

DIVISION 200
Earthwork

Section 201—Clearing & Grubbing

Description

201.01 Work. Clear and grub; treat timber, construction slash, and debris; and preserve vegetation and objects designated to remain free from injury or defacement.

Construction

201.02 Clearing & Grubbing. Clear and grub in accordance with the following:

(a) **Exceptions.** Within the clearing limits, clear and treat trees, debris, stumps, roots, and other protruding vegetative material not designated to remain, except the following:

- (1) Undisturbed stumps outside the roadway or in embankment areas, provided they do not extend more than 300 mm above the original ground (measured from the uphill side); they are no closer than 600 mm to the finished subgrade or 300 mm to any slope surface, or as otherwise SHOWN ON THE DRAWINGS; and they do not interfere with the placement or compaction of embankments.
- (2) Material in channel changes, rock sections, and ditches that is below the depth of the proposed excavation.
- (3) Uncut vegetation less than 1 m in height and less than 75 mm in diameter, that is within the clearing limits but beyond the roadway and not in a decking area, and that does not interfere with sight distance along the road.

(b) **Performance.** Grub all roots over 75 mm in diameter within the roadbed area to a minimum depth of 150 mm below subgrade. Cut flush with the excavated road surface all roots over 75 mm in diameter that protrude from the excavated slope.

Clear slash treatment areas and treat debris in accordance with Subsections 201.02(a) and 201.05.

Clear decking areas and treat debris in accordance with Subsection 201.05.

Unless shown otherwise in the SPECIAL PROJECT SPECIFICATIONS, fell trees into the area being cleared when ground conditions, tree lean, and shape of clearing permit.

Use controlled felling to ensure the direction of fall to prevent damage to property, structures, trees designated to remain, and traffic.

Dead trees over 150 mm in diameter measured 300 mm above the ground that lean toward the road and are sufficiently tall to reach the roadbed are designated for cutting. Fell hazard trees or unstable live trees that are tall enough to reach the roadbed, when marked, before felling timber in the immediate clearing vicinity. Maximum stump height is 300 mm or one-third of the stump diameter, whichever is higher, measured on the side adjacent to the highest ground. Leave trees felled outside the clearing limits in place, and treat them no further unless otherwise SHOWN ON THE DRAWINGS.

Trim branches on remaining trees or shrubs to give a clear height of 5 m above the roadbed, unless otherwise SHOWN ON THE DRAWINGS. Trim tree limbs as near flush with the trunk as practicable.

201.03 Utilization of Timber. Merchantable timber is timber that meets Utilization Standards in the SPECIAL PROJECT SPECIFICATIONS. Conform logging methods and utilization to the following:

(a) Felling & Bucking. Fell trees to minimize damage to merchantable timber and to remaining trees located outside of clearing limits. Fell trees with saws or shears unless shown otherwise in the SPECIAL PROJECT SPECIFICATIONS. Buck logs to permit removal of all minimum pieces set forth in the SPECIAL PROJECT SPECIFICATIONS.

(b) Utilization & Removal of Timber. Remove or treat trees that equal or exceed the diameters and minimum lengths listed in the SPECIAL PROJECT SPECIFICATIONS, and that contain one minimum piece, using one of the following methods, as DESIGNATED IN THE SCHEDULE OF ITEMS:

- (1) Dispose of merchantable timber designated for removal in accordance with the B(BT) provisions of the Timber Sale Contract.
- (2) Limb and deck logs that meet Utilization Standards at locations approved by the CO or SHOWN ON THE DRAWINGS. Deck logs such that logs are piled parallel one to the other; can reasonably be removed by standard log-loading equipment; will not damage standing trees; and will not roll. Log decks are to be free of brush and soil.
- (3) Remove from Government land merchantable timber designated for removal, without charge to the Government. This timber becomes the property of the Contractor, but may not be exported from the United States or used as substitution (as defined in 23 CFR 223.10) for timber from private lands exported by the Contractor or an affiliate, directly or indirectly.

- (4) Dispose of unmerchantable timber in accordance with Subsection 201.05 by the treatment methods SHOWN ON THE DRAWINGS and DESIGNATED IN THE SCHEDULE OF ITEMS.

201.04 Pioneer Roads. During pioneering operations, prevent undercutting of the final excavation slope. Avoid any restriction of drainages while pioneering the road. Keep all materials within the roadway limits unless otherwise SHOWN ON THE DRAWINGS.

201.05 Slash Treatment. Use or treat construction slash larger than 75 mm in diameter and 1 m in length by one or more of the following methods, as DESIGNATED IN THE SCHEDULE OF ITEMS:

- (1) Windrowing construction slash.
- (2) Windrowing large material.
- (3) Windrowing and covering.
- (4) Scattering.
- (5) Burying.
- (6) Chipping or grinding.
- (7) Piling and burning.
- (8) Decking unmerchantable material.
- (9) Placement in cutting units.
- (10) Removal.
- (11) Piling.
- (12) Placing slash on embankment slopes.
- (13) Debris mat.

Pieces of wood less than 75 mm in diameter and 1 m in length may be scattered within the clearing limits.

(a) All Methods. Construction slash placement will not be allowed in lakes, meadows, streams, or streambeds. Immediately remove construction slash that interferes with drainage structures.

Fell and dispose of trees that are scorched or damaged beyond recovery, and adjacent to the clearing limits, in accordance with Subsection 201.03; or treat these trees as construction slash.

(b) *Specific Methods.* When using one or more of the following slash treatment methods, meet requirements specified below:

(1) *Windrowing Construction Slash.* Windrow according to the following requirements unless otherwise specified in the SPECIAL PROJECT SPECIFICATIONS. Clear areas to accommodate the windrow slash. Place construction slash outside the roadway in neat, compacted windrows laid approximately parallel to and along the toeline of embankment slopes. Do not permit the top of the windrows to extend above the top of subgrade. Use construction equipment to matt down all material in a windrow to form a compact and uniform pile. Construct breaks of at least 5 m at least every 60 m in a windrow. Do not place windrows against trees. A pioneer road may be constructed to provide an area for placement of windrows, provided the excavated material is kept within the clearing limits and does not adversely affect the road construction.

(2) *Windrowing Large Material.* Windrow construction slash that is 250 mm or more in diameter at the small end, and 2 m or more in length, as specified in Subsection 201.05(b)(1). Treat smaller material by one or more of the other included methods for slash treatment.

(3) *Windrowing & Covering.* Place and compact construction slash as specified in Subsection 201.05(b)(1), and cover with at least 150 mm of rock and soil to form a smooth and uniform windrow.

(4) *Scattering.* Scatter according to the following requirements unless otherwise specified in the SPECIAL PROJECT SPECIFICATIONS. Scatter construction slash outside the clearing limits without damaging trees. Limb all logs. Place logs and stumps away from trees, positioned so they will not roll, and are not on top of one another. Limb and scatter other construction slash to reduce slash concentrations.

(5) *Burying.* Bury construction slash at the locations SHOWN ON THE DRAWINGS and designated on the ground. Mat construction slash down in layers, and cover it with at least 600 mm of rock and soil. Smooth and slope the final surface to drain.

(6) *Chipping or Grinding.* Process construction slash that is up to at least 100 mm in diameter and longer than 1 m through a chipping machine or machine designed and operated to grind slash and stumps into pieces, such as a tub grinder. Deposit chips or ground woody material on embankment slopes or outside the roadway to a loose depth not exceeding 150 mm. Minor amounts of chips or ground woody material may be permitted within the roadway if they are thoroughly mixed with soil and do not form a layer.

(7) *Piling & Burning.* Deposit construction slash in areas SHOWN ON THE DRAWINGS and designated on the ground. Construct piles so that burning does not damage standing trees. If burning is incomplete, repile and burn the slash remaining until pieces are reduced to less than 75 mm in diameter and 1 m in length. Scatter the remaining pieces.

(8) *Decking Unmerchantable Material.* Deck logs that do not meet Utilization Standards specified in Subsection 201.03, and other material that exceeds the diameter and length shown in the SPECIAL PROJECT SPECIFICATIONS in areas SHOWN ON THE DRAWINGS. Other locations may be approved by the CO.

Cut material into lengths not exceeding 9.7 m, and remove all limbs. Decks are to be stable and free of brush and soil. Treat other material according to slash treatment methods SHOWN ON THE DRAWINGS and in the SCHEDULE OF ITEMS.

(9) *Placement in Cutting Units.* Place construction slash from within cutting units and the adjacent 60 m with cutting unit logging slash. Place construction slash at least 15 m inside the cutting unit boundary such that it will not inhibit logging of the unit and may be treated by the prescribed logging slash treatment method.

(10) *Removal.* Remove or haul construction slash to locations SHOWN ON THE DRAWINGS or designated on the ground.

(11) *Piling.* Pile construction slash in areas SHOWN ON THE DRAWINGS or designated on the ground. Place and construct piles so future burning will not damage remaining trees. Keep piles reasonably free of dirt from stumps. Cut unmerchantable logs into lengths of less than 6 m prior to placement in the pile.

(12) *Placing Slash on Embankment Slopes.* Place construction slash on completed embankment slopes to reduce soil erosion where SHOWN ON THE DRAWINGS. Place construction slash as flat as practicable on the completed slope. Place slash from the toe of the embankment to a point at least 600 mm below subgrade elevation. Priority for use of available slash is for: (1) through fills; (2) insides of curves; and (3) ditch relief outlets.

(13) *Debris Mat.* Use tree limbs, tops, cull logs, split stumps, wood chunks, and other debris to form a mat upon which construction equipment is operated. Place stumps upside down and blend stumps into the mat.

Measurement

201.06 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Linear measurements are to be horizontal along the road centerline.

Area quantities are the number of hectares within the clearing limits.

Individual removal of trees is the number of trees of the various size designations removed. Measure tree diameters at a height of 300 mm above ground. Do not count trees less than 150 mm in diameter. Size designations are shown in table 201-1.

Table 201-1.—Size designations for trees removed.

Pay Item Designation	Size of Least Diameter at Height of 300	
	Greater Than	Less Than
Small	150 mm	600 mm
Medium	600 mm	1 m
Large	1 m	—

Payment

201.07 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
201 (01) Clearing and grubbing, slash treatment methods for tops and limbs _____, logs _____, and stumps _____, utilization of timber _____	Hectare
201 (02) Clearing and grubbing, slash treatment methods for tops and limbs _____, logs _____, and stumps _____, utilization of timber _____	Kilometer
201 (03) Clearing and grubbing, slash treatment methods for tops and limbs _____, logs _____, and stumps _____, utilization of timber _____	Lump Sum
201 (04) Individual removal of trees, small; slash treatment methods for tops and limbs _____ and logs _____, utilization of timber _____	Each

201 (05) Individual removal of trees, medium; slash treatment methods for tops and limbs _____ and logs _____, utilization of timber Each

201 (06) Individual removal of trees, large; slash treatment methods for tops and limbs _____ and logs _____, utilization of timber Each

201 (07) Individual removal of trees, miscellaneous; slash treatment methods for tops and limbs _____ and logs _____, utilization of timber Each

201 (08) Individual removal of trees; slash treatment methods for tops and limbs _____ and logs _____, utilization of timber Kilometer

201 (09) Individual removal of stumps, slash treatment methods Each

Section 202—Removal of Structures & Obstructions

Description

202.01 Work. Salvage, remove, and/or dispose of buildings, fences, structures, pavements, culverts, utilities, curbs, sidewalks, and other obstructions as SHOWN ON THE DRAWINGS. Salvage designated materials and backfill the resulting trenches, holes, pits, or as SHOWN ON THE DRAWINGS.

Construction

202.02 Salvaging Material. Use reasonable care to salvage all material designated to be salvaged. Salvage in readily transportable sections or pieces. Replace or repair all members, pins, nuts, plates, and related hardware damaged, lost, or destroyed during the salvage operations. Wire all loose parts to adjacent members or pack them in sturdy boxes with the contents clearly marked.

Carefully remove culvert, taking precautions to avoid damage. Store culverts to be relaid, when necessary, to prevent loss or damage before relaying. Replace without additional compensation all sections lost from storage or damaged by use of improper methods.

Matchmark members of salvaged structures. Furnish the CO with one set of drawings identifying the members and their respective matchmarks.

Stockpile salvaged material in a designated area.

202.03 Removing Material. Saw cut sidewalks, curbs, pavements, and structures when partial removal is required.

Raze and remove all buildings, foundations, pavements, sidewalks, curbs, fences, structures, and other obstructions that interfere with the work and are not designated to remain.

Existing culverts may be left in an embankment, provided that no portion of the culvert is within 600 mm of the subgrade, the embankment slope, or a new culvert or structure. Crush culvert ends.

Remove structures and obstructions in the roadbed to 300 mm below subgrade elevation. Remove structures and obstructions outside the roadbed to 300 mm below finished ground or to the natural stream bottom.

Prior to removal, place rock and soil material located on the bridge deck, or structure so that it does not enter a stream.

Remove the substructures of existing structures down to the natural stream bottom, and remove the parts outside of a stream down to at least 300 mm below natural ground surface or finished groundline, whichever is lower. Remove portions of existing structures that lie wholly or in part within the limits for a new structure to accommodate construction of the proposed structure.

Except in excavation areas, fill cavities left by structure removal with material to the level of the finished ground, and compact. Place and compact the type of backfill material that is SHOWN ON THE DRAWINGS, designated in the SPECIAL PROJECT SPECIFICATIONS, or approved by the CO.

202.04 Disposing of Material or Structures Not Designated for Salvage.

Dispose of material and structures as SHOWN ON THE DRAWINGS or designated in the SPECIAL PROJECT SPECIFICATIONS, using one or more of the following methods:

(a) Removal From Project. Make necessary arrangements with property owners, and haul debris to suitable disposal locations as approved by the CO. Furnish a signed copy of the disposal agreement. Hazardous materials must be properly disposed of.

(b) Burning. Burn debris using high-intensity burning processes that produce few emissions. Examples include incinerating, high stacking, or pit and ditch burning. Provide a watchperson during burning operations.

When burning is complete, extinguish the fire so no smoldering debris remains. Dispose of unburned material in accordance with Subsection 202.04(c).

(c) Burying. Bury debris in trenches or pits in approved areas within the right-of-way. Do not bury debris inside the roadway prism limits, beneath drainage ditches, or in any riparian areas.

Place debris with earth material in alternating layers consisting of 1 m of debris covered by 600 mm of earth. Distribute stumps, logs, and other large pieces to form a compact mass and minimize air voids. Fill all voids. Cover the top layer of buried debris with at least 300 mm of compacted earth. Grade and shape the area.

Measurement

202.05 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

202.06 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
202 (01) Removal of structures and obstructions	Lump Sum
202 (02) Removal of _____	Each
202 (03) Removal of _____	Meter
202 (04) Removal of _____	Square Meter
202 (05) Removal of _____	Lump Sum

Section 203—Excavation, Embankment, & Haul

Description

203.01 Work. Excavate material and construct embankments. Furnish, haul, stockpile, place, dispose of, slope, shape, compact, and/or finish earthen and rocky material.

203.02 Excavation. Excavation consists of the excavation and placement of all excavated material that is not included under other PAY ITEMS listed in the SCHEDULE OF ITEMS.

203.03 Borrow Excavation. Excavate and utilize material from sources SHOWN ON THE DRAWINGS or described in the SPECIAL PROJECT SPECIFICATIONS. Additional sources of borrow excavation will be subject to advance approval by the CO. Develop sources in accordance with Section 611.

Construction

203.04 Clearing & Grubbing. Clear and grub in accordance with Section 201 before work under Section 203 begins. Road pioneering, slash disposal, and grubbing of stumps may proceed concurrently with excavation when approved by the CO. Conduct excavation and placement operations so material to be treated under Section 201 will not be incorporated in the roadway unless specifically included in the slash treatment method.

203.05 Pioneering. During pioneering operations, prevent undercutting of the final excavation slope. Avoid any restriction of drainages while pioneering the road. Keep all materials within the roadway limits unless otherwise SHOWN ON THE DRAWINGS.

203.06 Utilization of Excavated Materials. Use all suitable excavated material in the construction of embankments, subgrades, shoulders, slopes, bedding, and backfill for structures and other purposes, as SHOWN ON THE DRAWINGS.

(a) Excess Excavation. Place excess excavation as SHOWN ON THE DRAWINGS.

(b) Rock for Slope Protection. Conserve and use suitable excavated rock for protecting embankments.

(c) Conserving Material. Excavated material suitable for cushion, road finishing, or other purposes may be conserved and utilized instead of materials from designated

sources. Field drain and dry excessively wet material that is otherwise suitable for embankment before placement.

(d) Excavation of Unsuitable Material & Backfill. Place unsuitable excavated material as SHOWN ON THE DRAWINGS. Backfill excavated areas with suitable material when necessary to complete the work. Do not place frozen material in embankments.

Break up rocks that are too large to be incorporated into the embankment or move them to locations approved by the CO. Broken pieces of rock may be placed on the face of the embankment and embedded so they will not roll or obstruct the use and maintenance of the roadbed. Immediately remove any excavated material that inadvertently reaches a stream course.

(e) Conservation of Topsoil. When SHOWN ON THE DRAWINGS, remove, transport, and deposit suitable topsoil in the designated stockpile areas.

(f) Abandoned Structures & Obstructions. Treat abandoned structures and obstructions in accordance with Section 202.

203.07 Drainage Excavation. Construct side ditches, minor channel changes, inlet and outlet ditches, furrow ditches, ditches along the road but beyond roadway limits, and other minor earth drainage structures as SHOWN ON THE DRAWINGS. Utilize excavated material in accordance with Subsection 203.06.

203.08 Sloping, Shaping, & Finishing. Complete slopes and ditches before placing aggregate courses. Slope, shape, and finish as follows:

(a) Sloping. Leave all earth slopes with uniform roughened surfaces, except as described in Subsection 203.08(b), with no noticeable break as viewed from the road. Except in solid rock, round the tops and bottoms of all slopes, including the slopes of drainage ditches, where SHOWN ON THE DRAWINGS. Round the material overlaying solid rock to the extent practical.

If a slide or slipout occurs on a cut or embankment slope, remove or replace the material, and repair or restore all damage to the work. Bench or key slope to stabilize the slide. Reshape the cut or embankment slope to an acceptable condition.

(b) Stepped Slopes. Where SHOWN ON THE DRAWINGS, construct steps on slopes of 1.3:1 to 1:2. Construct the steps about 500 mm high. Blend the steps into natural ground at the end of the cut. If the slope contains nonrippable rock outcrops, blend steps into the rock. Remove loose material found in transitional area. Except for removing large rocks that may fall, scaling stepped slopes is not required.

(c) **Shaping.** Shape the subgrade to a smooth surface and to the cross section required. Shape slopes to gradually transition into slope adjustments without noticeable breaks. At the ends of cuts and at intersections of cuts and embankments, adjust slopes in the horizontal and vertical planes to blend into each other or into the natural ground. For roads receiving base or surface course, rocks may remain in place if they do not protrude above the subgrade more than one-third of the depth of the base or surface course, or 75 mm, whichever is less.

(d) **Finishing.** Finish the road surface to be reasonably smooth, uniform, and shaped to conform to the typical sections as SHOWN ON THE DRAWINGS. Remove unsuitable material from the roadbed and replace it with suitable material. Finish roadbeds to the tolerance class shown in table 203-1 or as SHOWN ON THE DRAWINGS.

Ensure that the subgrade for both surfaced and unsurfaced roads is visibly moist during shaping and dressing. Bring low sections, holes, cracks, or depressions to grade with suitable material. Compact the subgrade as required by the designated embankment placing method.

Finish the roadbed for unsurfaced roads using one of the following methods, as SHOWN ON THE DRAWINGS:

(1) **Method A.** Ensure that the top 100 mm below the finished roadbed contains rocks no larger than 100 mm. Remove oversize material, reduce to acceptable size, or cover by importing suitable material approved by the CO.

(2) **Method B.** Roll the roadbed to break down rocky material. Roll a minimum of five full-width passes, or until visual displacement ceases, with a vibratory grid roller or equivalent weighing a minimum of 9 t.

(3) **Method C.** Tractor finish work by spreading the excavation for roads SHOWN ON THE DRAWINGS as Construction Tolerance Class K, L, or M, as shown in table 203-1. Eliminate rock berms that may form during embankment construction with a tractor finish.

203.09 Snow Removal. Remove snow and ice in advance of the work and deposit beyond the roadway limits in a manner that will not waste material. Snow and ice will not be incorporated into the embankment or be placed to cause damage.

203.10 Finishing Slopes. Ensure that finished slopes conform reasonably to the lines STAKED ON THE GROUND or SHOWN ON THE DRAWINGS. Finish slopes in a roughened condition to facilitate the establishment of vegetative growth. The finish associated with template and stringline or hand-raking methods will not be required. Remove rock, debris, and other loose material that are more than 150 mm in diameter, unless otherwise SHOWN ON THE DRAWINGS.

Table 203-1—Construction tolerances.

	Tolerance Class ^a												
	A	B	C	D	E	F	G	H	I	J	K	L	M
Roadbed width (mm)	150	150	300	300	300	300	300	450	300	600	600	600	600
Subgrade elevation (mm)	±30	±60	±60	±150	±150	±300	±300	±450	±600	±900	±600	±900	- ^c
Centerline alignment (mm)	60	60	150	150	300	300	300	450	600	900	900	1500	- ^c
Slopes, excavation, and embankment (% slope ^b)	±3	±5	±5	±5	±5	±5	±10	±10	±10	±10	±20	±20	±20

a. Maximum allowable deviation from construction stakes and drawings.

b. Maximum allowable deviation from staked slope measured from slope stakes or hinge points.

c. Unless otherwise SHOWN ON THE DRAWINGS, the centerline alignment and subgrade elevation, as built, have no horizontal curves with a radius of less than 26 m, and no vertical curves with a curve length of less than 25 m when the algebraic difference in the grade change is less than 10 percent, or a curve length of less than 30 m when the algebraic difference of the grade change is greater than or equal to 10 percent. The centerline grade is not to exceed 20 percent in 30 m of length.

In areas that require blasting, use blasting techniques in accordance with Section 220, as SHOWN ON THE DRAWINGS. Presplitting is not required, unless controlled backslope blasting is SHOWN ON THE DRAWINGS.

Perform test blasting in accordance with Subsection 220.06, unless directed otherwise by the CO.

203.11 Landscape & Stream Protection. Confine excavation, blasted material, and embankment material within the roadway limits, unless otherwise approved by the CO, to avoid overbuilding and to protect the landscape and streams. Retrieve and incorporate into designated areas all material deposited outside of the clearing limits.

203.12 Subgrade Treatments. Subgrade treatment consists of soil modification by admixing aggregates or placing geotextiles, fiber mat, wood corduroy, rock blanket, or other similar materials over areas of unsuitable embankment foundation materials that are SHOWN ON THE DRAWINGS. The construction and material requirements for the type of subgrade treatment will be specified in the SPECIAL PROJECT SPECIFICATIONS or SHOWN ON THE DRAWINGS.

203.13 Earth Berms. Construct permanent earth berms along the shoulder of traveled ways at locations SHOWN ON THE DRAWINGS. Use well-graded material that contains no rocks having a dimension greater than one-fourth the height of the berm in the construction. Acceptable material for the berm may be windrowed as the roadbed is constructed. When local material is not acceptable, import material from approved sources. Frozen material, roots, sod, or other deleterious material is unacceptable for berm construction. Do not waste materials over the embankment slope.

Accomplish compaction by operating the spreading equipment over the full section of the berm.

203.14 Water. Develop, haul, and apply water in accordance with Section 207.

203.15 Compaction Equipment. Use equipment capable of obtaining compaction requirements. The compacting units may be of any type, provided that they are capable of compacting each lift of material as specified, and that they meet the minimum requirements specified below. Heavier compacting units may be required to achieve the specified density of the embankment. Minimum requirements for rollers are as follows:

- (a) Sheepsfoot, tamping, or grid rollers shall be capable of exerting a force of 4.5 kg/mm of width of roller drum.
- (b) Steel-wheel rollers, other than the vibratory type, shall be capable of exerting a force of not less than 4.5 kg/mm of width of the compression roll or rolls.

- (c) Vibratory steel-wheel rollers shall have a minimum weight of 5 t. The compactor shall be equipped with amplitude and frequency controls, and specifically designed to compact the material on which it is used.
- (d) Pneumatic-tire rollers shall have smooth tread tires of equal size that will provide a uniform compacting pressure for the full width of the roller and capable of exerting a ground pressure of at least 550 kPa.

203.16 Embankment Placement. Place embankment in accordance with the following requirements:

(a) All Methods. Construct the lower part of the embankment in a single layer to the minimum depth necessary to support construction equipment when an embankment is to be placed across swampy ground and removal of unsuitable material or subgrade treatment is not required.

(b) Specific Methods. Place all embankments using one or more of the following methods, as SHOWN ON THE DRAWINGS and listed in the SCHEDULE OF ITEMS:

(1) Method 1—Side Casting & End Dumping. Embankment may be placed by side casting and end dumping. Build solid embankments by working smaller rocks and fines in with the larger rocks and fines to fill the voids.

(2) Method 2—Layer Placement. Roughen or step surfaces steeper than a ratio of 1 vertical to 3 horizontal (1:3) upon which embankment is to be placed, when SHOWN ON THE DRAWINGS, in order to provide permanent bonding of new and old materials.

Layer place embankment, except over rock surfaces. Over rock surfaces, material may be placed by end dumping to the minimum depth needed for operation of spreading equipment. Level and smooth each embankment layer before placement of subsequent layers. Operate hauling and spreading equipment uniformly over the full width of each layer.

Place suitable material in layers no more than 300 mm thick, except when the material contains rock more than 225 mm in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. Ensure that no layer exceeds 600 mm before compaction.

Placing individual rocks or boulders greater than 600 mm in diameter will be permitted, provided that the embankment will accommodate them and that they are at least 150 mm below the subgrade. Carefully distribute rocks and fill the voids with finer material to form a dense and compacted mass.

Where material containing large amounts of rock is used to construct embankments, make layers of sufficient thickness to accommodate the material involved. Construct a solid embankment with adequate compaction by working smaller rock and fines in with the larger rocks to fill the voids, and by operating hauling and spreading equipment uniformly over the full width of each layer as the embankment is constructed.

Ensure that material is at a moisture content suitable to obtain a mass that will not visibly deflect under the load of the hauling and spreading equipment. Handle excessively wet material in accordance with Subsection 203.06(c).

(3) *Method 3—Layer Placement (Roller Compaction)*. Place embankments as specified in method 2. Place in horizontal layers not exceeding 300 mm prior to compaction, except when the material contains rock more than 225 mm in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. Obtain compaction using equipment listed in Subsection 203.15. Operate compaction equipment over the full width of each layer until visible deformation of the layer ceases or, in the case of the sheepsfoot roller, the roller “walks out” of the layer. Make at least three complete passes.

(4) *Method 4—Controlled Compaction*. Place embankments as specified in method 2; but place earth embankments in horizontal layers not exceeding 300 mm (loose measure), and compact them. Ensure that the moisture content of material is suitable for attaining the required compaction. Compact the embankments and the top 300 mm of excavation sections to at least 95 percent of the maximum density, as determined by AASHTO T 99, method C or D.

Determine the density of the embankment material during the progress of the work, in accordance with AASHTO T 191, T 205, or T 238; and T 217, T 239, or T 255. Correct for coarse particles in accordance with AASHTO T 224.

Density requirements will not apply to portions of rock embankments that cannot be tested in accordance with approved methods. When this condition exists, accomplish compaction by working smaller rocks and fines in with the larger rocks to fill the voids and by operating equipment over the embankment materials.

(5) *Method 5—Special Project Controlled Compaction*. Place and compact embankments to at least 90 percent of the maximum density determined by AASHTO T 180, method C or D, but obtain compaction of not less than 95 percent of AASHTO T 180, method C or D, for a minimum depth of 300 mm below subgrade for the width of the roadbed in both excavation and embankment sections.

Determine density during the work in accordance with AASHTO T 191, T 205, or T 238; T 217, T 239, or T 255; and T 224.

203.17 Construction Tolerances. Construct to the tolerance class as SHOWN ON THE DRAWINGS and in accordance with table 203-1. Construct roadway ditches to flow in the direction SHOWN ON THE DRAWINGS.

Ensure that deviations are uniform in the direction of change for a distance of 60 m or more along the project centerline.

203.18 Haul. Haul is incidental to excavation and borrow excavation, unless listed as a separate PAY ITEM in the SCHEDULE OF ITEMS.

Measurement

203.19 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Quantities of excavation will include:

- (a) Roadway excavation.
- (b) Rock and unsuitable material below the required grade, and unsuitable material beneath embankment areas.
- (c) Furrow ditches outside the roadway, except when furrow ditches are included in the SCHEDULE OF ITEMS.
- (d) Topsoil and other material removed and stockpiled as directed.
- (e) Borrow material used in the work, except when borrow is included in the SCHEDULE OF ITEMS.
- (f) The volume of conserved materials taken from stockpiles and used in the work, except topsoil included under other PAY ITEMS.
- (g) Slide material not attributable to negligence of the Contractor.

Quantities of excavation will not include:

- (a) Material used for other than approved purposes.
- (b) Unauthorized excavation or borrow.
- (c) Quantity of material excavated from slope rounding or slope tapering.
- (d) Overbreakage from the backslope in rock excavation requiring blasting.

- (e) Material scarified in place to receive the first layer of embankment.
- (f) Benching or stepping existing ground for embankment foundation.
- (g) Stepping or scaling cut slopes.
- (h) Oversize material removed when finishing unsurfaced roads.

When designed quantities are DESIGNATED IN THE SCHEDULE OF ITEMS as the method of measurement, estimate the quantities from design data based on undisturbed ground surface elevations.

When staked quantities are DESIGNATED IN THE SCHEDULE OF ITEMS as the method of measurement, determine excavation quantities by the average end area method using slope stake information taken prior to construction.

When actual quantities are DESIGNATED IN THE SCHEDULE OF ITEMS as the method of measurement, take preliminary cross sections, or comparable measurements, of the undisturbed ground surface; and measure final quantities in accordance with the following:

- (a) When excavation is designated as a PAY ITEM in the SCHEDULE OF ITEMS, take final cross sections, or comparable measurements, of the completed and accepted work.
- (b) When embankment is designated as a PAY ITEM in the SCHEDULE OF ITEMS, determine measurement in the final position.
- (c) When borrow excavation is designated as a PAY ITEM in the SCHEDULE OF ITEMS, determine measurement in the original position.

Payment

203.20 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
203 (01) Excavation, placement method 1	Cubic Meter
203 (02) Excavation, placement method 2	Cubic Meter
203 (03) Excavation, placement method 3	Cubic Meter

203 (04)	Excavation, placement method 4	Cubic Meter
203 (05)	Excavation, placement method 5	Cubic Meter
203 (06)	Excavation, placement method _____	Kilometer
203 (07)	Excavation, placement method _____	Lump Sum
203 (08)	Borrow excavation, placement method _____ ...	Cubic Meter
203 (09)	Borrow excavation, placement method _____	Ton
203 (10)	Unsuitable excavation	Cubic Meter
203 (11)	Embankment, placement method _____	Cubic Meter
203 (12)	Embankment, placement method _____	Kilometer
203 (13)	Subgrade treatment, type _____	Square Meter
203 (14)	Rounding cut slopes	Meter
203 (15)	Drainage excavation, type _____	Cubic Meter
203 (16)	Drainage excavation, type _____	Meter
203 (17)	Drainage excavation, type _____	Each
203 (18)	Furrow ditches	Meter
203 (19)	Topsoil (stockpiled)	Cubic Meter
203 (20)	Earth berms	Meter
203 (21)	Haul	Cubic Meter Kilometer

Section 204—Soil Erosion & Water Pollution Control

Description

204.01 Work. Furnish, construct, and maintain permanent and temporary erosion and sediment control measures.

Materials

204.02 Requirements. Ensure that materials meet the requirements specified in the following subsections:

Agricultural Limestone	713.02
Bales	713.13
Erosion Control Mats, Roving, & Geocell	713.07
Fertilizer	713.03
Geotextiles	714.01
Mulch	713.05
Sandbags	713.14
Seed	713.04
Stabilizing Emulsion Tackifiers	713.12

Ensure that all other materials are as SHOWN ON THE DRAWINGS or specified in the SPECIAL PROJECT SPECIFICATIONS.

Construction

204.03 Performance. Prior to the start of construction, submit a written plan that provides permanent and temporary erosion control measures to minimize erosion and sedimentation during and after construction. Do not begin work until the necessary controls for that particular phase of work have been implemented. Do not modify the type, size, or location of any control. An alternate erosion control plan with all necessary permits may be submitted 30 days before intended use.

Incorporate all permanent erosion control features into the project at the earliest practicable time, as outlined in the approved plan, to minimize the need for temporary erosion control.

Before grubbing and grading, construct all erosion controls around the perimeter of the project, including filter barriers, diversion, and settling structures. When required by the SPECIAL PROJECT SPECIFICATIONS, schedule clearing and grubbing so that grading operations and permanent erosion control measures can follow without interference.

Install any temporary erosion or pollution control measures that are required due to negligence or carelessness, without compensation.

204.04 Construction. Construct erosion control and sediment control measures as follows:

- (a) Construct temporary erosion controls in incremental stages as construction proceeds.
- (b) Construct temporary slope drains, diversion channels, and earth berms to protect disturbed areas and slopes.
- (c) Apply permanent turf establishment to the finished slopes and ditches within 30 days, or as required in the SPECIAL PROJECT SPECIFICATION or SHOWN ON THE DRAWINGS.
- (d) Apply temporary turf establishment on disturbed areas that will remain exposed for more than 30 days.
- (e) Construct outlet protection as soon as culverts or other structures are complete.
- (f) Construct permanent erosion controls, including waterway linings and slope treatments, as soon as practical or upon completion of the roadbed.
- (g) Construct and maintain erosion controls on and around soil stockpiles to prevent soil loss.
- (h) Following each day's grading operations, shape earthwork to minimize and control erosion from storm runoff.

204.05 Filter Barriers. Construct silt fence, straw bales, and brush barriers for filtering sediment from runoff and reducing the velocity of sheet flow.

204.06 Sediment Retention Structures. Construct sediment retention structures of the following types:

(a) Temporary Sediment Traps. Construct temporary sediment traps to detain runoff from disturbed areas and settle out sediment. Provide outlet protection.

(b) Sediment Basins. Construct sediment basins to store runoff and settle out sediment for large drainage areas. Construct sediment basins according to Section 203. Construct riser pipes according to Section 603A or 603B. Provide outlet protection.

204.07 Outlet Protection. Construct riprap aprons or basins to reduce water velocity and prevent scour at the outlet of permanent and temporary erosion control measures. Construct riprap according to Section 251.

204.08 Water Crossings. Construct temporary culvert pipe at temporary crossing where construction vehicles cross a live waterway.

204.09 Diversions. Construct temporary channels, temporary culverts, earth berms, or sandbags to divert water around disturbed areas and slopes. Use temporary channels, temporary culverts, pumps, sandbags, or other methods to divert the flow of live streams for permanent culvert installations and other work. Stabilize channels and provide outlet protection.

204.10 Waterway & Slope Protection & Stabilization. Use plastic lining, riprap, check dams, erosion control blankets and mats, and temporary slope drains as follows:

(a) **Plastic Lining.** Use plastic lining to protect underlying soil from erosion. Place the plastic lining loosely on a smooth soil surface free of projections or depressions that may cause the liner to puncture or tear. Lap transverse joints a minimum of 600 mm in the direction of flow. Do not use longitudinal joints. Anchor the lining in place using riprap.

(b) **Riprap.** Construct riprap for channel lining according to Section 251.

(c) **Check Dams.** Construct riprap, sandbags, or earth berms for temporary dams to reduce the velocity in ditches and swales.

(d) **Temporary Slope Drains.** Use drainpipe, riprap, or plastic lined waterway for temporary slope drains to channel runoff down slopes. Channel water into the slope drain with an earth berm constructed at the top of a cut or fill. Anchor slope drains to the slope. Provide outlet protection.

204.11 Temporary Turf Establishment. Apply seed, fertilizer, and mulch for soil erosion protection at the rates SHOWN ON THE DRAWINGS or in the SPECIAL PROJECT SPECIFICATIONS.

204.12 Inspection & Reporting. Inspect all erosion control facilities at least every 7 days, within 24 hours after more than 20 mm of rain in 24 hours, and as required in the contract permits.

Furnish inspection reports that include the following:

- (a) Summary of the inspection.

- (b) Names of personnel making the inspection.
- (c) Date and time of inspection.
- (d) Observations made.
- (e) Corrective action necessary.

204.13 Maintenance & Cleanup. Maintain temporary erosion control measures in working condition until the project is complete or the measures are no longer needed. Clean erosion control measures when half full of sediment. Use the sediment in the work, if acceptable, or place it in accordance with Subsection 203.06.

Replace erosion control measures that cannot be maintained and those that are damaged by construction operations.

Remove and dispose of temporary erosion control measures when the turf is satisfactorily established, and when drainage and channels are lined and stabilized. Remove and dispose of erosion control measures according to Subsection 202.04(a).

Restore the ground to its natural or intended condition and provide permanent erosion control measures.

Measurement

204.14 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

204.15 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
204 (01) Temporary seeding and fertilizing	Hectare
204 (02) Mulching	Ton
204 (03) Asphaltic material	Liter
204 (04) Temporary netting	Square Meter

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204 (05)	Straw/hay bales	Each
204 (06)	Gravel blanket	Cubic Meter
204 (07)	Silt fence	Meter
204 (08)	Brush barrier	Meter
204 (09)	Sediment basin	Each
204 (10)	Berm	Meter
204 (11)	Dike	Meter
204 (12)	Dam	Each
204 (13)	Temporary water bars	Each
204 (14)	_____ for soil erosion and pollution control	Each
204 (15)	_____ for soil erosion and pollution control	Meter
204 (16)	_____ for soil erosion and pollution control	Square Meter
204 (17)	_____ for soil erosion and pollution control	Hectare
204 (18)	_____ for soil erosion and pollution control	Cubic Meter
204 (19)	Soil erosion and pollution control	Lump Sum

Section 206—Structural Excavation for Major Structures

Description

206.01 Work. Excavate, backfill, and dispose of material for the construction of structures. Preserve channels; shore and brace; construct cofferdams; seal foundations; dewater; excavate; prepare foundations; backfill; and subsequently remove safety features and cofferdams.

Materials

206.02 Requirements. Ensure that material conforms to specifications in the following sections and subsections:

Foundation Fill	704.01
Structural Backfill	704.04
Structural Concrete	552

Construction

206.03 Preparation for Structural Excavation. Clear the area of vegetation and obstructions according to Sections 201 and 202.

When structural excavation is to be measured and paid for by the cubic meter, notify the CO sufficiently before beginning any clearing, grubbing, or excavation so that cross-sectional measurements of the undisturbed ground may be taken. Do not disturb the natural ground adjacent to the structure until authorized by the CO.

206.04 General. Consider the elevations of the bottoms of footings or foundations when SHOWN ON THE DRAWINGS to be approximate elevations. The CO may order, in writing, changes in the elevations of footings and foundations when necessary to secure a satisfactory foundation.

Excavate trenches or foundation pits to a width and length that allows room for work. Provide a firm foundation of uniform density throughout its length and width. Do not place footings until the depth of excavation and the foundation material have been approved in writing.

Where necessary to blast rock, blast according to Section 220.

Follow Occupational Safety and Health Administration (OSHA) safety regulations (29 CFR, part 1926, subpart P, Excavation), or OSHA-approved State Plan requirements for sloping the sides of excavations and for using shoring, bracing, and

other safety features. When sides of excavations are sloped for safety considerations, provide one copy of the design that demonstrates conformity with OSHA regulations. Submit working drawings and construction details when required by the SPECIAL PROJECT SPECIFICATIONS where support systems, shield systems, or other protective systems are used. Ensure that drawings demonstrate conformity with regulations.

Remove safety features when no longer necessary. Remove shoring and bracing to at least 300 mm below the surface of the finished ground.

Saw cut existing pavements or concrete structures that are adjacent to the area to be excavated and are designated to remain.

Conserve suitable material for structural backfill from excavated material. Do not deposit excavated material in or near a waterway. Do not stockpile excavated material closer than 1 m from the edge of the excavation.

Place unsuitable or excess material according to Subsection 203.06. If approved, suitable material may be used in embankment construction.

Remove all water as necessary to perform work.

206.05 Channel Preservation. Perform work in or next to a running waterway as follows:

- (a) Excavate inside cofferdams, sheeting, or other approved separations such as dikes or sandbags.
- (b) Do not disturb the natural bed of the waterway adjacent to the work.
- (c) Backfill the excavation with structural backfill to original groundline.
- (d) Do not pump water from foundation excavations directly into live streams. Pump water into settling areas as SHOWN ON THE DRAWINGS or as approved.

206.06 Cofferdams. Use cofferdams when excavating under water or when the excavation is affected by groundwater.

Submit three working copies of drawings and calculations 21 days prior to installation, showing proposed methods and construction details of cofferdams. Place seal and signature of a licensed professional engineer on the drawings and calculations.

Shore and construct cofferdams according to OSHA standards. Ensure that cofferdams:

- (a) Extend below the bottom of the footing.
- (b) Are braced to withstand expected pressures and loads without buckling, and are secured in place to prevent tipping or movement.
- (c) Are as watertight as practicable.
- (d) Provide sufficient clearance for the placement of forms and the inspection of their exteriors.
- (e) Provide for dewatering.
- (f) Protect fresh concrete against damage from sudden rises in water elevation.
- (g) Prevent damage to the foundation by erosion.

When no longer required, remove all cofferdam material down to the natural bed of the waterway. Remove cofferdam material outside the waterway to a minimum of 300 mm below the surface of the finished ground.

Do not disturb, damage, or mar finished structure. Remove all timber or bracing in the cofferdam that extends into substructure masonry.

206.07 Foundation Seal. Construct a foundation seal of seal-concrete where a foundation area cannot be pumped reasonably free of water, and/or where the substructure concrete cannot be placed in accordance with Section 552.

While placing a foundation seal, maintain the water level inside the cofferdam at the same level as the water outside the cofferdam. Where a foundation seal is placed in tidal water or in a stream subject to sudden water level increases, vent or port the cofferdam at low water level.

Do not dewater a concrete-sealed cofferdam until the concrete strength is sufficient to withstand the hydrostatic pressure.

206.08 Dewatering. While placing concrete, locate and operate the pumps outside the foundation form. If pumping is permitted from the interior of any foundation enclosure, pump in a manner to avoid removal or disturbance of concrete material.

206.09 Foundation Preparation. Prepare footing foundations as follows:

(a) Footings Placed on Bedrock. Cut the bottom of the excavation to the specified elevations. Clean the foundation surface of loose or disintegrated material. Clean and grout all open seams and crevices that will remain beneath the footing.

(b) Footings Placed on an Excavated Surface Other Than Bedrock. Do not disturb the bottom of the foundation excavation. Remove material to foundation grade and compact the foundation immediately before concrete is placed. Treat material below the foundation grade that is disturbed as unstable material (see Subsection 206.09(d)).

(c) Footings Keyed Into Undisturbed Material. Excavate the foundation to the neat lines of the footing and compact the foundation. Where material does not stand vertically, fill all space between the neat lines of the footing and the remaining undisturbed material with concrete. If the top of the excavation is below the top of the footing, fill only to the top of the excavation; otherwise, fill to the top of the footing. Concrete placed against steel sheet piles in cofferdams is considered to be against undisturbed material.

(d) Unstable Material Below Footing Elevation. Excavate unstable material below foundation grade to the depth and lateral extent as approved, and replace it with foundation fill. Place foundation fill material in horizontal layers that, when compacted, do not exceed 150 mm in depth. Compact each layer according to Subsection 206.11.

(e) Foundations Using Piles. Excavate to the foundation elevation and drive the piles. Remove all loose and displaced material and reshape the bottom of the excavation to the foundation elevation. Smooth and compact the bed to receive the footing.

206.10 Backfill. Backfill structural excavation with structural backfill material.

Place structural backfill in horizontal layers that, when compacted, do not exceed 150 mm in depth. Compact each layer according to Subsection 206.11.

Do not place backfill or embankment behind the walls of concrete culverts or abutments of rigid frame structures until the top slab has been placed and cured. For all structures held at the top by the superstructure and behind the sidewalls of concrete culverts, bring backfill and embankment up evenly behind opposite abutments or sidewalls.

Do not place rock that is greater than 150 mm in its largest dimension within any backfill or embankment that is within 1 m of any structure.

Extend each layer to the limits of the excavation or to natural ground.

Do not place backfill against concrete that is less than 7 days old, or until 90 percent of the design strength is achieved.

206.11 Embankment. Construct all embankments, and backfill in horizontal layers adjacent to structures. Compact backfill in accordance with Subsection 203.16(b), method 4, except that mechanical tampers may be used for the required compaction. Use special care to prevent wedging action against the structure. Bench all slopes that bound or are within the areas to be backfilled to prevent wedging action. Extend compacted material horizontally for a distance at least equal to the height of the substructure or wall that is to be backfilled against, except where undisturbed material remains within the area.

Measurement

206.12 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure structural excavation by the cubic meter that is in place in its original position. Do not include the following volumes in structural excavation:

- (a) Material excavated outside vertical planes located 450 mm outside and parallel to the neat lines of footings or foundations. Use these vertical planes to determine pay quantities, regardless of the amount of material excavated inside or outside these planes.
- (b) Any material included within the staked limits of the roadway excavation, such as contiguous channel changes and ditches, for which payment is otherwise provided in the contract.
- (c) Water or other liquid material.
- (d) Material excavated before the survey of elevations and measurements of the original ground.
- (e) Material rehandled, except when the contract specifically requires excavation after embankment placement.
- (f) Material excavated for footings or foundations at a depth more than 1.5 m below the lowest elevation for such footings or foundations, as shown on the plans.

Measure foundation fill, when DESIGNATED IN THE SCHEDULE OF ITEMS, by the cubic meter in place.

Measure structural backfill, and structural backfill for walls, by the cubic meter in place. Limit the volume of structural backfill measured to that placed inside vertical planes located 450 mm outside and parallel to the neat lines of footings or foundations. Use these vertical planes to determine pay quantities, regardless of the amount of backfill material placed outside these planes.

Measure work for shoring and bracing and for cofferdams on a lump-sum basis for all work needed to complete excavation to a depth of 1.5 m below the lowest elevation, as SHOWN ON THE DRAWINGS, for each foundation structure.

Payment

206.13 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Excavation for footings or foundations, shoring and bracing, and cofferdams at depths more than 1.5 m below the lowest elevation for such footing or foundation as SHOWN ON THE DRAWINGS will be paid for by design change.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
206 (01) Structural excavation	Cubic Meter
206 (02) Foundation fill	Cubic Meter
206 (03) Structural backfill	Cubic Meter
206 (04) Structural backfill for walls	Cubic Meter
206 (05) Shoring and bracing	Lump Sum
206 (06) Cofferdams	Lump Sum
206 (07) Structural excavation	Lump Sum

Section 206A—Structural Excavation for Minor Structures

Description

206A.01 Work. Excavate, backfill, and dispose of material for the construction of culverts and minor structures. Preserve channels; shore and brace; seal foundations; dewater; excavate; prepare foundations; bed; and backfill.

Materials

206A.02 Requirements. Ensure that material conforms to specifications in the following sections and subsections:

Backfill Material	704.03
Bedding	704.02
Foundation Fill	704.01
Minor Concrete Structures	602
Structural Concrete	552
Unclassified Borrow	704.06

Construction

206A.03 Preparation for Structural Excavation. Clear the area of vegetation and obstructions according to Sections 201 and 202.

206A.04 General. Excavate trenches or foundation pits according to Subsection 206.04 and the following:

- (a) **Minor Structures.** Clean all loose material from all rock or other foundation material and cut to a firm surface that is level, stepped, or serrated. Remove all loose and disintegrated rock and thin strata. When the footing is to rest on material other than rock, complete the excavation just before the footing is to be placed.
- (b) **Culverts.** Construct the width of trenches in natural ground to permit satisfactory joining of the culvert sections and thorough tamping of the bedding material under and around the culvert. Excavate trenches to a minimum width equal to the culvert diameter plus 600 mm.

Construct trenches for culverts being placed in embankments to a width of one diameter, plus one diameter on each side.

Excavate unsuitable foundation material below the invert of the culvert to an approximate depth of 600 mm and a width of at least the culvert diameter plus

1.25 m. Remove rock, hardpan, or other unyielding material below the foundation grade for a depth of at least 300 mm and a width of at least 600 mm greater than the outside width of the culvert.

Excavate to foundation grade without unduly disturbing the trench or foundation surface. Foundation grade is the elevation at the bottom of any bedding for the installation of the structure.

206A.05 Channel Preservation. Preserve channels according to Subsection 206.05, but excavate inside separations such as dikes or sandbags.

206A.06 Foundation Seal. Where necessary, construct foundation seal according to Subsection 206.07.

206A.07 Dewatering. Where necessary, dewater according to Subsection 206.08.

206A.08 Foundation Preparation. Excavate any unsuitable material present at foundation grade, and replace it with foundation fill. Place and compact the foundation fill material according to Subsection 206.09(d).

Where footing must be keyed into undisturbed material, prepare foundation and construct footing according to Subsection 206.09(c). Notify the CO when each excavation is completed, and receive written approval of the excavation and the foundation material before placing footings.

206A.09 Utilization of Excavated Materials. Utilize all suitable excavated material as backfill or embankment. Do not place excavated material in live streams.

Dispose of all surplus material as SHOWN ON THE DRAWINGS. Do not deposit excavated material in a manner that will endanger the partly finished structure.

206A.10 Backfill & Embankments for Minor Structures. Backfill excavated areas around minor structures to the level of the original ground surface. Backfill with selected material placed in horizontal layers not over 150 mm (loose measure) in depth. Use compactible material free of frozen lumps, chunks of highly plastic clay, or other objectionable material. Do not use rocks larger than 75 mm in diameter within 300 mm of the structure. Compact each layer in accordance with Subsection 203.16(b), method 4.

206A.11 Bedding, Backfill, & Embankment for Pipe Culverts. Install bedding, backfill, and embankment for pipe culverts in accordance with Sections 603, 603A, and 603B, unless otherwise SHOWN ON THE DRAWINGS or described in the SPECIAL PROJECT SPECIFICATIONS.

Measurement

206A.12 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure bedding material by the cubic meter in place. Measure foundation fill under Section 206. Measure concrete under Section 552.

Payment

206A.13 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
206A (01) Minor structure excavation	Cubic Meter
206A (02) Pipe culvert excavation	Cubic Meter
206A (03) Bedding material	Cubic Meter
206A (04) Foundation fill	Cubic Meter
206A (05) Structural concrete class for _____ Cubic Meter
<i>Description</i>	
206A (06) Minor structure excavation and backfill	Lump Sum
206A (07) Pipe culvert excavation and backfill	Lump Sum

Section 207—Developing Water Supply & Watering

Description

207.01 Work. Furnish, haul, and apply water.

Materials

207.02 Requirements. In the planting or care of vegetation, use water that is free of substances injurious to plant life.

Ensure that water meets requirements of Subsection 725.01.

Water sources are SHOWN ON THE DRAWINGS. If other sources of water are used, obtain the right to use the water, and pay any royalty costs.

Construction

207.03 Development of Supply & Access. Develop water supplies and access as SHOWN ON THE DRAWINGS.

207.04 Equipment. Use watertight tanks of known capacity with mobile watering equipment. Provide uniform and controlled application of water without ponding or washing. Maintain positive control of water from the driver's position at all times.

Measurement

207.05 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Furnish calibrated tanks, distributors, or accurate water meters for measurement when directed by the CO.

When the SCHEDULE OF ITEMS calls for developing water supply and water, the cost of developing the supply is included in the unit price for the quantity of water delivered.

Measure hauling of water along the shortest feasible route to the nearest water supply. Do not include the cost of developing the supply.

Payment

207.06 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
207 (01) Developing water supply	Lump Sum
207 (02) Water	k Liters
207 (03) Water	Lump Sum
207 (04) Developing water supply and water	k Liters
207 (05) Developing water supply and water	Lump Sum
207 (06) Hauling water	k Liters-km

Section 210—Closing, Obliteration, or Treatment of Existing Roads

Description

210.01 Work. Treat roadways by removing rigid material, including culverts and bridges; constructing waterbars, overflow ditches, and earthen barriers; sloping and scarifying the roadbed; removing selected fill; hauling materials to designated disposal areas; and revegetating.

210.02 Performance. Break rigid material such as pavements, curbs, gutters, sidewalks, and other nonasphalt material into pieces with a maximum dimension of 300 mm.

Dispose of material by one of the methods listed in Subsection 202.04 or as SHOWN ON THE DRAWINGS.

Restore and maintain the natural drainage patterns.

210.03 Treatment of Roadway. Treat the roadway using one of the following methods, as specified in the SCHEDULE OF ITEMS:

(a) **Method A.** Fill ditches and restore the roadway to approximate original ground contour or shape to blend with the terrain. Loosen the roadbed by ripping, plowing, or scarifying to promote the establishment of vegetation. Scarify a representative area to determine the number of passes necessary to decompact the road surface. Apply this number to the entire project. Pull all major embankments, and use material to contour or fill ditches; or haul it to designated areas, as SHOWN ON THE DRAWINGS. Keep excavated material within the original roadway limits, unless otherwise directed by the CO or SHOWN ON THE DRAWINGS.

(b) **Method B.** Shape the roadway as SHOWN ON THE DRAWINGS to drain water. Fill ditches and outslope the roadbed when SHOWN ON THE DRAWINGS. Loosen the roadbed by ripping or scarifying to provide a seedbed, and promote establishment of vegetation.

(c) **Method C.** Treat the roadway as SHOWN ON THE DRAWINGS.

210.04 Waterbars & Barriers. Construct barriers to prevent vehicle access and waterbars as SHOWN ON THE DRAWINGS.

210.05 Establishing Vegetative Cover. Seed, fertilize, and mulch all disturbed areas as specified in Section 625 or SHOWN ON THE DRAWINGS.

Measurement

210.06 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

210.07 Basis. The quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Seed, fertilizer, and mulch will be a separate PAY ITEM under Section 625.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
210 (01) Treatment of existing roadway, method _____	Square Meter
210 (02) Treatment of existing roadway, method _____	Kilometer
210 (03) Treatment of existing roadway, method _____	Lump Sum
210 (04) Treatment of _____	Each

Section 220—Rock Blasting

Description

220.01 Work. Fracture rock and construct stable final rock cut faces using controlled backslope blasting and production-blasting techniques, as SHOWN ON THE DRAWINGS. For controlled backslope blasting, use explosives to form a shear plane in the rock along a specified backslope. Controlled backslope blasting includes presplitting and cushion blasting. For production blasting, use explosives to fracture rock to produce slopes in reasonable conformity to the drawings and to minimize rock throw.

Materials

220.02 Requirements. Ensure that material conforms to the specifications in the following subsection:

Explosives & Blasting Accessories 725.24

Construction

220.03 Regulations. Furnish copies or other proof of all applicable permits and licenses. There are Federal, State, and local regulations on the purchase, transportation, storage, and use of explosive material. Federal regulations include the following:

(a) **Safety & Health.** OSHA, 29 CFR, part 1926, subpart U.

(b) **Storage, Security, & Accountability.** Bureau of Alcohol, Tobacco, and Firearms, 27 CFR, part 181.

(c) **Shipment.** U. S. Department of Transportation (DOT), 49 CFR, parts 171–179, 390–397.

220.04 Blasting Plan. Submit a blasting plan at least 14 days before drilling operations begin or whenever a change in drilling and blasting procedures is proposed. Include full details of drilling and blasting patterns and the techniques proposed for controlled and production blasting, including provisions for loading wet holes.

Ensure that the blasting plan contains at least the following:

- (a) Maximum dimensions for width, length, and depth of shot.
- (b) Typical plan and section view of the drill pattern for controlled backslope blast holes and production blast holes. Show the free face, burden, hole diameters, depths, spacings, inclinations, and depth of subdrilling, if any.
- (c) Loading pattern diagram showing:
 - (1) Location of each hole.
 - (2) Location and amount of each type of explosive in each hole, including primer and initiators.
 - (3) Location, type, and depth of stemming.
- (d) Initiation and delay methods, delay times, and overall powder factor.
- (e) Manufacturer's data sheets for all explosives, primers, initiators, and other blasting devices.
- (f) Working procedures and safety precautions for storing, transporting, and handling explosives.
- (g) Working procedures and safety precautions for blasting.

The blasting plan is for quality control and recordkeeping purposes. The review of the blasting plan does not relieve the Contractor of the responsibility for using existing drilling and blasting technology, and for obtaining the required results.

220.05 Blaster-In-Charge. At least 10 days before the delivery or use of explosive material, designate in writing a blaster-in-charge.

220.06 Test Blasting. Drill, blast, and excavate one or more short test sections, as proposed in the blasting plan, before full-scale drilling and blasting. Test blasts may be made away from or at the final slope line.

Space blast holes according to the blasting plan for the initial test blast. Adjust the spacing as needed. A blast is unacceptable when it results in fragmentation beyond the final rock face; excessive fly rock; vibration; air blast; overbreak; damage to the final rock face; or a violation of other requirements. When a blast is determined to be unacceptable, revise the blasting plan and make an additional test blast.

220.07 Controlled Backslope Blasting. Perform controlled backslope blasting according to the following specifications:

(a) **General.** Drill and blast according to the blasting plan. Use controlled backslope blasting methods to form the final rock cut faces when the rock height is more than 3 m above ditch grade and slopes are staked 2:1 or steeper.

Use downhole angle or fan drill blast holes for pioneering the tops of rock cuts or preparing a working platform for controlled blasting. Use the blast hole diameter established for controlled backslope blasting and a hole spacing not exceeding 750 mm.

(b) **Drilling.** Remove overburden soil and loose rock along the top of the excavation for at least 10 m beyond the production hole drilling limits, or to the end of the cut.

Drill 75 ± 25 -mm-diameter controlled backslope blast holes along the final rock face line. Drill controlled blast holes at least 10 m beyond the production holes to be detonated, or to the end of the cut.

Use drilling equipment with mechanical or electrical-mechanical devices that accurately control the angle at which the drill enters the rock. Select a lift height and conduct drilling operations so that the blast hole spacing and down-hole alignment do not vary more than 200 mm from the proposed spacing and alignment. When more than 5 percent of the holes exceed the variance, reduce the lift height and modify the drilling operations until the blast holes are within the allowable variance. Maximum lift height is limited to 20 m.

A 300-mm offset is allowed for a working bench at the bottom of each lift for drilling the next lower controlled blasting hole pattern.

Adjust the drill inclination angle or the initial drill collar location so that the required ditch cross section is obtained when the bench is used.

Drilling 500 mm below the ditch bottom is allowed for removing the toe.

(c) **Blasting.** Free blast holes of obstructions for their entire depth. Place charges with reasonable care to not cave in the blast hole walls.

Use the types of explosives and blasting accessories necessary to obtain the required results. A bottom charge may be larger than the line charges if no overbreak results. Do not use bulk ammonium nitrate and fuel oil for controlled blasting.

Stem the upper portion of all blast holes, preferably with dry sand or other granular material that passes a 9.5-mm sieve.

Where presplitting, delay the nearest production blast row at least 25 milliseconds after blasting the presplit line. Presplit a minimum of 10 m ahead of production blasting zone.

Where cushion (trim) blasting, delay the cushion blast row from 25 to 75 milliseconds after blasting the nearest production row.

220.08 Production Blasting. Perform production blasting according to the following specifications:

(a) General. Drill production holes and blast according to the blasting plan. Take all necessary precautions to minimize blast damage to the final rock face.

Following a blast, stop work in the entire blast area and check for misfires before allowing workers to return to excavate the rock.

Remove or stabilize all cut face rock that is loose, hanging, or potentially dangerous. Scale by hand using a standard steel mine scaling rod. Machine scale using hydraulic splitters or light blasting when necessary. Leave minor irregularities or surface variations in place if they do not create a hazard. Drill the next lift only after cleanup and stabilization work are completed.

If blasting operations cause fracturing of the final rock face, repair or stabilize it in an approved manner. Repair or stabilization may include removal, rock bolting, rock dowels, or other stabilization techniques.

Halt blasting operations if any of the following occur:

- (1) Slopes are unstable.
- (2) Slopes exceed tolerances.
- (3) Backslope damage occurs.
- (4) Public safety is jeopardized.
- (5) Property or natural features are endangered.
- (6) Fly rock is generated.

(b) Drilling. Drill the row of production blast holes closest to the controlled blast line parallel to the controlled blast line and no closer than 2 m to it. Do not drill production blast holes lower than the bottom of the controlled blast holes.

(c) **Blasting.** Use the types of explosives and blasting accessories that will obtain the desired fragmentation. Clean the blast holes, place the charges, and stem the holes according to Subsection 220.07(c). Detonate production holes on a delay sequence toward a free face.

220.09 Blasting Log. Submit a blasting log for each blast, including the following in the log:

- (a) All actual dimensions of the shot, including blast hole depths, burden, spacing, subdrilling, stemming, powder loads, and timing.
- (b) A drawing or sketch showing the direction of the face or faces, and the physical shot layout.

Measurement

220.10 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure controlled backslope blast holes by the meter based on the actual length of drilling as recorded in the blasting log when it is included in the SCHEDULE OF ITEMS. All other rock blasting is subsidiary to other PAY ITEMS.

Payment

220.11 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
220 (01) Controlled backslope blast hole	Meter

Section 221—Earthwork Geotextiles

Description

221.01 Work. Furnish and place a geotextile as a permeable separator or permanent erosion control measure.

Geotextile types are designated as follows:

- Type II (A, B, or C) Separation
- Type III (A or B) Stabilization
- Type IV (A, B, C, D, E, or F) Permanent erosion control

Materials

221.02 Requirement. Ensure that material conforms to specifications in the following subsection:

Geotextiles 714.01

Construction

221.03 General. Where placing geotextiles on native ground, cut the trees and shrubs flush with the ground surface. Do not remove the topsoil and vegetation mat. Remove all sharp objects and large rocks. Fill depressions or holes with suitable material to provide a firm foundation.

Replace or repair all geotextile that is torn or punctured. When repairing, place a patch of the same type of geotextile overlapping 1 m beyond the damaged area.

221.04 Separation & Stabilization Applications. Where placing geotextiles on a subgrade, prepare the subgrade according to Subsections 203.08(c) and 203.08(d).

Place the geotextile smooth and free of tension, stress, or wrinkles. Fold or cut the geotextile to conform to curves. Overlap in the direction of construction. Overlap the geotextile a minimum of 500 mm at the ends and sides of adjoining sheets, or sew the geotextile joints according to the manufacturer’s recommendations. Do not place longitudinal overlaps below anticipated wheel loads. Hold the geotextile in place with pins, staples, or piles of cover material.

End dump the cover material onto the geotextile from the edge of the geotextile or from previously placed cover material. Do not operate equipment directly on the

geotextile. Spread the end-dumped pile of cover material, maintaining a minimum lift thickness as SHOWN ON THE DRAWINGS. Compact the cover material with rubber-tired or nonvibratory smooth drum rollers. Avoid sudden stops, starts, or turns of the construction equipment. Fill all ruts from construction equipment with additional cover material. Do not regrade ruts with placement equipment.

Place subsequent lifts of cover material in the same manner. Vibratory compactors may be used for compacting subsequent lifts. If foundation failures occur, repair the damaged areas and revert to the use of nonvibratory compaction equipment.

221.05 Erosion Control Applications. Place and anchor the geotextile on an approved smooth-graded surface. For slope or wave protection, place the long dimension of the geotextile down the slope. For stream bank protection, place the long dimension of the geotextile parallel to the centerline of the channel.

Overlap the geotextile a minimum of 300 mm at the ends and sides of adjoining sheets, or sew the geotextile joints according to the manufacturer’s recommendations. Overlap the uphill or upstream sheet over the downhill or downstream sheet. Offset end joints of adjacent sheets a minimum of 1.5 m. Pins may be used to hold the geotextile sheets in place. Space pins along the overlaps at approximately 1 m between pins.

Place aggregate, slope protection, or riprap on the geotextile starting at the toe of the slope and proceed upward. Place riprap onto the geotextile from a height of less than 300 mm. Place slope protection rock or aggregate backfill onto the geotextile from a height less than 1 m. In underwater applications, place the geotextile and cover material on the same day.

Measurement

221.06 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Measure earthwork geotextile by the square meter on a plane parallel to the ground surface, excluding overlaps.

Payment

221.07 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
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221 (01) Earthwork geotextile, type ____	Square Meter
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Section 249—Composite Road Construction

Description

249.01 Work. Perform clearing and grubbing, excavation and embankment, and erosion control. During clearing and grubbing, treat merchantable timber and construction slash, including all trees designated for removal. During excavation and embankment, excavate and use borrow material; excavate drainage; shape the roadway, including approaches, turnarounds, ditches, and drainage dips; and place all excavated material, regardless of nature. Perform erosion control by furnishing and placing seed, fertilizer, mulch, and tackifier as SHOWN ON THE DRAWINGS. Construct the roadway in conformance with the dimensions SHOWN ON THE DRAWINGS or designated on the ground.

Materials

249.02 Requirement. Ensure that materials are as SHOWN ON THE DRAWINGS, and that they meet requirements specified in the following section and subsection:

Seeding & Mulching	625
Stabilizing Emulsion Tackifiers	713.12

Construction

249.03 Clearing & Disposal. Protect construction stakes and construction control markers. Remove or treat all trees, snags, downed timber, brush, and stumps within the clearing limits according to the following specifications:

(a) **Merchantable Timber.** Deck or remove timber meeting Utilization Standards as SHOWN ON THE DRAWINGS.

(b) **Unmerchantable Timber.** Treat unmerchantable timber as SHOWN ON THE DRAWINGS.

(c) **Large Construction Slash.** Treat construction slash larger than 75 mm in diameter and longer than 1 m by one or more of the following methods, as SHOWN ON THE DRAWINGS:

(1) **Method A.** Incorporate construction slash in the embankment.

(2) *Method B.* Windrow construction slash inside the clearing limits. When slash is windrowed, place it approximately parallel to the roadway outside the toe of the fill slope.

(3) *Method C.* Scatter construction slash outside the roadway without damaging trees. Limb all logs. Place logs and stumps away from trees, positioned so they will remain in place and are not on top of one another.

(4) *Method D.* Construct piles that are free of soil, with smaller slash well mixed with larger slash. Buck unmerchantable logs into lengths less than 6 m prior to placement in piles.

(5) *Method E.* Sidecast construction slash into the area below the roadway. Slash may be sidecast beyond the lower clearing limit for a distance not to exceed 3 m.

(6) *Method F.* Bury construction slash within the roadway limits. Construct mats in layers and cover the mats with at least 500 mm of rock and soil.

(7) *Method G.* Construct piles of construction slash in the areas SHOWN ON THE DRAWINGS or designated on the ground. Construct the piles so that burning does not damage standing trees. Burn the piles until all the material remaining in the pile is charred or ash.

(8) *Method H.* Bury the construction slash outside the roadway at the locations SHOWN ON THE DRAWINGS or designated on the ground. Construct mats in layers, and cover the mats with at least 500 mm of rock and soil. Slope the final surface to drain.

(9) *Method J.* Construct a debris mat of construction slash under the road subgrade. Use tree limbs, tops, cull logs, split stumps, wood chunks, and other debris to form a mat. Place stumps upside down and blended into the mat as SHOWN ON THE DRAWINGS.

(d) ***Small Construction Slash.*** Construction slash less than 75 mm in diameter and less than 1 m may be incorporated into embankments so long as the material is distributed so that it does not result in concentrations or matting.

Immediately remove slash deposited in stream courses.

Fell all dead trees outside the clearing limits that lean toward the road and are sufficiently tall to reach the roadbed. Fell hazard or unstable live trees designated on the ground outside the clearing limits before felling timber in the immediate clearing vicinity.

Leave stump heights less than 300 mm or one-third of the stump diameter, whichever is greater, measured on the side adjacent to the highest ground. Leave felled trees outside the clearing limits in place, and treat them no further unless otherwise SHOWN ON THE DRAWINGS.

249.04 Pioneering. Do not undercut the final back slope during pioneering operations. Deposit material inside the roadway limits. Do not restrict drainage.

249.05 Grubbing. Grub within the limits as SHOWN ON THE DRAWINGS. Stumps outside the grubbing limits may remain if cut no higher than 300 mm or one-third of the stump diameter, whichever is greater, above the original ground, measured on the uphill side, unless otherwise SHOWN ON THE DRAWINGS. Grub stumps that will protrude through the subgrade or have less than 150 mm of cover.

249.06 Excavation & Embankment. Construct the roadway to conform to the typical sections SHOWN ON THE DRAWINGS. Protect backslopes from being undercut. Embankment may be placed by side casting and end dumping.

Locate and use borrow material, and remove and treat unsuitable or excess material, as SHOWN ON THE DRAWINGS.

Place rocks that are too large to be incorporated in the embankment outside the traveled way on the downhill side such that they will not roll, obstruct drainage, or hinder roadbed use and maintenance.

Leave slopes that are to be seeded in a roughened condition.

Shape and finish the roadbed to the condition ordinarily accomplished by a crawler tractor with dozer blade to provide drainage of surface water, unless otherwise SHOWN ON THE DRAWINGS. Do not permit individual rocks to protrude more than 100 mm above the subgrade of the roadbed. A motor grader finish is not required.

Unless otherwise SHOWN ON THE DRAWINGS, observe a width tolerance for the traveled way of (+) 750 mm.

249.07 Erosion Control. Perform erosion control measures, including seeding, as SHOWN ON THE DRAWINGS. Use methods and rates of application, and types of seed, fertilizer, mulch, and tackifier, as specified in Section 625 and SHOWN ON THE DRAWINGS. Apply materials uniformly to the areas to be treated.

Measurement

249.08 Method. Use the method of measurement that is DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment

249.09 Basis. The accepted quantities will be paid for at the contract unit price for each PAY ITEM DESIGNATED IN THE SCHEDULE OF ITEMS.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
249 (01) Composite road construction	Kilometer
249 (02) Composite road construction	Lump Sum