

2101 CLEARING AND GRUBBING

2101.1 DESCRIPTION

This work consists of removing and disposing of the trees, brush, stumps, roots, and other plant life, including dead and decayed matter, within the construction area, unless otherwise designated to remain by the contract or as directed by the Engineer.

2101.2 (BLANK)

2101.3 CONSTRUCTION REQUIREMENTS

The Engineer will establish the right-of-way lines and construction limits confining the clearing and grubbing operations. The Engineer will designate those trees, brush, and other vegetation for preservation and those for removal. Remove and dispose of the trees, brush, stumps, and roots from the limits designated for clearing and grubbing.

Salvage topsoil in accordance with 2105, "Excavation and Embankment."

Protect the items designated to remain in accordance with 1712, "Protection and Restoration of Property," and 2572, "Protection and Restoration of Vegetation," place temporary fence, and perform clearing and grubbing operations in a manner that will not damage or jeopardize the surrounding plant life and property.

Prune branches for the following reasons:

- (1) For pedestrian, vehicle, and infrastructure clearance;
- (2) To reduce risk of branch failure;
- (3) To improve a site line and sign visibility; and
- (4) To maintain tree health in accordance with 2571.3, "Plant Installation and Establishment, Construction Requirements."

A Clearing and Grubbing Operations

Cut off, remove, and dispose of the trees, brush, stumps, and roots from designated areas within the construction limits as a clearing and grubbing operation. Perform clearing and grubbing on the project to construct the proposed improvements, including the clearing and grubbing of designated areas outside those construction limits as shown on the plans or as designated by the Engineer and in accordance with the following:

- (1) Within the right-of-way, remove trees, brush, stumps, and other items that can be viewed from the traveled way as directed by the Engineer, and

- (2) Within 15 ft [5 m] of the construction limits outside of structures, remove trees, stumps, roots, brush, and branches to protect and maintain the completed improvements as directed by the Engineer.

B Clearing Operations

Cut off, remove, and dispose of trees and brush in the areas identified as a clearing operation on the plans or as directed by the Engineer. If the contract does not require grubbing or if the Engineer directs the Contractor not to perform grubbing, cut off at a point within 6 in [150 mm] of the ground.

C Grubbing Operations

Remove and dispose of the brush, stumps, roots, and other remains in the areas designated as a grubbing operation on the plans, or as directed by the Engineer. Completely remove stumps in accordance with 2104.3.C, "Removal Operations," unless otherwise approved by the Engineer. If the Engineer approves of a stump to remain, cut the stump no greater than 6 in [150 mm] above the ground, and flush with or below the ground surface if directed by the Engineer.

Fill depressions resulting from the grubbing operations with suitable material in accordance with 2105.2.B, "Borrow Material," and compact the material as approved by the Engineer, except in those areas to be excavated as part of the work.

D Disposal Limitations

Dispose of trees, brush, stumps, roots, and other debris or byproducts by chipping, tub grinding, or marketing. The Contractor may chip the wood through a chipping machine or tub grinding, and use or dispose of the chips as approved by the Engineer within the construction limits. Provide to the Engineer an Emerald Ash Borer compliance agreement with the Minnesota Department of Agriculture. Dispose of ash, pine, elm, and oak wilt infected trees in accordance with proper forestry disposal standards that prevent spreading insects and disease pests.

D.1 Marketable Trees

The Contractor may make market trees designated for removal to wood-using industries, biofuel industries, or both. Do not market any part of an ash tree from a quarantined area to wood-using industries or individuals without an Emerald Ash Borer compliance agreement with Minnesota Department of Agriculture.

The Department defines marketable trees as all trees except for the following:

- (1) Elm trees,
- (2) Oak wilt infected oak trees, and

- (3) Ash trees that have a diameter of 6 in [150 mm] or more when measured at a point 24 in [600 mm] above the ground surface.

D.2 Elm, Oak Wilt Infected Oak Trees and Ash

D.2.a Elm Trees

Dispose of elm trees, brush, stumps, roots, and debris by chipping or tub grinding and using the mulch within the construction limits for erosion control, construction of exit pads or landscaping purposes.

D.2.b Oak Wilt Infected Oak Trees

Dispose of stumps, roots, and debris from oak wilt infected oak trees by chipping or tub grinding and using the mulch within the construction limits for erosion control, construction of exit pads or landscaping purposes.

D.2c Disposal Deadlines and Locations

Dispose of elm and oak wilt infected oak trees in accordance with the following:

- (1) Within 20 calendar days of notification or of clearing and grubbing, whichever comes first, when performing the cutting operations between April 1 and September 15;
- (2) By April 1 when performing cutting operations between September 15 and March 31,
- (3) Within the right of way by tub grinding or chipping and using the mulch within the construction limits for erosion control, construction exit pads, or landscaping purposes; and
- (4) Off the right of way provided the tree logs are processed by debarking or made into wood chip mulch to prevent the spread of Dutch elm disease and oak wilt.

D.3 Pine

Dispose of all non-marketable pine trees, brush, stumps, roots, and slash debris by chipping, tub grinding, or debarking within 20 calendar days of being cleared during the growing season to prevent the infestation and spread of pine bark beetles.

D.4 Ash Trees (*Fraxinus* species)

Do not market ash trees to the wood-using industries or individuals without having an Emerald Ash Borer compliance agreement with the Minnesota Department of Agriculture. Do not make ash or non-coniferous species with bark attached available to the public for use as firewood from the quarantined area. Do not transport entire ash trees, limbs, branches, logs, chips, ash lumber with bark, stumps, and roots outside of a quarantined county without fulfilling the requirements of an Emerald Ash

Borer compliance agreement with the Minnesota Department of Agriculture. Contact the Minnesota Department of Agriculture to speak with a regulatory official and visit the Minnesota Department of Agriculture Emerald Ash Borer website to determine the quarantine area.

D.4 Ash Tree Disposal and Locations

Dispose of ash trees in accordance with the following:

- (1) The Emerald Ash Borer compliance agreement, and
- (2) Use the ash wood chips within the construction limits for erosion control, construction exit pads, or landscaping purposes.

D.5 Burning not allowed 2104.3

D.6 Burying not allowed 2104.3

2101.4 METHOD OF MEASUREMENT

The Engineer will measure clearing and grubbing by area, lump sum, or individual unit as required by the contract. The Engineer will measure tree diameter by measuring the circumference of the tree at 4.5 ft above the ground and dividing the circumference by 3.14, or by measuring the diameter or the tree stump after removal.

A Qualifying Trees and Stumps

The Engineer will only measure trees for payment having a diameter greater than 4 in [100 mm] at a point measured 24 in [600 mm] above the ground surface.

The Engineer will only measure stumps for payment having a diameter greater than 4 in [100 mm] when measured at one of the following points:

- (1) 2 ft [600 mm] above the ground surface for a tree cleared under the contract, or
- (2) The point of cutoff for an existing stump not cleared under the contract.

The Engineer will not measure for the removal and disposal of stumps and brush with a diameter equal to or less than 4 in [100 mm] at the point of cutoff.

B Area Basis

If the contract specifies the unit as a hectare, the Engineer will determine quantities by measuring, to the nearest 0.05 acre [0.02 ha], all areas cleared and all areas grubbed within the limits as shown on the plans or staked by the Engineer. The Engineer will make all measurements horizontally to points 10 ft [3.0 m] outside the

trunks of qualifying trees or stumps on the perimeter of the area being measured. The Engineer will measure separate areas less than 0.05 acre [0.02 ha] as 0.05 acre [0.02 ha].

If isolated trees or stumps require removal outside the areas designated for clearing or grubbing by the hectare, and no unit price is provided in the contract for clearing and grubbing individual trees or stumps, the Department will pay based on the following:

- (1) The Engineer will consider each isolated qualifying tree less than 40 in [1 m] in diameter when measured at a point 2 ft [600 mm] above the ground surface, and each isolated qualifying stump measuring less than 40 in [1 m] at the point of cutoff as 0.05 acre [0.02 ha].
- (2) The Engineer will consider each isolated tree or stump at least 40 in [1 m] in diameter when measured at the points described in (1) above as 0.1 acre [0.04 ha].

C Individual Unit Basis

When the contract specifies “tree” as the unit, the Engineer will count the number of qualifying trees cleared and the number of qualifying stumps grubbed to determine the quantity.

D Lump Sum Basis

The Engineer will not measure an individual area, tree, or stump if the contract specifies clearing and grubbing as a lump sum item.

2101.5 BASIS OF PAYMENT

The contract unit prices for the accepted quantities of clearing and grubbing includes the cost for removal and disposal; securing outside disposal sites in accordance with 2104.3.D, “Disposal of Materials and Debris;” bringing in a tub grinder if necessary; securing an Emerald Ash Borer compliance agreement with the Minnesota Department of Agriculture; and performing the required treatment for disposing of elm, oak wilt infected oaks, pine, ash, and marketable trees.

The contract lump sum price for *Clearing and Grubbing*, regardless of the sizes of the trees and stumps, includes the cost of all clearing and grubbing required by the contract.

The Department will include the costs for removing and disposing of brush and stumps with a diameter equal to or less than 4 in [100 mm] at the point of cutoff in the contract unit prices of other relevant pay items.

The Department will not pay for pruning except as specified in 2572.5, "Protection and Restoration of Vegetation, Basis of Payment."

If the contract does not specify a pay item for clearing and grubbing, the Department will pay for clearing and grubbing of qualifying trees and stumps as specified in 2101.4, "Clearing and Grubbing, Method of Measurement," as extra work in accordance with 1402, "Contract Revisions."

The Department will pay for clearing and grubbing items on the basis of the following schedule:

Item No.:	Item:	Unit:
2101.501	Clearing	hectare [acre]
2101.502	Clearing	tree
2101.506	Grubbing	hectare [acre]
2101.507	Grubbing	tree
2101.511	Clearing and Grubbing	lump sum

2102 PAVEMENT MARKING REMOVAL

2102.1 DESCRIPTION

This work consists of removing temporary and permanent pavement markings, except for removable preformed plastic pavement markings, that conflict with revised traffic patterns.

2102.2 MATERIALS — (BLANK)

2102.3 CONSTRUCTION REQUIREMENTS

Before making a change in traffic pattern, remove conflicting pavement markings as required by the contract and as directed by the Engineer without damaging the pavement structure or surface texture. If determined by the Engineer, repair damaged areas as directed by the Engineer at no additional cost to the Department.

Control or restrict operations to avoid exposing traffic to hazardous conditions in accordance with 1701, "Laws to be Observed," 1707, "Public Convenience and Safety," and 1717, "Air, Land, and Water Pollution." Remove expended materials or agents used in the pavement marking removal process from the pavement surface as the work progresses. Dispose of removed marking material in accordance with 1701, "Laws to be Observed," and 1717, "Air, Land, and Water Pollution."

Removed pavement marking material shall become the property of the Contractor.

2102.4 METHOD OF MEASUREMENT

The Engineer will measure *Pavement Marking Removal* by area or length of the original markings as removed.

The Engineer will measure removal areas on the basis of nominal widths and actual lengths as originally applied and still visible at the time of pavement marking removal. The Engineer will enclose irregularly shaped markings within rectangular boundaries of least dimension as determined by the Engineer.

The Engineer will measure removal length by the actual length of each 4 in [100 mm] wide pavement marking removed. The Engineer will measure longitudinal pavement marking removal quantities greater than 4 in [100 mm] wide based on a ratio of actual pavement marking width relative to 4 in [100 mm]. The Engineer will not include the gap between the broken lines in the removal length measurement.

The Department will include the cost of removing removable preformed pavement marking tape with the relevant contract unit prices in accordance with 2581, "Removable Preformed Pavement Marking Tape."

2102.5 BASIS OF PAYMENT

The contract unit price for *Pavement Marking Removal* includes the cost of obliterating the markings as required by the contract and for restoring the original pavement texture as directed by the Engineer.

Unless the contract requires otherwise, the Department will pay for the removal of markings of all types under a single contract item.

The Department will pay for pavement marking removal on the basis of the following schedule:

Item No.:	Item:	Unit:
2102.501	Pavement Marking Removal	square foot [square meter]
2102.502	Pavement Marking Removal	linear foot [linear meter]

2103 BUILDING REMOVAL

2103.1 DESCRIPTION

This work consists of removing unsalvageable and vacated buildings from the right-of-way, making sewer and water service disconnections, and removing sidewalks, driveways, or miscellaneous structures, unless otherwise required by the contract.

2103.2 BLANK

2103.3 REMOVAL REQUIREMENTS

A General

Perform building removals as required by the contract. The contract will provide a general description and the street addresses or references to a survey station for the buildings and miscellaneous items requiring removal.

Remove buildings, including all fixtures except those owned by public or private utilities by demolition before removal from the right-of-way.

The Contractor is responsible for any damage caused to adjacent property during the building removal process.

The Department assumes no responsibility for the condition of any buildings at any time, and no guarantee is made or implied that any building will remain in the condition the bidder finds it at the time of examination before preparing the Proposal.

B Removal

Remove buildings and structures, including steps, basement floors and walls, floor slabs, and footings from the right-of-way. If the building rests on a concrete surface slab, remove the entire slab and related footings.

C Utilities..... 1507

C.1 Disconnection of Sewer and Water Services

Locate, expose, cut off, and plug all sewer and water service connections at the sewer and water mains. Plug all sewers leading from the building using watertight plugs at no additional cost to the Department.

Abandon wells in accordance with 2104, "Removing Pavement and Miscellaneous Structures."

C.2 Other Utilities

The utility owners will disconnect telephone, electric power, other wire services, and gas service pipes outside the buildings. The utility owners will also remove utility-owned fixtures in accordance with 1507, "Utility Property and Service."

D Disposal of Materials and Debris

Dispose of the demolished building in accordance with 2104.3.D, "Disposal of Materials and Debris," at a demolition landfill permitted by the Minnesota Pollution Control Agency, except the Contractor may recycle parts of the building as approved by the Engineer. Do not dispose of buildings at permit-by-rule landfills, transfer stations, or waste storage facilities.

E Filling Basement Excavations

If the building was removed by another contract, fill all basement excavations and other excavations previously made as required by the contract. Fill the excavation to the level of the existing ground surface using backfill that matches the existing soil conditions. Provide the fill material from sources outside the right-of-way in accordance with 1405, "Use of Materials Found on the Project." Compact the fill in accordance with the quality compaction requirements in 2105, "Excavation and Embankment."

If the building removal is included with the grading in this contract, remove the foundations in accordance with 2103.3.B, "Removal," and fill basement excavations in accordance with 2105.3.H, "Finishing Operations."

2103.4 METHOD OF MEASUREMENT

A Building Removal

The Engineer will measure all buildings listed for removal as a single lump sum.

B Basement Excavation Fill

The Engineer will measure the volume of fill provided by the Contractor by the volume of the basements below the ground surface as required by the contract.

C Disconnection of Sewer and Water Services

The Engineer will measure each sewer and water service connection cut off and plugged at the main.

2103.5 BASIS OF PAYMENT

The contract unit price for the *Disconnect Sewer Service* and *Disconnect Water Service* includes the cost of the restoration of street and property surfaces.

The Department will pay for building removal based on the following schedule:

Item No.:	Item:	Unit:
2103.501	Building Removal	lump sum
2103.505	Disconnect Sewer Service	each
2103.507	Disconnect Water Service	each
2103.511	Basement Excavation Fill	cubic yard [cubic meter]

2104 REMOVING PAVEMENT AND MISCELLANEOUS STRUCTURES

2104.1 DESCRIPTION

This work consists of removing and disposing of pavement, sewers, culverts, guardrails, abandoned structures, and other obstructions on the right-of-way, except as specified in 2442, "Removal of Existing Bridges," and 2103, "Building Removal." This work also consists of salvaging material and backfilling trenches, holes, and depressions.

2104.2 MATERIALS — (BLANK)

2104.3 CONSTRUCTION REQUIREMENTS

A General

Remove and dispose of structures and obstructions as required by the contract.

B Salvage Operations

Remove, dismantle, and store salvaged materials to allow re-use.

When salvaging guardrail and fences, coil the wire and cable, pull posts from the ground, and remove nails and staples from posts and boards.

Stockpile materials designated for salvage by the Department on the right-of-way at locations approved by the Engineer. Remove, dismantle, and clean materials as required by the contract before stockpiling.

C Removal Operations

C.1 Removing Portion of Structure

Do not damage existing structures to be retained for use during the removal operations. Ensure a length of at least 40 bar diameters from the face of the cut for existing reinforcement bars for concrete structures left in place.

C.2 Pavements and Sidewalks

Saw the existing concrete pavement or sidewalks or bituminous pavement at the locations as shown on the plans and as staked by the Engineer to establish a neat line for extending the new work.

C.3 Concrete and Masonry Structures

Remove concrete and masonry structures to the excavation limits as shown on the plans.

Remove septic tanks, cisterns, and cesspools.

Rebuild and reconnect live sewers after removing related manholes, catch basins, and drop inlets. Provide a by-pass and maintain the service during the removal operations.

Use concrete or masonry plugs to plug pipes draining into abandoned basements, manholes, or similar structures.

C.4 Timber Structures and Underground Tanks

Remove timber structures and underground tanks meeting the requirements of applicable laws and regulations.

C.5 Wells and Holes

Refer to Minnesota Rules, Chapter 4725, "Wells and Borings," for the definition of "wells" and "borings." Construct and seal most wells and borings meeting the requirements of Minnesota Rules, Chapter 4725, "Wells and Borings."

Seal wells and borings taken out of service meeting the requirements of Minnesota Rule Chapter 4725, "Wells and Borings." Protect wells and borings until permanently meeting the requirements of Minnesota Rule Chapter 4725, "Wells and Borings," during the work to prevent surface drainage from entering the opening. Cut and remove casing in the well or boring to the elevation as shown on the plans or as directed by the Engineer after sealing. Submit one copy of the sealing record to the Minnesota Department of Health and one copy to the Engineer within 30 calendar days after sealing a well or boring.

C.6 Miscellaneous Items

When removing railroad tracks, remove rails, ties, paving, crossings, track encasements, and other appurtenances.

D Disposal of Materials and Debris

D.1 Disposal Plan

Provide the Engineer with information and documentation substantiating proper disposal arrangements and operations. The Department will not pay for removal before acceptance of the initial disposal plan or, if required, a modified disposal plan.

D.2 Disposal within Right-of-Way

Do not dispose material or debris within the right-of-way, except for wood ashes.

The Contractor may burn untreated wood within the right-of-way, after obtaining the required burning permits. Conduct burning operations under the constant care of a competent caretaker in accordance with 1506.2, "Competent Individual," and in accordance with the requirements of the permit.

The Contractor may incorporate the ashes from a burning operation into the soil on the proposed backslope or dispose off the right-of-way.

D.3 Disposal outside Right-of-Way

Dispose of materials and debris, resulting from removal or demolition operations having no specific disposal provisions, outside the right-of-way.

Assume full responsibility for acceptable disposition of the material and for damages resulting from the disposal operations.

The Engineer may not give final acceptance of the work:

- (1) Unless disposal is made at a publicly controlled dumping site, or
- (2) Until the disposal areas are in acceptable condition with respect to the Contractor's obligations.

E Backfilling Depressions

Backfill depressions with material in accordance with 2105, "Excavation and Embankment."

2104.4 METHOD OF MEASUREMENT

A Area

The Engineer will measure pavements, sidewalks, surfacing, and other uniform thickness items by area without specifying the thickness.

The Engineer will classify pavement removal by kind of paving material when the material is comprised entirely of portland cement concrete (remove concrete pavement) or entirely of bituminous-aggregate mixtures (remove bituminous pavement). If the pavement is comprised of a combination of different paving materials, such as a concrete base or pavement overlaid with bituminous surfacing, the Engineer will measure the removal of the entire structure as the unclassified item of "remove pavement." Regardless of classification, the Engineer will include the removal of integral curb removed as a part of pavement removal.

The Engineer will separately measure the removal of pavement as part of the excavation of trenches for installation of drainage structures or utility items as the pay item for remove trench pavement. Remove trench pavement will include the removal of paving courses including unclassified materials.

B Length

The Engineer will measure the length along the longitudinal centerline of the structure, parallel to the base or foundation supporting the structure, and from end to end of the removed structure. The Engineer will measure pipe from center to center of junction fittings, catch basins, or manholes. The Engineer will include the length of aprons removed as shown on the plans with the pipe measurements.

The Engineer will measure sawing of concrete and bituminous pavements by length along the saw cut lines as staked by the Engineer, if included as contract items.

C Volume

The Engineer will determine the volume of concrete or masonry structures by taking measurements on the in-place structure as it is being uncovered and removed, except if otherwise established.

D Number (Complete Unit)

The Engineer will measure contract items with a contract "each" price by counting the number of individual units removed, salvaged, or abandoned, including all appurtenances.

E Lump Sum

The Engineer will measure portions of completed work.

2104.5 BASIS OF PAYMENT

The contract unit prices for *Remove*, *Salvage*, or *Abandon* includes the cost of the following:

- (1) Removing the material or portions of the material as specified by the contract,
- (2) Disposing of the materials removed,
- (3) Salvaging of parts as specified by the contract,
- (4) Backfilling depressions and other restoration work as specified by the contract,
- (5) Performing well abandonment procedures, and
- (6) Other work of a special nature as specified in the contract or imposed by laws, ordinances, and regulations.

The contract unit prices for sawing only includes sawing of concrete and bituminous pavements using a saw. Use of any other method, approved by the Engineer, at the option of the Contractor, will be at no additional cost to the Department. The Department will include the cost of sawing with other relevant contract pay items if the contract does not include a contract pay item for sawing.

The contract unit price for fence removal includes the cost of removing abandoned fences. The Department will include the cost of removal of abandoned fences with other relevant contract pay items, if the contract does not include a contract item for fence removal.

For salvage items, the Department will only pay for units removed in a condition acceptable for re-use. The Department will include the cost of the necessary removal of damaged or deteriorated units with other relevant removal contract items or as extra work in accordance with 1402, "Contract Revisions."

If the Contractor's negligence damages materials designated for salvage, the Department will deduct from any moneys due or becoming due the Contractor an amount equal to 60 percent of the current delivered price of new material of the same type and size as that damaged and equal to the quantity of material so damaged. The damaged material shall then become the property of the Contractor.

The Department will pay for the removal of the ends of old box culverts preparatory to extending the structure by the cubic yard [cubic meter] or by each unit.

The Department will pay for backfilling depressions resulting from the removal of structures as embankment construction.

The Department will pay for removing pavement and miscellaneous structures on the basis of the following schedule:

Item No.:	Item:	Unit:
2104.501	Remove*	linear foot [meter]
2104.503	Remove*	square foot [square meter]
2104.505	Remove*	[square yard]
2104.507	Remove*	cubic yard [cubic meter]
2104.509	Remove*	each
2104.510	Remove*	lump sum
2104.511	Sawing Concrete Pavement	linear foot [meter]
2104.513	Sawing Bituminous Pavement	linear foot [meter]
2104.521	Salvage*	linear foot [meter]
2104.523	Salvage*	each
2104.525	Abandon*	each

* Specify item name, such as: culvert pipe, sewer pipe, drain pipe, curb and gutter, curb, sidewalk, fence, concrete or masonry structures, railway track, manholes or catch basins, integrant curb, concrete pavement, bituminous pavement, pavement, trench pavement, guardrail, water well, etc.

2105 EXCAVATION AND EMBANKMENT

2105.1 DESCRIPTION

This work consists of excavating and placing embankment.

A Definitions

A.1 Road Core

The road core is the area below the grading grade to the bottom of the excavation and between the following:

- (1) For embankment heights no greater than 30 ft. [10 m], from the grading grade point of intersections (P.I.s) with a 1:1 (V:H) slope, and
- (2) For embankment heights greater than 30 ft. [10 m], from the grading grade point of intersections (P.I.s) with a 1:1½ (V:H) slope.

A.2 Grading Grade

Grading grade is the surface of the material immediately beneath the aggregate base; also referred to as the top of the subgrade.

A.3 Optimum Moisture Content

The optimum moisture content is determined by the Standard Proctor Density Method, One-Point Standard Proctor Density Method, or by the Estimated Optimum

Moisture Content form (EOMC) for granular materials. Each method is available in the Grading and Base Manual.

A.4 Maximum Density

Maximum density is determined by the MnDOT Modified AASHTO T99, Method C in the Grading and Base Manual.

A.5 Select Grading Material

Select grading materials are all mineral soils found in the Triaxial Chart in the Grading and Base Manual, excluding silt (Silt is defined as soils containing 80% or more silt sized particles). Marl and organic soils are also excluded.

A.6 Slope Dressing

Slope dressing is Type A or Type B horizon soils defined in the Soil Profile section of the Grading and Base Manual, and is similar to topsoil found adjacent to the project.

A.7 Non-Structural Grading Materials

Non-Structural grading materials are all mineral soils, excess slope dressing, and organic soils, capable of supporting construction equipment.

A.8 Uniform Soils

Uniform soils have the same soil class per Triaxial Chart in the Grading and Base Manual and have similar color, moisture content, and performance characteristics.

A.9 Organic Soils

Organic soils contain at least 5 percent organic content.

2105.2 MATERIALS

A Excavation Material

The Engineer will classify the excavation using the following categories:

A.1 Common Excavation

Material not classified in any other category.

A.2 Subgrade Excavation

All excavation in the road core below the grading grade, exclusive of rock, muck, channel, or rock channel excavation.

A.3 Rock Excavation

Material that requires drilling, blasting, or ripping before excavation. This includes boulders and other detached rock greater than 1 cu. yd. [1 cu. m.].

A.4 Muck Excavation

The removal of organic soils as defined in 2105.1.A.9, "Organic Soils," and other unstable soils as designated by the plan, and below the natural ground level of marshes, swamps, or bogs, regardless of the moisture content. Muck excavation is limited to areas over which the roadway embankment or a structure is to be constructed.

A.5 Channel and Pond Excavation

Material from channel changes, waterways, and ponds outside of the roadway embankment not classified as rock channel excavation.

A.6 Rock Channel Excavation

Material classified as rock excavation from channel changes and waterways outside of the roadway embankment.

B Borrow Material

Supply borrow meeting the specifications listed in Table 2105-1.

Table 2105-1 Borrow Specifications	
Material	Specification
Common Borrow	2105.1.A.5, "Select Grading Material"
Granular Borrow	3149.2.B1, "Granular Material"
Select Granular Borrow	3149.2B2, "Select Granular Material"
Topsoil Borrow	3877, "Topsoil Borrow"
Slope Dressing Borrow	2105.1.A.6, "Slope Dressing" Borrow

Materials obtained by the Contractor from sources outside the roadway excavations as defined in Section 2105.2.A, "Excavation Materials," must comply with 1601, "Source of Supply and Quality," and 1602, "Natural Material Sources."

Excess materials from within the excavation limits shown on the plans that meet the specified requirements can be used by the Contractor for borrow items shown on the plans. These excess materials must comply with 1405, "Use of Materials Found on the Project." Use all available slope dressing on the project.

C Salvage Material

Salvage material is material available on the project that is saved for a specific use under the contract or future construction.

D Stabilizing Aggregate3149.2.C

If the plans show a contract pay item for stabilizing aggregate, place stabilizing aggregate in accordance with 2211, "Aggregate Base".

2105.3 CONSTRUCTION REQUIREMENTS

A General

Perform excavation and embankment operations within the excavation limits as required by the contract.

Before beginning excavation and embankment operations, comply with the requirements of 2101, "Clearing and Grubbing."

Remove excess materials in accordance with 2104, "Removing Pavement and Miscellaneous Structures."

Maintain drainage in excavations and embankment operations at all times. Provide and maintain temporary drainage facilities until the permanent facilities are complete and operational. These requirements do not override the provisions of 1806, "Determination and Extension of Contract Time".

Salvage and stockpile material, if the contract has a pay item for salvage material.

Repair or replace settlement plates damaged by construction operations.

Protect structures during construction operations. Repair structures damaged by construction operations.

Materials containing recycled bituminous can only be placed in and above the road core, or used in base per 3138, "Aggregate for Surface and Base Courses".

B Contractor Quality Control (QC) Testing

Test according to the rates in the Schedule of Materials Control.

Test corrected areas that fail either QC or Verification Tests (VT).

B.1 Aggregate Certification

Certify granular materials on Form 24346-02 (*Certification of Aggregate and Granular Materials*) available on the Grading and Base website.

Material placed without QC tests and certifications is unauthorized work in accordance with 1512, "Unacceptable and Unauthorized Work."

Perform the following QC tests during production:

- (1) Gradation,
- (2) Crushing,
- (3) Aggregate quality, and
- (4) Bitumen and concrete content.

B.2 Moisture Control

Determine the optimum moisture content.

Test for the moisture content in areas that appear least likely to meet specifications.

Determine the moisture content during compaction using test methods listed in the Grading and Base Manual.

Meet the moisture content requirements listed in Table 2105-2.

Table 2105-2 Moisture Content Requirements	
Minimum Compaction Requirements	Relative Moisture Content *
100 % of maximum density	65 % – 102 %
95 % of maximum density	65 % – 115 %
Quality Compaction	65 % – 102 %
Granular Penetration Index Method	≥ 65 %
<p>* Relative Moisture Content = $\left(\frac{\text{Moisture Content}}{\text{Optimum Moisture Content}} \right) \times 100$</p>	

Correct for moisture in areas represented by failing moisture tests before testing the compaction. Compaction tests taken in areas represented by failing moisture tests are not valid.

C Preparation of Embankment Foundation

Construct steps, before placing embankment material, at a minimum width of 12 in [300 mm] when slopes are steeper than 1:4 (V:H).

Ensure the foundation area drains freely, when using non-granular embankment materials.

Compact the bottom of the excavation according to Table 2105-3.

**Table 2105-3
Required Compaction for Bottom of Excavation**

Excavation Depth Below Grading Grade *	Estimated Relative Moisture Content 	Required Compaction
≤ 30 in [750 mm]	–	Compact to 95% of maximum density
≥ 30 in [750 mm]	65% to 115%	Compact with 4 passes of a compactor †
	≤ 65% or ≥ 115%	Corrective action for moisture content. The estimate relative moisture content should be from 65 to 115%.
*: Excavation below the planned subgrade may be subject to 1403, “Notification for Contract Revisions” : An estimated value for the optimum moisture content may be used instead of determining this value using the methods listed under 2105.1 A.3 †: Compactor must meet the requirements of 2123 “Equipment Rental”; the Engineer may waive this requirement, if subgrade will not support compaction equipment.		

Remove surfacing and excavate an existing road core in accordance with 2112, “Subgrade Preparation,” or as required by the contract before placing embankments.

D Excavating Operations

Obtain the Engineer’s written approval before excavating beyond the limits and elevations established by the contract.

Remove rock outcroppings from within the slope lines and to the elevations shown on the plans. Remove loosened rock from the backslopes. Provide drainage for the shoulder slopes. Do not leave undrainable depressions.

Presplit rock back slopes steeper than 1:1 (V:H). Control blasting operations to eliminate flying rock or debris.

E Placing Embankment Materials

Place embankments in uniform lifts, parallel to the profile grade, over the full width of the roadway. Construct each lift of material using uniform soil.

Protect structures during placement of embankments.

Use granular materials from the excavation in the uppermost portion of the roadway embankment, if it does not significantly change normal grading operations.

Excavate, stockpile, and place slope dressing as required by the contract.

Obtain written permission from the Engineer before removing slope dressing or granular material from the project.

Embankment materials placed on the road core may not increase the moisture content of the underlying material beyond the specified limits.

Non-granular materials placed above granular material must be at least 3 ft. [1 m.] thick.

Limit lift thickness by the capability of the equipment to uniformly blend and compact the entire layer in accordance with the following:

- (1) The Engineer will restrict lift thickness to no greater than 12 in [300 mm] (loose thickness) when uniform results are not achieved.
- (2) The Engineer may allow thicker lifts over saturated foundation soils. The top of the thicker lift must be at least 3 ft. [1 m] below the grading grade.

Uniformly blend the entire thickness of each lift before testing moisture content and compaction. Disc soils with greater than 20 percent passing the No. 200 [75 µm] sieve.

Stagger construction traffic uniformly over the full width of the roadway embankment.

Remove snow, ice, and frozen soils from road core before placing embankment.

Use embankment material in the road core with particle sizes no larger than specified in Table 2105-4:

Table 2105-4		
Maximum Particle Size in Road Core		
Depth from Grading Grade	Maximum Particle Size	
	Inches	[mm]
< 12 in [300 mm]	3	[75]
1 ft. – 3 ft. [300 mm – 900 mm]	6	[150]
3 ft. – 6 ft. [900 mm – 1,800 mm]	12	[300]
> 6 ft. [1,800 mm]	24	[600]
≤ 2 ft. [600 mm] of a structure	3	[75]
Areas where piling is to be placed	6	[150]

Remove surcharges as directed by the contract.

Install settlement plates, if required by the contract. Do not disturb settlement plates.

F Compacting Embankments

Maintain moisture content during compaction per Table 2105-2.

Correct the moisture in areas represented by failing tests before testing the compaction.

Compaction tests taken in areas represented by failing moisture tests are not valid

Uniformly compact each lift of the road core in accordance with the Specified Density Method, unless specified differently in the contract.

Compact all roadway embankment outside of the road core from approximately 80 to 85 percent of the Maximum Density.

Compact the entire length and width of each lift with a roller. Construction traffic does not replace the rolling requirement.

Compaction requirements on swamp backfills start when the road core embankment is 4 ft. [1,200 mm] above the water elevation at the time of construction operations.

The Engineer may waive mechanical compaction requirements on embankment containing predominately rock, slope dressing, or when subgrade is not capable of supporting compaction equipment.

Compact soils around structures with specialized equipment or hand methods, to prevent damage to adjacent structures,.

Correct or replace materials in areas represented by a failing test.

Compaction must comply with one of the following requirements:

F.1 Specified Density Method

Compact according to Table 2105-5, if using Specified Density.

Table 2105-5 Specified Density Requirements	
Embankment Location	Required Compaction (Relative Density) *
≤ 3ft (1 m) Below Grading Grade of Road Core	100%
≤ 3ft (1 m) of Structures	100%
Within the Horizontal Distance Equal to the Full Height of the Walls and Abutments	100%
Remaining embankment in the road core	95%
*: Percent of maximum density.	

F.2 Quality Compaction Method

Compact each lift until there is no further evidence of consolidation using rollers in accordance with 2123, "Equipment Rental."

F.3 Granular Penetration Index Method

Compact each lift to achieve a dynamic cone penetration (DCP) index value and a seating value as per Table 2105-6.

Table 2105-6 Maximum Allowable Penetration for DCP				
Grading Number *	Moisture Content 	Maximum Allowable Seat, mm †	Maximum Allowable DPI, ‡ mm/blow ‡	Test Lift, inches
3.1–3.5	<5.0	40	10	4–6
	5.0–8.0	40	12	
	>8.0	40	16	
3.6–4.0	<5.0	40	10	4–6
	5.0–8.0	45	15	
	>8.0	55	19	
4.1–4.5	<5.0	50	13	5–6
	5.0–8.0	60	17	
	>8.0	70	21	
4.6–5.0	<5.0	65	15	6–12
	5.0–8.0	75	19	
	>8.0	85	23	
5.1–5.5	<5.0	85	17	7–12
	5.0–8.0	95	21	
	>8.0	105	25	
5.6–6.0	<5.0	100	19	8–12
	5.0–8.0	115	24	
	>8.0	125	28	

* Grading Number (GN) is the sum of the percent passing these sieves divided by 100: GN = % Passing (1 in + ¾ in + 3/8 in + No. 4 + No. 10 + No. 40 + No. 200)/100
 || Percent of dry weight.
 † Total of two blows.
 ‡ Average of each set of three subsequent blows, following seating blows. For example, average of blows 3 - 5, 6 - 8, 9 - 11, etc.

G Agency Verification Testing (VT)

The Department will perform VT testing at the testing rates as specified in the Schedule of Materials Control.

G.1 Material Testing

Perform the following VT tests during placement:

- (1) Gradation,
- (2) Crushing,
- (3) Aggregate Quality, and

(4) Bitumen and concrete content.

Sample the granular materials from the road core after spreading and before compaction. However, when layer thickness is 3 inches [75 mm] or less, sample prior to placement.

Select samples from locations that are at risk of not meeting the specification requirements.

G.2 Compaction Testing

The compaction test procedures are in the Grading and Base Manual.

Test for compaction in areas with the greatest rutting or deflection, and near structures.

Correct any area represented by a failing test.

Test corrected materials in areas with the greatest rutting or deflection.

The Engineer may perform any compaction tests listed in the Grading and Base Manual; however use the Specified Density Method only for virgin materials.

H Finishing Operations

Shape and maintain the roadway core to the required grade and cross section and within the tolerance in accordance with 2112.3.F, "Tolerances."

Perform earthwork finishing and slope dressing operations concurrently to allow timely completion of erosion control items. Scarify the surface to a minimum depth of 3 in [75 mm] before placing slope dressing. If the contract contains a contract item for subsoil tillage, perform subsoil tillage in accordance with 2574, "Soil Preparation," before placing slope dressing on compacted areas.

Remove all particles exceeding 3 in [75 mm] in the slope dressing or topsoil surface. The removal of preexisting oversized particles is subject to 1403, "Notification for Contract Revisions".

Complete turf establishment and erosion control after placing the slope dressing, as required by 2575, "Establishing Turf and Controlling Erosion."

2105.4 METHOD OF MEASUREMENT

A Excavation Material

The Engineer will measure and calculate excavated material quantities according to 1901, "Measurement of Quantities".

The Engineer will investigate disputed quantities and may adjust quantities based on excavation and embankment measurements taken during construction and after completion, in accordance with 1901, "Measurement of Quantities".

Quantities are limited to measurements within specified construction limits and variances authorized by the Engineer.

The Engineer will measure and calculate excavated quantities by excavated volume.

The Engineer will take measurements to determine the limits of material classifications during excavation.

A.1 Rock Excavation

The Engineer will include the following in the measurement for rock excavation:

- (1) Overbreakage if the plane of the bottom of the excavation falls within a layer or stratum of rock,
- (2) 6 in [150 mm] overbreak allowance outside the grading section or as indicated in the plans, and
- (3) 24 in [600 mm] measured horizontally, overbreak allowance outside the backslopes for hard rock types.

The Engineer will not provide an allowance for overbreak of pre-split backslopes.

B Borrow Material

The Engineer will measure borrow material quantities by volume in accordance with 1901, "Measurement of Quantities."

The Engineer will deduct borrow causing waste of planned excavation material from the borrow measurements.

The Engineer will deduct material placed in excess of the contract quantities from the borrow contract items.

C Salvage Material

The Engineer will measure salvage quantities by either loose volume (LV) or stockpile volume (SV).

D Stabilizing Aggregate

The Engineer will measure stabilizing aggregate quantities by compacted volume (CV) as provided and placed on the subgrade in accordance with 1901, "Measurement of Quantities."

2105.5 BASIS OF PAYMENT

A Stabilizing Aggregate

The contract cubic yard [cubic meter] price for *Stabilizing Aggregate* includes the cost of production, testing, and placement.

B Salvage Materials

The contract unit price for salvage materials placed in stockpiles includes the cost of production, testing, delivery, and stockpiling at the site. The contract unit price for salvage materials from stockpiles includes all costs to use this material in the new construction.

C Borrow Materials

The contract unit price for borrow materials includes the cost of source preparation, excavation, testing, and final finishing.

Payment for necessary site preparation from required sources will be compensated separately or as 1403, "Notification for Contract Revisions".

The Department will pay the contract unit prices of both the excavation and borrow contract item for excess material used as a borrow item.

D Excavated Materials

The contract unit price for excavated materials includes the cost of excavation, testing, final placement, construction of steps in existing slopes, and disposal.

All work necessary to construct steps in existing slopes is included in the pay item.

If the plans do not include a contract pay item for removal and disposal of debris, the Department will pay for these in accordance with 1402, "Contract Revisions."

D.1 Channel Excavation

The Department will pay an additional \$1.00 per cubic yard [\$1.30 per cubic meter] when the Engineer reclassifies *Common Excavation* to *Channel Excavation*.

D.2 Rock Excavation

The Department will pay an additional \$20.00 per cubic yard [\$26.00 per cubic meter] when the Engineer reclassifies *Common Excavation*, *Subgrade*, or *Channel Excavation* to *Rock Excavation*. The Department can only apply this price adjustment if the contract does not contain *Rock Excavation* and cannot exceed 250 cu. yd. [200 cu. m].

D.3 Rock Channel Excavation

The Department will pay an additional \$100.00 per cubic yard [\$130.00 per cubic meter] when the Engineer reclassifies *Channel Excavation* to *Rock Channel Excavation*. The Department can only apply this price adjustment if the contract does not contain *Rock Channel Excavation* and cannot exceed 25 cu. yd. [20 cu. m].

D.4 Muck Excavation

The Department will not increase payment for muck excavation deeper than the depth shown on the plans, except as listed in Table 2105-7.

Table 2105-7	
Price Adjustments for Additional Muck Excavation	
Depth below natural surface	Compensation
0 ft.–15 ft. [0 m–5 m]	<i>Muck Excavation</i> Contract Unit Price
>15 ft.–20 ft. [>5 m–7 m]	<i>Muck Excavation</i> Contract Unit Price plus \$0.30 per cubic yard [\$0.39 per cubic meter]
>20 ft.–25 ft. [>7 m–9 m]	<i>Muck Excavation</i> Contract Unit Price plus \$0.50 per cubic yard [\$0.64 per cubic meter]
>25 ft. [>9 m]	Negotiated Price
NOTE: These price adjustments are payment in full for all additional costs incurred. Exception: Compensation for additional Muck Excavation may be subject to the provisions of 1402, “Contract Revisions”.	

E (Blank)

F (Blank)

GPartial Payment Withholdings

Comply with the payment withholding requirements of 2575, “Establishing Turf and Controlling Erosion.”

H Topsoil Borrow

The Department will pay for topsoil borrow in accordance with 2575, “Establishing Turf and Controlling Erosion”.

I Water

The Department will include the cost of water used for compaction with the relevant embankment and excavation contract items.

J Contract Item Schedule

The Department will pay for excavation and embankment on the basis of the following schedule:

Item No.:	Item:	Unit:
2105.501	Common Excavation	cubic yard [cubic meter]
2105.503	Rock Excavation	cubic yard [cubic meter]
2105.505	Muck Excavation	cubic yard [cubic meter]
2105.507	Subgrade Excavation	cubic yard [cubic meter]
2105.511	Channel and Pond Excavation	cubic yard [cubic meter]
2105.513	Rock Channel Excavation	cubic yard [cubic meter]
2105.521	Granular Borrow	cubic yard [cubic meter]
2105.522	Select Granular Borrow	cubic yard [cubic meter]
2105.523	Common Borrow	cubic yard [cubic meter]
2105.533	Salvage Aggregate	cubic yard [cubic meter]
2105.535	Salvaged Slope Dressing	cubic yard [cubic meter]
2105.541	Stabilizing Aggregate	cubic yard [cubic meter]

2111 TEST ROLLING

2111.1 DESCRIPTION

This work consists of providing and operating equipment to test roll roadway embankments. Use the test procedures in the Grading and Base Manual.

2111.2 EQUIPMENT

Provide a test roller meeting the following requirements:

A Pneumatic Tires

- (1) Two pneumatic tires spaced at least 6 ft [1.8 m] apart, center to center,
- (2) Tire sizes of 18 × 24 or 18 × 25, and
- (3) Inflate tires to 95 psi [650 kPa].

B Load

Ensure a mass load on each tire from 14.9 ton to 15.1 ton [13.5 metric ton to 13.7 metric ton].

Position the roller tongue parallel to the grade at the time of testing.

C Deflection Measurement

Measure deflection from the top of the unrolled embankment to bottom of the rut at the time of rolling.

Mark failing areas with an approved deflection measurement device mounted over the center of the loaded axel and offset 12 inches [300 mm] from the outside edge of each tire. The Engineer may allow alternate deflection recording devices.

2111.3 CONSTRUCTION REQUIREMENTS

Construct the embankment surface to the design cross section and profile as per 2112, "Subgrade Preparation."

After test rolling, maintain the surface per 2112, "Subgrade Preparation" until placement of the next layer.

Test roll the entire length and width of embankment from shoulder point of intersection to shoulder point of intersection.

A Testing Requirements

Make two passes over each strip covered by the tire width at an operating speed from 2.5 mph to 5 mph [4 km/h to 8 km/h].

Ensure that unrolled areas between each strip are no greater than 12 in [300 mm].

Prior to testing, protect all structures from damage caused by the test roller.

B Acceptance Requirements

Meet the applicable requirement .

- (1) Deflection no greater than 3 in [75 mm] for granular subgrades that will be covered by stabilizing aggregate, or
- (2) Deflection no greater than 2 in [50mm] for all other materials.

C Testing Corrected Areas

Repeat testing after all failing areas have been repaired.

The Engineer may waive repeat testing on corrected areas less than 2 road stations [50 m].

2111.4 METHOD OF MEASUREMENT

The Engineer will measure test rolling by length for the entire width, when it is listed as a contract item in the contract.

The Engineer will separately measure test rolling on each roadbed for divided highways.

2111.5 BASIS OF PAYMENT

Test rolling on embankment constructed under this contract is incidental to the embankment contract item, unless it is listed as a separate contract item.

The Department will pay for all repairs to failing sections constructed under a previous contract in accordance with 1402, "Contract Revisions."

The Department will pay for test rolling embankment constructed under a previous contract based on the following schedule:

Item No.:	Item:	Unit:
2111.501	Test Rolling	road station [meter]

2112 SUBGRADE PREPARATION

2112.1 DESCRIPTION

This work consists of shaping, mixing, and compacting the subgrade before placing the next layer.

2112.2 MATERIALS — (BLANK)

2112.3 CONSTRUCTION REQUIREMENTS

A General

Scarify, mix, and compact the top 6 in [150 mm] of the subgrade. Correct areas represented by failing tests,

B Contractor QC Testing

Perform Contractor QC testing in accordance with the testing rates listed in the Schedule of Materials Control.

B.1 (Blank)

B.2 Moisture Control During Placement

Determine the moisture content during compaction using test methods described in the Grading and Base Manual.

Provide daily QC testing results for the moisture content to the Engineer.

Keep the moisture content during compaction between 65 percent and 102 percent of optimum moisture.

C Density

Maintain the density per the Specified Density Method in 2105, "Excavation and Embankment", until placement of the next Lift.

D Agency Verification Testing (VT)

Refer to the testing rates listed in the Schedule of Materials Control. . The Engineer will test for compaction in areas with the greatest rutting of deflection. Retest failing areas after correction.

E Tolerances

Finish the surface of each layer within 0.05 ft [15 mm] above to 0.10 ft. [30 mm] below the cross section shown on the plans before placing the next layer.

2112.4 METHOD OF MEASUREMENT

The Engineer will measure subgrade preparation by length, along the centerline of the embankment. The Engineer will separately measure work on each embankment on divided highways.

2112.5 BASIS OF PAYMENT

The contract road station [meter] price for *Subgrade Preparation* includes all costs of subgrade preparation on embankment constructed as required by this contract.

The Department will pay for the correction of unstable conditions below the top 6 in [150 mm] of subgrade not constructed by this contract in accordance with 1402, "Contract Revisions."

Areas not represented by passing QC tests are unacceptable work per 1512, "Unacceptable and Unauthorized Work."

The Department will pay for subgrade preparation on the basis of the following schedule:

Item No.:	Item:	Unit:
2112.501	Subgrade Preparation	road station [meter]

2118 SURFACE AGGREGATE

2118.1 DESCRIPTION

This work consists of placing an aggregate wearing course on the roadway and shoulders.

2118.2 MATERIALS

A Aggregate 3138

Provide the class of aggregate as required by the contract.

2118.3 CONSTRUCTION REQUIREMENTS

Construct surface aggregate in accordance with 2211, "Aggregate Base." Use the Quality Compaction Method specified in 2211, "Aggregate Base". Do not substitute surface aggregate for base or shoulder aggregate. Maintain the moisture content at or above 5 percent by dry weight during compaction.

A Contractor Quality Control (QC) Testing

Comply with the QC requirements of the Schedule of Materials Control.

B Agency Verification Testing (VT)

Comply with the verification requirements in 2211, "Aggregate Base".

2118.4 METHOD OF MEASUREMENT

The Engineer will measure the surface aggregate in accordance with 1901, "Measurement of Quantities." The Engineer will not make deductions for the mass or volume of water and admixtures.

2118.5 BASIS OF PAYMENT

The Engineer may allow the Contractor to accept a price reduction in lieu of correcting failing material in accordance with Table 2211-4, Table 2211-5, and Table 2211-6. If the failing materials fall within the "Corrective Action" section of the tables, the Engineer, in conjunction with the Grading and Base Engineer, may issue a price reduction.

The Department will pay for surface aggregate on the basis of the following schedule:

Item No.:	Item:	Unit:
2118.501	Surface Aggregate, Class ____	ton [metric ton]
2118.502	Surface Aggregate (LV), Class ____	cubic yard [cubic meter]

2123 EQUIPMENT RENTAL

2123.1 DESCRIPTION

This work consists of providing laborers and operating equipment for work required by the contract, directed by the Engineer, and paid by the Department.

2123.2 GENERAL REQUIREMENTS

Provide equipment as approved by the Engineer.

Provide equipment with rubber tires or smooth street plates when operating on bituminous or concrete surfaces.

Provide towing equipment with sufficient power to tow equipment required by the contract and not damage the work.

2123.3 SPECIFIC REQUIREMENTS

Provide rental equipment in accordance with the following specific requirements regarding type, size, capacity, power, or dimensions.

A Motor Grader

Provide a self-propelled motor grader with the following characteristics:

- (1) Pneumatic-tired wheels,
- (2) Power-assisted controls
- (3) A mass of at least 19,000 lb [8,600 kg],
- (4) Moldboard at least 12 ft [3.6 m] long with a suitable cutting edge, and
- (5) A suitable scarifier.

B Dozer

Provide a crawler-type tractor with at least 75 hp [56 kw] at the tow bar and power assisted controls, equipped with an angle or fixed dozer blade at least 90 in [2.3 m] wide. When providing an angle blade, ensure that the blade will adjust to an angle of 90 degrees with the direction of travel of the tractor.

The Department will consider the dozer blade and tractor as a single unit.

C Scraper

Provide scrapers meeting the following characteristics:

- (1) Carryall type scrapers mounted on pneumatic-tired wheels, or
- (2) Rotary type scrapers towed by a tractor of suitable size, and

- (3) Having a volumetric capacity as required by the contract that shall correspond with the manufacturer's rated heaped capacity.

D Dragline

Provide a full-revolving type dragline equipped with a bucket of at least the size required by the contract.

Provide 1 cu. yd [0.75 cu. m] draglines with at least a 45 ft [13.7 m] boom and a working radius of at least 35 ft [10.6 m].

Provide 2½ cu. yd [1.9 cu. m] draglines with at least an 80 ft [24.3 m] boom and a working radius of at least 60 ft [18.2 m].

Provide draglines in other sizes with the boom length and working radius as required by the contract.

For swamp work, provide one set of mats for each dragline. Provide mats each with a length at least equal to twice the distance between the outside edges of the crawler treads. Ensure the combined width of all the mats equals at least twice the bearing length of the crawler treads.

E Power Shovel

Provide a full-revolving, crawler-type power shovel with a bucket in the size recommended by the manufacturer. Provide the shovel in the size required by the contract in accordance with the bucket capacity.

F Tractor

Provide a crawler type tractor with the power at the draw-bar as required by the contract. Measure the power in horsepower [kilowatts].

G Pneumatic-Tired Roller

Provide pneumatic-tired rollers meeting the following characteristics:

- (1) Compacting width of at least 5 ft [1.5 m],
- (2) Constructed to allow the gross mass to vary, as directed by the Engineer, from 100 lb per in to 250 lb per in [1,700 kg per m to 4,400 kg per m] of rolling width,
- (3) Tires arranged to obtain compaction over the full compacting width with each pass of the roller, and
- (4) Self-propelled or provided with suitable tractive equipment, unless otherwise required by the contract.

If a single tractive unit propels more than one roller, the Engineer will count the combination as a single roller unit.

H Tamping Roller

Provide a tamping roller meeting the following characteristics:

- (1) Consists of two sections, each with a drum at least 48 in [1.2 m] in diameter; and
- (2) A gross mass and number of pads as approved by the Engineer.

I (Blank)

J Steel-Wheeled Roller

Provide a self-propelled steel-wheeled roller meeting the following characteristics:

- (1) A total mass of at least 8 tons [7.3 tonnes] unless otherwise required by the contract,
- (2) Capable of reversing without backlash,
- (3) Equipped with spray attachments for moistening rolls on both the front and back, and
- (4) Either tandem type or three-wheeled type, unless otherwise required by the contract.

If using vibratory rollers, use rollers that produce 250 lb per in [45 kN per m] of width.

K Truck

Provide a truck meeting the following characteristics:

- (1) A manufacturer's rated capacity of at least 1.5 ton [1.3 metric ton],
- (2) A volumetric capacity of at least 5 cubic yards [3.6 cubic meters],
- (3) A power-operated hoist,
- (4) A end dump type metal dump box, and
- (5) A rear axle equipped with dual wheels and tires at least 8 in [200 mm] wide in accordance with the manufacturer's designated size.

L Rotary Tiller

Provide a rotary tiller at least 54 in [1,370 mm] wide and adjustable to depths up to 9 in [225 mm].

M Front End Loader

Provide a crawler type or rubber-tired front end loader meeting the following characteristics:

- (1) Equipped with a power-operated loader bucket with the minimum struck capacity required by the contract,
- (2) Capable of excavating at least 10 in [250 mm] deep below the bottom of the treads or tires, and
- (3) Capable of loading the excavated material on the trucks used for hauling.

N Disk Harrow

Provide a disk harrow of sufficient size and mass to manipulate the soils to 12 in [300 mm] deep as approved by the Engineer.

2123.4 METHOD OF MEASUREMENT

A Equipment Hours

The Engineer will measure rental of each unit of equipment by the number of hours of actual working time and necessary traveling time within the project.

B Common Laborer Hire

The Engineer will measure common laborer hire by the hours of actual working time and necessary traveling time within the project.

2123.5 BASIS OF PAYMENT

The contract price per hour for equipment rental includes the cost of the use and operation of equipment, the operators and any tractive equipment and required accessories. The contract price per hour is subject to the requirements of this section for additional compensation if the Contractor is obligated to pay overtime wages for work performed on Sundays, holidays, or during overtime periods.

The contract price per hour for *Common Laborers* includes the cost of hand tools used by laborers. The contract price per hour is subject to the requirements of this section for additional compensation if the Contractor is obligated to pay overtime wages for work on Sundays, holidays, or during overtime periods.

The Department will only compensate the Contractor in addition to the Contract price per hour for equipment rental or common laborer hire for work performed during overtime periods or on Sundays or holidays if the work is directed by the Engineer. If the Engineer directs the use of equipment or common laborers during overtime periods or on Sundays or holidays, the Department will pay the Contractor only the increased wages that the Contractor is obligated to pay under the terms of wage agreements. The Department will pay the increased wages to the Contractor by increasing the contract price per hour for the equipment or common laborers used by an amount equal to the difference between the normal hourly wage for straight time

work and the overtime hourly wage actually paid the laborers for operating the equipment or performing the labor, based on the Contractor's payroll.

The contract price per hour for equipment rental includes the cost of supervision by the Contractor necessary to accomplish the work, as directed by the Engineer.

The Department will provide payment for equipment rental on the basis of the following schedule:

Item No.:	Item:	Unit:
2123.501	Common Laborers	hour
2123.503	Motor Grader	hour
2123.506	___ cubic yard [cubic meter] Dragline	hour
2123.507	___ cubic yard [cubic meter] Shovel	hour
2123.508	___ cubic yard [cubic meter] Scraper	hour
2123.509	Dozer	hour
2123.510	___ cubic yard [cubic meter] Truck	hour
2123.511	___ horsepower [kilowatt] Tractor	hour
2123.512	Rotary Tiller	hour
2123.513	Disk Harrow	hour
2123.514	___ cubic yard [cubic meter] Front End Loader	hour
2123.521	Pneumatic-Tired Roller	hour
2123.522	Pneumatic-Tired Roller (Tractor Drawn)	hour
2123.523	Pneumatic-Tired Roller (Self Propelled)	hour
2123.524	Tamping Roller	hour
2123.525	___ ton [metric ton] Steel-Wheeled Roller	hour

2130 APPLICATION OF WATER FOR DUST CONTROL

2130.1 DESCRIPTION

This work consists of providing and applying water to control dust created by the traveling public within the project as directed by the Engineer.

2130.2 MATERIALS

Provide reasonably clean water.

2130.3 CONSTRUCTION REQUIREMENTS

Use a water supply and equipment capable of applying the quantity of water required to abate dust and avoid unwarranted loss of water through evaporation,

absorption, or drainage. Apply the water at the time and in the quantity approved by the Engineer.

2130.4 METHOD OF MEASUREMENT

The Engineer will measure water for payment by volume. The Engineer may deduct payment for water wasted if the Contractor fails to coordinate the water application with other operations as directed by the Engineer.

2130.5 BASIS OF PAYMENT

The contract unit price for *Water* includes the cost of providing, transporting, and applying the water as directed by the Engineer. The Department will only pay for water applied for dust control for the project as approved by the Engineer.

The Department considers the cost of water used for the following as included in the contract unit prices for the relevant contract pay items:

- (1) Water used for sprinkling,
- (2) Water used in the construction of concrete pavements,
- (3) Water used in the production or curing of concrete,
- (4) Water used to maintain plant life,
- (5) Water used in compacting soil and aggregate, and
- (6) Water used for dust control on Contractor-selected haul roads, detours, or work sites outside of the project, and
- (7) Water applied for dust control or pavement cleaning caused by the Contractor's equipment and operations, including abatement of nuisance dust for adjacent landowners and dust conditions detrimental to the safety of the traveling public, as directed by the Engineer.

The Department will pay for water applied to aggregate surfaces for dust control caused by the traveling public on portions of the project open to traffic as directed or approved by the Engineer at a unit price of \$20 per 1,000 gal [\$5.45 per cu. m] in the absence of the Contract Pay Item 2130.501.

The Department will pay for application of water for dust control on the basis of the following schedule:

Item No.:	Item:	Unit:
2130.501	Water	MGal [cubic meter]

2131 APPLICATION OF CALCIUM CHLORIDE

2131.1 DESCRIPTION

This work consists of applying calcium chloride as a surface treatment or as an admixture while grading or placing aggregate base or surface courses.

2131.2 MATERIALS

A Calcium Chloride 3911

B Water

Provide water meeting the water quality rules established by the State of Minnesota.

2131.3 CONSTRUCTION REQUIREMENTS

A Surface Application

Applying a uniform layer of dry or liquid following the rates listed in the Grading and Base Manual.

B Admixture Application

Use one of the following calcium chloride application methods:

- (1) Mix the calcium chloride with the aggregate during aggregate production. Use a separate conveyor or metering device to add calcium chloride to the aggregate.
- (2) Apply dry calcium chloride as a surface application and mix with the specified layer.
- (3) Apply calcium chloride solution as a surface application.

2131.4 METHOD OF MEASUREMENT

The Engineer will measure dry calcium chloride by weight and calcium chloride solutions by volume..

2131.5 BASIS OF PAYMENT

The Department will pay for the application of water used with dry calcium chloride in accordance with 2130, "Application of Water for Dust Control."

The Department will pay for the application of calcium chloride on the basis of the following schedule:

Item No.:	Item:	Unit:
2131.501	Calcium Chloride, Type ____	ton [metric ton]
2131.502	Calcium Chloride Solution	gallon [cubic meter]