) of water per acre (hectare) by an approved hydraulic mulch applicator. The hydraulic mulch slurry shall be agitated a minimum of five minutes before application and shall be agitated during application.
 - (3) Procedure 3. This procedure shall consist of stabilizing the straw with a chemical mulch binder. The chemical mulch binder may be applied simultaneously with the straw or as an overspray.
 - a. Simultaneous Application. The coated straw shall be placed by equipment which will blow or eject, by means of a constant air stream, controlled quantities of straw and binder in a uniform pattern. The binder shall be introduced into the air stream of the machine by means of a spray which will partially coat the straw with a spotty tack. If the straw is excessively cut or broken, corrective measures shall be taken.

- b. Overspray Application. The overspray application shall be performed according to Procedure 2.

The chemical mulch binder shall be approved by the Engineer and shall be applied at the rate recommended by the supplier and approved by the Engineer.

- (c) Method 3. This method shall not be used on slopes steeper than 1:3 (V:H). This method shall consist of machine application of wood or paper fiber hydraulic mulch at the specified rate using an approved hydraulic seeder. The hydraulic mulch shall be applied as a slurry of 1 ton (2.25 metric tons) of mulch and not less than 2000 gal (19000 L) of water/acre (hectare). The hydraulic mulch slurry shall be agitated a minimum of five minutes before application. The seeding shall not be applied concurrently with this operation.
- (d) Method 4. This method shall consist of applying compost combined with a performance additive designed to bind/stabilize the compost. The compost/performance additive mixture shall be applied to the surface of the slope using a pneumatic blower at a depth of 2 in. (50 mm).

Following the mulching operation, foot and vehicular traffic, or the movement of equipment over the mulched area shall be prohibited. At any location where mulching has been displaced by any Contractor's equipment or personnel, the seeding and mulch or other work damaged as a result of that displacement shall be repaired or replaced immediately.

251.04 Erosion Control Blanket. Erosion control blanket may be placed using either excelsior blanket or knitted straw blanket. The blanket shall be placed within 24 hours after seeding operations have been completed on the areas specified. Prior to placing the blanket, the areas to be covered shall be relatively free of rocks or clods over 1 1/2 in. (40 mm) in diameter, and sticks or other foreign material which will prevent the close contact of the blanket with the seed bed. If, as a result of rain, the prepared seed bed becomes crusted or eroded, or if eroded places, ruts, or depressions exist for any reason, the Contractor shall rework the soil until it is smooth and reseed such areas which are reworked.

After the area has been properly shaped, fertilized, and seeded, the blanket shall be laid out flat, evenly, and smoothly, without stretching the material. The blankets shall be placed so that the netting is on the top and the fibers are in contact with the soil.

For placement in ditches, the erosion control blanket shall be applied parallel to the centerline of the ditch so that there are no longitudinal seams within 2 ft (600 mm) of the bottom centerline of the ditch. The blanket shall be toed in on the upslope edge and shingled or overlapped with the flow.

On slopes, the blanket shall be applied either horizontally or vertically to the contour, toed in on the upslope edge, and shingled or overlapped with the flow.

Anchoring the blankets in ditches and on slopes shall be as follows.

- (a) Excelsior Blanket. In ditches, the blankets shall be stapled in place, using six staples across the upstream end at the start of each roll and placing staples on 4 ft (1.2 m) centers along each side. A common row of staples shall be used along seams of adjoining blankets. Another row of staples shall be used in the center of each roll and be alternately spaced between each side staple at 4 ft (1.2 m) centers. All seams shall overlap at least 2 in. (50 mm).

On slopes, the blankets shall be stapled in place similar to ditch application, except that the space interval shall be 6 ft (1.8 m).

- (b) Knitted Straw Blanket. In ditches, the blankets shall be stapled in place using six staples across the upstream end at the start of each roll. Additional staples shall be spaced in a diamond pattern with the longer dimension in the direction of the slope and the shorter dimension across the slope. The longer dimension shall be a maximum of 6 ft (1.8 m) and the shorter dimension shall be a maximum of 3 ft (900 mm). A common row of staples may be used on adjoining rolls.

On slopes, the blankets shall be stapled per the manufacturer's specifications.

- (c) Heavy Duty Erosion Control Blanket. This blanket shall be installed according to Article 251.04, except that the following stapling pattern shall be used: place six staples across the start of each roll and continue this pattern along the roll at 2 ft (600 mm) intervals. Adjacent blankets shall overlap 2 in. (50 mm), and the edge staples shall penetrate both blankets. The center two staples shall be alternately spaced between each side staple.

251.05 Method of Measurement. This work will be measured for payment as follows.

- (a) Contract Quantities. The requirement for use of contract quantities shall be according to Article 202.07(a).
- (b) Measured Quantities. Mulch Methods 1, 2, 3, and 4 will be measured for payment in acres (hectares) of surface area mulched. Erosion Control Blanket and Heavy Duty Erosion Control Blanket will be measured for payment in place in square yards (square meters) of actual surface area covered.

251.06 Basis of Payment. This work will be paid for at the contract unit price per acre (hectare) for MULCH, METHOD 1; MULCH, METHOD 2; MULCH, METHOD 3; or MULCH, METHOD 4; and at the contract unit price per square yard (square meter) for EROSION CONTROL BLANKET or HEAVY DUTY EROSION CONTROL BLANKET.

SECTION 252. SODDING

252.01 Description. This work shall consist of preparing the ground surface and furnishing and placing sod and other materials required in the sodding operations.

252.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Sod	1081.03
(b) Salt Tolerant Sod	1081.03(b)
(c) Agricultural Ground Limestone	1081.07
(d) Fertilizer	1081.08

CONSTRUCTION REQUIREMENTS

252.03 Ground Preparation. The area to be sodded shall be finished according to Section 212 before sodding operations are begun. Immediately prior, but not in excess of 24 hours before the sod is placed, the soil surface shall be worked until it is free from debris, washes, gullies, clods and stones. The surface shall be worked to a depth of not less than 3 in. (75 mm) with a disk, tiller or other equipment approved by the Engineer. Prepared surface shall be finished to a fine smooth finish free of irregularities. Finished ground elevations shall allow for the thickness of sod to match grade of existing turf or structures.

All soil surfaces shall be moist when the sod is placed. When directed by the Engineer, the Contractor shall be required to apply water to dry soil surfaces at a minimum rate of 1 gal/sq yd (5 L/sq m) immediately prior to placing the sod.

When specified, agricultural ground limestone and fertilizer nutrients shall be applied at the designated rates over the areas to be sodded.

When fertilizer is specified, 180 lb (210 kg) of fertilizer nutrients per acre (hectare) shall be applied over the areas to be sodded at a 1:1:1 ratio as follows.

Nitrogen Fertilizer Nutrients	60 lb/acre (70 kg/ha)
Phosphorus Fertilizer Nutrients	60 lb/acre (70 kg/ha)
Potassium Fertilizer Nutrients	60 lb/acre (70 kg/ha)

252.04 Sodding Time. Sod shall be placed when the ground is in a workable condition and temperatures are less than 80 °F (26 °C). Sod shall not be placed when the sod or ground surface is frozen. Sod shall not be placed during the months of July and August.

252.05 Transportation. All sod shall be properly protected during transportation to maintain it in a live, healthy condition. Sod cut for more than 48 hours shall only be used with the approval of the Engineer. Any sod that has dried out, has heated to over 100 °F (38 °C), or is frozen prior to placing will be rejected and shall be immediately removed from the jobsite by the Contractor.

252.06 Placing Sod. The sod shall be placed on the prepared surface with the edges in close contact and alternate courses staggered.

In ditches, the sod shall be placed with the longer dimension perpendicular to the flow of water in the ditch. On slopes, starting at the bottom of the slope, the sod shall be placed with the longer dimension parallel to the contours of the ground. The exposed edges of sod shall be buried flush with the adjacent soil.

On slopes where the sod may be displaced during sodding operations, the workmen shall work from ladders or treaded planks.

252.07 Staking Sod. The sod shall be staked on all slopes of 1:2 (V:H) or steeper. Sod shall be staked with not less than four stakes per sq yd (sq m) with at least one stake for each piece of sod. Stakes shall be a minimum of 6 in. (150 mm) long. Stakes shall be installed so that they hold the sod firmly in place yet present no danger to pedestrians or mowing crews. The type of stake and the method of installation shall meet the approval of the Engineer.

252.08 Sod Watering. Within two hours after the sod has been placed, water shall be applied at a rate of 5 gal/sq yd (25 L/sq m). Additional water shall be applied every other day at a rate of 3 gal/sq yd (15 L/sq m) for a total of 15 additional waterings. During periods exceeding 80 °F (26 °C) or subnormal rainfall, the schedule of additional waterings may be altered with the approval of the Engineer.

The Contractor shall have on hand enough equipment to completely water all sodded areas in two days at the watering rates specified above. The Engineer will make periodic checks of the Contractor's watering equipment to determine its adequacy and operating condition.

All watering described shall be done with a spray application. An open end hose will not be acceptable. The method of watering shall meet the approval of the Engineer.

252.09 Supplemental Watering. During periods exceeding 80 °F (26 °C) or subnormal rainfall, supplemental watering may be required after the initial and additional waterings. Supplemental watering shall be performed when directed by the Engineer. Water shall be applied at the rate specified by the Engineer within 24 hours of notice.

252.10 Disposal of Surplus Material. Surplus and waste materials resulting from sodding operations shall be disposed of according to Article 202.03.

252.11 Inspection. The Contractor shall notify the Engineer of the localities from which the sod is to be obtained so that an authorized representative may inspect the fields for approval.

A copy of the inspection certificate required by law to this effect shall accompany each shipment and on arrival shall be filed with the Engineer.

With every shipment of salt tolerant sod, the Contractor shall provide to the Engineer a letter of certification from an authorized representative of the nursery stating that the seed mixture used in the sod conforms to the specifications.

252.12 Method of Measurement. Sodding will be measured for payment in place and the area computed in square yards (square meters). To be acceptable for final payment, the sod shall be growing in place for a minimum of 30 days in a live, healthy condition. When directed by the Engineer, any defective or unacceptable sod shall be removed, replaced, and watered.

Sod watering will not be measured for payment.

Supplemental watering will be measured for payment in units of 1000 gal (1000 L) of water applied on the sodded areas. Waterings performed in addition to those required by Article 252.08 or after the 30 day establishment period will be considered as supplemental watering.

Fertilizer and agricultural ground limestone will be measured for payment according to Article 250.09.

252.13 Basis of Payment. Sodding will be paid for at the contract unit price per square yard (square meter) for SODDING or SODDING, SALT TOLERANT according to the following schedule.

- (a) Initial Payment. Upon placement of sod, 25 percent of the pay item will be paid.
- (b) Final Payment. Upon acceptance of sod, the remaining 75 percent of the pay item will be paid.

Supplemental watering will be paid for at the contract unit price per unit for SUPPLEMENTAL WATERING.

Fertilizer and agricultural ground limestone will be paid for according to Article 250.10.

SECTION 253. PLANTING WOODY PLANTS

253.01 Description. This work shall consist of furnishing, transporting, and planting woody plants such as trees, shrubs, vines, and seedlings. The work shall also include all mulching, bracing, wrapping, watering, weeding, replacement of plants when required, and all work described.

253.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Trees, Shrubs, Vines, and Seedlings	1081.01
(b) Topsoil	1081.05(a)
(c) Mulch	1081.06(b)
(d) Bracing	1081.13
(e) Weed Barrier Fabric	1081.14

CONSTRUCTION REQUIREMENTS

253.03 Planting Time. Except for container grown items, plants must be dormant when delivered to the storage site or project.

In reference to the following planting dates, that portion of the State which lies north of a line formed by the southern boundaries of Hancock, Schuyler, Mason, Tazewell, McLean, Ford, and Iroquois Counties shall be considered the northern zone, while that portion of the State which lies south of this line shall be considered the southern zone.

Bare root plant material shall be planted only when the air temperatures exceed 35 °F (2 °C).

- (a) Spring Planting. This work shall be performed from the time the soil can be worked until the plant, under field conditions, is not dormant, except the following circumstances.
 - (1) Evergreen planting shall end April 1 in the southern zone and April 30 in the northern zone.
 - (2) Seedlings, broadleaf evergreens, vines and willow (*Salix* spp.), poplar (*Populus* spp.), oak (*Quercus* spp.), alder (*Alnus* spp.), birch (*Betula* spp.), hawthorn (*Crataegus* spp.), red maple (*Acer Rubrum*), cherry (*Prunus* spp.), and pear (*Pyrus* spp.) species shall be planted only during the spring planting season.
 - (3) The planting time may be extended for container grown plants, if the Engineer determines that the weather conditions are favorable.
- (b) Fall Planting. This work shall be performed from the time the plant becomes dormant until the ground cannot be satisfactorily worked, except that evergreen planting shall be performed between August 15 and October 15 in the northern zone, and between September 1 and November 1 in the southern zone.

All plant material not planted according to the specified seasonal date shall require prior written approval from the Engineer. Failure to secure such approval shall result in the rejection of the plant material and replacement at no additional cost to the Department.

253.04 Digging of Plants. Plants shall not be dug until the Contractor is ready to transport them from their original locations to the site of the work or approved storage. The maximum time lapse between digging and being properly loaded, as defined in Article 1081.01 for delivery to the site of the work or being placed in approved storage, shall be four days for balled or burlapped plants and one day for bare root plants. They shall be dug with care, avoiding injury to the plants or loss or damage of the roots, particular attention being given to fibrous roots. Immediately after digging, roots shall be protected against drying out and freezing. Bare root plants shall be dug only when air temperatures exceed 35 °F (2 °C).

253.05 Transportation. During transportation, the Contractor shall exercise care to prevent injury and drying out of the plants. Upon arrival at the temporary storage location or the site of the work, plants will be inspected for proper shipping procedures as defined in Article 1081.01(d). Should the roots be dried out, large branches be broken, balls of earth be broken or loosened, or areas of bark be torn, the Engineer may reject the injured tree. When a tree has been so rejected, the Contractor shall at once remove it from the area of the work and replace it.

253.06 Temporary Storage. No plant shall remain in temporary storage over the summer. Plants delivered to the project that are not to be planted immediately shall be protected in the following manner.

- (a) **Bare Root Plants.** Plants may remain on the site of the work only 24 hours prior to being planted or placed in storage. During this 24 hour period, the Contractor shall continue to exercise care to prevent injury and drying out of the plants. The roots of plants to be placed in storage shall first be puddled in a paste solution of topsoil and water. The plants shall then be protected and kept moist by “heeling-in” the roots or by placing the plant in a cool moist storage building. The “heeling-in” procedure shall require the plants to be separated and the roots heeled in a suitable moist soil. If plants are stored in a building, the roots shall be covered with a suitable moist mulch. Winter storage of bare rooted plants will be allowed only in temperature and humidity controlled buildings. The Engineer shall approve the storage methods. The duration of storage, the method of storage and the materials used for mulch and “heeling-in” shall meet the approval of the Engineer.
- (b) **Balled and Burlapped Plants and Container Grown Plants.** Plants may remain on the site of the work only 72 hours prior to being planted or placed in storage.

Balled and burlapped plants shall be kept moist and their solidity carefully preserved. To prevent drying out or freezing, they shall be stored either in a cool moist storage building or placed in a compact group with a suitable mulch material placed around and between the balls so they are completely covered.

Container grown plant material shall be kept moist by watering as directed by the Engineer. To prevent freezing, they shall be stored either in a cool moist storage building or placed in a compact group with a suitable mulch material placed around and between the containers so that they are completely covered.

The duration of storage, method of storage, and mulch material for balled and burlapped plant material and container grown plant material shall meet the approval of the Engineer.

253.07 Layout of Planting. The area to be planted shall be finished to line and grade before planting operations are begun. The Contractor shall furnish all marking flags for locating plants, and shall mark the common name of plants. The Engineer will place the marking flags and outline each area for mass or solid planting. Where seedlings are to be planted, the planting areas shall be delineated with

selective mowing stakes. Selective mowing stakes shall be according to Article 250.08.

253.08 Excavation of Plant Holes. The sides of all plant holes shall be saucer shaped with the proportions being the width equal to three times the depth. On slopes, the depth of excavation will be measured at the center of the hole. The excess material excavated from the holes shall be spread in the immediate area as directed by the Engineer. The excavated material shall not be stockpiled on turf or in ditches. The sides of holes shall not be glazed or smooth.

- (a) Excavation for Trees. Holes for trees shall be dug at the location indicated by the marking flags. The diameter and depth of the hole shall be according to the following chart.

PLANT MATERIAL SIZE	MINIMUM DIAMETER OF BALL (W)	MINIMUM BALL DEPTH (D)	PLANTING HOLE WIDTH (3W)
4ft (1.2 m) < 8 ft (2.4 m) (height)	14 in. (355 mm) < 22 in. (560 mm) Shrubs	10.5 in. (270 mm) < 14.5 in. (370 mm) Shrubs	42 in. (1070 mm) < 66 in. (1680 mm) Shrubs
8 ft (2.4 m) < 12 ft (3.6 m) (height)	16 in. (400 mm) < 28 in. (700 mm) Evergreens	12 in. (300 mm) < 18.5 in. (470 mm) Evergreens	48 in. (1220 mm) < 84 in. (2140 mm) Evergreens
1 in. (25 mm) < 2 in. (50 mm) (diameter)	22 in. (560 mm) < 38 in. (960 mm) Shrubs	14.5 in. (370 mm) < 23 in. (585 mm) Shrubs	66 in. (1680 mm) < 114 in. (2900 mm) Shrubs
2 in. (50 mm) < 3 in. (75 mm) (diameter)	28 in. (700 mm) < 38 in. (960 mm) Evergreens	12 in. (300 mm) < 23 in. (585 mm) Evergreens	84 in. (2140 mm) < 114 in. (2900 mm) Evergreens
3 in. (75 mm) < 4 in. (100 mm) (diameter)	16 in. (400 mm) < 24 in. (600 mm)	12 in. (300 mm) < 16 in. (400 mm)	48 in. (1220 mm) < 72 in. (1830 mm)
4 in. (100 mm) < 5 in. (125 mm) (diameter)	24 in. (600 mm) < 31 in. (775 mm)	16 in. (400 mm) < 19.5 in. (495 mm)	72 in. (1830 mm) < 93 in. (2300 mm)
5 in. (125 mm) or larger (diameter)	31 in. (775 mm) < 42 in. (1070 mm) 42 in. (1070 mm) < 53 in. (1340 mm) 53 in. (1340 mm) or larger (diameter)	19.5 in. (495 mm) < 25 in. (635 mm) 25 in. (635 mm) < 32 in. (780 mm) 32 in. (780 mm) or larger (diameter)	93 in. (2300 mm) < 126 in. (3200 mm) 126 in. (3200 mm) < 150 in. (4000 mm) 150 in. (4000 mm) or larger (diameter)

- (b) Excavation for Shrubs, Vines, and Seedlings. Holes for shrubs, vines, and seedlings shall be dug within the marked outline of the planting bed. The spacing of plants will be designated on the plans. Spacing shall be measured from center-to-center and alternate rows shall be staggered.

Prior to digging shrub and vine holes, existing vegetation on the area shall be mowed or treated with a non-selective, post emergent, non-residual herbicide approved by the Engineer. The area shall then be tilled to a minimum depth of 2 in. (50 mm) until free of debris, gullies, clods, weeds, stones, and roots.

Holes for shrubs shall be dug to a minimum diameter equal to three times the root ball diameter and equal to the root ball depth. Holes for vines shall be dug to a minimum diameter of 8 in. (200 mm) and depth of 8 in. (200 mm).

Immediately prior to planting seedlings, the existing grass and weed growth within the planting area shall be cut to a maximum height of 2 in. (50 mm). On slopes flatter than 1:3 (V:H), the soil adjacent to the plant row parallel to the contour shall be prepared by cultivating or scalping to remove all grass and weed growth, in a continuous strip not less than 18 in. (450 mm) wide. The seedlings shall be planted in the center of this strip.

Holes for seedlings shall be made large enough to accommodate the root system with a spade, planting bar, or an approved mechanical tree planting machine. Individual holes for container grown plants shall be excavated to the same dimensions for comparable size balled and burlapped plant material.

253.09 Pruning. All pruning shall be performed by a professional arborist. Pruning shall be done in the presence of the Engineer, and in such a manner as to preserve the natural growth habit of each plant. All pruning shall be done in conformance with National Arborists Association Pruning Standards for Shade Trees Class 1 - Fine Pruning.

The ends of all broken and damaged roots of 1/4 in. (6 mm) or larger shall be pruned with a clean cut, removing only the injured portion. All broken branches, stubs, and improper cuts of former pruning shall be removed.

- (a) Deciduous Trees. Pruning shall consist of thinning the twigs or branches as dictated by the habit of growth of the various types of the trees to be pruned, and as directed by the Engineer. The leader and terminal buds shall not be cut unless directed by the Engineer.
- (b) Deciduous Shrubs. In general, shrubs shall be cut back to half of their height. Shrubs that are slow growing or do not sucker readily shall be pruned in the same manner as deciduous shade trees.
- (c) Evergreens. Evergreens shall not be pruned, except to remove broken or dead branches.

253.10 Planting Procedures. When directed by the Engineer, the backfill shall consist of suitable soil removed from the hole and topsoil as needed to match the level of the existing grade. If the existing soil is determined to be unsuitable, the backfill shall consist of topsoil as approved by the Engineer. Topsoil shall be stockpiled only at locations approved by the Engineer.

The backfill soil at the time of planting shall be capable of providing a sound growth environment and be in a loose, friable condition. At no time shall the backfill or other topsoil used on the job be stockpiled on turf or in ditches.

All plants shall be placed in a plumb position and set 2 in. (50 mm) higher than the depth they grew in the nursery. Prepared backfill shall be placed around the root system. Tamping or watering shall accompany the backfilling operation to eliminate air pockets.

Thorough watering of trees, shrubs, and vines, with a method approved by the Engineer, shall immediately follow the backfilling operation. This watering shall completely saturate the backfill and be performed during the same day of planting. After the ground settles, as a result of the watering, additional backfill shall be placed to match the level of the finished grade. Approved watering equipment shall be at the site of the work and in operational condition prior to starting the planting operation.

- (a) Balled and Burlapped Plants. After the plant is placed in the hole, all cords and burlap shall be removed from the trunk. Wire baskets shall be removed from at least the upper one half of the planting ball. All materials shall be disposed of properly.
- (b) Container Grown Plants. Prior to placing the plant in the hole, the container shall be removed with care so as not to disturb the ball of soil that contains the root system. During the planting operation, care shall be taken not to destroy the solidity of the ball of soil. Pots which will decompose in one growing season shall be removed to a point just below the surface of the ground.
- (c) Bare Root Plants. The roots shall be carefully spread in a natural position and prepared backfill shall be worked in around the roots so each root is individually packed to eliminate air pockets. The plant shall be gently raised and lowered to assure contact of the roots with the soil.
- (d) Seedling Plants. When seedlings are removed from storage for planting, they shall be transported to the planting site in containers of water and the roots shall be continuously immersed until planted. Any unplanted seedlings left at the end of each day shall be removed from the water, the roots wrapped in moist materials and the seedlings placed in storage.
 - (1) If holes are prepared according to Article 253.08, the roots shall be placed in the center of the hole and the backfill shall be compacted around the roots to eliminate air pockets. The backfill shall be saturated with water after the plant is placed.
 - (2) If an approved tree planting machine or a hand method that utilizes a planting bar or spade is used, no backfill will be required.
- (e) Water Saucer. All plants, except seedlings, placed individually and not specified to be bedded with other plants, shall have a water saucer constructed of soil equal to one half the diameter of the planting hole width and 4 in. (100 mm) in depth.

253.11 Mulch Cover. Within 30 days after planting, weed barrier fabric shall be placed around all plants and covered with mulch in the entire mulched bed or saucer area specified. Weed barrier and mulch will not be required for seedlings.

The fabric shall be cut as needed and fitted around the plant material. Wire staples, meeting the approval of the Engineer and driven at a 90 degree angle to the plane of the soil, shall be installed to hold the fabric in place. A minimum of one staple per square yard (square meter) is required. Strips of fabric shall overlap 6 in. (150 mm) at the seams. After placing the weed barrier fabric, the top surface of the fabric shall be clear of any topsoil, and mulch shall be placed in such a way as to completely cover the weed barrier to a depth of 4 in. (100 mm).

253.12 Wrapping. Within seven days after planting, a double lift of commercial screen wire mesh shall be wrapped around the trunk of all deciduous trees. All other plants planted individually shall be similarly wrapped when directed by the Engineer. The screen wire shall be secured to itself with staples or single wire strand tied to the mesh. The lower edge of the screen wire shall be in continuous contact with the ground and shall extend up to the lowest major branch.

253.13 Bracing. All deciduous and evergreen trees over 8 ft (2.5 m) in height shall require three 8 ft (2.5 m) long steel posts so placed that they are equidistant from each other and adjacent to the outside of the ball. The posts shall be driven vertically to a depth of 18 in. (450 mm) below the bottom of the hole. The anchor plate shall be aligned perpendicular to a line between the tree and the post. The tree shall be firmly attached to each post with a double guy of 14 gauge (2.03 mm) steel wire. The portion of the wire in contact with the tree shall be encased in a hose of a type and length approved by the Engineer.

During the life of the contract, if trees blow down, or are otherwise injured because of improper bracing, the Engineer may reject such injured trees, and the rejected trees shall be replaced.

253.14 Period of Establishment. Partial inspections of planting work as specified in Article 105.13 will not be made unless the planting work is unavoidably detained due to uncompleted highway construction that must precede the planting operation. Inspection for the successful completion of the period of establishment will be made during the month of September each year. To qualify for inspection, the Contractor must receive written certification from the Engineer stating that all specified plant material was in place and in a live healthy condition on or before June 1 of the year of inspection. To be acceptable, the plant must be in a live healthy condition, representative of its species. No portion of this work will be inspected until all items of work are completed.

This delay in inspection and acceptance of plant material shall not delay acceptance of the entire project and final payment due if the Contractor provides the Department with a surety bond in the full amount of all plant material items listed in the contract. The bond shall be executed prior to acceptance and final payment of the non-plant material items, and shall be in full force and effect until final inspection and acceptance of all plant material, including replacements.

The Department will assume the responsibility for all plant material found to be satisfactory at the time of inspection for successful completion of the period of establishment. Plants that do not meet the requirements for acceptance shall be replaced following the date of inspection and prior to November 30. Items specified for spring planting only shall be planted prior to the following April 30. Changes in the above dates will be allowed by the Engineer only if extreme weather conditions or other mitigating circumstances so dictate. When replacements are completed, the Contractor shall weed and thoroughly clean up the entire job to the satisfaction of the Engineer. Cleanup shall include pruning dead branches off the accepted plant material, spraying insect infected plants, removing staking and screening material, weeding, restoring mulch, removing work-related debris, and generally cleaning up the work site. When clean up operations have been completed, inspection will be made for replacement items only. All replacement items shall meet and be planted according to the original job specifications. Replacement plantings need not undergo a period of establishment to be accepted. However, replacement plants must be properly installed and in a live healthy condition at the time of inspection. Should replacements include both spring and fall items, the Contractor may elect to plant all replacements in the spring, prior to May 15.

The Contractor shall remove, immediately from the site of the work, any dead plant material. During spring or fall planting, the Contractor will not be permitted to terminate the operation until all plant material is in a live, healthy condition. All plant material which dies within 15 days after being planted shall be replaced at that time and shall be considered as part of the original planting and be subject to the requirements of the period of establishment.

253.15 Plant Care. During the period of establishment, the Contractor shall properly care for all plants including weeding, watering, adjusting of braces, repair of water saucers, or other work which is necessary to maintain the health and satisfactory appearance of the plantings. All requirements for proper care during the period of establishment shall be considered as included in the cost of the contract and shall be performed within five days following notification by the Engineer.

- (a) During the period of establishment, additional watering shall be performed at least once within every 30 days during the months of May through December. The Engineer may direct the Contractor to adjust the watering rate and frequency depending upon weather conditions.

The water shall be applied to individual plants in such a manner that the plant hole shall be saturated without allowing the water to overflow beyond the earthen saucer. Watering of plants in beds shall be applied in such a manner that all plant holes are uniformly saturated without allowing the water to flow beyond the periphery of the bed. The plants to be watered and the method of application will be approved by the Engineer. The Contractor will not be relieved in any way from the responsibility for unsatisfactory plants due to the amount of watering.

- (b) During the period of establishment, weeds and grass growth shall be removed from within the earthen saucer of individual trees and from the area within the mulched plant beds. This weeding shall be performed twice during each of the months of May through September. The Contractor will

not be relieved in any way from the responsibility for unsatisfactory plants due to the extent of weeding.

The weeding may be performed in any manner approved by the Engineer, provided the weed and grass growth, including their roots and stems, are removed from the area specified. Mulch disturbed by the weeding operation shall be replaced to its original condition. All debris which results from this operation must be removed from the right-of-way at the end of each day.

253.16 Method of Measurement. Trees, shrubs, and vines will be measured for payment in place as individual plants. Seedlings will be measured for payment in units of 100 plants in place. Only acceptable plants will be measured for payment.

253.17 Basis of Payment. This work will be paid for at the contract unit price per each for several kinds and sizes of TREES, SHRUBS, and VINES, and per unit for SEEDLINGS.

SECTION 254. PLANTING PERENNIAL PLANTS

254.01 Description. This work shall consist of furnishing, transporting, and planting perennial plants.

254.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Bulbs and Tubers	1081.02(a)
(b) Herbaceous Plants	1081.02(b)
(c) Mulch	1081.06(b)

254.03 Types and Mixtures. Types and mixtures of perennial plants and bulbs shall be as follows.

- (a) Bulbs. Bulbs shall be of the color and variety specified.
- (b) Ornamental Herbaceous Plants. Ornamental herbaceous plants shall be of the color and variety specified. Bare root plants may be used if installed in the spring prior to the normal budding time of the plant. Potted plants shall be used when specified on the plans or directed by the Engineer.
- (c) Prairie Type Plants. The following mixture shall be used.

Prairie Type. A random mixture consisting of no more than 20 percent of any one of the species shall be planted.

- Aster laevis - Smooth Aster
- Baptisia leucantha - White Wild Indigo
- Echinacea pallida - Pale Purple Coneflower
- Eryngium yuccifolium - Rattlesnake Master
- Liatris pycnostachya - Gayfeather
- Monarda fistulosa - Wild Bergamont
- Ratibida pinnata - Yellow Coneflower

Rudbeckia hirta - Black-eyed Susan
Silphium terebinthinaceum - Prairie Dock
Tradescantia ohiensis - Spiderwort

- (d) Wetland Type Plants. The following mixtures shall be used.

Wetland Emergent Type. An equal number of each of the following species shall be planted.

0 to 6 in. (0 to 150 mm) Water Depth Plants

Acorus calamus - Sweet Flag
Iris virginica shrevei - Blue Flag Iris
Polygonum coccineum - Marsh Smartweed
Sagittaria latifolia - Arrowhead
Sparganium eurycarpum - Large Fruited Burreed

6 to 12 in. (150 to 300 mm) Water Depth Plants

Nuphar advena - Yellow (Spatterdock) Water-lily
Nymphaea tuberosa - White (Tuberous) Water-lily
Pontederia cordata - Pickerelweed
Sagittarium rigida - Sessile-fruited Arrowhead
Scirpus acutus - Hardstem Bulrush

- (e) Sedge Meadow Type. The following mixtures shall be used.

Sedge Meadow Type. A random mixture consisting of no more than 20 percent of any one of the species shall be planted.

Calamagrostis canadensis - Blue Joint Grass
Carex lacustris - Lake Bank Sedge
Carex hystricina - Bottle Brush Sedge
Carex stricta - Tussock Sedge
Juncus tenuis - Path Rush
Scirpus fluviatilis - River Bulrush
Spartina pectinata - Prairie Cord Grass

- (f) Woodland Type Plants. The following mixture shall be used.

Woodland Type. A random mixture consisting of no more than 20 percent of any one of the species shall be planted.

Aquilegia canadensis - Columbine
Arisaema triphyllum - Jack-In-The-Pulpit
Delphinium tricorne - Wild Larkspur
Dicentra cucullaria - Dutchman's Breeches
Dodecatheon meadia - Shooting Stars
Geranium maculatum - Wild Geranium
Hydrophyllum virginianum - Virginia Waterleaf
Mertensia virginica - Bluebells
Phlox divaricata - Blue Phlox

Polemonium reptans - Jacob's Ladder
 Sangiunaria canadensis - Bloodroot
 Smilacina racemosa - False Solomon's Seal
 Tradescantia ohiensis - Spiderwort
 Uvularia grandiflora - Yellow Bellwort

254.04 Planting Time. Planting times for the various types of perennial plants shall be as follows.

- (a) Bulbs. Bulbs shall be planted between October 15 and November 15.
- (b) Ornamental Herbaceous Plants, Prairie Type Plants, Wetland Emergent Type Plants, and Sedge Meadow Type Plants shall be planted between May 1 and June 15 or between August 15 and September 15.
- (c) Woodland Type Plants shall be planted between April 1 and May 15.

254.05 Transporting and Storing Plants. The Engineer will inspect the plants and bulbs at the work site at the beginning of each planting day and reject any material that is not properly packaged (including clear labeling by species) or that is not in a firm, moist, or viable condition. Any plants remaining at the end of the day shall be removed from the work site and properly stored by the Contractor.

Before planting, sufficient water shall be added to potted plants to insure that the soil around the roots is not dry and crumbly when the plants are removed from the pots.

254.06 Layout of Planting. When plants are specified to be planted in prepared soil planting beds, the planting bed shall be approved by the Engineer prior to planting. If no prepared soil planting bed is specified, the plants shall be planted in areas that have existing cover or have been seeded and mulched or sodded. Where perennial plants, except bulbs, shall be planted, the planting beds shall be delineated with selective mowing stakes. Selective mowing stakes shall be according to Article 250.08.

254.07 Planting Procedures. The spacing of the plants shall be as shown on the plans, or as directed by the Engineer, to uniformly fill the planting beds. Individual plants within the beds shall be planted as follows.

- (a) Bulbs. Bulbs shall be planted to a depth of 6 in. (150 mm) in turf areas or prepared beds.
- (b) Ornamental Herbaceous Plants, Prairie Type Plants, Sedge Meadow Type Plants, and Woodland Type Plants. When planted in prepared soil planting beds, these plants shall be planted by a hand method approved by the Engineer.

When planted in existing turf, the planting area shall be mowed to a maximum height of 2 in. (50 mm).

In existing cover, or seeded and mulched or sodded planting areas, a 12 in. (300 mm) diameter planting area for individual plants shall be prepared. The

existing cover, or seed and mulch shall be cut and removed from the 12 in. (300 mm) diameter planting area and the soil within the planting area loosened to a depth of 6 in. (150 mm). The plants shall be planted within the planting area and immediately watered with at least 1 gal (5 L) of water per plant.

254.08 Mulching. Within 24 hours, the plants shall be mulched with 2 in. (50 mm) of a fine grade mulch meeting the approval of the Engineer. Care shall be taken to place the mulch in a way that does not smother the plants. When plants are planted in prepared soil planting beds, the entire bed shall be mulched. Bulbs planted in existing turf need not be mulched.

254.09 Period of Establishment. Period of Establishment for the various types of perennial plants shall be as follows.

- (a) No period of establishment will be required for bulbs.
- (b) Perennial plants must undergo a 30 day period of establishment. Additional waterings shall be performed at least once within every seven days for four weeks following installation. Water shall be applied at the rate of 2 gal/sq yd (9 L/sq m). Should excess moisture prevail, the Engineer may delete any or all of the additional watering cycles. In severe weather, the Engineer may require additional waterings.

Watering of plants in beds shall be applied in such a manner that all plant holes are uniformly saturated without allowing the water to flow beyond the periphery of the bed.

At the end of the period of establishment, the Contractor will be permitted to replace any unacceptable plants and shall thoroughly weed all the beds.

254.10 Method of Measurement. This work will be measured for payment in units of 100 perennial plants of the type specified. Measurement for payment of this work will not be performed until at the end of the 30 day establishment period for the replacement planting. Only plants that are in place and alive at the time of measurement will be measured for payment, except that if fewer than 25 percent of the plants are acceptable, a quantity equal to 25 percent of the number of units of plants originally planted will be considered measured for payment.

Selective mowing stakes will be measured for payment as each in place.

254.11 Basis of Payment. This work will be paid for at the contract unit price per each per unit for PERENNIAL PLANTS, of the type specified.

Selective mowing stakes will be paid for at the contract unit price per each for SELECTIVE MOWING STAKES.

EROSION CONTROL

SECTION 280. TEMPORARY EROSION CONTROL

280.01 Description. This work shall consist of constructing, maintaining, removing, and disposing of temporary erosion control systems.

280.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Bale Stakes	1081.15(a)
(b) Fence Stakes.....	1081.15(b)
(c) Hay or Straw Bales	1081.15(c)
(d) Fence	1081.15(d)
(e) Aggregate	1081.15(e)
(f) Silt Filter Fence	1080.02
(g) Temporary Mulch Material	1081.06
(h) Rolled Excelsior	1081.15(f)
(i) Temporary Erosion Control Seeding.....	1081.15(g)
(j) Inlet Filters	1081.15(h)

CONSTRUCTION REQUIREMENTS

280.03 General. The Contractor shall name a person at the preconstruction meeting who shall be on the jobsite during construction and who shall be responsible for ensuring the erosion control work is completed in a timely manner.

The Contractor and the Department shall schedule and conduct a jobsite inspection to review and designate the locations and types of erosion control systems to be placed. This inspection shall be conducted prior to beginning any work which will disturb existing drainage or require erosion control.

Erosion control systems shall be installed prior to beginning any construction activities which will potentially create erodible conditions. Erosion control systems for borrow pits, equipment storage sites, plant sites, haul roads, and other sites shall be installed prior to beginning construction activities at each site.

Work shall be coordinated such that no more than a total of 10 acres (4 hectares) are disturbed at a time. Completed slopes shall be seeded and mulched as the excavation proceeds to the extent considered desirable and practical. Permanent seeding shall be used whenever possible. Under no circumstances shall the Contractor prolong final grading and shaping so that the entire project can be permanently seeded at one time.

Temporary erosion control systems shall be coordinated with the permanent erosion control features to ensure economical, effective, and continuous erosion control. Work shall also be coordinated such that permanent erosion control features and seeding are not damaged; and repeated disturbances of temporary erosion control systems are kept to a minimum.

280.04 Temporary Erosion Control Systems. Temporary erosion control systems shall be constructed as shown on the plans and, where appropriate, according to the manufacturer's specifications. Specific requirements for the various types of systems shall be as follows.

- (a) **Temporary Ditch Checks.** This system consists of the construction of temporary ditch checks to prevent siltation, erosion, or scour of ditches and drainageways. Temporary ditch checks shall be constructed with products from the Department's approved list or shall be constructed with aggregate, when specified. Spacing of ditch checks shall be such that the low point in the center of one ditch check is at the same elevation as the base of the ditch check immediately upstream.
- (b) **Perimeter Erosion Barrier.** This system consists of a continuous barrier placed adjacent to an area of construction to intercept a sheet flow of water borne silt and sediment and prevent it from leaving the construction area. The barrier shall be constructed with hay or straw bales, rolled excelsior, or silt filter fence.
- (c) **Inlet and Pipe Protection.** This system consists of surrounding inlets, pipe inlets or outfalls, and other similar locations as required to intercept water borne silt and sediment and prevent it from entering the drainage system or exiting the construction area. The protection shall be constructed with hay or straw bales, silt filter fence, or inlet filters.

When inlet filters are specified, they shall be installed either directly on the drainage structure or under the grate of the drainage structure resting on the lip of the frame. The fabric bag shall hang down into the drainage structure. Prior to ordering materials, the Contractor shall determine the size and shape of the various drainage structures being protected.

- (d) **Sedimentation Basins.** This system consists of excavating and maintaining temporary basins at pipe inlets or outfalls, in ditches, and in drainageways to capture water borne silt and prevent it from exiting the construction area. The outfall of these basins is usually protected by perimeter erosion barrier to capture remaining silt.
- (e) **Temporary Ditches.** This system consists of constructing temporary ditches to intercept water borne silt and runoff.
- (f) **Temporary Erosion Control Seeding.** This system consists of seeding all erodible/bare areas to minimize the amount of exposed surface area. Seed bed preparation will not be required if the soil is in a loose condition. Light disking shall be done if the soil is hard packed or caked. Fertilizer nutrients will not be required.

The original seed bags shall be opened in the presence of the Engineer. The seed shall be applied by hand broadcasting to achieve a reasonably uniform coverage at a rate of 100 lb/acre (110 kg/ha). Seed shall be applied to all bare areas every seven days, regardless of weather conditions or progress of the work. The Engineer may require that critical locations be

seeded immediately and the Contractor shall seed these areas within 48 hours of such a directive.

- (g) Temporary Mulch. This system consists of installing temporary mulch cover over designated areas to prevent sheet erosion of areas that are to be altered during a later construction phase. The temporary mulch cover shall be according to either Article 251.03(a) or Article 251.03(b).

280.05 Maintenance. The temporary erosion control systems shall be properly maintained as directed by the Engineer to control siltation. This work shall include repair of the various systems, removal of trapped sediment, and cleaning of any silt filter fabric. Accumulated silt in sediment basins shall be removed when the basin becomes 75 percent filled. Trapped sediment and accumulated silt shall be disposed of according to Article 202.03.

280.06 Disposal. All temporary erosion control systems shall be removed at the direction of the Engineer and be disposed of according to Article 202.03.

280.07 Method of Measurement. This work will be measured for payment according to the following.

- (a) Sediment Basins and Temporary Ditches. The earth excavation for sediment basins and temporary ditches will be measured for payment in place and the volume computed in cubic yards (cubic meters).

The aggregate used for sediment basins will be measured for payment in tons (metric tons).

- (b) Temporary Ditch Checks. This work will be measured for payment as individual items and the unit of measurement will be each.
- (c) Perimeter Erosion Barrier. This work will be measured for payment in place in feet (meters).
- (d) Inlet and Pipe Protection. This work will be measured for payment as individual items and the unit of measurement will be each.
- (e) Temporary Erosion Control Seeding. This work will be measured for payment in pounds (kilograms) of seed applied.
- (f) Temporary Mulch. This work will be measured for payment in acres (hectares).

Temporary erosion control measures and work ordered by the Engineer due to the Contractor's carelessness or failure to install permanent controls will not be measured for payment.

280.08 Basis of Payment. This work will be paid for according to the following.

- (a) Sediment Basins and Temporary Ditches. The earth excavation for sediment basins and temporary ditches will be paid for at the contract unit

price per cubic yard (cubic meter) for EARTH EXCAVATION FOR EROSION CONTROL.

The aggregate used for sediment basins will be paid for at the contract unit price per ton (metric ton) for AGGREGATE (EROSION CONTROL).

- (b) Temporary Ditch Checks. This work will be paid for at the contract unit price per each for TEMPORARY DITCH CHECKS or AGGREGATE DITCH CHECKS.
- (c) Perimeter Erosion Barrier. This work will be paid for at the contract unit price per foot (meter) for PERIMETER EROSION BARRIER.
- (d) Inlet and Pipe Protection. This work will be paid for at the contract unit price per each for INLET AND PIPE PROTECTION.

Protection of drainage structures with inlet filters will be paid for at the contract unit price per each for INLET FILTERS.

- (e) Temporary Erosion Control Seeding. This work will be paid for at the contract unit price per pound (kilogram) for TEMPORARY EROSION CONTROL SEEDING. When light disking of hard or caked soil is directed by the Engineer, it will be paid for according to Article 109.04.
- (f) Temporary Mulch. Temporary Mulch will be paid for at the contract unit price per acre (hectare) for MULCH, METHOD 1, or MULCH, METHOD 2.

Maintenance of temporary erosion control systems will be paid for according to Article 109.04.

SECTION 281. RIPRAP

281.01 Description. This work shall consist of furnishing and placing bedding material, a protective course of stone or broken concrete laid as riprap for erosion protection or sediment control.

281.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Stone	1005.01
(b) Broken Concrete	1005.02

CONSTRUCTION REQUIREMENTS

281.03 Preparation. The bed for the riprap shall be excavated to allow the finished surface to conform to the lines specified. At the toe of the slope, the riprap shall commence on a continuation of the slope after excavation to accommodate the full depth of fabric, bedding lift, and riprap specified.

281.04 Placing. No riprap shall be placed until the preparation has been approved by the Engineer.

Installation of filter fabric and bedding material will be required under stone riprap gradations RR 4, RR 5, RR 6, and RR 7 for all uses, and under broken concrete and stone, or broken concrete dumped riprap when used for erosion protection. The fabric shall be installed according to the plans and Section 282. The placement of material shall begin at the lower elevations, progressing up the slope.

- (a) Stone Riprap. Class A1 bedding material shall be used with riprap Classes A4, A5, B4, and B5. Class A2 bedding material shall be used with riprap Classes A6, A7, B6, and B7. When filter fabric is used, the following substitutions of bedding material may be made: Quality B may be used in lieu of Quality A; Gradation CA 3 may be used in lieu of Gradation RR 1; and Gradation CA 1 may be used in lieu of Gradation RR 2.

Bedding material shall be spread uniformly on the filter fabric to the lines specified. Placing of material by methods which will tend to segregate particle sizes within the bedding will not be permitted. Any damage to the surface of the bedding material or the filter fabric during placing of the bedding shall be repaired before proceeding with the work.

Compaction of the bedding material will not be required; but it shall be finished to present a reasonably even surface, free from mounds, windrows, or depressions.

The thickness of the stone riprap lift shall be according to the following table.

Gradation	Min. Thickness	Bedding Thickness
RR 1 & RR 2	6 in. (150 mm)	-
RR 3	8 in. (200 mm)	-
RR 4	16 in. (400 mm)	6 in. (150 mm)
RR 5	22 in. (550 mm)	8 in. (200 mm)
RR 6	26 in. (650 mm)	10 in. (250 mm)
RR 7	30 in. (750 mm)	12 in. (300 mm)

Stone riprap shall be placed to the lines and grades shown on the plans. All tapers between minimum thickness and any high points shall be at a uniform rate. There shall be no abrupt changes in the riprap surface.

The riprap shall be placed to its full course thickness in one operation and in such a manner as to avoid displacing the bedding material. The riprap shall not be placed or dropped from a height of more than 1 ft (300 mm). Placing riprap by dumping into chutes or by similar methods likely to cause segregation of the various sizes will not be permitted.

The finished riprap shall be reasonably well graded with a minimum of voids. The desired distribution of the various sizes of stones shall be obtained by selective loading of the material at the source, by controlled dumping of successive loads during final placing, or by other methods of placement

which will produce the specified results. Rearranging of individual stones by mechanical equipment or by hand will be required to the extent necessary to obtain a reasonably well-graded distribution of stone sizes as specified above.

- (b) **Broken Concrete Riprap.** Bedding placement, when required, shall be as described for stone riprap in (a). The individual pieces of broken concrete shall be placed by hand, flat upon the slope. The pieces shall be laid with close joints, the larger pieces being placed in the lower courses. Any open joints shall be filled with spalls thoroughly rammed into place. The finished surface of the riprap shall present an even, close surface, true to the lines, grades and sections given.
- (c) **Stone or Broken Concrete Dumped Riprap.** Bedding placement, when required, shall be as described for stone riprap in (a). The dumped riprap shall be a minimum of 12 in. (300 mm) thick. Dumped riprap of stone or broken concrete, as specified, shall be placed on slopes or in channels by mechanical means. End dumping of material using mechanical equipment will be permitted, provided the larger stones or pieces of broken concrete are well-distributed and the entire mass, in final position, is roughly graded to conform to the gradation specified. Placement by dumping into chutes or other methods likely to cause segregation will not be permitted.

The finished riprap shall be reasonably free from objectionable pockets of small pieces and clumps of large pieces, and the surface shall be shaped to follow the grade of the slope or channel. Rearranging of the dumped stone or broken concrete by mechanical equipment or by hand will be required only to the extent necessary to remove objectionable pockets or clumps of small or large material, and to obtain a surface reasonably true to line and grade.

281.05 Disposal of Surplus Material. Surplus or waste material shall be disposed of according to Article 202.03.

281.06 Method of Measurement. This work will be measured for payment in tons (metric tons); or measured in place, and the area computed in square yards (square meters). The area for measurement will include the upper sloped surface of the riprap and upper horizontal surface of the toe anchor.

Filter fabric will be measured for payment according to Article 282.08.

281.07 Basis of Payment. This work will be paid for at the contract unit price per square yard (square meter) or per ton (metric ton) for STONE RIPRAP or STONE DUMPED RIPRAP, of the class (stone quality and gradation) specified; BROKEN CONCRETE RIPRAP; or BROKEN CONCRETE DUMPED RIPRAP.

Filter fabric will be paid for according to Article 282.09.

SECTION 282. FILTER FABRIC

282.01 Description. This work shall consist of furnishing and installing geotechnical filter fabric on a prepared earth surface.

282.02 Materials. The filter fabric shall be according to Article 1080.03.

CONSTRUCTION REQUIREMENTS

282.03 General. The filter fabric shall be stored above the ground, inside and away from sunlight at temperatures less than 140 °F (60 °C), and protected from damage. The exposure of the filter fabric to the elements between laydown and cover shall be a maximum of 14 days.

282.04 Preparation. The depth and area of excavation shall not exceed the dimensions necessary to properly place the filter fabric. Prior to the installation of the fabric, the surface shall be cleared of debris, sharp objects, and trees. Tree stumps shall be cut to the level of the prepared ground surface. If stumps cannot be cut to the ground level, they shall be completely removed. All wheel tracks, ruts, or surface irregularities in excess of 2 in. (50 mm) in depth shall be graded smooth or otherwise filled with soil to provide a reasonably smooth surface. The filter fabric shall not be placed until the preparation has been approved by the Engineer.

282.05 Placement. At the time of placement, the fabric shall be free of defects, deterioration, and damage.

The fabric shall be unrolled directly over the surface either by hand or by mechanical methods, provided the surface is not rutted. The long dimension of the fabric shall be parallel to the centerline of the channel or shoreline. Overlaps in the fabric shall be placed so that any upstream strip of fabric will overlap the downstream strip, and the upslope roll shall overlap the downslope roll.

The fabric shall be laid loosely, free of folds and creases. The fabric shall be turned down and buried 2 ft (600 mm) at all exterior limits, except where a stone filled key trench is provided below natural ground. As the riprap proceeds up the grade, the top edge of the fabric shall be buried as a part of the last operation.

Fabric of insufficient width or length to fully cover the specified area shall be lapped or sewn. The minimum laps for lap only areas are 12 in. (300 mm) and for sewn areas are 4 in. (100 mm).

When sewn, the fabric shall be stitched at a minimum rate of four stitches per 1 in. (25 mm) with high-strength polyester, polypropylene, or kevlar thread. The seam strength shall be equal to or more than the minimum grab tensile strength of the fabric when tested wet according to ASTM D 4632.

282.06 Securing Pins. Securing pins for anchoring filter fabric shall be nominally 3/16 in. (5 mm) diameter steel bars, pointed at one end and fabricated with a head to retain a steel washer having an outside diameter of not less than 1 1/2 in. (40 mm). The length of the pin shall not be less than 12 in. (300 mm). Securing pins

shall be inserted through both strips of overlapped cloth at not greater than the following intervals along a line through the midpoint of the overlap.

Slope	Pin Spacing
Steeper than 1:3 (V:H)	2 ft (600 mm)
1:3 (V:H) to 1:4 (V:H)	3 ft (900 mm)
Flatter than 1:4 (V:H)	5 ft (1.5 m)

Each securing pin shall be pushed through the fabric until the washer bears against the fabric and secures it firmly to the surface. Additional pins, regardless of location, shall be installed as necessary to prevent any slippage of the filter fabric. When the Engineer determines that the proper lap is not being maintained by the use of pins, the fabric shall be sewn according to Article 282.05.

282.07 Protection. The fabric shall be protected during construction from contamination by surface runoff, and any fabric so contaminated shall be removed and replaced.

Fabric damaged during its installation or during placement of riprap shall be replaced or repaired. Repairs shall be made by removing the material around the damage and covering it with a patch of fabric using an overlap of 4 ft (1.2 m) in each direction. The patch shall be held in position with securing pins.

282.08 Method of Measurement. This work will be measured for payment in place and the area computed in square yards (square meters). The buried edges of the fabric will not be measured for payment and the overlap joints and seams will be measured as a single lift of material.

282.09 Basis of Payment. This work will be paid for at the contract unit price per square yard (square meter) for FILTER FABRIC.

SECTION 283. AGGREGATE DITCH

283.01 Description. This work shall consist of furnishing and installing aggregate in roadside ditches.

283.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Aggregate Ditch	1005.01
(b) Filter Fabric	1080.03

CONSTRUCTION REQUIREMENTS

283.03 Aggregate Ditch. The stone aggregate ditch shall be constructed on filter fabric without any bedding material.

The filter fabric shall be constructed according to Section 282, except that the edges along the centerline of the ditch shall be turned down and buried 6 in. (150 mm), the upstream and downstream edges shall be turned down and buried 12 in. (300 mm), and securing pins at overlaps shall be inserted at each edge of the ditch bottom and at intervals of not greater than 5 ft (1.5 m) extending up the slopes.

The aggregate lift shall be a minimum of 12 in. (300 mm) thick and placed to the lines and grades as shown on the plans, or as directed by the Engineer. The placement of the aggregate shall begin at the lower elevation and proceed up the slope in such manner to construct a reasonably well graded mass of stone free from objectionable pockets of small stones and clusters of large stones. Arranging of stones may be required to the extent necessary, either mechanically or by hand, to obtain a well graded distribution of stone sizes and grade lines. Disturbed soil surfaces not covered with stone aggregate shall be seeded, fertilized and mulched according to Sections 250 and 251.

283.04 Method of Measurement. Aggregate ditch will be measured for payment in tons (metric tons) according to Article 311.08(b).

Filter fabric will be measured for payment according to Article 282.08

283.05 Basis of Payment. This work will be paid for at the contract unit price per ton (metric ton) for AGGREGATE DITCH.

Filter fabric will be paid for according to Article 282.09.

SECTION 284. GABIONS AND SLOPE MATTRESS

284.01 Description. This work shall consist of furnishing and placing a protective course of stone confined by wire baskets used as retaining walls, slope paving, bank protection, weirs, drop structures, or outfall structures.

284.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Stone for Erosion Control (Note 1)	1005.01
(b) Gabions and Slope Mattresses	1006.35
(c) Wire Fasteners	1006.36
(d) Anchor Stakes	1006.04, 1006.18
(e) Filter Fabric	1080.03

Note 1. The stone shall conform to the requirements of Quality Designation A and shall not contain objectionable quantities of dirt, sand, clay, or rock fines. The stone shall be well graded with maximum stone dimensions ranging between 4 to 8 in. (100 to 200 mm). No stone shall have a minimum dimension less than 3 in. (75 mm), and the ratio of maximum to minimum dimension shall not be greater than two.

CONSTRUCTION REQUIREMENTS

284.03 Fabricating Gabions and Slope Mattresses. Baskets shall be fabricated in such a manner that the sides, ends, lid, and diaphragms can be assembled at the construction site into rectangular baskets of the sizes specified and shown on the plans. Baskets furnished by the manufacturer shall be of uniform size. Baskets shall be of single unit construction, i.e., the base, lid, ends, and sides shall be either woven into a single unit or one edge of these members connected to the base section of the basket in such a manner that strength and flexibility at the point of connection is at least equal to that of the mesh. Where the length of the basket exceeds $1\frac{1}{2}$ its horizontal width, the basket shall be equally divided by diaphragms, of the same mesh and gauge as the body of the baskets, into cells whose length does not exceed the horizontal width. The basket shall be furnished with the necessary diaphragms secured in proper position on the base in such a manner that no additional tying at this juncture will be necessary. Baskets shall be assembled by tying or fastening all untied edges. The tying wire shall be tightly laced around every fabric opening along the seams in such a manner that single and double loops are alternated. If wire fasteners are used, they shall be installed at approximately 4 to 6 in. (100 to 150 mm) intervals, but not less than one fastener for each fabric opening along the joint.

Sufficient wire fasteners, lacing, and connecting wire to match the basket material shall be supplied with the baskets for all fastening operations carried out in the construction of the gabion and mattress work.

All perimeter edges of the baskets, including end panels and the diaphragms, if any, shall be mechanically selvaged in such a way as to prevent any unravelling of the fabric and to develop the full strength of the fabric. The wire used for the selvedge shall have a diameter greater than that of the wire used to form the fabric.

284.04 Foundation Preparation. The bed for the gabions or slope mattress shall be trimmed and shaped to conform to the line and grade shown on the plans and as directed by the Engineer.

284.05 Placing. After the Engineer has approved the foundation preparation, a layer of filter fabric shall be installed. Installation of the filter fabric will be required under both the gabions and the slope mattress, and behind the gabions. The filter fabric shall be installed according to the plans.

The baskets shall be placed as shown on the plans. The stone material shall be placed in close contact in the unit so that maximum fill is obtained.

Empty basket units shall be assembled individually and placed on the approved surface to the lines and grades as shown on the plans or as directed by the Engineer, with the sides, ends, and diaphragms erected in such a manner to insure the correct position of all creases and that the tops of all sides are level. All adjoining empty gabion units shall be secured to the adjoining unit in order to obtain a monolithic structure. Wire fasteners may be used in lieu of lacing wire for forming individual baskets, joining empty baskets together and closing lids. Binding wire or wire fasteners shall be used along vertical reinforced edges and top selvages. When baskets are stacked, the base of the top basket shall be tightly wired or fastened to

the lower basket at front and back. Lacing of adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops at intervals of not more than 5 in. (125 mm). All lacing wire terminals shall be securely fastened. If wire fasteners are used, a fastener shall be provided at each fabric opening along the joint. A minimum of six fasteners are required per 3 ft (1 m) seam, three fasteners are required per 18 in. (450 mm) seam and two fasteners per 12 in. (300 mm) seam.

The initial line of basket units shall be placed on the prepared surface in a direction parallel to stream flow, and partially filled to provide anchorage against deformation and displacement during filling operations. After adjoining empty basket units are set to line and grade and common sides with adjacent units thoroughly laced or fastened, baskets shall be placed in tension and stretched to remove any kinks from the fabric and to a uniform alignment. The stretching of empty basket units shall be accomplished in such a manner as to prevent any possible unraveling.

Stone filling operations shall carefully proceed with placement by hand or machine so as not to damage the wire coating, to assure a minimum of voids between the stones, and the maintenance of alignment throughout the filling process. Undue deformation and bulging of the fabric shall be corrected prior to further stone filling. To avoid localized deformation, the basket units in any row are to be filled in stages consisting of maximum 12 in. (300 mm) courses. Baskets 18 in. (450 mm) tall or more shall use connecting wires in each internal compartment after each 9 or 12 in. (225 or 300 mm) lift, except when the lid is closed over the last lift. For baskets 18 in. (450 mm) tall, the connecting wires shall be installed between the 9 in. (225 m) lifts of stone. The 3 ft (1 m) tall baskets shall have connecting wires installed between each 12 in. (300 mm) lift of stone. These wires shall connect the front face to the back face. All connecting wires shall be looped around two fabric openings and the ends of the wires securely twisted to prevent loosening. For end units, two additional connecting wires shall be placed at each level perpendicular to the normally required connecting wires.

At no time shall any cell be filled to a depth exceeding 12 in. (300 mm) more than the adjoining cell. The maximum height from which the stone may be dropped into the basket units shall be 3 ft (1 m).

Along all exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to insure a neat and compact appearance. The last layer of stone shall be leveled with the top of the gabion to allow for the proper closing of the lid and to provide an even surface that is uniform in appearance. Lids shall be stretched tight over the stone fill using only an approved lid closing tool, until the lid meets the perimeter edges of the front and end panels. Using crowbars or other single point leverage bars for lid closing shall be prohibited. The lid shall then be tightly tied with lacing wire along all edges, ends, and internal cell diaphragms by continuous stitching with alternating single and double loops at intervals not more than 5 in. (125 mm). Wire fasteners may be used in lieu of lacing wire. Special attention shall be given to see that a projections or wire ends are turned into the baskets. Where shown on the plans or as directed by the Engineer, or where a complete gabion unit cannot be installed because of space limitations, the basket unit shall be cut, folded, and wired together to suit existing site conditions. The fabric must be cleanly cut and the surplus fabric cut out completely, or folded back and neatly wired to an adjacent

gabion face. The assembling, installation, filling, lid closing, and lacing of the reshaped gabion units shall be carried out as specified above.

The slope mattress shall be anchored as shown on the plans. If the Contractor elects to drill for the soil anchor stakes, care shall be taken to avoid drilling holes to a greater depth than is necessary to place the top of the finished stake slightly above the top of the finished mattress.

The Contractor may assemble, partially fill, and tie together mattress units on the subgrade, provided they can be placed on the slope without abrading the zinc or vinyl coating on the wire mattress or permanently distorting the shape of the mattress in transporting and installing the units on the slope. All prefabrication procedures shall be subject to the approval of the Engineer.

The Contractor shall maintain the gabions or slope mattress until final acceptance and any material displaced by any cause shall be replaced.

284.06 Disposal of Surplus Material. Surplus or waste material resulting from the gabion or slope mattress operations shall be disposed of according to Article 202.03.

284.07 Method of Measurement. Gabions will be measured for payment in place and the volume computed to the nearest cubic yard (cubic meter), based on the actual lengths, widths, and depths. Slope mattress will be measured for payment in place and the area computed in square yards (square meters) based on the actual lengths and widths over which placement is made.

Filter fabric will be measured for payment according to Article 282.08.

284.08 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) for GABIONS, of the type of material specified or at the contract unit price per square yard (square meter) for SLOPE MATTRESS, of the type of material and thickness specified.

Filter Fabric will be paid for according to Article 282.09.

SECTION 285. CONCRETE REVETMENT MATS

285.01 Description. This work shall consist of constructing fabric formed concrete revetment mat; or furnishing and placing precast block revetment mat, and articulated block revetment mat.

285.02 Materials. Materials shall be according to the following.

(a) Fabric Formed Concrete Revetment Mat.

Item	Article/Section
(1) Portland Cement	1001
(2) Fine Aggregate	1003.02
(3) Water	1002
(4) Fly Ash	1010.01, 1010.02
(5) Concrete Admixtures	1021.01 - 1021.03
(6) Fabric Formed Concrete Revetment Mats	1080.04

(b) Precast and Articulated Block Revetment Mats.

Item	Article/Section
(1) Precast Concrete Block (Note 1)	1042
(2) Cable, Anchors and Fittings (Note 2)	
(3) Portland Cement Concrete (Note 3)	1020

Note 1. The block size, block weight (mass), block configuration (interlocking or non-interlocking), and mat configuration (open-cell or closed-cell) shall be as specified on the plans.

Note 2. Cable, anchors, and fittings, such as sleeves, clamps, and stops, shall be according to the manufacturer's specifications and shall be corrosion resistant.

Note 3. Class SI concrete shall be used.

285.03 Equipment. Equipment shall be according to the following.

(a) Fabric Formed Concrete Revetment Mat. Mixing and pumping equipment used in preparation and handling of the grout shall be approved by the Engineer. All oil or other rust inhibitors shall be removed from the mixing drums, stirring mechanisms, and other portions of the equipment in contact with the grout before the mixers are used. The pumping equipment shall have a variable flow rate to provide enough pressure for pumping without breaking the fabric.

(b) Precast and Articulated Block Revetment Mats. Equipment used to lift and place the blocks/mats shall be approved by the Engineer.

CONSTRUCTION REQUIREMENTS

285.04 General. The surface to be protected shall be graded as shown on the plans and prepared such that it is stable in the absence of erosive forces. Any fill material required to restore the surface to its original condition shall be approved by the Engineer.

285.05 Fabric Formed Concrete Revetment Mat. The grout shall consist of a mixture of portland cement, fine aggregate, and water so proportioned and mixed as to provide a pumpable slurry. Fly ash and concrete admixtures may be used at the option of the Contractor. The grout shall have an air content of not less than 6.0 percent nor more than 9.0 percent of the volume of the grout. The mix shall obtain a compressive strength of 2500 psi (17,000 kPa) at 28 days according to Article 1020.09.

All materials shall be accurately measured by volume or weight (mass) as they are fed into the mixer. Time of mixing shall be not less than one minute. If agitated continuously, the grout may be held in the mixer or agitator for a period not exceeding two and one-half hours in temperatures below 70 °F (21 °C), and for a period not exceeding two hours at higher temperatures. If there is a lapse in a pumping operation, the grout shall be recirculated through the pump or through the mixer drum (or agitator) and pump.

Prior to grout injection, the fabric shall be positioned at its design location. Each panel shall be a continuous or monolithic unit for its full width, including the trench portion.

Each panel shall consist of two or more mill-widths of open selvage construction; the two upper layers shall be joined together by sewing, and the two bottom layers shall be sewn together at the edges. Where adjacent panels cannot be joined in this manner, they shall be lapped a minimum of 24 in. (600 mm). In no case will simple butt-joints, either sewn or unsewn, be permitted. The ends and upper limits of the fabric shall be placed in a trench of suitable width as shown on the plans.

Filling of the fabric shall begin at the lower elevations and proceed up the slope. The grout shall be injected between the layers of fabric through small cuts. The point of injection shall be a maximum of 30 ft (9 m) from the end of the panel. The grout shall be pumped without exerting excessive pressure on the fabric envelope.

After grouting has been completed, the void between the trench wall and filled fabric shall be backfilled. Injection holes left in the fabric shall be closed by temporarily inserting a piece of burlap or similar material. The burlap shall be removed when the grout is no longer fluid and the surface is firm to hand pressure. Foot traffic on the filled revetment mats shall be kept to an absolute minimum for one hour after pumping.

285.06 Precast Block Revetment Mat. Filter fabric shall be installed according to Section 282 prior to placement of the precast block revetment mat, or it may be secured to the bottom of the mat according to the manufacturer's specifications and installed concurrently.

The precast blocks may be placed individually or as pre-assembled mats. Normally, placement shall begin at the downstream end and proceed upstream. At side slopes, placement shall begin at the toe and proceed up. All edges of the precast block revetment mat shall be flush with the existing ground.

Orientation of the blocks with respect to water flow shall be as specified by the manufacturer.

After placement, the voids in and around the blocks shall be filled with soil meeting the approval of the Engineer.

285.07 Articulated Block Revetment Mat. Filter fabric shall be installed according to Section 282 prior to placing the articulated block revetment mat, or it may be secured to the bottom of the mat according to the manufacturer's specifications and installed concurrently.

Normally, placement of the mats shall begin at the downstream end and proceed upstream. At side slopes, placement shall begin at the toe and proceed up. The upstream and outside edges of the mat shall be trenched at least one block deep and backfilled. The downstream edge shall be flush with the existing ground.

As mats are placed, they shall be anchored at the frequency and depth shown on the plans. If required by the manufacturer, adjacent mats shall be clamped or crimped together as well.

After placement of the mats, the voids in and around the blocks shall be filled with soil meeting the approval of the Engineer.

Excessive openings between mats shall be filled, as directed by the Engineer, with concrete.

285.08 Disposal of Surplus Material. Surplus or waste material shall be disposed of according to Article 202.03. Excess excavated material shall not remain in the flood plain, nor shall it be placed within the banks of the waterway.

285.09 Method of Measurement. This work will be measured for payment in place and the area computed in square yards (square meters). The area for measurement will include the upper, sloped surface of the mat. The portion of the mat in trenches will not be measured for payment. No allowance will be made for overlaps.

Filter fabric will be measured for payment according to Article 282.08.

285.10 Basis of Payment. This work will be paid for at the contract unit price per square yard (square meter) for FABRIC FORMED CONCRETE REVETMENT MAT, PRECAST BLOCK REVETMENT MAT, or ARTICULATED BLOCK REVETMENT MAT.

Filter fabric will be paid for according to Article 282.09.